COUNTY OF SAN JOAQUIN

PROJECT MANUAL
ENVIRONMENTAL HEALTH BUILDING
TENANT IMPROVEMENTS PROJECT
1868 E. HAZELTON AVE., STOCKTON, CA

Owner
San Joaquin County Board of Supervisors
44 N. San Joaquin Street, Suite 627
Stockton, CA  95202

Project Manager
General Services - Capital Projects
44 N. San Joaquin, Suite 590
Stockton, CA  95202
David Castagna, 209-468-9598
dcastagna@sjgov.org

Architect/Engineer
Siegfried Engineering
3244 Brookside Road, Ste. 100
Stockton, CA  95219
Anthony J. Lopes, 209-943-2021
ajlopes@siegfriedeng.com
CERTIFICATION PAGE

ARCHITECTURAL
I hereby certify that the plans and specifications for Architectural Work were prepared
By me or under my direct supervision and that I am a duly Licensed Architect under the
Laws of the State of California.

MECHANICAL
I hereby certify that the plans and specifications for Mechanical Work were prepared
By me or under my direct supervision and that I am a duly Licensed Professional
Engineer under the Laws of the State of California.

ELECTRICAL
I hereby certify that the plans and specifications for Electrical Work were prepared
By me or under my direct supervision and that I am a duly Licensed Professional
Engineer under the Laws of the State of California.
CIVIL
I hereby certify that the plans and specifications for Civil Engineering Work were prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the Laws of the State of California.
# TABLE OF CONTENTS

## A. Front End Documents

1. Notice Inviting Bids
2. Instructions to Bidders
3. Bid Form
4. Bidder Local Hire Information Form and Checklist
5. Certification of Drug-Free Workplace
6. Non-collusion Affidavit
7. General Construction Contract Form
8. Payment Bond Form
9. Performance Bond Form

## B. General Conditions

## C. Division 1 Specifications

## D. Technical Specifications

**DIVISION 2 SITE CONSTRUCTION**  
02 41 19  Selective Demolition

**DIVISION 3 CONCRETE**  
03 30 00  Cast in Place Concrete

**DIVISION 6 WOOD AND PLASTICS**  
06 10 00  Rough Carpentry  
06 20 00  Finish Carpentry

**DIVISION 7 THERMAL AND MOISTURE PROTECTION**  
07 21 00  Thermal Insulation  
07 92 00  Joint Sealants

**DIVISION 8 DOORS AND WINDOWS**  
08 14 16  Door Frames  
05 53 13  Vinyl Windows  
08 53 23  Fiberglass Windows  
08 71 00  Door Hardware  
08 80 00  Glazing

**DIVISION 9 FINISHES**  
09 29 00  Gypsum Board  
09 30 00  Tiling
09 51 13  Suspended Acoustical Ceilings
09 65 13  Resilient Base and Accessories
09 65 19  Resilient Tile Flooring
09 68 13  Tile Carpeting
09 91 00  Painting Kelly More Cal Green

**DIVISION 10 SPECIALTIES**
10 14 00  Signage
10 28 00  Toilet Accessories
10 44 13  Fire Extinguishers and Cabinets

**DIVISION 12 FURNISHINGS**
12 21 16  SP Vertical Louver Blinds
12 24 13  Roller Window Shades

**DIVISION 22 PLUMBING**
22 00 50  Basic Plumbing
22 10 00  Plumbing Piping Systems
22 40 00  Plumbing Fixtures
22 50 00  Plumbing Equipment

**DIVISION 23 HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)**
23 00 50  Basic HVAC Materials and Methods
23 05 16  Expansion Fittings and Loops for HVAC Piping
23 05 29  Hangers and Supports for HVAC Piping and Equipment
23 05 48  Vibration and Seismic Controls for HVAC Piping and Equipment
23 05 53  Identification for HVAC Piping and Equipment
23 07 19  HVAC Piping Insulation
23 21 13  Hydronic Piping
23 21 23  Hydronic Pumps
23 51 00  Breechings, Chimneys, and Stacks
23 52 33  Water-Tube Boilers
23 73 13  Custom Variable Air Volume Air Handlers
23 80 00  Heating, Ventilating, and Air Conditioning

**DIVISION 25 INTEGRATED AUTOMATION**
25 05 50  Temperature Control System

**DIVISION 26 ELECTRICAL**
26 05 00  Common Work Results for Electrical
26 05 19  Low Voltage Electrical Power Conductors and Cables
26 05 26  Grounding and Bonding for Electrical Systems
26 05 33  Raceways and Boxes for Electrical Systems
26 24 16  PanelBoards
Wiring Devices
Exterior Lighting
Interior Lighting

DIVISION 27 COMMUNICATIONS
Communication

DIVISION 31 EARTHWORK
Excavating Filling Compacting and Grading

DIVISION 32 EXTERIOR IMPROVEMENTS
Site Clearing and Demolition
Asphalt Paving
NOTICE INVITING BIDS

NOTICE IS HEREBY GIVEN that sealed bids will be received by the Board of Supervisors of the County of San Joaquin, State of California, at the General Services - Capital Projects, Administration Building, 44 N. San Joaquin Street, Suite 590, Stockton, CA 95202, until 10:00 AM, October 28, 2011, for furnishing all labor, material, tax, transportation, equipment, and services necessary for the construction and completion of the Environmental Health Building Tenant Improvements Project, all in accordance with the specifications and working details and other contract documents now on file with the Clerk of the Board of Supervisors, Suite 627, Administration Building, located as noted above.

NOTICE IS GIVEN that a mandatory prebid conference for all bidders is tentatively scheduled for Monday, October 17, 2011, at 10:00 AM at 1868 E. Hazelton Avenue, Stockton, CA 95207. Bids will not be accepted from any contractor not attending this prebid conference.

Bids will be opened and tabulated by or on behalf of said Board at General Services - Capital Projects immediately after 10:00 AM, on said October 28, 2011.

Bids must be from contractors holding a State of California B-General Building Contractor license. Bids must be sealed and accompanied by certified check, cashier's check, or bid bond made payable to the County of San Joaquin in the sum of not less than ten percent (10%) of the amount of the bid. The check or bonds shall be given as a guarantee that the successful bidder will enter into a written contract within ten (10) calendar days after being requested to do so and will be considered as the stipulated amount of liquidated damages in the event the bidder is unable to or refuses to execute a contract for the work.

The general prevailing wage rates have been determined by the Director of the California Department of Industrial Relations and it shall be mandatory upon the contractor to whom the contract is awarded, and upon any subcontractor, to pay not less than these specified rates to all laborers, workmen, mechanics and apprentices employed by them in execution of the contract, all in accordance with the provisions of Labor Code Sections 1770 through 1781, inclusive. Copies of the general prevailing wage rates are on file with and available upon request from the Clerk of the Board of Supervisors.

San Joaquin County has adopted a goal to strongly encourage local hire participation in the construction workforce in accordance with Board of Supervisors policy.

a. Contracts estimated by the County to be less than $200,000 do not have a local hire goal.

b. Contracts estimated by the County to cost $200,000 or more require the successful bidder to demonstrate their attempts to employ local hire.

Bids shall be made upon the form provided by the County and shall be properly completed with all items filled out; numbers shall be in writing and figures; the signatures of all persons signing shall be in longhand. No bidder may withdraw his bid for a period of 60 calendar days after the time set for the opening of bids, and the Board will act to accept or reject bids within that period of time.

Upon the contractor's request, the County will make payment of funds withheld from progress payments pursuant to the requirements of Public Contract Code Section 22300 if the contractor deposits in escrow with the County's Treasurer-Tax Collector, or with a bank acceptable to the County, securities eligible for the investment under Government Code Section 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 County. The escrow agreement between the contractor and the County in this regard shall be substantially similar to the form set forth in Public Contract Code Section 22300(f).

The Board reserves the right to reject any or all bids, and further reserves the right to waive any informalities or irregularities in the bids.
INSTRUCTIONS TO BIDDERS

Bids: Bids, to receive consideration, shall be made in accordance with the following instructions.

a. Bids shall be made on the bid form provided by the Owner, a copy of which is included in these documents. All items on the form should be filled out; numbers should be stated both in writing and in figures and the signatures of all individuals must be in longhand. The completed form shall be without interlineations, alterations, or erasures.

b. Bids shall not contain any recapitulation of the work to be done, and alternative bids will not be considered unless called for.

c. Should a bidder find discrepancies in or omissions from the drawings or other contract document, or should he be in doubt as to their meaning, he shall at once notify David Castagna, Project Manager, General Services – Capital Projects, 209-468-9598, dcastagna@sjgov.org (email preferred), who is the Owner's representative. The Owner, General Services - Capital Projects, will send written instructions to all bidders. Neither Owner nor its representative will be responsible for any oral instructions. The cut-off date for the receipt of questions from bidders is 4:00 PM, Thursday, October 20, 2011. The Owner anticipates that any addenda, if required, will be released no later than Monday, October 24, 2011.

d. All addenda issued during the bidding period are to be included in the bid, and they will become a part of the contract for the project.

e. Pursuant to the provisions of Sections 4100 to 4113, inclusive, of the Government Code, every bidder shall in his bid set forth:

(1) The name and location of the place of business of each subcontractor who will perform work or labor or render service to the bidder in or about the work in an amount in excess of one-half of one percent of the total bid.

(2) The portion of the work which will be done by each subcontractor. If the bidder fails to specify a subcontractor for any portion of the work to be performed under the contract in excess of one-half of one percent of the total bid, he agrees to perform that portion himself.

The successful bidder shall not, without the consent of the Owner:

(a) Permit any subcontract to be assigned or transferred or allow it to be performed by anyone other than the original subcontractor listed in the bid.

(b) Other than in the performance of change order, sublet or subcontract any portion of the work in excess of one-half of one percent of the total bid as to which his original bid did not designate a subcontractor.

(c) The Owner may legally consent to a substitution only in the limited cases enumerated in Section 4107 of the Government Code.

f. Bids must be accompanied by a certified or cashier's check, or bidder's bond, for an amount not less than ten percent (10%) of the bid, made payable to the order of the County of San Joaquin. If a bidder's bond accompanies the bid, the bond shall be secured from a surety company satisfactory to the Owner. Said check or bond shall be given as a guarantee that the case of refusal or failure to enter into a contract, it is agreed that the check or bond, as the case may be, shall be retained by the Owner as the measure of stipulated liquidated damages.

g. Bids shall be addressed to the Owner and shall be delivered to the Owner enclosed in an opaque sealed envelope, addressed to San Joaquin County General Services - Capital Projects, 44 N. San Joaquin Street, Suite 590, Stockton, California, 95202. Each envelope shall bear the title of the work and the name of the bidder. No telephonic or telegraphic bids or amendments to bids shall be effective.

Withdrawal of Bids: Bids may be withdrawn by the bidder prior to but not after the time fixed for opening of bids.

Opening of Bids: Bids will be opened and read at or about the time set in the advertised Notice Inviting Bids. Bidders, or their representatives, and other interested persons may be present at the opening of bids.

Award or Rejection of Bids: The contract, if awarded, will be awarded to the lowest responsible bidder based on the lowest total bid received and in compliance with these instructions and the advertised Notice Inviting Bids, provided his bid is reasonable and it is to the interest of the Owner to accept it. If the bid form contains additive and/or deductive alternates, the Owner, for cost considerations, may select additive and/or deductive alternates before determining the lowest bidder. The competency and the
responsibility of bidders and of their proposed subcontractors will be considered in making the award of contract. Any bidder before being awarded a contract may be required to furnish evidence satisfactory to the Owner that he and his proposed subcontractors have sufficient means and experience in the type of work called for to assure completion of the contract in a satisfactory manner. The Owner reserves the right to reject the bid of any bidders who have previously failed to perform properly or to complete on time contracts with the Owner of a nature similar to this project. The Owner reserves the right to reject any or all bids or alternates and waive any informality or irregularity in the bids or in the bidding.

Examination of Contract Documents and Site of Work: Before submitting a bid, bidders should examine the drawings, read the specifications, the "Form of Agreement" and other contract documents. They should visit the site of the proposed work, examine any improvements and any work that may have been done thereon. They should fully inform themselves of all conditions on, in, at, and about the site, the building and the proposed new work that is to be done thereon. There shall be included in the bid a sum sufficient to cover the cost of all items included in the contract.

Form of Contract: The form of contract which the successful bidder will be required to execute, if awarded the work, is the San Joaquin County General Construction Contract, which is set forth herein.

Equals: Pursuant to Section 3400 of the Public Contract Code, any item or requirement calling for a designated material, product, thing, or service by specific brand or trade name shall be construed as being followed by the words "or equal" so that bidders may finish any material, product, thing or service which is in all respects equal to the item specified, including but not limited to size, quality, guarantees, and materials. The proposed "equal" must in all respects be equal to or better than the item for which it is proposed to be substituted.

A copy of the specifications, working details, and other contract documents for the project are on file at the General Services - Capital Projects, located at 44 N. San Joaquin Street, Suite 590, Stockton, CA 95202.

Insurance – Bonds: The successful bidder will be required to obtain Worker's Compensation Insurance coverage, Bodily Injury and Property Damage Liability Insurance, and Builder's Risk (Fire) Insurance. He will also be required to furnish Faithful Performance and Payment (Labor and Material) surety bonds.

All bonds submitted to the County of San Joaquin must be printed on the letterhead or similar document of the Surety. The bond form must provide an address and a telephone number where the County may contact the surety for any questions regarding the bonds. In addition, both the signature of the principal and the signature of the surety must be acknowledged before a notary and certificates of acknowledgment must accompany the bonds.

Completion Date - Liquidated Damages: Time is of the essence in this contract. Contractor must commence work on the project the first working day following receipt of Notice to Proceed issued by the Owner.

a. The project must be completed in 90 calendar days.

b. The contract will provide for liquidated damages in the amount of $1,000 per day for each day the work is not completed beyond the time specified in the preceding paragraph and in the Bid Form. The contract will provide a bonus of $100 per day for each day completed before the time specified in the preceding paragraph.

Worker's Compensation: In accordance with the provisions of Section 3700 of the Labor Code, every contractor will be required to secure the payment of compensation to his employees. Each contractor to whom a public works contract is awarded is required to sign and file with the awarding body the following certification prior to performing the work of the contract:

"I am aware of the provisions of Section 3700 of the Labor Code which requires every employer to be insured against liability for worker's compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work on this contract."

Anti-Discrimination: The successful bidder shall not discriminate against any employee or applicant for employment because of race, creed, color, sex or national origin. The contractor shall comply with all provisions of Executive Order No. 10925 of March 6, 1961, as amended, and all rules, regulations and relevant orders of the Presidents Committee on Equal Employment Opportunity created thereby.

Local Hire: San Joaquin County has adopted a policy goal to strongly encourage local hire and apprenticeship participation in the construction workforce in accordance
with Board of Supervisors policy. Bidders’ attention is directed to the following provisions relating to this policy:

a. For purposes of this policy only, the definition of contractor is limited to the total workforce of the prime or principal contractor and all subcontractors who will work in San Joaquin County under the construction contract.

b. A "local hire" is defined as an employee whose residence is within San Joaquin County at the time of opening of bids for the project.

c. Bidders are to complete the "Bidder Local Hire Information Form and Checklist."

With respect to application of the local hire policy, bidders’ attention is directed to the following:

a. San Joaquin County Board of Supervisors hereby adopts a policy to strongly encourage, within the constraints of federal and state law, the employment of County residents on County funded construction projects.

b. Bidders on construction projects will be required to complete a Local Hire Information Form to be submitted with construction bids in excess of $200,000, which indicates the bidder’s effort to employ local hire.

c. In the event that two or more bids are the same and the lowest, the County shall award the contract in accordance with the best intended effort of the bidder to employ local residents as indicated on the bidder Local Hire Information Form.

(1) Contracts estimates by the County to be less than $200,000 do not have a local hire goal.

(2) Contracts estimated by the County to cost $200,000 or more require the successful bidder to demonstrate their attempts to employ local hire.

Apprenticeship Program: Unless such provision would conflict with a state or federal law or regulation applicable to a particular contract for a public works project, County contracts for public works in excess of $200,000 shall contain provisions pursuant to which each contractor or subcontractor shall make a good faith effort to employ apprentices who are enrolled in and participating in a viable apprenticeship program serving the San Joaquin County and approved by the State Department of Apprenticeship Standards. This apprenticeship requirement shall apply for each apprenticable craft or trade in which the contractor employs workers in performing any of the work under the contract. A contractor may evidence its good faith effort by complying with California Labor Code Section 1777.5 and the implementing regulations and seeking apprentices from apprenticeship programs service the San Joaquin County.

A contractor employing apprentices pursuant to this section shall employ apprentices in a ratio consistent with the provisions of the California Labor Code or federal requirements applicable for federal aid contracts.

This section shall not be construed to exempt a contractor from any other applicable requirement imposed upon the contractor by federal or state law.

Prebid Conference: A mandatory prebid conference for all bidders is tentatively scheduled for Monday, October 17, 2011, at 10:00 AM. at 1868 E. Hazelton Avenue, Stockton, CA. Bids will not be accepted from any contractor not attending this prebid conference.

Unique Requirements: Contractor is advised to review the specifications, specifically the General Conditions for unique requirements. Special attention and protection will be necessary to avoid any detrimental effects to occupied facility caused by dust, vibration, demolition, inclement weather, roof removal, noise, fumes, etc. By submission of bid, contractor acknowledges and accepts the related construction limitations.

Commencement of Work: Work must begin on the working date stipulated in the Notice to Proceed. This may or may not be the same date as the contract. The Notice to Proceed will be issued in a reasonable amount of time. If it is not the same day as the award of contract, then no later than 40 calendar days.
Honorable Board of Supervisors  
County of San Joaquin  
General Services - Capital Projects  
44 N. San Joaquin Street, Suite 590  
Stockton, CA 95202  

Dear Board Members:  
Pursuant to the Notice Inviting Bids, and in compliance with the Instructions to Bidders, having reviewed the contract documents and the site(s) of the work, the undersigned hereby proposes to furnish all work, labor, materials, transportation, equipment and services necessary, including State of California and local sales or use taxes, license or permit fees, if any, for the construction and completion of

**Environmental Health Building Tenant Improvements Project**

all in accordance with the specifications and drawings and other contract documents, together with Addenda issued at the time of bidding, if any, now on file with General Services - Capital Projects of San Joaquin County, for the sum of:

__________________________________________________________________________________________

____________________________________________($__________________________). (Base Bid)

Addenda Received:__________________________________________________________________________

__________________________________________________________________________________________

__________________________________________________________________________________________

If awarded the contract, work must begin on the date stipulated in the Notice to Proceed.
FILL IN ALL BLANKS

Enclosed please find a ( ) cash deposit, ( ) cashier's check ( ) certified check, or ( ) surety bid bond (check as appropriate) of the ____________________________________________ in an amount not less than ten percent (10%) of the amount of the bid. If the enclosure is a check or bond, it is made payable to the County of San Joaquin.

The undersigned agrees that the enclosed cash deposit, cashier's check, certified check or surety bond accompanying this bid, shall be left on deposit with the General Services - Capital Projects, that this amount is the measure of the liquidated damages which the County of San Joaquin will sustain by the default of the undersigned through failure to execute and deliver the above agreement and bonds within ten (10) calendar days of written notice of the award of the contract and that the money or surety bond so deposited by contractor shall be collectible and become the property of the County of San Joaquin in cash of such default.

Within seven (7) calendar days after the date of the bid opening, the responsible low bidder shall deliver to the Owner's Representative, in a form acceptable to said Owner's Representative, a complete cost breakdown for the project herein bid.

Listed hereunder is the name of each subcontractor and the address of the mill, shop or office of each subcontractor who will perform work or labor or render service to the undersigned in or about the construction of the work hereinabove described in excess of one-half of one percent of the total bid and the portion of said work which will be done by each subcontractor, if the contract for the said work is awarded to the undersigned. (Attach additional sheet, if necessary, and note attachment on this page.) (See Government Code Sections 4100-41113.)

<table>
<thead>
<tr>
<th>NAME OF SUBCONTRACTOR</th>
<th>ADDRESS</th>
<th>PORTION OF WORK TO BE PERFORMED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
By submission of a bid, a bidder certifies possession of duly issued and valid contractor's license issued by the State of California, which license authorizes bidder to contract to perform the type of work required by the specifications. Should the bidder fail to provide below the number and classification of bidder's State of California Contractor's License, the Owner may reject this bid therefore.

CONTRACTOR: ________________________________

BY (Signature): ________________________________

TITLE: ________________________________

MAILING ADDRESS: ________________________________

______________________________

______________________________

______________________________

TELEPHONE NO: ________________________________

STATE OF CALIFORNIA LICENSE NO. ________________________________

STATE OF CALIFORNIA LICENSE CLASSIFICATION: ________________________________

DATED: THIS _____ DAY OF ________________________________, 20____.
NONCOLLUSION AFFIDAVIT TO BE EXECUTED

BY BIDDER AND SUBMITTED WITH BID

State of California  )
                          )
County of San Joaquin      ) ss.

___________________________________, being first duly sworn, deposes and says that he or she is
____________________________________ of _________________________ the party making the
foregoing bid that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership,
company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the
bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and
has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put
in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or
indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder
or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other
bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the
proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not,
directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or
divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation,
partnership, company association, organization, bid depository, or to any member or agent thereof to
effectuate a collusive or sham bid.

_______________________________________
(Bidder Signature)

_______________________________________
(Date)
CERTIFICATION OF A DRUG-FREE WORKPLACE

(Must be Submitted With Bid)

This certification is required by the regulations implementing the Drug-Free Workplace Act of 1990 (Chapter 1170, Statutes of 1990). The regulations as set forth in Chapter 5.5 (commencing with Section 8350) Division I of Title 2 of the Government Code requires every person or organization awarded a contract or a grant for the procurement of any property or services from any State agency to certify to the contracting or granting agency that it will provide a drug-free workplace. The certification set out below is a material representation of fact upon which reliance will be placed when the agency determines to award the grant or contract. The contract or grant may be subject to suspension of payments or termination of the contract or grant, or both, and the contractor or grantee thereunder may be subject to debarment if the agency determines that the contractor or grantee has made a false certification or violates the certification by failing to carry out the requirements as listed below. (Chapter 5.5, Section 8356, Division I of Title 2 of the Government Code.)

By my signature hereunder, as contractor/grantee or contractor/grantee's duly appointed representative, I certify that I or my firm or organization will provide a drug-free workplace by:

A. Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance is prohibited in the person's or organization's workplace and specifying the actions that will be taken against employees for violation of the prohibition.

B. Establishing a drug-free awareness program to inform employees about all of the following:
   1. The dangers of drug abuse in the workplace
   2. The person's or organization's policy of maintaining a drug-free workplaces
   3. Any available drug counseling, rehabilitation, and employee assistance programs;
   4. The penalties that may be imposed upon employees for drug abuse violations

C. Making it a requirement that each employee engaged in the performance of the contract or grant be given a copy of the statement required by Paragraph A, above, and that, as a condition of employment on the contract or grant, the employee agrees to abide by the terms of the statement.

This certification shall not be construed to require any contractor or grantee to ensure that other businesses with which it subcontracts also provide drug-free workplaces. (Chapter 5.5, Section 8357, Division 1 of Title 2 of the Government Code.)

____________________________________________
Contractor

____________________________________________
Address

____________________________________________
FEDERAL EMPLOYER

____________________________________________
ID NO.

____________________________________________
Signature

____________________________________________
Title

County of San Joaquin (Aug. 1997)
BIDDER LOCAL HIRE
INFORMATION FORM AND CHECKLIST

Project Name: Environmental Health Building Tenant Improvements Project

Bidder's Name: _______________________

Address: ____________________________

Bid Amount $: ________________________

Bid Opening Date: October 28, 2011

Bidders are required to complete and submit this Form and Checklist with their bid

<table>
<thead>
<tr>
<th>LOCAL HIRE INFORMATION</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contractor agrees to attempt to employ local hire in their workforce and the workforce of their subcontractors.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contractor agrees to purchase at least one display ad in a newspaper of general circulation in San Joaquin County announcing job opportunities on the construction project and encouraging local residents to apply.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Contractor intends to secure his workforce from the following sources: (Please Describe)

______________________________________________________________________________________________________
______________________________________________________________________________________________________
______________________________________________________________________________________________________
LOCAL HIRE INFORMATION CHECKLIST
COUNTY OF SAN JOAQUIN

Please check all boxes that apply:

☐ Placed a valid job order for existing and projected position vacancies with the local office of the State Employment Development Department, for no less than 10 consecutive calendar days.

☐ Placed a valid job order for existing and projected position vacancies with Worknet of San Joaquin County, for no less than 10 consecutive calendar days.

☐ Advertised existing and projected position vacancies, job informational meetings, job application workshops, and job interviews by posting notices which identify the position(s) to be filled, the qualifications required, and where to obtain additional information about the application process, in conspicuous local authorized public places, including but not limited to post offices and libraries.

☐ Conducted a job informational meeting to inform the community of employment opportunities of the contractor (may be combined with other contractors).

☐ Provided ongoing assistance to residents of San Joaquin County in completing job application forms.

☐ Conducted a job application workshop to assist the community in applying and interviewing for jobs in the contracting industry (may be combined with other contractors).

☐ Conducted job interviews within San Joaquin County.

☐ Advertised valid existing and projected position vacancies through the local media, such as community television network, local newspapers of general circulation, and trade papers or minority focus newspapers.

☐ Any other means of obtaining employees who reside within San Joaquin County that are reasonably calculated to comply with the goals of this policy. Please describe:  

Please provide supporting documentation for all boxes checked. Sign and submit form and checklist with your bid.

I declare the above information is true and accurate and submitted under penalty of perjury.

By my signature below, I acknowledge that I have met the requirements of the County's Local Hire Policy.

Owner/Authorized Representative (Signature)  Name of firm

Name and Title (Print)
SAN JOAQUIN COUNTY

GENERAL CONSTRUCTION CONTRACT

DATED:

PARTIES: 

OWNER:
COUNTY OF SAN JOAQUIN
44 N. San Joaquin Street, Suite 627
Stockton, Ca 95202

CONTRACTOR:

THE WORK:
Environmental Health Building
Tenant Improvements Project
1868 E. Hazelton Avenue
Stockton, CA  95205

ARCHITECT/ENGINEERS:
Siegfried Engineering
3244 Brookside Road, Ste. 100
Stockton, CA  95219

THE OWNER AND THE CONTRACTOR AGREE THAT:

1. The Contract Documents. The complete Contract consists of the following documents:
   Notice Inviting Bids
   Accepted Bid
   General Construction Contract (including Addenda)
   Labor and Material Bond
   Faithful Performance Bond
   Specifications and General & Supplemental Conditions
   Drawings

2. The Work. The Contractor shall perform all the work required by the Contract Documents.

3. Time for Completion. All work under this Contract shall be completed within 90 calendar days, starting on the first working day stipulated in the Notice to Proceed.
4. **Contract Price.** The Owner shall pay, in full payment for the work, for the base bid sum of __________________________ and no/100 ($_______) Dollars, subject to additions and deductions as provided in the Contract Documents.

5. **Liquidated Damages.** Liquidated damages shall be:

   1. **One Thousand and no/100 ($1,000.00) Dollars** for each day the work is not completed beyond the time specified.

   2. If the work is completed and accepted by the Owner before the time required, the Owner will pay a premium to the Contractor at the rate of **One Hundred and no/100 ($100.00) Dollars** for each day (See General Conditions.)

6. **Additional Provisions.** None

This contract, entered into as of the date first written above.

ATTEST: LOIS M. SAHYOUN
Clerk of the Board of Supervisors of the
County of San Joaquin, State of California

COUNTY OF SAN JOAQUIN, a political
Subdivision of the State of California

By___________________________________
Deputy Clerk

(SEAL)

APPROVED AS TO FORM:
County Counsel

By___________________________________
Jason R. Morrish
Deputy County Counsel

Title__________________________________
State of California
County of San Joaquin

On this ___ day of ________ 2011, before me KENNETH W. BLAKEMORE, County Assessor/Recorder/Clerk of the County of San Joaquin, State of California, personally appeared FRANK L. RUHSTALLER known to be (or proved to me on the basis of satisfactory evidence) to be the person who executed this instrument as Chairman of the Board of Supervisors of the County of San Joaquin, State of California, and acknowledged to me that the political subdivision executed it.

GARY W. FREEMAN, County Assessor/Clerk/Recorder

BY______________________________
Deputy Clerk

CALIFORNIA ALL-PURPOSE ACKNOWLEDGEMENT

State of California
County of ________________________________
On____________ before me___________________________
Date   Name, Title of Officer – E.G.,"Jane Doe,,Notary Public”

Personally appeared_______________________________________________________
Name(s) of Signers(s)

Personally known to me – OR □ proved to me on the basis of satisfactory
Evidence to be the person(s) whose name(s)
Is/are subscribed to the within instrument and
Acknowledged to me that he/she/they executed
The same in his/her/their authorized capacity(ies),
And that by his/her/their signature(s) on the
Instrument the person(s), or the entity upon
Behalf of which the person(s) acted, executed the
Instrument.

WITNESS my hand and official seal.

________________________________
SIGNATURE OF NOTARY

OPTIONAL SECTION
CAPACITY CLAIMED BY SIGNER

□ INDIVIDUAL
□ CORPORATE OFFICER(S)
□ PARTNERS □ LIMITED
□ GENERAL
□ ATTORNEY-IN-FACT
□ TRUSTEE(S)
□ GUARDIAN/CONSERVATOR
□ OTHER:

SIGNER IS REPRESENTING:
NAME OF PERSON(S) OR ENTITY(IES)

OPTIONAL SECTION
THIS CERTIFICATE MUST BE ATTACHED TO
THE DOCUMENT DESCRIBED AT RIGHT:
TITLE OR TYPE OF DOCUMENT ________________________
NUMBER OF PAGES ________ DATE OF DOCUMENT _________
SIGNER(S) OTHER THAN NAMED ABOVE __________________________________________

Though the data requested here is not required by law, it could prevent
Fraudulent reattachment of this form.
KNOW ALL MEN BY THESE PRESENTS:

THAT WHEREAS, the Board of Supervisors of the County of San Joaquin, a political subdivision of the State of California, has entered into a contract with

(hereinafter designated as the "Principal"), which said contract, dated ________________, referred to and made a part hereof, is for the work described below:

AND WHEREAS, said Principal is required by the provisions of Chapter 7, Title 15, Part 4, Division 3, Section 3247 et seq., of the Civil Code of the State of California, to furnish a bond in connection with said contract, as hereinafter set forth.

NOW, THEREFORE, said Principal and___________________________________________
_______________________________________________________________________________________
as corporate Surety, are held firmly bound unto the County of San Joaquin and all contractors, subcontractors, laborers, materialmen and other persons employed in the performance of the aforesaid contract and referred to in the aforesaid Civil Code in the sum of ____________________________________________ ($ ___________), for materials furnished or labor thereon of any kind, or for amounts due under the Unemployment Insurance Act with respect to such work or labor, that said Surety will pay the same in an amount not exceeding the amount herein above set forth, and also in case suit is brought upon this bond, will pay, in addition to the face amount thereof, costs and reasonable expenses and fees, including reasonable attorney's fees, incurred by County in successfully enforcing such obligation, to be awarded and fixed by the court, and to be taxed as costs and to be included in the judgment therein rendered.

It is hereby expressly stipulated and agreed that this bond shall inure to the benefit of any and all persons, companies and corporations entitled to file claims under Title 15 (commencing with Section 3082) of Part 4 of Division 3 of the Civil Code of the State of California, so as to give a right of action to them or their assigns in any suit brought upon this bond.

Should the condition of this bond be fully performed, then this obligation shall become null and void, otherwise it shall be and remain in full force and effect.

The Surety hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of contract or the specifications accompanying the same shall in anywise affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the specifications.

In witness whereof, this instrument has been duly executed by the Principal and Surety above named, on ___________________________ 1994 .

_____________________________________________
(Typed Name)     (Title)
Principal

(ATTACH CERTIFICATES OF ACKNOWLEDGEMENT HERE)
_____________________________________________
(Name of Surety)

_____________________________________________
(Typed Name)     (Title)
Attorney-in-Fact

County of San Joaquin (March 1994)
KNOW ALL MEN BY THESE PRESENTS:

THAT WHEREAS, the Board of Supervisors of the County of San Joaquin, a political subdivision of the State of California, has entered into a contract with ____________________________________________

(hereinafter designated as the "Principal"), which said contract, dated ______________________________, referred to and made a part hereof, is for the work described below:

AND WHEREAS, said Principal is required under the terms of the contract to furnish a bond for the faithful performance of said contract;

NOW, THEREFORE, we the Principal and ____________________________________________

(hereinafter designated "Surety") are held and firmly bound unto the County of San Joaquin (hereinafter designated as "Obligee"), its successors and assigns, in the penal sum of _____________________________ dollars ($_______________) lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, successors, executors and administrators, jointly and severally, firmly by these presents.

The condition of this obligation is such that if the above bounded principal, his or its heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions and provisions in the said contract and any alteration thereof made as therein provided, on his or their part, to be kept and performed at the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall indemnify and save harmless the Obligee, its officers, agents and employees, as therein stipulated, then this obligation shall become null and void; otherwise it shall be and remain in full force and effect.

As part of the obligation secured hereby and in addition to the face amount specified therefor, there shall be included costs and reasonable expenses and fees, including reasonable attorney's fees, incurred by Obligee in successfully enforcing such obligation, all to be taxed as costs and included in any judgment rendered.

The Surety hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of contract or to the work to be performed thereunder or the specifications accompanying the same shall in anywise affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

In witness whereof, this instrument has been duly executed by the Principal and Surety above named, on ______________________________________________, 20_____.

_______________________________________
(Typed Name)    (Title)
Principal

_______________________________________
(Name of Surety)

_______________________________________
(Typed Name)        Attorney-in-Fact

(ATTACH CERTIFICATES OF ACKNOWLEDGEMENT HERE)
# TABLE OF CONTENTS

## A. GENERAL 1
- Clause 1 Definitions 1
- Clause 2 Specialist 4
- Clause 3 Authorities and Limitations 4
- Clause 4 Legal Requirements 4
- Clause 5 Standard References 5
- Clause 6 Permits, Licenses & Fees 5
- Clause 7 Separate Contracts 5
- Clause 8 Representative & Architect/Engineer 6

## B. BONDS & INSURANCE 6
- Clause 9 Bid Bond (Guarantee) 6
- Clause 10 Performance and Payment Bonds 6
- Clause 11 Insurance 7

## C. SITE CONDITIONS 8
- Clause 12 Differing Site Conditions 8
- Clause 13 Site Investigation and Conditions Affecting the Work 9
- Clause 14 Dimensions and Measurements 9
- Clause 15 Notice of Conflicting Conditions 9

## D. SPECIFICATIONS AND DRAWINGS 10
- Clause 16 Specifications and Drawings, General 10
- Clause 17 Summary of the order of Precedence 10
- Clause 18 Clarifications Request for Information and Additional Instructions 11

## E. SHOP DRAWINGS AND SUBMITTALS 11
- Clause 19 Shop Drawings, Product Data, Coordination Drawings and Schedules 11
- Clause 20 Samples 12
- Clause 21 Substitutions 13

## F. SCHEDULES 14
- Clause 22 Construction Schedule 14
# Environmental Health Building Tenant Improvements Project

## General Conditions

<table>
<thead>
<tr>
<th>Section</th>
<th>Clause #</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>G. TIME AND LIQUIDATED DAMAGES</strong></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Time of Work, Liquidated Damages, and Extensions</td>
<td>23</td>
<td>15</td>
</tr>
<tr>
<td><strong>H. PERFORMANCE</strong></td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>Supervision &amp; Construction Procedures</td>
<td>24</td>
<td>17</td>
</tr>
<tr>
<td>Supervision</td>
<td>25</td>
<td>17</td>
</tr>
<tr>
<td>Conduct of Work</td>
<td>26</td>
<td>17</td>
</tr>
<tr>
<td>Protection of Work &amp; Property</td>
<td>27</td>
<td>18</td>
</tr>
<tr>
<td>Overloading</td>
<td>28</td>
<td>18</td>
</tr>
<tr>
<td>Contractor’s Responsibility For Work</td>
<td>29</td>
<td>18</td>
</tr>
<tr>
<td>Utilities</td>
<td>30</td>
<td>18</td>
</tr>
<tr>
<td>Working Hours</td>
<td>31</td>
<td>19</td>
</tr>
<tr>
<td>Material &amp; Workmanship</td>
<td>32</td>
<td>19</td>
</tr>
<tr>
<td>Layout of Work</td>
<td>33</td>
<td>19</td>
</tr>
<tr>
<td>Use of Premises</td>
<td>34</td>
<td>20</td>
</tr>
<tr>
<td>Operations &amp; Storage</td>
<td>35</td>
<td>20</td>
</tr>
<tr>
<td>Heat</td>
<td>36</td>
<td>20</td>
</tr>
<tr>
<td>Cleaning up</td>
<td>37</td>
<td>20</td>
</tr>
<tr>
<td><strong>I. SAFETY &amp; HEALTH</strong></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Accident Prevention</td>
<td>38</td>
<td>21</td>
</tr>
<tr>
<td>Sanitary Facilities</td>
<td>39</td>
<td>21</td>
</tr>
<tr>
<td>Responsibility for Compliance With (OSHA):</td>
<td>40</td>
<td>21</td>
</tr>
<tr>
<td>Toxic and Hazardous Materials and Waste</td>
<td>41</td>
<td>22</td>
</tr>
<tr>
<td><strong>J. COUNTY FURNISHED PROPERTY</strong></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>Owner Furnished Property</td>
<td>42</td>
<td>22</td>
</tr>
<tr>
<td><strong>K. BENEFICIAL OCCUPANCY</strong></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>Beneficial Occupancy</td>
<td>43</td>
<td>22</td>
</tr>
<tr>
<td><strong>L. INSPECTION AND TESTING</strong></td>
<td></td>
<td>23</td>
</tr>
<tr>
<td>Inspection and Testing</td>
<td>44</td>
<td>23</td>
</tr>
<tr>
<td>Condemned Materials and Labor</td>
<td>45</td>
<td>24</td>
</tr>
<tr>
<td>Inspection by Other Jurisdictions</td>
<td>46</td>
<td>25</td>
</tr>
<tr>
<td>Final Inspection and Tests</td>
<td>47</td>
<td>25</td>
</tr>
</tbody>
</table>
M. ACCEPTANCE

Clause 48 Acceptance of the Work

N. WARRANTY AND GUARANTEES

Clause 49 Contractor’s Warranty and Guarantee

O. ENVIRONMENTAL PROTECTION

Clause 50 Dust Control
Clause 51 Excessive Noise
Clause 52 Pollution Control; Cleaning

P. EMPLOYMENT PRACTICES

Clause 53 Qualifications for Employment
Clause 54 Hours of Work
Clause 55 Wages & Records
Clause 56 Notice of Labor Disputes
Clause 57 Nondiscrimination

Q. SUBCONTRACTING

Clause 58 Subcontractors
Clause 59 Relations of Contactor and Subcontractor
Clause 60 Subcontracts

R. TAXES

Clause 61 Sales and Payroll Taxes

S. CHANGES

Clause 62 Change Order Work Notification
Clause 63 Change Order Process
Clause 64 Audit

T. PAYMENT

Clause 65 Payment
Clause 66 Final Payment
Clause 67 Assignment
Environmental Health Building Tenant Improvements Project

General Conditions

U. SUSPENSION OF WORK TERMINATION  37

   Clause 68  Suspension of Work  37
   Clause 69  Non-Compliance with Contract Requirements  38
   Clause 70  Termination  38

V. DISPUTES/CLAIMS  40

   Clause 71  Disputes/Claims  40
Environmental Health Building Tenant Improvements Project
General Conditions

A. GENERAL

Clause 1 - Definitions

Whenever the following terms, pronouns in place of them, or initials of organizations appear in the contract documents, they shall have the following meaning:

Acceptance - "Acceptance" is when the Owner determines all of the contract requirements have been completed (based on the closeout procedures set forth herein). A copy of Board acceptance will be sent to the Contractor. Upon receipt of the acceptance, the Contractor will be relieved of the duty of maintaining and protecting the work. After acceptance of the work, the Owner will initiate final settlement and payment in accordance with state statutes.

Act of God - "Act of God" means an earthquake of magnitude 3.5 or greater on the Richter scale, flood, tornado, or other cataclysmic phenomenon of nature or rain, snowstorm windstorm, high water, or other natural phenomenon in excess of the norm as established by NOAA weather data.

Addendum - A document issued by the Owner during the bidding period which modifies, supersedes, or supplements the original contract documents.

AED - Association Equipment Distributors. Organization providing a listing of equipment rental charges.

Agreement - The written document of agreement, executed by the Owner and the Contractor.

Architect/Engineer - Shall mean the architect, engineer, individual, partnership, corporation, association, joint venture or any combination thereof, employed by the Owner as designated on the title sheet of these specifications. When the Owner is designated as the Engineer, Engineer shall mean the County Administrator, or its authorized representative.

Beneficial Occupancy - The right of the Owner to occupy all or any portion of the project prior to final completion of the work. Such occupancy does not constitute acceptance or substantial completion by the Owner of the work or any portion thereof, nor will it relieve the Contractor of the responsibility for correcting the defective work or materials found at any time before acceptance of the work.

Bid - The offer of the bidder to perform the work when made out and submitted on the prescribed bid form, properly executed and guaranteed.

Bid Form - The approved form upon which the Owner requires a formal bid be prepared and submitted for the work.

Bidder - Any individual, partnership, corporation, association, joint venture, or any combination thereof, which has submitted a proposal for the work, acting directly, or through a duly authorized representative.

Board or Board of Supervisors - Shall mean the duly elected or appointed officials who constitute such a Board, who have the ultimate legal authority in all matters pertaining to the contract.

Bulletin - A "bulletin" is a document consisting of supplemental details, instruction or information, issued by the Architect/Engineer through the Owner after the Award of Contract which clarifies or corrects the contract documents in connection with the performance of the contract which may supplement the Request for Information documents.

Change or Change Order - Is a document issued by the Owner which authorizes any change or equitable adjustment to the Contract Documents.

Construction Manager - "Construction manager" or owner representative as used under this contract, shall be as selected by the Owner. The construction manager will be the Owner's duly authorized representative and agent to the Contractor with respect to this project during construction and until the final completion.

Contract - The "contract" or "contract documents" shall mean the written agreement covering the performance of the work and the furnishing of labor, materials, tools, and equipment in the construction of the work. The contract shall include the Notice to Contractors, supplemental conditions, proposal, drawings, specifications, special provisions, instructions to bidders, addenda, General conditions, and contract bonds; also, any and all supplemental agreements are written agreements covering alterations, amendments or extensions to the contract and include contract change orders.
Contract Drawings - "Contract drawings" or "drawings" means and includes (a) all drawings which have been prepared on behalf of the Owner and are included in the contract documents and all modifying drawings issued by addenda thereto; (b) all drawings submitted pursuant to the terms of the contract by the Contractor with his/her proposal to the Owner during the progress of the work which are accepted by the Owner; and (c) all drawings submitted by the Owner to the Contractor during the progress of the work.

Contractor - "Contractor" means the prime or principal Contractor, including all joint ventures, subcontractors, equipment, or material supplier, and their employees. References to subcontractor or others are only for convenience and all such references shall be considered to refer to the Contractor. The prime or principal Contractor shall be responsible for all subcontractors, and all subcontractors shall require their subcontractors to comply with the relevant provisions of the prime or principal contract.

County or Owner - Shall mean the County of San Joaquin, a political subdivision of the State of California and party of the first part, or its duly authorized agent, acting within the scope of their authority.

Critical Path Method (CPM) - "Critical path method" is a schematic technique.

Day - "Day" or "working day" means calendar day and shall include every day including Saturdays, Sundays, and legal holidays.

Directed - "Directed," "designated," "permitted," "required," "accepted," and works of like import, wherever and in whatever manner used, with or without reference to the Owner, means as directed, designated, permitted, required, and accepted by the Owner.

Field Instruction - Is an instruction given during the course of the work.

Final Completion - "Final completion" is that point in the contract as determined by the Owner through a final inspection that the Contractor has completed all physical work and is ready to prepare for final closeout and acceptance as prescribed herein. All work is complete, accessible, operable, and usable by the Owner; all parts, systems and site work are 100% complete and cleaned for the Owners use. The Owner will issue a certificate of final completion.

General Notes - The written instructions, provisions, conditions, or other requirements appearing on the drawings, and so identified thereon, which pertain to the performance of the work.

Herein - “Herein,” “hereinafter,” and words of similar import shall refer to the contract documents.

Inspect - "Inspectors" are the agents for the Owner who are responsible for quality control on the project.

Install - "Install," wherever and in whatever manner used, shall mean the installation complete in place of any item or equipment or material.

Liquidated Damages - The amount prescribed in the Contract to be paid to the Owner or to be deducted from any payments due or to become due the Contractor for each day's delay in completing the whole or any specified portion of the work beyond the time allowed in the Contract plus approved time extensions.

Material or Materials - "Materials(s)" shall be construed to include machinery, equipment, manufactured articles, materials, or construction such as form work, fasteners, etc., and any other classes of material to be furnished in connection with the Contract, except where a more limited meaning is indicated by the context.

May - "May," wherever and in whatever manner used, is permissive.

Modification to the Contract - See change orders above.


Notice Inviting Bidders - The public advertisement inviting sealed bids for the work.

Notice to Proceed - The "Notice to Proceed" is the written notification giving the Contractor notice that he shall commence with the prosecution of his work as defined in the Contract Documents. The day following receipt of the Notice to Proceed will constitute the first calendar day of the specified duration to bring the work to Substantial Completion as determined by the Owner (unless specified otherwise).

Owner - County of San Joaquin
Plans - The official drawings including plans, elevations, sections, detail drawings, diagrams, general notes, information and schedules thereon, or exact reproductions thereof, adopted and approved by the Owner showing the location, character, dimension, and details of the work.

Provide - "Provide," wherever and in whatever manner used, shall be understood to mean provide complete in place, that is, furnish and install.

Request for Change - Shall mean any detailed request for a monetary change or equitable adjustment.

Request for Information - The form and procedure established for communication between the Contractor and Owner/Architect/Engineer to clarify or interpret the contract documents or discover conflicts, omissions, or errors in these document. In addition, the Request for Information may be a precursor to Potential Change Orders and the document to transmit bulletins as prepared by the architect to the Contractor.

Shall or Will - "Shall" or "will," whenever used to stipulate anything is mandatory, means shall or will be done or be performed by either the Contractor or the Owner and means that the Contractor or the Owner has thereby entered into a covenant with the other party to do or perform the same.

Shown - "Shown," "indicated," "detailed," and words of like import, wherever and in whatever manner used, with or without reference to the drawings, means shown, indicated, or detailed on the drawings.

Singular - "Singular" words include the plural and vice versa.

Specifications - "Specifications" means and includes:

a. All specifications which have been prepared on behalf of the Owner and are included in the Contract Documents and all modifications issued by addenda thereto;

b. All specifications or descriptive literature submitted pursuant to the terms of the Contract by the Contractor with his/her proposal of the work which are accepted by the Owner and;

c. All specifications submitted by the Owner to the Contractor during the progress of the work.

Specified - "Specified," "described," or "noted," wherever and in whatever manner used, means as specified, described, shown or noted in the contract documents.

Subcontract - An individual, partnership, corporation, association, joint venture, or any combination thereof, who contracts at any tier with the Contractor (or subcontractor) to perform work or labor or render service in or about the work. The term subcontractors shall not include those who supply materials only.

Submittals - The term "submittals" shall include shop drawings, calculations, samples, schedules, procedures, manufacturers brochures, pamphlets catalog cuts, color charts, or other descriptive data, clearly defining the article, material, equipment, or device proposed for use in the work. The shop drawings are the drawings and diagrams showing details of fabrication and erection which the Contractor is required to submit to the Architect/Engineer through the Owner's authorized representative.

Submitted - "Submitted," wherever and in whatever manner used, means submitted to the Owner for review or acceptance.

Substantial Completion - "Substantial completion" is when the Owner determines the contract work can be used for its intended purpose as prescribed by the closeout procedures contained herein. The Contractor will be so notified when the work is substantially complete and it is the point at which guarantees or warranties begin and liquidated damages are stopped. Substantial completion does not constitute acceptance or final completion of the work. Remaining on omissions and defects must be completed prior to final completion and acceptance.

Sufficient - "Sufficient," “necessary,” “proper,” “acceptable,” “satisfactory,” “desirable,” and words of like import wherever and in whatever manner used, with or without reference to the Owner, means sufficient, necessary, proper, acceptable, satisfactory, and desirable in the judgment of the Owner.

Superintendent - The representative of the Contractor as approved by the Owner who shall be present at the work site at all times during performance of the work. Such Superintendent shall at all times be fully authorized to receive and act upon instructions from the Architect/Engineer or the Owner's authorized agents and to execute and direct the work on behalf of the Contractor.
Supplier - "Supplier" shall mean an individual, partnership, firm, or corporation, or legally constituted Joint Venture entering into an agreement with the Owner, Contractor or subcontractor for furnishing a portion of the work which requires no labor at the job site, other than common carriers.

Work - The furnishing and installing of all labor materials, articles, supplies, and equipment as specified, designated, or required by the contract.

Clause 2 - Specialist

The term "Specialist" as used in the contract specification shall mean an individual or firm of established reputation (or, if newly organized, whose personnel have previously established a reputation in the same field), which is regularly engaged in, and which maintains a regular work force of workmen skilled in either (as applicable) manufacturing or fabricating items required by the contract, installing items required by the contract, or otherwise performing work required by the contract. Where the contract specification requires installation by a specialist, that term shall also be deemed to mean either the manufacturer of the item, an individual or firm licensed by the manufacturer, or an individual or firm who will perform the work under the manufacturer's direct supervision.

Clause 3 - Authorities and Limitations

The Owner has designated the Facilities Management's Capital Projects Division as its representative during the work. All work shall be performed under the general direction of the Facilities Management Capital Projects Division. The Board of Supervisors alone shall have the power to bind the Owner and to exercise the rights, responsibilities, authorities, and functions vested therein by the contract documents, except that it shall have the right to designate authorized representatives to act for them. Wherever any provision in this contract specifies an individual (such as, but not limited to, Construction Manager, Resident Engineer, Inspector, Custodian or other agent) or organization, whether governmental or private, to perform any act on behalf of or in the interests of the Owner, that individual or organization shall be deemed to be the Facilities Management Capital Projects Division's authorized representative under this contract but only to the extent so specified. The Owner may, at any time during the performance of this contract, vest in any such authorized representatives additional power and authority to act for him or designate additional representatives, specifying the extent of their authority to act for him; a copy of each document vesting additional authority in an authorized representative or designating an additional authorized representative shall be furnished to the Contractor.

The Contractor shall perform the contract in accordance with any order (including, but not limited to, instruction, direction, interpretation, or determination) issued by an authorized representative in accordance with his authority to act for the Owner but the Contractor assumes all the risk and consequences of performing the contract in accordance with any order (including but not limited to instruction, direction, interpretation, or determination) of anyone not authorized to issue such order.

Clause 4 - Legal Requirements

a. Contractor shall keep informed of, and comply with, all federal, state and county laws, ordinances, rules, and regulations applicable to the work or to those engaged or employed in the work of this contract, especially (but not limited to) those laws relating to hours of employment, minimum wages, payment of wages, sanitary and safety conditions for workers, worker's compensation insurance, type and kind of materials that can be used, and nondiscrimination in employment. Contractor shall indemnify and save harmless the Owner, its officers, agents and employees from all claims, suits, or actions arising from or based on the violation of any such law, rule, or regulation, whether violation is committed by Contractor, or his/her subcontractors, suppliers, agents, or employees. Certain of those provisions are set forth herein or in the General Construction Contract. The existence of these provisions does not excuse the Contractor from complying with other statutory requirements or provisions which are not set forth in these contract documents. If conflict arises between provisions of the plans and specifications and any such laws, rules, or regulations, Contractor shall notify Owner at once in writing. If, before receiving clarification, Contractor performs
any portion of the work affected by such apparent conflict, such performance shall be at Contractor's own risk; and it shall not be entitled to any additional compensation or time by reason of the conflict or its later correction.

Contractor shall be responsible for liability imposed by law on Contractor for damage to any persons or property resulting from defects of obstructions or from any cause whatsoever during progress of the work or at any time before acceptance or thereafter.

b. All work and materials shall be in full accordance with the latest codes, rules, and regulations including, but not limited to, the following:

- Uniform Building, Electrical & Plumbing Ordinances of San Joaquin County
- Uniform Fire Code
- State Fire Marshal
- State Codes and Ordinances
- State Industrial Accident Commission’s Safety Orders
- Rules of Local Utilities
- Local City and/or County Ordinances

Nothing in the specifications is to be construed to permit work not conforming to the above, and expense in compliance with the above work shall be borne by the Contractor. Whenever the specifications and working details require higher standards than those required by the ordinances, codes and statutes, the specifications and working details shall take priority over the ordinances, codes and statutes. The Contractor will keep copies of codes on the job site at all times during construction.

c. Royalties and Patents. The Contractor shall pay all royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and shall save the Owner and Agents harmless from loss on account thereof, except that the Owner shall be responsible for all such loss when a particular process or the product of a particular manufacturer or manufacturers is specified, but if the Contractor has information that the process or articles specified is an infringement of a patent he shall be responsible for such loss unless he promptly gives such information to the Representative.

Clause 5 - Standard References

All documents and publications (such as, but not limited to, manuals, handbooks, codes, standards, and specifications) which are cited in this contract for the purpose of establishing requirements applicable to equipment, materials, or workmanship under this contract, shall be deemed to be incorporated herein as fully as if printed and bound with the specifications of this contract, in accordance with the following:

Wherever reference is made to any such document, the Contractor shall comply with the requirements set out in the edition specified in this contract or, if not specified, the latest edition or revision thereof, as well as the latest amendment or supplement thereto, in effect on the date of the solicitation on this project, except as modified by, as otherwise provided in, or as limited to type, class, or grade, by the specifications of this contract.

Clause 6 - Permits, Licenses & Fees

The Contractor shall, at his expense, obtain all necessary permits and licenses, easements, etc., for the construction of the project, give all necessary notices, pay all fees required by law, and comply with all laws, ordinances, rules, and regulations relating to the work and to the preservation of the public health and safety. The exception to the aforementioned is as specifically noted in the contract documents.

Clause 7 - Separate Contracts

The Owner reserves the right to let other contracts in connection with the work. The Contractor shall afford other Contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate his work with theirs.

To insure the proper execution of his subsequent work, the Contractor shall measure work already in place and shall at once report in writing to the Representative and to the Architect/Engineer any discrepancy between the executed work and the drawings.
Clause 8 - Representative & Architect/Engineer

a. The Owner has designated the Facilities Management Capital Projects Division as its representative during the work and as inspector of all construction, who may be known as "Resident Inspector," "Inspector," "Project Manager" or "Construction Manager." He shall have the right to be at the job site during construction and shall supervise any additional job inspectors appointed by the Owner.

The Representative will have the right to observe the installation of all materials and equipment to be incorporated into the work and the placing of such material and equipment to determine in general if the work is proceeding in accordance with the contract documents. On the basis of his observations, he will keep the Owner informed as to the progress of the work. The Representative shall not be responsible for means, methods, techniques, sequences, or procedures of construction nor for safety precautions and programs in connection with the work, nor will he be responsible for the Contractor's failure to carry out the work in accordance with the contract documents.

b. Architect/Engineer: The Owner has retained an Architect/Engineer for this project. The Architect/Engineer will advise and consult with the Owner, and the Owner will issue instructions to the Contractor as directed. The Architect/Engineer will be requested to interpret the requirements of the contract documents and judge the performance thereunder. As requested by the Owner, the Architect/Engineer will, within reasonable time, render such interpretations as he may deem necessary for the proper execution of the work (see clarifications clause).

As requested by the Owner, Architect/Engineer will make periodic visits to the job site to familiarize itself generally with the progress and quality of the work and to determine in general whether such work is proceeding in accordance with the contract documents. Based on such observations he may be requested to recommend applications for progress payments made by Contractor.

B. BONDS & INSURANCE

Clause 9 - Bid Bond (Guarantee)

a. Failure to furnish a bid guarantee, in the proper form and amount, by the time set for opening of bids, may be cause for rejection of the bid.

b. The offeror (bidder) shall furnish a bid guarantee in the form of a firm commitment, such as a bid bond, certified check, cashier's check, or irrevocable letter of credit of not less than ten percent (10%) of the amount of the bid payable to the County of San Joaquin. "The amount of the bid" is defined to include all additive alternates and no deductive alternates. The check, bond or letter of credit shall be given as a guarantee that the successful bidder will enter into a written contract within ten (10) days after award and will be considered as the stipulated amount of liquidated damages in the event the bidder is unable to or refuses to execute a contract for the work. The Owner will return bid guarantees, other than bid bonds, to (1) unsuccessful bidders as soon as practicable after the opening of bids and (2) the successful bidder upon execution of contractual documents and bonds (including any necessary coinsurance or reinsurance agreements), as required by the bid as accepted.

c. If the successful bidder, upon acceptance of its bid by the Owner within the period specified for acceptance, fails to execute all contractual documents or provide the performance and/or payment bond(s) as required by the solicitation within the time specified, the Owner may terminate the contract for default.

d. Unless otherwise specified in the bid, the bidder will allow sixty (60) days for acceptance of its bid.

c. In the event the Contractor is terminated for default, the bidder is liable for any cost of bidding the work that exceeds the amount of its bid, and the bid guarantee is available to offset the difference.

Clause 10 - Performance and Payment Bonds

a. The Contractor shall furnish the Owner, within ten (10) days (or as otherwise specified) of the
execution of a contract for the work called for in the specifications and prior to beginning of work, with the following separate surety bonds:

1. **Faithful Performance Bond.** Said bond shall be in an amount equal to one hundred percent (100%) of the contract price, shall be for the faithful performance of the contract, shall be approved by the Owner, and shall be secured from a surety or sureties satisfactory to said Owner.

2. **Payment Bond for Public Works.** The Contractor shall furnish a separate surety bond in an amount at least equal to one hundred percent (100%) of the contract price as security for the payment of all persons for furnishing materials, provisions, provender, or other supplies, or items, used in, upon, for, or about the performance of the work contracted to be done, or for performing any work or labor thereon of any kind, and for the payment of amounts due under the Unemployment Insurance Code with respect to such work or labor in connection with this Contract, and for the payment of a reasonable attorney's fee to be fixed by the court in case suit is brought upon the bond.

Each of said bonds shall be substantially in the form attached to and located at the end of these General Conditions or AIA forms, Document A311.

b. The Contractor shall promptly furnish additional security required to protect the Owner and persons supplying labor or material under this contract if:

1. Any surety upon any bond furnished with this contract becomes unacceptable to the Owner;

2. Any surety fails to furnish reports on its financial condition as required by the Owner; or

3. The contract price is increased so that the penal sum of any bond becomes inadequate in the opinion of the Owner.

**Clause 11 - Insurance**

The Contractor shall not commence work under this contract until he has obtained all insurance required under this paragraph and such insurance has been approved by the Owner, nor shall the Contractor allow any subcontractor to commence work on his subcontract until all similar insurance required of the subcontractor has been so obtained and approved. Contractor shall furnish the Owner with satisfactory proof of the carriage of insurance required within, and there shall be a specific contractual liability endorsement extending the Contractor's coverage to include the contractual liability assumed by the Contractor pursuant to this Contract and particularly the hold harmless requirements. Any policy of insurance required of the Contractor under this contract shall also contain an endorsement providing that thirty (30) days' notice must be given in writing to the Owner of any pending change in the limits of liability or of any cancellation or modification of the policy. Three (3) copies of insurance certificates evidencing the required coverage shall be furnished Owner. Certificates of insurance must indicate that the coverage cannot be reduced or cancelled until THIRTY (30) days written notice has been furnished Owner.

a. **Compensation Insurance and Employer’s Liability Insurance.** The Contractor shall take out and maintain during the life of this Contract Workmen’s Compensation Insurance and Employer's Liability Insurance for all of his employees employed at the site of the project and, in case any work is sublet, the Contractor shall require the subcontractor similarly to provide Workmen’s Compensation Insurance and Employer's Liability Insurance for all of the latter's employees unless employees are covered by the protection afforded by the Contractor.

In signing this Contract, the Contractor makes the following certification, required by Section 1861 of the Labor Law:

I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workmen's compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this contract."

b. **Liability Insurance** The Contractor shall take out and maintain during the life of this contract such Bodily Injury Liability and Property Damage Liability Insurance as shall protect him and any subcontractor performing work covered by this contract from claims for damages for bodily
injury, including accidental death as well as from claims for property damage, including third-party property damage, to include coverage on property in the care, custody and control of the Contractor, and also excluding what are commonly known as the "X, C and U" exclusions (having to do with blasting, collapse, and underground property damage), which may arise from Contractor’s operations under this contract, whether such operations be by himself or by a subcontractor or by anyone directly or indirectly employed by either of them and the amounts of such insurance shall be as follows:

Comprehensive Liability Insurance covering personal injury, bodily injury, and property damage liability with a combined single limit in an amount not less than $1,000,000. SUCH INSURANCE SHALL NAME OWNER, ITS OFFICERS, AGENTS, AND EMPLOYEES AS ADDITIONAL INSURED. CONTRACTOR’S LIABILITY INSURANCE POLICY SHALL BE ENDORSED AS PRIMARY INSURANCE.

c. Fire Insurance. The Contractor will at his expense maintain Builder’s Risk Fire Insurance, including Extended Coverage and Vandalism and Malicious Mischief endorsements, jointly in the names of the Owner and Contractor, payable as their respective Interest may appear, such insurance at all times to be of sufficient amount to cover fully all loss or damage to the work under this agreement, resulting from fire and the perils covered by Extended Coverage and Vandalism and Malicious Mischief endorsements not less than 100% of contract price.

d. Indemnification. Contractor will indemnify and defend Owner and its agents such as construction manager or architect from all claims, demands, or liability arising out of or encountered in connection with this contract or the prosecution of work under it, whether such claims, demands, or liability are caused by Contractor, Contractor’s agents or employees, or subcontractors employed on the project, their agents or employees, or products installed on the project by Contractor or subcontractors, excepting only such injury or harm as may be caused solely and exclusively by Owner’s fault or active negligence. Such indemnification shall extend to claims, demands, or liability for injuries occurring after completion of the project as well as during the work’s progress.

e. Hold Harmless. The Contractor will save, keep, and bear harmless the Owner and all officers, employees, and agents such as construction manager and architect thereof from all damages, costs, or expenses, in law or in equity, that may at any time arise or be set up because of personal injury or damage to property sustained by any person or persons by reason of, or in the course of the performance of said work, or by reason of any infringement or alleged infringement of the patent rights of any person or persons, firm or corporation in consequence of the use in, on or about said work, of any article or material supplied or installed under this contract. Notwithstanding the above the Contractor shall wherever it is necessary keep and maintain at his sole cost and expense during the course of his operations under this contract such warnings, signs, and barriers as may be required to protect the public. The provisions of the preceding sentence shall not impose any liability upon the Owner and are for the express benefit of the general public.

f. The Contractor shall insert the substance of this clause, number 11 including this paragraph f, in subcontracts under this contract that require work on a Owner installation and shall require subcontractors to provide and maintain the insurance required in this clause or elsewhere in the contract. At least five (5) days before entry of each subcontractor’s personnel on the Owner installation, the Contractor shall furnish (or ensure that there has been furnished) to the Owner a current certificate of insurance, meeting the requirements of paragraph b. above, for each such subcontractor.

C. SITE CONDITIONS

Clause 12 - Differing Site Conditions

a. The Contractor shall promptly (no more than one day), and before the conditions are disturbed, give a written notice to the Owner as to (1) subsurface or latent physical conditions at the site which differ materially from those indicated in this contract, or (2) unknown physical conditions at the site of an unusual nature, which differ materially from those normally encountered and generally recognized.
as inherent in the work of the character
provided for in the contract.

b. The Owner shall investigate the site conditions
promptly after receiving the notice. If the
conditions do materially so differ and cause an
increase or decrease in the Contractor's cost of,
or the time required for, performing any part of
the work under this contract, whether or not
changed as a result of the conditions, a change
order shall be made under this clause and the
contract modified in writing in accordance with
the changes clause and the contract modified in
writing accordingly.

c. No request by the Contractor for an equitable
adjustment to the contract under this clause
shall be allowed unless the Contractor has given
the written notice required.

d. No request by the Contractor for a change to the
contract for differing site conditions shall be
allowed if made after final payment under this
contract.

Clause 13 - Site Investigation and Conditions
Affecting the Work

a. The Contractor acknowledges that it has taken
steps reasonably necessary to ascertain the
nature and location of the work, and that it has
investigated and satisfied itself as to the general
and local conditions which can affect the work
or its cost, including but not limited to: (1)
conditions bearing upon transportation,
disposal, handling, and storage of materials; (2)
the availability of labor, water, electric power,
and roads; (3) uncertainties of weather, water
table, river stages, tides, or similar physical
conditions at the site; (4) the conformation and
condition of the ground; and (5) the character of
equipment and facilities needed preliminary to
and during work performance. The Contractor
also acknowledges that it has satisfied itself as
to the character, quality, and quantity of surface
and subsurface materials or obstacles to be
encountered insofar as this information is
reasonably ascertained from an inspection of
the site, including all exploratory work done by
the Owner, as well as from the drawings and
specifications made a part of this contract. Any
failure of the Contractor to take the actions
described and acknowledged in this paragraph
will not relieve the Contractor from
responsibility for estimating properly the
difficulty and cost of successfully performing
the work, or for proceeding to successfully
perform the work without additional expense to
the Owner.

b. The Owner assumes no responsibility for any
conclusions or interpretations made by the
Contractor based on the information made
available by the Owner. Nor does the Owner
assume responsibility for any understanding
reached or representation made concerning
conditions which can affect the work by any of
its officers or agents before the execution of this
contract, unless that understanding or
representation is expressly stated in these
contract documents.

Clause 14 - Dimensions and Measurements

All dimensions shown of existing work and all
dimensions required for work that is to connect with
work now in place, shall be verified and calculated
by the Contractor by actual measurement of the
existing work. Any discrepancies between the
contract requirements and the existing conditions
shall be referred to the authorized representative
of the Owner before any work affected thereby has been
performed. Failure to notify the Owner before
starting work will be considered acceptance by the
Contractor. Where doubts as to dimensions exist,
Owner shall determine the correct dimensions.

Clause 15 - Notice of Conflicting Conditions

Where the Contractor's work is associated with that
of another Owner Contractor, the Contractor shall
examine the preceding or adjacent work and report in
writing to the Owner's authorized representative any
visible defect or condition preventing the proper
execution of his contract. If he proceeds without
giving notice, the Contractor shall be held to have
accepted the work or material, and the existing
conditions, and shall be responsible for any defects in
his own work consequent thereon, and shall be
relieved of any obligation or any guarantee because
of any such condition or imperfection. This provision
shall be included in any and all other contracts or
subcontracts for work to be performed where such a
conflict could exist.
D. SPECIFICATIONS AND DRAWINGS

Clause 16 - Specifications and Drawings, General

a. Subdivision: For convenience, these specifications are arranged into several sections, but such separation shall not be considered as the limits of the work required of any separate trade. The terms and conditions of such limitations are wholly between the Contractor and his subcontractors.

b. As-Built Drawings: The Contractor shall keep on the work site a current copy of the drawings and specifications and shall at all times give the Owner access thereto.

The Contractor will be given one extra set of drawings and specifications which shall be kept at the site of the work at all times and updated weekly. Payment may be withheld if drawings are not kept current. Exact locations of all pipes and conduits and all changes in construction and details shall be indicated and dimensions provided upon these drawings, and all changes in materials and equipment installed shall be indicated in these specifications. Upon completion of the work, the "as-built" drawings and specifications shall be returned to the Owner prior to the final payment.

In general, the working details will indicate dimensions, position, and kind of construction, and the specifications, qualities, and methods. Any work indicated on the working details and not mentioned in the specifications, or vice versa, shall be furnished as though fully set forth in both. Work not particularly detailed, marked, or specified shall be the same as similar parts that are detailed, marked, or specified.

In case of discrepancy in the documents, the matter shall be promptly submitted to the Owner's authorized representative, who shall make a determination in writing. Any adjustment by the Contractor without such a determination shall be at its own risk and expense. The Owner shall furnish from time to time such detailed drawings and other information as considered necessary, unless otherwise provided.

c. Similar Drawings: Where the word "similar" occurs on the drawings, it shall have a general meaning and not be interpreted as being identical, and all details shall be worked out in relation to their location and their connection with other parts of the work.

d. Standard Details: Standard Details or specification drawings are applicable when listed, bound with specifications, noted on the drawings or referenced elsewhere in the specifications. Where the notes on the drawings indicate modifications, such modifications shall govern.

Clause 17 - Summary of the Order of Precedence

In case of conflicts between the contract documents the order of precedence shall be as follows:

a. Modifications or changes last in time are first in precedence.

b. Addenda.

c. Owner-Contractor agreement.

d. General Conditions except for specific modifications thereto stated in the Supplementary Conditions or Division One Specification.

e. Supplementary Conditions.

f. Specifications.

g. Note: Should there be conflict among the General Conditions, Supplementary Conditions and Division One specification the more restrictive will apply.

h. Drawings; as between figures given on drawings and the scaled measurements, the figures shall govern; as between large-scale drawings and small-scale drawings, the larger scale shall govern. Structural drawings will take precedence over architectural drawings.

i. As between detailed drawings and standard plates bound within the specifications, the detailed drawings govern.

j. In the event where provisions of codes, safety orders, contract documents, referenced manufacturer’s specifications or industry
standards are in conflict, the more restrictive and higher quality shall govern.

k. Schedules on the drawings take precedence over conflicting information given on other drawings.

l. Architectural/structural drawings.

m. Mechanical/electrical drawings.

Clause 18 – Clarifications, Request for Information and Additional Instructions

a. Notification by Contractor: Should Contractor discover conflicts, omissions, or errors in the contract documents or have any question concerning interpretation or clarification of the contract documents, or if it appears to Contractor that the work to be done or any matters relative thereto are not sufficiently detailed or explained in the contract documents, then, before proceeding with work affected, Contractor shall immediately notify Owner's authorized representative in writing, and request interpretation, clarification, or additional detailed information concerning the work. Owner, whose decision shall be final and conclusive, shall resolve such questions and issue instructions to Contractor within a reasonable amount of time but in no less than 14 calendar days. Should Contractor proceed with work affected before receipt of instructions from Owner, Contractor shall remove and replace or adjust work which is not in accordance therewith and it shall be responsible for resultant damage, defect or added cost. In event of failure to agree as to scope of contract requirements, Contractor shall follow procedure set forth in the disputes clause. The Contractor shall ask for any clarification or request for information (clarification) immediately upon discovery based on the latest updated version of the Official Contract Schedule. The Contractor shall submit all requests for clarification and/or additional information to the Owner's authorized representative.

b. Additional Detailed Instructions: The Owner may furnish additional detailed written instructions to further explain the work, and such instructions shall be a part of the contract requirements. Should additional detailed instructions, in the opinion of Contractor, constitute work in excess of scope of the contract, it must submit written notice thereof immediately to the county but not more than seven (7) calendar days following receipt of such instruction, and in any event prior to commencement of work thereon. Owner will then consider such notice and, if in its judgment it is justified, the Owner's instructions will be revised or the extra work authorized. Contractor shall have no claim for additional compensation because of such additional instructions unless Contractor gives the Owner written notice thereof within the seven days specified above. For procedure concerning protests in case of dispute as to contract requirements, attention is directed to the disputes clause.

E. SHOP DRAWINGS AND SUBMITTALS

Clause 19 – Shop Drawings, Product Data, Coordination Drawings and Schedules

a. Shop drawings means drawings, submitted to the Owner by the Contractor, subcontractor, or any lower tier subcontractor manufacturer, supplier or distributor pursuant to a construction contract, showing in detail (1) the proposed fabrication and assembly of structural elements and (2) the installation (i.e., form, fit, and attachment details) of materials or equipment. It includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, fabrication, erection and setting drawings, manufacturers' scale drawings, wiring and control diagrams, cuts or entire catalogs, pamphlets, and performance and test data, and similar materials furnished by the Contractor to explain in detail specific portions of the work required by the contract. The Owner may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.

b. If this contract requires shop drawings, the Contractor shall coordinate all such drawings and review them for accuracy, completeness, and compliance with contract requirements and shall indicate its approval thereon as evidence of such coordination and review. Shop
drawings submitted to the Owner without evidence of the Contractor’s approval may be returned for rescissions. The Architect/Engineer will indicate an approval or disapproval of the shop drawings and if not approved as submitted shall indicate the reasons therefor. Any work done before such approval shall be at the Contractor’s risk. Approval or disapproval by the Architect/Engineer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this contract, except with respect to variations described and approved in accordance with paragraph c. below.

c. If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Architect/Engineer approves any such variation, no change in time or price will be allowed for Contractor changes. Should the Architect/Engineer make changes on the shop drawings, affecting time and/or cost, the Contractor will immediately notify the Owner with a request for information. If the Owner approves the change, it shall issue an appropriate contract modification, except that, if the variation is minor or does not involve a change in price or in time of performance, a modification need not be issued.

d. Clause 19 shall be included in all subcontracts at any tier.

e. The Contractor shall submit shop drawings, coordination drawings, and schedules for approval as required by the specifications or requested by the Owner as follows. The Contractor will provide a submittal schedule listing all shop drawings and submittals, the submission dates by the Contractor and return dates from the architect, this schedule will be provided two weeks after Notice to Proceed.

f. Shop drawings and schedules, other than catalogs, pamphlets, and similar printed material, shall be submitted with one reproducible plus six copies. The reproducible will be returned to the Contractor who shall submit as many additional copies as the Contractor may desire or need for his use or use by subcontractors.

g. Before submitting shop drawings on the mechanical and electrical work, the Contractor shall submit and obtain the Owner’s approval of such lists of mechanical and electrical equipment and materials as may be required by the specifications, and shall submit a submittal schedule.

h. Each shop drawing or coordination drawing shall have a blank area 5 by 5 inches located adjacent to the title block. The title block shall display the following:

- Number and title of drawing
- Date of drawing or revision
- Name of project building or facility
- Name of Contractor and (if appropriate) name of subcontractor submitting drawings
- Clear identity of contents and location on the work
- Project title and contract number
- Submittal number

i. Unless otherwise provided in this contract, or otherwise directed by Owner, shop drawings, coordination drawings, and schedules shall be submitted to the Architect/Engineer with a letter in triplicate, sufficiently in advance of construction requirements to permit no less than fifteen (15) working days for checking and appropriate action. More complex submittals will take in excess of 15 working days for architect action.

j. Approval of drawings and schedules will be general and shall not be construed as permitting any departure from the contract requirements, or as approving departures from full-size details furnished by the Owner.

Clause 20 - Samples

a. After the award of the contract, the Contractor shall furnish for the approval of the Owner samples required by the specifications or by the Owner. Samples are physical examples which illustrate materials, equipment or workmanship
Environmental Health Building Tenant Improvements Project
General Conditions

and establish standards by which the work will be judged. Samples shall be delivered to the Owner or to the Architect/Engineer as specified or as directed. The Contractor shall prepay all shipping charges on samples. Materials or equipment for which samples are required shall not be used in the work until approved in writing by the Owner.

b. Each sample shall have a label indicating:

(1.) Name of project building or facility, project title, and contract number.

(2.) Name of Contractor and, if appropriate, name of subcontractor.

(3.) Identification of material or equipment with specification requirement.

(4.) Place of origin.

(5.) Name of producer and brand (if any).

Samples of finished materials shall have additional markings that will identify them under the finish schedules.

c. The Contractor shall mail under separate cover a letter in triplicate submitting each shipment of samples and containing the information required in paragraph b. above. He shall enclose a copy of this letter with the shipment and send a copy to the Owner representative on the project. Approval of a sample shall be only for the characteristics or use named in such approval and shall not be construed to change or modify any contract requirement. Substitutions will not be permitted unless they are approved in writing by the Owner.

d. Approved samples not destroyed in testing will be sent to the Owner representative. Approved samples of hardware in good condition will be marked for identification and may be used in the work. Materials and equipment incorporated in the work shall match the approved samples. Other samples not destroyed in testing or not approved will be returned to the Contractor at his expense if so requested at time of submission.

e. Failure of any material to pass the specified tests will be sufficient cause for refusal to consider, under this contract, any further samples of the same brand or make of that material or equipment which previously has proven unsatisfactory in service.

f. Samples of various materials or equipment delivered on the site or in place may be taken by the Owner representative for testing. Samples failing to meet contract requirements will automatically void previous approvals of the items tested. The Contractor shall replace such materials or equipment found not to have met contract requirements, or there shall be a proper adjustment of the contract price as determined by the Owner.

g. Unless otherwise specified, when tests at required only one test of each sample proposed for use will be made at the expense of the Owner. Samples, which do not meet specification requirements will be rejected. Testing of additional samples will be made by the Owner at the expense of the Contractor.

Clause 21 - Substitutions

a. For convenience in designation on the plans or in the specifications, certain materials, articles, or equipment may be designated by a brand or trade names or the names of the manufacturers together with catalog designations or other identifying information, hereinafter referred to generically as “designated by brand names.” An alternative material, article, or equipment which is of equal or superior quality and of the required characteristics for the purpose intended may be proposed for use provided the Contractor complies with the following requirements:

b. The Contractor shall submit all his proposals for a substitution in writing within forty-five (45) days after Notice to Proceed. No substitution will be considered after the 45-day period except as allowed by the Owner.

c. No such proposal will be considered unless accompanied by complete information and descriptive data necessary to determine the
equality of the offered materials, articles, or equipment. Samples shall be provided when requested by the Owner.

d. The Contractor shall note that the burden of proof as to the comparative quality or suitability of the offered materials, articles, or equipment shall be upon the Contractor. The Owner or its agents shall be the sole judge as to such matters. In the event that the Owner rejects the use of such alternative materials, articles, or equipment, then one of the particular products designated by brand name shall be furnished.

e. The Owner will examine, with reasonable promptness, such submittals, and return of submittals to the Contractor shall not relieve the Contractor from responsibility for deviations and alternatives from the contract plans and specifications, nor shall it relieve him from responsibility for errors in the submittals. A failure by the Contractor to identify, in his letter of transmittal, material deviations from the plans and specifications shall void the submittal and any action taken thereon by the Owner. When specifically requested by the Owner, the Contractor shall resubmit such shop drawings, descriptive data, and samples as may be required.

f. If any mechanical, electrical, structural, or other changes are required for the proper installation and fit of alternative materials, articles, or equipment, or because of deviations from the contract plans and specifications, such changes shall not be made without the consent of the Owner and shall be made without additional cost to the Owner.

g. Contractor will be liable for cost of the architect and/or engineer to provide technical review and approval of any substitutions.

h. The Contractor is directed to Public Contract Code Section 3400 for substitution requirements for items that list only one brand or trade name. The contractor shall have five (5) days after the bid date to provide documentation for review of these proposed substitutions. No award shall be made during this period.

F. SCHEDULES

Clause 22 - Construction Schedule

a. The Contractor shall, within fourteen (14) calendar days after the Notice to Proceed or another period of time determined by the Owner, prepare and submit to the Owner for approval three copies of a practicable schedule showing the order in which the Contractor proposes to perform the work, and the dates on which the Contractor contemplates starting and completing the several salient features of the work (including acquiring materials and equipment). The schedule shall be in the form of a progress chart or CPM (critical path method) schedule (as selected and approved by the Owner) of suitable scale to indicate appropriately the percentage of work scheduled for completion by any given date during the period (CPM activities will not exceed 14 days). If the Contractor fails to submit a schedule within the time prescribed, the Owner may withhold approval of progress payments until the Contractor submits the required schedule.

b. The Contractor shall enter the actual progress on the chart/schedule at least monthly with the payment request or as directed by the Owner, and upon doing so shall immediately deliver three copies of the annotated schedule to the Owner's authorized representative. If, in the opinion of the Owner, the Contractor falls behind the approved schedule, the Contractor shall take steps necessary to improve its progress, including those that may be required by the Owner, without additional cost to the Owner. In this circumstance, the Owner may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of construction plant, and to submit for approval any supplementary schedule or schedules in CPM or chart form as the Owner deems necessary to demonstrate how the approved rate of progress will be regained.

c. Failure of the Contractor to comply with the requirements of the Owner under this clause shall be grounds for a determination by the Owner that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the
contract. Upon making this determination, the Owner may terminate the Contractor's right to proceed with the work, or any separable part of it, in accordance with the termination clause of this contract.

G. TIME AND LIQUIDATED DAMAGES

Clause 23 - Time of Work, Liquidated Damages, and Extensions

a. Time of Work

The Contractor shall commence work on this project the day following receipt of the written Notice to Proceed. Upon receipt of such notice the Contractor shall begin work and shall prosecute the work diligently to completion within the number of calendar days specified in the contract. No work shall be commenced before the contract is fully executed.

b. Liquidated Damages

If the work is not completed within the time required, damage will be sustained by the Owner. It is and will be impracticable and extremely difficult to ascertain and determine actual damage which Owner will sustain by reason of such delay; and it is therefore agreed that Contractor will pay to Owner the sum of money stipulated per day in the Contract for each and every day's delay in finishing the work beyond the time prescribed. If the Contractor fails to pay such liquidated damage, the Owner may deduct the amount thereof from any money due or that may become due the Contractor under the contract.

c. Unavoidable Delays

(1.) Time Extension

(a.) The Contractor will be granted an extension of time for completion of the work beyond that named in the Contract Documents, for delays which may result through causes beyond the control of the Contractor and which he could not have avoided by the exercise of care, prudence, foresight and diligence.

(b.) Contractor shall be allowed extensions of time in which to complete the work equal to the sum of all unavoidable delays, plus any adjustments of contract time due to contract change orders. During such extension of time liquidated damages shall not be charged to the Contractor.

(c.) Unavoidable delays within the meaning of this section shall be those caused by acts or neglect of the Owner, its employees, or those under it by contract or otherwise; by Acts of God (including weather) or of the public enemy, fire, epidemics, or strikes. Material shortages and delays in utility company connections may be classified as an unavoidable delay if the Contractor can produce satisfactory evidence that he acted in a timely manner. There will be no damages for delays caused by Acts of God, public enemy, fire, epidemics, strikes, material shortages, and utility companies. There will be no damage for delays as described under this paragraph (c).

(d.) Delays in the prosecution of parts of the work which may in themselves be unavoidable, but do not necessarily prevent or delay the prosecution of other parts of the work nor the completion of the work within the time specified, which do not necessarily prevent the completion of the whole work within the time herein specified, will not be considered as unavoidable delays within the meaning of the contract.

(2.) Weather

The Contractor will not be allowed a day for day weather delay when the contract is bid to be constructed during a period that will normally include inclement weather. The Contractor will only be allowed a time extension for unusually severe weather if it results in precipitation or other conditions which in the amount frequency, or duration is in excess of the norm at the location and time of the year in question as established by NOAA weather data. A day for day extension
will only be allowed for those days in excess of the norm.

The Contractor is expected to work seven (7) days per week (if necessary, irrespective of inclement weather), to maintain access, and weather protect the work under construction. During wet periods, the Contractor shall provide site/soil stabilization to allow access for his construction equipment. Stabilization of the site shall be achieved by lime stabilization, placement of aggregate base and fabric on roadways and work/staging areas or other suitable means as approved by the Owner. The Contractor shall seal all excavated areas each night to promote drainage and to decrease saturation.

If the weather is unusually severe (or conditions resulting therefrom) in excess of the NOAA data norm and prevents the Contractor from beginning at the usual starting time, or prevents the Contractor from proceeding with seventy-five percent (75%) of the normal labor and equipment force towards completion of the day's current controlling item on the accepted schedule for a period of at least five hours, and the crew is dismissed as a result thereof, the Owner will designate such time as unavoidable delay and grant one (1) calendar-day extension.

(3.) Notice

Whenever the Contractor foresees any delay in the prosecution of the controlling (critical path) work activity, and in any event immediately upon the occurrence of any delay which he regards as an unavoidable delay, the Contractor shall notify the Owner in writing of such delay and its cause, in order that the Owner may take immediate steps to prevent, if possible, the occurrence or continuance of the delay, and may determine whether the delay is to be considered avoidable or unavoidable, how long it continues, and to what extent the prosecution and completion of the work are to be delayed thereby.

After the completion of any part or the whole of the work, the Owner, in calculating the amount due the Contractor, will assume that any and all delays which have occurred have been avoidable delays, except such delays as shall have been called to the attention of the Owner at the time of their occurrence and found by the Owner to have been unavoidable as substantiated by a change order. The Contractor will make no claims that any delay not called to the attention of the Owner at the time of its occurrence has been an unavoidable delay.

d. Request for Time Extension

In the event the Contractor requests an extension of contract time for unavoidable delay (or for changes see Change Order Process Clause), such justification shall be submitted no later than seven days after the initial occurrence of any such delay. When requesting time for change orders they must be submitted with the change with full justification. If the Contractor fails to submit justification with the change they will waive their right to a time extension at a later date. Such justification must be based on the official contract schedule as updated at the time of occurrence of delay or execution of work related to any changes to the scope of work. The justification must include, but is not limited to, the following information:

(1.) The duration to perform the activity relating to the changes in the work and the resources (manpower, equipment, material, etc.) required to perform these activities within the stated duration.

(2.) Logical ties to the official contract schedule for the proposed changes and/or delay showing the activity/activities in the schedule whose start or completion dates are affected by the change and/or delay.

The Owner, after receipt of such justification and supporting evidence, shall make its finding of fact. The Owner's decision shall be final and conclusive and the Owner will advise the Contractor in writing of such decision. If the Owner finds that the Contractor is entitled to any extension of contract time, the Owner's determination as to the total number of days of extension shall be based upon the latest updated version of the official contract schedule. Such
data will be included in the next monthly updating of the schedule.

H. PERFORMANCE

Clause 24 - Supervision & Construction Procedures

The Contractor shall supervise and direct the work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for all construction means, methods, techniques, sequences and procedures, and shall coordinate all portions of the work under the contract, including the relations of the various trades to the progress of the work, in accordance with the provisions of the contract documents.

The Contractor shall be responsible to the Owner for the acts and omissions of the Contractor's employees, subcontractors, and their agents and employees, and any other persons performing any of the work under a contract with the Contractor.

The Contractor is an independent agent and nothing in the Contract Documents shall be interpreted to make the Contractor an agent of the Owner.

Clause 25 - Supervision

a. Within seven (7) days after Notice to Proceed, the Contractor shall provide to the Owner his/her organization chart outlining key job personnel. The Contractor will also provide a Letter of Authority for those personnel who are authorized to sign contract documents on his/her behalf, i.e., payment requests, change orders, inspection reports, etc.

b. The Contractor shall employ, during the progress of the work, a competent Project Manager and Superintendent as approved by the Owner, and any necessary assistants. The Superintendent shall not be changed except with the consent of the Representative, unless the Superintendent proves to be unsatisfactory to the Contractor or ceases to be in his employ. The Representative shall be notified immediately of any new Superintendent appointed to the work and the Contractor shall submit qualifications for approval. The Superintendent shall represent the Contractor and all directions given to him shall be as binding as if given to the Contractor. Important directions shall be confirmed in writing by the Contractor. Other directions shall be so confirmed on written request in each case.

The Contractor shall give efficient supervision to the work, using his best skill and attention. He shall carefully study and compare all drawings, specifications, and other instructions and shall at once report to the Representative any error, inconsistency, or omission which he may discover but he shall not be held responsible for their existence or discovery.

c. The Superintendent shall be present at the site of the work at all times, both while work is actually in progress on the Contract and during periods when work is suspended. The Superintendent shall not be employed on any other project during the course of this work unless approved by the Owner.

d. The Owner shall be supplied at all times with the names and telephone numbers of at least two (2) persons in charge of or responsible for the work, who can be reached for emergency work twenty-four (24) hours a day, seven (7) days a week.

e. The Superintendent will be provided a copy of all contract documents by the Contractor.

f. The Superintendent (and others as requested) shall attend all meetings called by the Owner.

Clause 26 - Conduct of Work

a. The Owner reserves the right to do other work in connection with the project by contract or otherwise, and the Contractor shall at all times conduct his work so as to impose no hardship on the Owner or others engaged in the work. He shall adjust correct, and coordinate his work with the work of others so that no discrepancies shall result in the whole work.

b. In engaging one kind of work with another, marring, or damaging same will not be
permitted and, in the event such occurs, shall be corrected by the Contractor at his cost prior to acceptance by the Owner. Should improper work of any trade be covered by another which results in damage or defects, the whole work affected shall be made good by the Contractor without expense to Owner.

**Clause 27 - Protection of Work & Property**

a. The Contractor shall continuously maintain adequate protection of all his work from damage and shall protect the Owner's property from injury, or loss arising in connection with this contract. He shall make good any such damage, injury, or loss, except such as may be directly due to errors in the contract documents or caused by agents or employees of the Owner. He shall adequately protect adjacent property as provided by law and the contract documents.

b. The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with tree-pruning compound as directed by the Owner.

c. The Contractor shall protect from damage all existing improvements and utilities (1) at or near the work site and (2) on adjacent property of a third party, the locations of which are known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Owner may have the necessary work performed and charge the cost to the Contractor.

**Clause 28 - Overloading:**

a. If the Contractor shall cause, permit, or allow any part of the building or buildings to be overloaded by storing, piling, or setting thereon any material or equipment, or by performing thereon any of his work, he shall do so at his sole risk, and he shall be solely responsible for any and all loss, damage, and/or injury arising or resulting therefrom.

b. All materials brought onto the site shall be stacked up in an orderly manner in a designated area not in conflict with the area where work is being performed.

c. Contractor shall provide and maintain all scaffolding for use of subcontractors unless otherwise specified.

**Clause 29 - Contractor's Responsibility For Work**

Until formal acceptance of the work by the Owner, Contractor shall have the charge and care thereof and shall bear risk of injury of damage to any part of the work by action of the elements, or from any other cause except for such damages as are directly and proximately occasioned by acts of the Federal or State Government and the public enemy.

Contractor, at its cost, shall rebuild, repair, restore and make good all such damages to any portion of the work occasioned by such causes before its acceptance.

No advertising of any description will be permitted in or about the work, except by order of the Owner.

Contractor shall not create or permit the continued existence of any nuisance in or about the work.

**Clause 30 - Utilities**

a. **Furnish Utilities.** Unless otherwise provided for under separate sections hereinafter described, Contractor will arrange for and provide continuously until acceptance of the work, all water, gas, and electricity required. Contractor shall pay for such services unless specifically otherwise noted.
b. **Interruption of Utilities.** Utilities shall not be interrupted except with the approval of the Owner. Forty-eight (48) hour written notice is required prior to all interruptions. Interruptions shall be scheduled so as to minimize duration and disruption to existing operation.

(2.) See substitution clause concerning "or equal" requirements and procedure for submitting alternative material, articles, or equipment.

(3.) All materials shall be delivered so as to insure a speedy and uninterrupted progress of the work. Same shall be stored so as to cause no obstruction and so as to prevent overloading of any portion of the structure on work site, and the Contractor shall be entirely responsible for damage or loss by weather, theft, vandalism or other cause.

(4.) Materials shall be stored to assure the preservation of their quality and fitness for the work. Stored materials shall be reasonably accessible for inspection. When considered necessary by the Owner, stored materials shall be placed on wooden plat-forms or on other hard, clean surfaces and not directly on the ground, and shall be placed under cover when so directed.

(5.) No materials manufactured or produced in a penal or correctional institution shall be incorporated in the project under this contract, except as permitted by California law.

c. **Public Utilities**

(1.) The Contractor shall send proper notices, make all necessary arrangements, and perform all other services required in the care and maintenance of all public utilities. The Contractor shall assume all responsibility concerning same for which the Owner may be liable.

(2.) To the satisfaction of the Owner, enclosing or boxing in, for protection of any public utility equipment, shall be done by the Contractor. Upon completion of the work, the Contractor shall remove all enclosures, fill in all openings in masonry, grouting the same watertight, and leave in a finished condition.

(3.) All connections to public utilities shall be made and maintained in such manner as not to interfere with the continuing use of same by the Owner during the entire progress of the work.

---

**Clause 31 - Working Hours**

It is contemplated that all work will be performed on a calendar day basis during the customary working hours of the trades involved unless otherwise specified in this contract. Work performed by the Contractor of his own volition outside such customary working hours shall be at no additional expense to the Owner and with Owner approval.

**Clause 32 - Material & Workmanship**

a. **Materials & Equipment:**

(1.) Materials, equipment, and articles incorporated into the work shall be new and of quality equal or superior to that specified. When not particularly specified, materials shall be the best of their class or kind. The Contractor shall, if required, submit satisfactory evidence as to the kind and quality of material.

---

**Clause 33 - Layout of Work**

The Contractor shall lay out its work from Owner-established base lines and bench marks indicated on the drawings, and shall be responsible for all measurements in connection with the layout. The Contractor shall furnish, at its own expense, all stakes, templates, platforms, equipment, tools, material, and labor required to layout any part of the work. The Contractor shall be responsible for executing the work to the lines and grades that may be established or indicated by the Owner. The Contractor shall also be responsible for maintaining and preserving all stakes and other marks established by the Owner until authorized to remove them. If such marks are destroyed by the Contractor or through its negligence before their removal is authorized, the Owner may replace them and deduct the expense of the replacement from any amounts due or to become due to the Contractor.
Clause 34 - Use of Premises

a. If the premises are occupied, the Contractor, his subcontractors, and their employees shall comply with the regulations governing access to, operation of, and conduct while in or on the premises and shall perform the work required under this contract in such a manner as not to unreasonably interrupt or interfere with the conduct of Owner business.

b. Any request received by the Contractor from occupants of existing buildings to change the sequence of work shall be referred to the Owner or authorized representative for determination.

c. If the premises are occupied, the Contractor, his subcontractors and their employees shall not have access to or be admitted into any building outside the scope of this contract except with official permission of authorized representative.

Clause 35 - Operations & Storage

a. The Contractor shall confine all operations (including storage of materials) on Owner premises to areas authorized or approved by the Owner. The Contractor shall hold and save the Owner, and its officers and agents, free and harmless from liability of any nature occasioned by the Contractor’s performance.

b. Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the Owner and shall be built with labor and materials furnished by the Contractor without expense to the Owner. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Owner, the buildings and utilities may be abandoned and need not be removed.

c. The Contractor shall, under regulations prescribed by the Owner, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Owner. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or Owner regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

Clause 36 - Heat

Unless otherwise specified or unless already provided by the Owner, the Contractor shall:

a. Provide heat, as necessary to protect all work, materials, and equipment against injury from dampness and cold;

b. Protect, cover and/or heat as may be necessary, to produce and maintain a temperature of not less than 50 degrees Fahrenheit (1) for the concrete during the placing, setting, and curing, and (2) for the plaster during the application, setting, and curing of plaster; and

c. Provide heat as necessary in the area where work is to be done to provide the minimum temperature recommended by the supplier or manufacturer of the material, but in no case less than 50 degrees Fahrenheit, for a period beginning 10 days before placing of interior finishes and finish materials and continuing until substantial completion or beneficial occupancy of the area, whichever is earlier.

Clause 37 - Cleaning Up

The Contractor shall at all times keep the work area, including storage areas, free from accumulations of waste materials. Before completing the work, the Contractor shall remove from the work and premises any weeds rubbish, tools, scaffolding, equipment, and materials that are not the property of the Owner. Upon completing the work, the Contractor shall leave the work area in a clean, neat, and orderly condition satisfactory to the Owner.
I. SAFETY & HEALTH

Clause 38 - Accident Prevention

a. In performing this contract, the Contractor shall provide for protecting the lives and health of employees and other persons; preventing damage to property, materials, supplies, and equipment; and avoiding work interruptions. For these purposes, the Contractor shall:

(1.) Provide a copy of its safety program;

(2.) Provide appropriate safety barricades, signs, and signal lights;

(3.) Comply with standards issued by the U.S. Government, State, County and City; and

(4.) Ensure that any additional measures be reasonably necessary for this purpose are taken.

b. The Contractor shall maintain an accurate record of exposure data on all accidents incident to work performed under this contract resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment. The Contractor shall report this data in the manner prescribed by the Owner.

c. Where conditions of the work present unreasonable risk of injury or death to persons, or property damage, in the judgement of the Owner it may direct Contractor at the Contractor's so expense, to take corrective action.

d. Before beginning excavation for a trench 5 feet or more in depth, Contractor shall submit to and shall receive acceptance from the Architect/Engineer through the authorized representative for detailed plans showing design of shoring, bracing, sloping, or other provisions to be made for worker protection from hazard of caving ground. Such plans shall be submitted at least 14 days before Contractor intends to begin trench work. If such plans vary from shoring system standards established by the State of California Construction Safety Orders, the plans shall be prepared by a registered civil or structural engineer.

Nothing herein shall be deemed to allow use of shoring, sloping, or protective systems less effective than those required by the Construction Safety Orders of the California Division of Industrial Safety.

Clause 39 – Sanitary Facilities:

Contractor shall supply and maintain at its expense such toilets and other sanitary facilities as are necessary for use by workers employed at the job site. Such facilities shall be approved by the Owner.

Clause 40 - Responsibility for Compliance With (OSHA):

All work, materials, work safety procedures and equipment shall be in full accordance with the latest OSHA rules and regulations.

Contractor warrants that he and each of his subcontractors shall, in performance of this contract, comply with each and every compliance order issued pursuant to OSHA. The Contractor assumes full and total responsibility for compliance with OSHA standards by his subcontractors as well as himself. The cost of complying with any compliance order and/or payment of any penalty assessed pursuant to OSHA shall be borne by the Contractor. Contractor shall save, keep, and hold harmless the Owner, and all officers, employees, and agents thereof, from all liabilities, costs, or expenses, in law or in equity, that may at any time arise or be set up because of Contractor's or a subcontractor's noncompliance or alleged noncompliance with OSHA requirements. Nothing contained therein shall be deemed to prevent the Contractor and his subcontractors from otherwise allocating between themselves responsibility for compliance with OSHA requirements; provided, however, that the Contractor shall not thereby be, in any manner whatsoever, relieved of his responsibility to the Owner as hereinabove set forth.
Clause 41 - Toxic and Hazardous Materials and Waste

a. Asbestos. Operations which may cause release of asbestos fibers into the atmosphere shall meet the requirements of CCR Title 8, General Industrial Safety Orders, Section 5208. Some operations which may cause such concentrations include sanding, grinding, abrasive blasting, sawing, drilling, shoveling, or otherwise handling materials containing asbestos so that dust will be raised.

Such materials can include resilient flooring, existing gypsum wallboard, asbestos-cement board, spray-on fiber-proofing for steel, cement plaster, asbestos pipe insulation and acoustical sprays, tiles, and boards.

In accordance with paragraph e., below, asbestos in building materials is prohibited. This section only applies to existing materials on the site that may be discovered during construction.

b. Toxic Materials. Operations which release toxic materials into the atmosphere shall meet the requirements of CCR Title 8, General Industrial Safety Orders. Some operations which may release such materials include use of adhesives, sealants, paint, and other coatings.

c. Lead-Based Paint. Lead-based paint is prohibited. Lead-based paint is defined as:

(1.) Any paint containing more than five-tenths of one percent lead by weight (calculated as lead metal in the total non-volatile content of the paint) or the equivalent measure of lead in the dried film of paint applied or both; or (2.) For paint manufactured after June 22, 1977, any paint containing more than six one-hundredths of one percent lead by weight (calculated as lead metal) in the total content of the paint or the equivalent measure of lead in the dried film or paint already applied.

d. Hauling and Disposal. Meet requirements of CAC Title 22, Division 4, Chapter 30, "Minimum Standards for Management of Hazardous and Extremely Hazardous Wastes.

e. Asbestos Prohibited. No products or materials containing asbestos shall be incorporated into the work without the prior written approval of the Owner.

J. COUNTY FURNISHED PROPERTY

Clause 42 - Owner-Furnished Property

a. The Owner will furnish to the Contractor the property identified in the specification to be incorporated or installed into the work or used in performing the contract. The listed property will be furnished f.o.b. railroad cars at the place specified in the contract or f.o.b. truck at the project site. The Contractor is required to accept delivery, pay any demurrage or detention charges, and unload and transport the property to the job site at its own expense. When the property is delivered, the Contractor shall verify its quantity and condition and acknowledge receipt in writing to the Owner. The Contractor shall also report in writing to the Owner within twenty-four (24) hours of delivery any damage to or shortage of the property as received. All such property shall be installed or incorporated into the work at the expense of the Contractor, unless otherwise indicated in this contract.

b. Each item of property to be furnished under this clause shall be identified by the Contractor in a schedule by quantity, item, and description.

c. The Contractor shall be held responsible for all material delivered to him and deductions will be made from any moneys due him to make good any shortages and deficiencies, from any clause whatsoever, which may occur after such delivery.

d. The Contractor shall set up accounting records and establish an inspection procedure as approved by the Owner.

K. BENEFICIAL OCCUPANCY

Clause 43 - Beneficial Occupancy

a. Use and Possession

(1.) The Owner shall have the right to take possession of or use any completed or partially
completed part of the work. Before taking possession of or using any work, the Owner shall furnish the Contractor a list of items of work remaining to be performed or corrected on those portions of the work that the Owner intends to take possession of or use. However, failure of the Owner to list any item of work shall not relieve the Contractor of responsibility for complying with the terms of the contract. The Owner’s possession or use shall not be deemed substantial completion nor an acceptance of any work under the contract. The Contractor will continue to pay for any portion of the utilities which it is using.

2. While the Owner has such possession or use, the Contractor shall be relieved of the responsibility for the loss of or damage to the work resulting from the Owner's possession or use. If prior possession or use by the Owner delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment shall be made in the contract price or the time of completion, and the contract shall be modified in writing accordingly.

b. Use of Equipment

1. The Owner may take over and operate, with Owner employees, such equipment as is necessary for heating or cooling such areas of the building as require the service, as soon as the installation is sufficiently complete.

2. The Owner will advise the Contractor by letter, prior to the use of equipment, which items of equipment will be operated, and the date and time such operation will begin.

3. Owner operation of equipment will not relieve the Contractor of the guarantee on materials and workmanship elsewhere provided for in this contract.

4. The guarantee period, elsewhere provided for in this contract, for each piece of equipment shall be in accordance with the "Guarantees" clause of this contract.

L. INSPECTION AND TESTING

Clause 44 - Inspection and Testing

a. The Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the work called for by this contract conforms to contract requirements. The Contractor shall maintain complete inspection records and make them available to the Owner. All work shall be subject to Owner inspection and tests at all places and at all reasonable times before acceptance to ensure strict compliance with the terms of the contract.

b. Owner inspections and tests are for the sole benefit of the Owner and do not:

1. Relieve the Contractor of responsibility for providing adequate quality control measures;

2. Relieve the Contractor of responsibility for damage to or loss of the material before acceptance;

3. Constitute or imply acceptance; or

4. Affect the continuing rights of the Owner after acceptance of the completed work latent defects, gross mistakes, fraud or the Owner's rights under any warranty or guarantee.

c. The presence or absence of a Owner inspector does not relieve the Contractor from any contract requirement, nor is the inspector authorized to change any term or condition of the specification without the Owner's written authorization.

d. The Contractor shall promptly furnish, without additional charge, all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by the Owner. The Owner may charge to the Contractor any additional cost of inspection or test when work is not ready at the time specified by the Contractor for inspection or test, or when prior rejection makes re-inspection or retest necessary. Special, full size, and performance tests shall be performed as described in the contract.

e. The Contractor shall, without charge, replace or correct work found by the Owner not to conform to contract requirements, unless in the public interest the Owner consents to accept the work with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.
f. If the Contractor does not promptly replace or correct rejected work, the Owner may (1) by contract or otherwise, replace or correct the work and charge the cost to the Contractor or (2) terminate for default the Contractor's right to proceed.

g. If, before acceptance of the entire work, the Owner decides to examine already completed work by removing it or tearing it out, the Contractor, on request, shall promptly furnish all necessary facilities, labor, and material. If the work is found to be defective or nonconforming in any material respect due to the fault of the Contractor or its subcontractors, the Contractor shall defray the expenses of the examination and of satisfactory reconstruction. However, if the work is found to meet contract requirements, the Owner shall issue a Change Order,

h. The Contractor shall at all times maintain proper facilities and provide safe access for inspection by the Owner to all parts of the work, and to the shops wherein the work is in preparation. Where the specifications require work to be specially tested or approved, it shall not be tested or covered up without timely notice to the Owner of its readiness for inspection and without the approval thereof or consent thereto by the latter. Should any such work be covered up without such notice, approval, or consent, it must, if required by Owner, be uncovered for examination at the Contractor's expense.

i. The Contractor shall notify the Owner at least twenty-four (24) hours in advance of the time required for the inspection. Should the Contractor fail to notify the Owner and proceed with work requiring inspection, all such work is rejected, and no further work shall be done on the Project until the rejected work is accepted by the Owner. Should the Contractor request acceptance of such rejected work the Owner shall, at the Contractor's expense, secure the services of private material testing laboratories, consulting engineers or licensed land surveyors, who shall certify that said work does in fact conform to the requirements of the Plans and these specifications. The work previously rejected shall be accepted by the Owner after receipt of such certification if the Owner approves of such certification.

j. Whenever the Contractor intends to perform work on Saturday, Sunday, a legal holiday, or after normal working hours, he shall give notice to the Owner representative of such intention at least two (2) working days prior to performing such work, or such other period as may be specified, so that the Owner may make necessary arrangement.

k. Construction review of the Contractor's performance by the Owner is not intended to include the review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.

l. The Owner will pay for initial testing services specified to be performed by the Owner. When initial tests indicate noncompliance with the contract documents, subsequent retesting occasioned by the noncompliance shall be performed by the same testing agency, and costs thereof will be deducted by the Owner from the contract sum.

Clause 45 - Condemned Materials and Labor

a. The Contractor shall promptly remove from the premises all work condemned by the Owner representative as failing to conform to the contract, whether incorporated or not, and the Contractor shall promptly replace and reexecute his own in accordance with the contract and without expense to the Owner and shall bear the expense of making good all work of other Contractors destroyed or damaged by such removal or replacement.

b. If the Contractor does not remove such condemned work within a reasonable time, fixed by written notice, the Owner may remove it and may store the material at the expense of the Contractor. If the Contractor does not pay the expenses of such removal within ten (10) days of the written notice, the Owner shall sell such materials at auction or at private sale and shall account for the net proceeds thereof, after deducting all the costs and expenses that should have been borne by the Contractor.

c. Neither the final certificate nor payment nor any provision in the contract documents shall relieve the Contractor of responsibility for faulty materials or workmanship, and, unless otherwise specified, he shall remedy any defects due thereto and pay for any damages to
other work, resulting therefrom which shall appear within a period of two (2) years from the date of substantial completion.

Clause 46 - Inspection by Other Jurisdictions

Whenever any part of the work to be performed is under the jurisdiction or control or is to be paid for, in whole or in part, by another entity or public jurisdiction, including but not limited to: city, United States Government, or State of California, such work shall be subject to inspection by the proper officials of such jurisdictions and it must pass inspection, in addition to Owner inspection and such other inspection as may be otherwise provided for in the contract documents.

Clause 47 - Final Inspection and Tests

The Contractor shall give the Owner at least ten (10) calendar days' advance written notice of the date the work will be fully completed and ready for final inspection and tests. Final inspection and tests will be started within 10 calendar days from the date specified in the aforesaid notice unless the Owner determines that the work is not ready for final inspection and so informs the Contractor.

M. ACCEPTANCE

Clause 48 - Acceptance of the Work

a. If, from the final inspection and after all contract documentation has been received, the Owner determines that the contract has been completed, the Representative will certify to the Board of Supervisors and a copy of a letter of acceptance will be sent to Contractor. (See final payment clause.) Upon receipt of the copy of the acceptance, Contractor will be relieved of the duty of maintaining and protecting the work. If the Owner determines that work is not complete after receipt of certification by Contractor, Contractor shall be notified in writing of deficiencies, and procedures for final inspection, as set forth above, shall again be initiated by Contractor. Neither determination by the Owner that the work is complete nor acceptance thereof shall operate as a bar to claim against Contractor pursuant to warranty and guarantees.

b. Partial payments shall not be construed as acceptance of any part of the work.

c. In judging the work no allowance for deviations from the drawings and specifications will be made, unless already approved in writing at the time and in the manner as called for herein.

d. Owner shall be given adequate opportunity to make any necessary arrangements for fire insurance and extended coverage.

e. Acceptance of the contract will not be given until all requirements of the contract documents are complete and approved by the Owner. This shall include, but is not limited to, all construction, guarantee forms, parts lists, schedules, tests, operating instructions, and as-built drawings - all as required by the contract documents.

N. WARRANTY AND GUARANTEES

Clause 49 - Contractor's Warranty and Guarantee

a. The Owner shall not, in any way or manner, be answerable or suffer loss, damage, expense or liability for any loss or damage that may happen to said building, work, or equipment or any part thereof, or in, on, or about the same during its construction and before acceptance. In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph j. of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or design furnished, or workmanship performed by the Contractor or any subcontractor or supplier at any tier.

b. This warranty shall continue for a period of two (2) years from the date of substantial completion of the work. If the Owner takes possession of any part of the work before final acceptance, this warranty shall continue for a period of two (2) years from the date the Owner
takes possession. Contract bonds are in full force during the warranty period.

c. The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Owner-owned or controlled real or personal property, when that damage is the result of:
(1.) The Contractor's failure to conform to contract requirements or
(2.) Any defect of equipment, material, workmanship, or design furnished

d. The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for two (2) years from the date of repair or replacement.

e. The Owner shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage. The Contractor further agrees that within ten (10) calendar days after being notified in writing by the Owner of any work not in accordance with the requirements of the contract or any defects in the work, the Contractor will commence and prosecute with due diligence all work necessary to fulfill the terms of this guarantee, and to complete the work within a reasonable period of time.

Notwithstanding the foregoing paragraph, in the event of any emergency constituting an immediate hazard to health or safety of Owner employees, property, or licensees, the Owner may undertake at Contractor's expense, without prior notice, all work necessary to correct such hazardous conditions when it was caused by work of Contractor not being in accordance with requirements of this contract.

f. If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, the Owner shall have the right to place, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

O. ENVIRONMENTAL PROTECTION

Clause 50 - Dust Control

a. The Contractor shall provide such and so much water, dust palliative, or other authorized material, and the labor and devices necessary to spread such material, as the Owner deems necessary to control dust. The Contractor shall provide any and all dust control required by the Owner or any regional, state or federal governmental entity having jurisdiction over the Site or the Project. The payment for dust control shall be considered as included in other items of work and no additional compensation shall be made therefor, unless otherwise provided by the contract documents.

b. Whenever the Contractor is negligent in providing adequate dust control, the Owner shall order the Contractor to provide such adequate dust control and, if the Contractor does not comply forthwith with such order, the Owner shall have the authority to suspend the work, wholly or in part, for such period as the
Owner may deem necessary until the Contractor provides adequate dust control to the satisfaction of the Owner, or the Owner may provide such dust control and charge the Contractor therefor by deducting the cost thereof from periodic payments to the Contractor as such costs are incurred by the Owner.

Clause 51 - Excessive Noise
The Contractor shall use only such equipment on the work and in such state of repair, that the emission of sound therefrom is within the noise tolerance level of that equipment, as established by accepted standards of the industry.

Should the Owner determine that the muffling device on any equipment used on the work is ineffective or defective so that the noise tolerance of such equipment, as established by accepted standards of the industry is exceeded, such equipment shall not, after such determination by the Owner, be used on the work until its muffling device is repaired or replaced so as to bring the noise tolerance level of such equipment within such standards.

Clause 52 - Pollution Control, Cleaning
The Contractor shall not, in connection with the work, discharge any smoke, dust or other contaminants into the atmosphere or discharge any fluids or materials into any lake, river, stream, or channel as will violate regulations of any legally constituted authority. The Contractor shall control accumulation of waste materials and rubbish and dispose waste materials and rubbish off-site at the least at weekly intervals. Burning of materials is not permitted.

P. EMPLOYMENT PRACTICES

Clause 53 - Qualifications for Employment
According to Section 1735 of the California Labor Code, no person under the age of 16 years of age and no person currently serving sentence in a penal or correctional institution shall be employed to perform any work under this contract. No person whose age or physical condition is such to make his employment dangerous to his health or safety or to the health or safety of others shall be employed to perform work under this contract; provided that this sentence shall not operate against any physically handicapped persons otherwise employable where such persons may be safely assigned to work which they ably perform.

The Contractor and each subcontractor shall comply with the provisions of Sections 1777.5 and 1777.6 of the Labor code of the State of California concerning employment of apprentices by the contractor or any subcontractor under him. The contractor is responsible for compliance with the requirements of Section 1777.5 and the prime contractor and any subcontractor under him shall comply with the requirements of Section 1777.6.

All employees engaged in work on the project under this contract shall have the right to organize and bargain collectively through representatives of their own choosing, and such employees shall be free from interference, restraint, and coercion of employers in the designation of such employees for the purpose of collective bargaining or other mutual aid or protection, and no person seeking employment under this contract shall be required as a condition of initial or continued employment to join any company, union, or to refrain from joining, organizing, or assisting a labor organization of such person's own choosing. No person in the employment of the Owner shall be further employed to do any work hereunder.

Clause 54 - Hours of Work:

Eight hours of labor during any one calendar day and forty hours of labor during any one calendar week shall constitute the maximum hours of service upon all work done hereunder, and it is expressly stipulated that no laborer, workman, or mechanic employed at any time by the Contractor or by any subcontractor or subcontractors under this contract, upon the work or upon any part of the work contemplated by this contract, shall be required or permitted to work thereon more than eight (8) hours during any one calendar day and forty (40) hours during any one calendar week, except, as provided by Section 1815 of the Labor Code of the State of California, work performed by employees of Contractors in excess of eight hours per day and forty hours during any one week shall be permitted upon public work upon compensation for all hours worked in excess of eight hours per day at not less than one and one-half times the basic rate of pay. It is further expressly stipulated that for each and every violation of Sections 181 1-
1815, inclusive, of the Labor Code of the State of California, all the provisions whereof are deemed to be incorporated herein, said Contractor shall forfeit, as a penalty to Owner, twenty-five dollars ($25.00) for each laborer, workman, or mechanic employed in the execution of this contract by Contractor, or by any subcontractor under this contract, for each calendar day during which said laborer, workman, or mechanic is required or permitted to work more than eight hours in any one calendar day and forty hours in any one calendar week in violation of the provisions of said Sections of the Labor Code.

The Contractor, and each subcontractor, shall keep an accurate record showing the names of and actual hours worked each calendar day and each calendar week by all laborers, workmen, and mechanics employed by him in connection with the work contemplated by this Contract, which record shall be open at all reasonable hours to the inspection of the Owner or its officers or agents and to the Division of Labor Law Enforcement of the Department of Industrial Relations.

Clause 55 - Wages & Records

a. Wage Rates

(1.) Pursuant to Section 1770 and 1773 et seq. of the Labor Code of the State of California, the Director of Industrial Relations has ascertained the general prevailing rate of per them wages and the rates for overtime and holiday work in the locality in which the work is to be performed for each craft, classification, or type of workman needed to execute the contract which will be awarded to the successful bidder, copies of which are on file and available upon request from the Clerk of the Board.

(2.) It shall be mandatory upon the Contractor and upon any subcontractor under him, to pay not less than the said specified rates to all laborers, workmen, and mechanics employed in the execution of the Contract. It is further expressly stipulated that the Contractor shall, as a penalty to Owner, forfeit Fifty dollars ($50.00) for each calendar day, or portion thereof, for each laborer, workman, or mechanic paid less than the stipulated prevailing rates for any work done under this Contract by him or by any subcontractor under him; and Contractor agrees to comply with all provisions of Section 1770 and 1773 of the Labor Code.

(3.) In case it becomes necessary for the Contractor or any subcontractor to employ on the project under this contract any person in a trade or occupation (except executives, supervisory, administrative, clerical, or other non-manual workers as such) for which no minimum wage rate is herein specified, the Contractor shall immediately notify the Owner who will promptly thereafter determine the prevailing rate for such additional trade or occupation and shall furnish the Contractor with the minimum rate based thereon. The minimum rate thus furnished shall be applicable as a minimum for such trade or occupation from the time of the initial employment of the person affected and during the continuance of such employment.

b. Wage Records

The Contractor and each subcontractor shall keep or cause to be kept an accurate record (certified payroll) showing the names and occupations of all laborers, workers, and mechanics employed by him in connection with the execution of this contract or any subcontract thereunder and showing also the actual per diem wages paid to each of said workers, which records shall be provided to the Owner, and to the Division of Labor Law Enforcement. Copies provided will include one which has the name and social security numbers marked out.

Clause 56 - Notice of Labor Disputes

a. If the Contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay the timely performance of this contract, the Contractor shall immediately give notice, including all relevant information, to the Owner.

b. The Contractor agrees to insert the substance of this clause, including this paragraph b, in any subcontract to which a labor dispute may delay the timely performance of this contract; except that each subcontract shall provide that in the event its timely performance is delayed or threatened by delay by any actual or potential labor dispute, the subcontractor shall immediately notify the next higher tier subcontractor or the prime Contractor, as the
case may be, of all relevant information concerning the dispute.

Clause 57 - Nondiscrimination

a. Contractor shall comply with the California Fair Employment and Housing Practices Act (Government Code 12900 et seq.) and any amendments thereto. No discrimination shall be made in the employment of persons upon public work because of the race, religious creed, color, national origin, ancestry, physical handicap, medical condition, marital status, or sex of such persons, except as provided in Section 12940 of the Government Code, and every contractor for public works violating this section is subject to all the penalties imposed for a violation of Chapter I of Part 7, Division 2 of the Labor Code.

b. This contract may, at the option of Owner, be terminated or suspended in whole or in part in the event Contractor fails to comply with the nondiscrimination clause of this contract. In the event termination under this paragraph, Contractor shall be compensated for goods and services provided to the date of determination. Termination or suspension shall be effective upon receipt of written notice thereof.

Q. SUBCONTRACTING

Clause 58 - Subcontractors

A subcontractor is a person or organization who has a direct contract with the Contractor to perform any of the work at the site. Subcontractors shall be listed in the bid proposal according to the instructions contained therein.

The Contractor agrees that he is as fully responsible to the Owner for the acts and omissions of his subcontractors and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.

Nothing contained in the contract documents shall create any contractual relation between any subcontractor and the Owner.

Clause 59 - Relations of Contractor and Subcontractor

The Contractor agrees to bind every subcontractor and every subcontractor agrees to be bound by the terms of the Agreement, the General Conditions, Supplementary Conditions, the drawings and specifications as far as applicable to his work, including the following provisions of this article, unless specifically noted to the contrary in a subcontract approved in writing as adequate by the Owner. This does not apply to minor subcontracts under $5,000.

The subcontractor agrees:

a. To be bound to the Contractor by the terms of the Agreement, General Conditions, Special Conditions, drawings and specifications, and to assume toward him all the obligations and responsibilities that he, by those documents, assumes toward the Owner.

b. To submit to the Contractor applications for payment in such reasonable time as to enable the Contractor to apply for payment under terms of the General Conditions.

c. To make all claims for extras, for extensions of time and for damages for delays or otherwise, to the Contractor in the manner provided in the General Conditions for claims by the Contractor upon the Owner.

The Contractor agrees:

a. To be bound to the subcontractor by all the obligations that the Owner assumes to the Contractor under the Agreement, General Conditions, Special Conditions, drawings and specifications, and by all the provisions thereof affording remedies and redress to the Contractor from the Owner.

b. To pay the subcontractor, upon the payment of certificates, the amount allowed to the Contractor on account of the subcontractor's work to the extent of the subcontractor's interest therein.

c. To pay the subcontractor to such extent as may be provided by the contract documents or the subcontract, if either of these provides for earlier or larger payments than the above.
Clause 60 - Subcontracts

Pursuant to the provisions of Sections 4100 to 4114 of the California Public Contract Code, inclusive of the State of California, the Contractor shall not without the consent of the Owner, either:

a. Substitute any persons as subcontractors in place of the subcontractors designated in his original bid. (The Owner's consent can only be given in cases permitted by Public Contract Code Section 4107.)

b. Permit any subcontractor to be assigned or transferred or allow any work to be performed by anyone other than the original subcontractor listed in his bid.

c. Other than in the performance of change orders, sublet or subcontract any portion of the work in excess of one-half of one percent of his bid to which his original bid did not designate a subcontractor. Should the Contractor violate any of the provisions of said Sections 4100 to 4114, inclusive, of the Public Contract Code, his so doing shall be deemed a violation of this contract, and the Owner may cancel the contract, or may assess the Contractor a penalty in the amount not more than ten (10) percent of the amount of the subcontract involved, or may both cancel the contract and assess the penalty.

R. TAXES

Clause 61 - Sales and Payroll Taxes

Each Contractor, subcontractor, and material dealer shall include all sales tax and payroll taxes required by law.

S. CHANGES

Clause 62 - Change Order Work Notification

a. Should the Owner at any time during the progress with notice to sureties of said work request any alterations, deviations, additions, or omissions from said specifications or Plans or other contract documents it shall be at liberty to do so, and the same shall in no way affect or make void the contract, but will be added to or deducted from the amount of said contract price, as the case may be, by a fair and reasonable valuation, agreed to in writing between the parties hereto. No extra work shall be performed or a change be made unless in pursuance of a written order from the Owner, duly authorized by resolution of its governing body, and by all agencies whose approval is required by law, stating that the extra work or change is authorized and no claim for an addition to the contract sum shall be valid unless so ordered. Changes may include but not be limited to:

(1.) The specifications (including drawings and designs);

(2.) The method or manner of performance of the work;

(3.) The Owner-furnished facilities, equipment, materials, services, or site;

(4.) Directing acceleration in the performance of the work; or

(5.) Extra terms or time.

b. Any other written or oral order (which, as used in this paragraph b., includes direction, instruction, interpretation, or determination) from the Owner that causes a change shall be treated as a change order under this clause; provided, that the Contractor immediately gives the Owner written notice stating (1) that date, circumstances, and source of the order and (2) that the Contractor regards the order as a change order.

c. Except as provided in this clause, no order, statement, or conduct of the Owner shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment.

d. If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the work under this contract, whether or not changed by any such order, the Owner shall make an equitable adjustment and modify the contract in writing as a Change Order. However, except for a "proposal for adjustment or request for a change (hereafter referred to as proposal) based on defective specifications, no proposal for any change under paragraph b.
above shall be allowed for any costs incurred more than seven (7) days before the Contractor gives written notice as required. In the case of defective specifications for which the Owner is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with the defective specifications.

e. No proposal by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this contract.

f. Changes will be performed in accordance with the original contract requirements.

**Clause 63 - Change Order Process**

a. Notice

The Contractor will give notice of a change on his letterhead within seven (7) days from discovery and, if the Owner agrees, a proposed change order will be issued on the Owner's standard proposed change order form.

b. Proposal

Upon receipt of the proposed Change Order, the Contractor shall submit a proposal, in accordance with the requirements and limitations set forth in the "Change Orders" clause, for work involving contemplated changes covered by the proposed change.

The Contractor's written statement of the monetary extent of a request for a change shall be submitted in the following form:

(1.) Cost proposals totaling $500 or less shall be submitted in the form of a lump sum proposal with supporting information to clearly relate elements of cost with specific items of work involved to the satisfaction of the Owner, or its representative.

(2.) For cost proposal in excess of $500, the cost proposal shall be submitted in the form of a lump sum proposal supported with a detailed itemized breakdown of all increases and decreases in the contract, including all labor, equipment and materials, as required by the following paragraphs. The Contractor will use the prescribed Owner furnished proposed change order form. The Contractor shall upon request by the Owner permit inspection of the original unaltered contract bid estimate, subcontract agreements, or purchase orders relating to the change; and documents substantiating all costs associated with the cost proposal.

c. Disagreement

If the Owner disagrees with the request for change it will notify the Contractor in writing and the Contractor may elect to issue a dispute notification according to the disputes clause.

d. Pricing Time

The Contractor must submit a proposal within fifteen (15) days upon receipt of the proposed change order or the furnishing of written notice. The Contractor must submit cost proposals in less than 15 days if requested by the Owner or if required by schedule limitations.

e. Failure to Price

If the Contractor fails to submit the cost proposal within the 15-day period (or as requested), the Owner has the right to order the Contractor in writing to commence the work immediately on a force account basis and/or issue a lump sum change to the contract price in accordance with the Owner's estimate of cost. If the change is issued based on the Owner estimate, the Contractor will waive his right to dispute the action unless within 15 days following completion of the added/deleted work, the Contractor presents proof that the Owner's estimate was in error.

f. Failure to Agree

If the Owner and the Contractor fail to agree as to the cost of the proposed change order, the Contractor upon written order from the Owner shall proceed immediately with the change work. The Contractor shall be directed to proceed on a time and materials (T&M) (force account) basis. When there has been failure to agree as to the cost, no payment will be made to the Contractor until completion of the work called for in the change order or in the written order authorizing performance of the work.

g. T&M Changes
The Owner will establish a budget not-to-exceed (NTE) price for the T&M change order which may be increased with the approval of the Owner. The Contractor will notify the Owner when he has reached 80% of the not-to-exceed budget. The Contractor shall proceed and shall maintain a daily job force account record containing detailed cost summary of labor, materials, and equipment required for the changed work. Upon being signed and agreed to by the Owner Representative on a daily basis, the force account record will become the basis for payment of the changed work, but such agreement shall not preclude subsequent adjustment based upon later audit by the Owner. The Contractor will provide a weekly accounting of cost compared to the NTE budget.

Upon completion of the work under the change order, the Contractor shall submit its invoice therefor containing only the items of labor, materials, and equipment which are in addition to the requirements of the contract and as approved by both parties, together with the allowable markups.

h. Time

The Contractor shall identify any adjustment in time of the final completion of the work as a whole which is directly attributable to the changed work within fifteen (15) days upon the receipt of the proposed change order. The Contractor's request for a change in time will be supported by a detailed schedule analysis indicating the activities which have been affected and the additional time being requested.

For a change in time for the work, the Contractor shall be entitled only to such adjustments in time by which completion of the entire work is delayed due to the performance of the changed work. Each estimate for change in the work submitted by the Contractor shall state amount of the extra time the Contractor considers should be allowed for making the requested change. Failure to request extra time when submitting such estimate shall constitute waiver of the right to subsequently claim adjustment in time for final completion based upon such changed work.

i. Type of Change

A change order may adjust the contract price either upward or downward in accordance with one or a combination of the following bases as the Owner may elect:

1. On a lump sum basis as supported by the breakdown of estimated costs.
2. On a unit price basis.
3. On a time and material (T&M) force account basis.

j. Change Order Costs.

1. Markups.
   a. For work performed by the General Contractor in the amount equal to the direct cost (as defined herein) for the work plus 15% of the direct costs for overhead and profit.
   b. For work performed by Subcontractor in the amount equal to the direct cost (as defined herein) for the work plus 20% of the direct cost for overhead and profit. (Suggested Breakdown: 15% to the Subcontractor, 5% to the General Contractor.)
   c. For work performed by a Sub-subcontractor (any tier), in the amount equal to the direct cost (as defined herein) for the work plus 25% of the direct cost for overhead and profit. (Suggested Breakdown: 15% to Sub-subcontractor, 5% to Subcontractor and 5% to General Contractor.)
   d. In no case will the total markups be greater than 25% of the direct cost notwithstanding the number of contract tiers actually existing.
   e. For deleted work the credit markup shall be 10% of the direct cost or the agreed upon estimate thereof.
   f. The markup shall include small tools, cleanup, bonds, engineering, supervision, warranties, job site overhead and Home Office overhead. No markup will be allowed on taxes. (See the following paragraphs for more detailed exceptions.)
(2.) Direct Costs.

(a.) Labor

Cost for labor shall include any employer payments to or on behalf of the workmen for health, welfare, pension, vacation, and similar purposes. Labor rates will not be recognized when in excess of those prevailing in the locality and time the work is being performed. The costs for all supervision including General Superintendents and Foremen will be included in the markups established by the Contract. The only exception to this will be working foremen who perform actual manual labor. No labor charges will be accepted for engineering or proposal preparation. These costs will be included in the markups established by the Contract. A breakdown of the payroll rates for each trade will be provided for all change orders 15 days after notice to proceed including the base rate, benefits, payroll taxes, and insurance.

Overtime and premium time pricing will only be allowed for labor which, based on mutual agreement, shall be performed after normal working hours.

(b.) Materials

The actual cost to the Contractor for the materials directly required for the performance of the changed work. Such cost of materials may include the cost of transportation and no delivery charges will be allowed unless the delivery is specifically for the changed work.

If a trade discount by an actual supplier is available to the Contractor, it shall be credited to the Owner. If the materials are obtained from a supplier or source owned wholly by or in part by the Contractor, payment thereof will not exceed the current wholesale price for the materials. The term “trade discount” includes the concept of cash discounting.

If in the opinion of the Owner, the cost of the materials is excessive or if the Contractor fails to furnish satisfactory evidence of a cost to him other from the actual supplier thereof, then, in either case, the cost of the materials shall be deemed to be the lowest current wholesale price at which similar materials are available in the quantities required. The Owner reserves the right to furnish such materials as it deems advisable and the Contractor shall have no claims for cost or profits on material furnished by the Owner.

(c.) Equipment

The actual cost to the Contractor for the use of equipment directly required in the performance of the changed work. In computing the hourly rental of equipment, any time less than 30 mines shall be considered one-half hour. No payment will be made for time while equipment is inoperative due to breakdown or for non-workdays. In addition, the rental time shall not include the time required to move the equipment to the work for rental of such equipment, and to return it to the source. No mobilization or demobilization will be allowed for equipment already on site. If such equipment is not moved by its own power, then loading and transportation costs will be paid in lieu or rental time thereof. However, neither moving time nor loading and transportation costs will be paid if the equipment is used on the project in any other way than upon the changed work.

Individual pieces of equipment having a replacement value of $1,000 or less shall be considered to be small tools or small equipment and no payment will be made thereof.

The rental rate for equipment will not exceed that as recommended by the lower of Cal-trans or as contained in the Association of Equipment Distributors (AED) book.

For equipment owned, furnished, or rented by the Contractor no cost thereof shall be recognized in excess of the rental
rates established by Cal-trans and/or the AED any tier book.

The amount to be paid to the Contractor for the use of equipment as set forth above shall constitute full compensation to the Contractor for the cost of fuel, power, oil, lubricants, supplies, small tools, small equipment, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, labor (except for equipment operators) and any and all costs to the Contractor incidental to the use of the equipment.

(d.) Records

The Contractor shall maintain his records in such a manner as to provide a clear distinction between the direct costs of extra work and the cost of other operations. This requirement pertains to proposed change orders, change orders and work the Contractor considers to be potential change orders.

The Contractor will provide at the beginning of the project a certified statement and detailed calculation from its accountant establishing the job site and pro rata home office overhead rates for itself and its major subcontractors.

The Contractor at the beginning of the project shall provide a complete listing of all Contractor and subcontractor hourly labor rates.

(e.) Emergency Changes

Changes in the work made necessary due to unexpected or unforeseen site conditions, discovery of errors in plans or specifications requiring immediate clarifications in order to avoid serious work stoppage, or other changes of kind where the extent cannot be determined until completed, or under any circumstances whatsoever deemed necessary by the Owner, are types of emergency changes which may be authorized by the Owner in writing to the Contractor. The Contractor shall commence performance of emergency changes immediately upon authorization. These changes will be performed on a time and material (force account) basis as aforementioned.

(f.) Surety

All alterations, extensions of time, extra and additional work and other changes authorized by these specifications or any part of the contract may be made without securing consent of the surety or sureties on the contract bonds.

(g.) Impact

The Contractor may not reserve a right to assess impact cost, extended job site costs, extended overhead, and/or constructive acceleration at some later date as related to any and all changes. These costs or estimated costs must be supported with full schedule and cost documentation with each proposed change within the prescribed submission times. If a request for a change is denied and the Contractor disputes the denial, the Contractor must supply the aforementioned documentation to support his claim under the disputes clause of this contract. The Contractor shall waive his right to impact extended jobs and overhead costs and construction acceleration due to the multiplicity of changes and clarifications.

Clause 64 - Audit

a. The Owner shall have the right to examine and audit all books, estimates, records, contracts, documents, bid documents, subcontracts, and other data of the Contractor (including computations and projections) related to negotiating, pricing, or performing the modification in order to evaluate the accuracy, completeness, and currency of the cost or pricing data at no additional cost to the Owner.

b. The Contractor shall make available at its office at all reasonable times the materials described in paragraph (a) above, for examination, audit, or reproduction, until 3 years after final payment under this contract.

c. The Contractor shall insert a clause containing all the provisions of this clause, including this
paragraph c., in all subcontracts over $10,000 under this contract.

T. PAYMENT

Clause 65 - Payment

a. The Owner shall pay the Contractor the contract price as provided in this contract.

b. The Owner shall make progress payments monthly as the work proceeds, on estimates approved by the Owner. The Contractor shall furnish a breakdown of the total contract price showing the amount included therein for each principal category of the work, in such detail as requested, to provide a basis for determining progress payments.

c. Contractor shall submit to the Owner and to the Representative vouchers, schedule activities, or other satisfactory proof of the value of any work for which he claims payment on such account, and receipts showing that progress payments have been duly made on such contracts, and for materials furnished.

d. In the preparation of estimates the Owner may authorize material delivered on the site and preparatory work done to be taken into consideration for major equipment if:

(1.) Consideration is specifically authorized by this contract; and

(2.) The Contractor furnishes satisfactory evidence that it has acquired title and paid invoices for such material and that the material will be used to perform this contract.

e. On the 25th of each month the Contractor will submit his request for payment. Prior to that submittal the Owner will review the requested percentage of completion for each activity. The payment request will be in the format as prescribed by the Owner and will refer to the schedule (or cost loaded CPM where required).

f. All estimates of work performed during the preceding calendar month and all requests for payment thereof or for partial payment on account of equipment delivered but not installed, as herein provided for, shall be certified by the Representative and countersigned by him before any certificate shall be given to Owner. If errors are found in a request for payment, the errors shall be corrected by the Contractor, and the request resubmit to the Owner and to the Representative for approval, bearing the date of same as corrected.

g. Retainage and Withholds

(1.) Retainage. In making progress payments, there shall be retained 10 percent of the estimated amount until final completion and acceptance of the contract work. When the work is substantially complete, the Owner shall retain an amount that the Owner considers adequate protection and may release to the Contractor all or a portion of any excess amount.

h. Payment of Employers

Contractor and each subcontractor shall pay each of his/her employees engaged in work under this contract in full (less deductions made mandatory by law) at least once a week.

i. Withholds

The Representative may withhold (in excess of retainage) or, on account of subsequently discovered evidence, nullify the whole or a part of any certificate to such extent as may be necessary to protect the Owner from loss on account of:

(1.) Defective work not remedied.

(2.) Claims filed or reasonable evidence indicating probable filing of claims.

(3.) Failure of the Contractor to make payments properly to subcontractors or for material or labor.

(4.) Damage to another Contractor.

(5.) Delays in progress toward completion of the work, with the stipulated amount of liquidated damages being withheld for each day of delay for which no extension is granted.
When the above grounds are removed, payment shall be made for the amount withheld because of them.

j. **Liens and Stop Notices**

   (1.) Should stop notices be filed with the Owner or Owner Auditor, Owner shall withhold the amount claimed from certificates until such claims shall have been resolved pursuant to law, Civil Code Section 3179 et seq.

   (2.) At the election of the Owner, Contractor shall provide, within ten (10) days of receipt of each progress payment, unconditional waivers and release of lien rights, signed by Contractor and each of its subcontractors and materials suppliers, in the form established therefor by Section 3262 of the Civil Code of the State of California.

   (3.) Subject to other conditions of these specifications, within thirty (30) days after receipt of Contractor's monthly request for payment on account, during the progress of the work, the Owner shall issue certificates of payment on account of the contract, for labor and materials actually incorporated in place in the building in a satisfactory manner approved by Representative.

k. **Rights to Property**

   All material and work covered by progress payments made shall, at the time of payment, become the sole property of the Owner, but this shall not be construed as:

   (1). Relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work; or

   (2.) Waiving the right of the Owner to require the fulfillment of all of the terms of the contract.

**Clause 66 - Final Payment**

a. **General.** The Owner shall pay the amount due the Contractor under this contract after:

   (1.) Final Completion and acceptance of all work; per the acceptance clause of this contract

   (2.) Presentation of a properly executed voucher;

   (3.) Release of all liens; and

   (4.) Presentation of release of all claims against the Owner arising by virtue of this Contract, other than claims, disputes in stated amounts, that the Contractor has specifically excepted from the operation of the release.

b. **Liens.** Neither the final payment nor any part of the retained percentage shall become due until the Contractor, if required, shall deliver to the Owner a complete release of all liens arising out of this contract, or receipts in full in lieu thereof and, if required in either case, an affidavit that so far as he has knowledge or information the releases and receipts include all labor and material for which a lien could be filed; but the Contractor may, if any subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to the Owner, to indemnify him against any lien. If any lien remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all moneys that the latter may be compelled to pay in discharging such a lien, including all costs and reasonable attorney's fees.

c. **Final Certificates.** When the work is ready for acceptance by the Owner, the Representative shall so certify in writing to the Board of Supervisors, and a certificate of acceptance will be issued to the Contractor which will bring his progress payment up to ninety percent of the contract price, less sums withheld regarding liquidated damages, if any.

Notice of Completion will be filed by the Owner upon completion and acceptance of the work. Providing no stop notices have been filed, thirty-five (35) days after filing of such Notice of Completion, payment due under the contract will become due to the Contractor and the Representative shall so certify to the Owner authorizing the final payment. Such payment may withhold any reasonable sums payable to Contractor for any work which could not have been completed on said date or that the Owner may have found defective and ordered to be replaced, final payment for withholdings to be made when certified by Representative in writing to Owner.
d. **Final Payment and Claims Disputes.** After acceptance of work, the Owner will submit to Contractor a statement of the sum due Contractor under this contract, together with Owner payment in the amount thereof. Said statement shall take into account the contract price, as adjusted by any change orders; amounts already paid; and sums to be withheld for incomplete work, liquidated damages, and for any other cause under the contract. Within thirty (30) days after receipt thereof, Contractor shall approve such statement or file a claim with the Owner under the disputes clause. Approval of said statement or failure to file claim within said 30 day period shall constitute a waiver by Contractor of additional right to compensation under or by reason of the contract and the payment so made by Owner shall thereupon become a complete settlement between Owner and Contractor. To constitute filing of claim Contractor shall set forth in writing and in detail the basis for claim and amount of money for which demand is made and shall submit same to the Owner in accordance with the disputes clause of this contract. No demand by Contractor shall be recognized as a claim by the Owner unless it is filed in accordance with this paragraph and the disputes clause.

The Owner shall examine claim so filed and, if the claim is found to be proper, an Owner payment will be issued in the amount due upon such claim. If the Owner finds that such claim is without merit, Contractor will be so notified. Finding by the Owner on such claim shall be binding and conclusive upon Owner and Contractor as to questions relating to performance of the contract and amount to be paid thereunder except in case of gross error. Decision of the Owner will be in writing and a copy finished to Contractor.

The Contractor shall, from the effective date of acceptance until the expiration of three (3) years after final settlement under this contract, preserve and make available to the Owner, all its books, records, documents, and other evidence bearing on the costs and expenses of the Contractor under this contract.

**Clause 67 - Assignment**

Neither the Contract, nor any part thereof, nor moneys due or to become due thereunder may be assigned by the Contractor without the prior written approval of the Owner.

**U. SUSPENSION OF WORK, TERMINATION**

**Clause 68 - Suspension of Work**

a. The Owner may order the Contractor, in writing, to suspend, delay, or interrupt all or any part of the work of this contract for the period of time that the Owner determines appropriate for the convenience of the Owner.

b. If the performance of all or any part of the work is, for any unreasonable period of time, suspended, delayed, or interrupted (1) by an act of the Owner in the administration of this contract, or (2) by the Owner's failure to act within the time specified in this contract (or within a reasonable time if not specified), the Contractor will provide notice according to this clause.

Any increase in the cost of performance of this contract (excluding profit) necessarily caused by the unreasonable suspension, delay, or interruption, will result in the contract being modified in writing accordingly by Change Order. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor, or for which a change order is provided for or excluded under any other term or condition of this contract.

c. A claim under this clause shall not be allowed (1) for any costs incurred more than seven (7) days before the Contractor notified the Owner in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order), and (2) unless the claim in an amount stated, is asserted in writing within 7 days after the termination of the suspension, delay, or interruption. Failure to provide a 7 day notice and/or a fully detailed claim including all facts and pricing within the 7 days after termination of suspension will result in the Contractor waiving his/her right to claim.
d. The Owner may stop work in accordance with the safety and health clause and noncompliance clause of this contract for no additional cost or time.

Clause 69 - Non-Compliance with Contract Requirements

In the event the Contractor, after receiving written notice from the Owner of noncompliance with any requirement of this contract, fails to initiate promptly such action as may be appropriate to comply with the specified requirement within a reasonable period of time, the Owner shall have the right to order the Contractor to stop any or all work under the contract until the Contractor has complied or has initiated such action as may be appropriate to comply within a reasonable period of time. The Contractor will not be entitled to any extension of contract time or payment for any costs incurred as a result of being ordered to stop work for such cause.

Clause 70 - Termination

a. Termination for Breach

If the Contractor should be adjudged bankrupt or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency, or if he or any of his subcontractors should violate any of the provisions of the Contract, the Owner may serve written notice upon him and his surety of its intention to terminate the Contract, such notice to contain the reasons for such intention to terminate the Contract, and, unless within ten (10) days after serving of such notice, such violation shall cease and satisfactory arrangements for correction thereof be made, the Contractor shall, upon the expiration of said ten days, cease and terminate. In the event of any such termination, the Owner shall immediately serve written notice thereof upon the surety and the Contractor, and the surety shall have the right to take over and perform the Contract; provided, however that, if the surety within fifteen (15) days after the serving upon it of notice of termination does not give the Owner written notice of its intention to take over and perform the contract or does not commence performance thereof within thirty (30) days from the date of the serving of such notice, the Owner may take over the work and prosecute the same to completion by contract or by any other method it may deem advisable, for the account and at the expense of the Contractor, and the Contractor and his surety shall be liable to the Owner for any excess cost occasioned the Owner thereby, and in such event the Owner may without liability for so doing take possession of and utilize in completing the work, such materials, appliances, plants, and other property belonging to the Contractor as may be on the site of the work and necessary therefor.

b. Termination for Convenience

(1.) The Owner may terminate performance of work under this contract in whole or, from time to time, in part if the Owner determines that a termination is in the Owner's interest. The Owner shall terminate by delivering to the Contractor a Notice to Terminate specifying the extent of termination and the effective date.

After receipt of a Notice of Termination, and except as directed by the Owner, the Contractor shall immediately proceed with the following obligations, regardless of any delay in determining or adjusting any amounts due under this clause:

- Stop work as specified in the notice.
- Place no further subcontracts or orders (referred to as subcontracts in this clause) for materials, services, or facilities, except as necessary to complete the continued portion of the contract.
- Terminate all subcontracts to the extent they relate to the work terminated.
- Assign to the Owner, as directed, all right, title, and interest of the Contractor under the subcontracts terminated, in which case the Owner shall have the right to settle or to pay any termination settlement proposal arising out of those terminations.
- With approval or ratification to the extent required by the Owner, settle all outstanding liabilities and termination settlement proposals arising from termination of
subcontracts; the approval or ratification will be final for purposes of this clause.

- As directed by the Owner, transfer title and deliver to the Owner (1) the fabricated or unfabricated parts, work in process, completed work, supplies, and other material produced or acquired for the work terminated, and (2) the completed or partially completed plans, drawings, information, and other property that, if the contract had been completed, would be required to be furnished to the Owner.

- Complete performance of the work not terminated.

- Take any action that may be necessary, or that the Owner may direct, for the protection and preservation of the property related to this contract that is in the possession of the Contractor and in which the Owner has or may acquire an interest.

- Use its best efforts to sell, as directed or authorized by the Owner, any property of the types referred to in subparagraphs above; provided, however, that the Contractor (1) is not required to extend credit to any purchaser and (2) may acquire the property under the conditions prescribed by, and at prices approved by, the Owner. The proceeds of any transfer or disposition will be applied to reduce any payments to be made by the Owner under this contract, credited to the price or cost of the work, or paid in any other manner directed by the Owner.

(2.) After termination, the Contractor shall submit a final termination settlement proposal to the Owner in the form and with the certification prescribed by the Owner. The Contractor shall submit the proposal promptly, but no later than 30 days from the effective date of termination. If the Contractor fails to submit the proposal within the time allowed, the Owner may determine, on the basis of information available, the amount, if any, due the Contractor because of the termination and shall pay the amount determined.

(3.) Subject to paragraph (2) above, the Contractor and the Owner may agree upon the whole or any part of the amount to be paid because of the termination. The amount may include a reasonable allowance for profit on work done. However, the agreed amount, whether under this paragraph (3) or paragraph (4) below, exclusive of costs shown in subparagraph (4) below, may not exceed the total contract price as reduced by (1) the amount of payments previously made and (2) the contract price of work not terminated. The contract shall be amended with a Change Order, and the Contractor paid the agreed amount. Paragraph (4) below shall not limit, restrict, or affect the amount that may be agreed upon to be paid under this paragraph.

(4.) If the Contractor and Owner fail to agree on the whole amount to be paid the Contractor because of the termination of work, the Owner shall pay the Contractor the amounts determined as follows, but without duplication of any amounts agreed upon under the above paragraphs:

(a.) For contract work performed before the effective date of termination, the total (without duplication of any terms) of:

   (i) The cost of this work;

   (ii) The cost of settling and paying termination settlement proposals under terminated subcontracts that are properly chargeable to the terminated portion of the contract if not included in subdivision (i) above; and

   (iii) A sum, as profit on (i) above, determined by the Owner to be fair and reasonable; however, if it appears that the Contractor would have sustained a loss on the entire contract had it been completed, the Owner shall allow no profit under this subdivision (iii) and shall reduce the settlement to reflect the indicated rate of loss.

(b.) The reasonable costs of settlement of the work terminated including:
(i) Accounting, legal, clerical, and other expenses reasonably necessary for the preparation of termination settlement proposals and supporting data;

(ii) The termination and settlement of subcontracts (excluding the amounts of such settlements); and

(iii) Storage, transportation, and other costs incurred, reasonably necessary for the preservation, protection, or disposition of the termination inventory.

(5.) Except for normal spoilage, the Owner shall exclude from the amounts payable to the Contractor under paragraph (4) above, the fair value, as determined by the Owner, defective work, and of property that is destroyed, lost, stolen, or damaged so as to become undeliverable.

(6.) The Contractor shall have the right of claim under the Disputes clause, from any determination made by the Owner under paragraph (2), (4), or (8), except that if the Contractor failed to submit the termination settlement proposal within the time provided in paragraph (2) or (8), and failed to request a time extension, there is no right of appeal. If the Owner has made a determination of the amount due under paragraph (2), (4), or (8), the Owner shall pay the Contractor the amount determined by the Owner if there is no right of appeal or if no timely appeal has been taken, or the amount finally determined on legal determination.

(7.) In arriving at the amount due the Contractor under this clause, there shall be deducted:

(a.) All unliquidated advance or other payments to the Contractor under the terminated portion of this contract;

(b.) Any claim which the Owner has against the Contractor under this contract; and

(c.) The agreed price for, or the proceeds of sale of, materials, supplies, or other things acquired by the Contractor or sold under the provisions of this clause and not recovered by or credited to the Owner.

(8.) If the termination is partial, the Contractor may file a proposal with the Owner for a Change Order of the price(s) of the continued portion of the contract. The Owner shall make any Change Order agreed upon. Any proposal by the Contractor for an equitable adjustment under this clause shall be requested within 30 days from the effective date of termination unless extended in writing by the Owner.

(9.) The Owner may, under the terms and conditions it prescribes, make partial payments and payments against costs incurred by the Contractor for the terminated portion of the contract, if the Owner believes the total of these payments will not exceed the amount to which the Contractor will be entitled. If the total payments exceed the amount finally determined to be due, the Contractor shall repay the excess to the Owner upon demand, together with interest.

(10.) Unless otherwise provided in this contract or by statute, the Contractor will maintain all records and documents relating to the terminated portion of this contract for 3 years after final settlement. This includes all books and other evidence bearing on the Contractor's costs and expenses under this contract. The Contractor shall make these records and documents available to the Owner, State and/or the U.S. Government or their representatives at all reasonable times, without any direct charge.

V. DISPUTES/CLAIMS

Clause 71 - Disputes/Claims

a. Definition of Claim: A "claim" means a separate demand by the contractor for (a) time extension, (b) payment of money or damages arising from work done by or on behalf of the contractor pursuant to the contract and payment of which is not otherwise entitled to, or (c) an amount the payment of which is disputed by the owner.

b. Filing Claim Is Not Basis To Discontinue Work: the contractor shall promptly comply with work under the contract or work requested by the owner even though a written claim has been filed. The contractor and the owner shall
make good faith efforts to resolve any and all claims that may arise during the performance of the work covered by this contract.

c. Claim Notification: the contractor shall, within seven (7) calendar days after the claim arises, submit a notification with the owner stating clearly the basis for the claim. The owner's representative will issue a decision. If the notification is not submitted within seven (7) days after the claim arises, the contractor shall be deemed to have waived all right to assert the claim and the claim shall be denied.

d. Formal Claim Submission: If the contractor does not concur with the representative's decision, the contractor will issue a formal claim within seven days of receipt and all detailed information within thirty days. All claims shall be submitted before the date of final payment. If the formal written claim is not submitted within seven calendar days and detailed information within thirty days, the contractor shall be deemed to have waived his right to assert the claim, and the claim shall be denied.

e. Formal Claim Format: The contractor shall provide all written detailed documentation which supports the claim, including but not limited to: arguments, justifications, cost, estimates, schedule analysis, and detailed documentation. The format of the claim shall be as follows:

(1.) Cover letter.

(2.) Summary of factual basis of claim and amount of claim.

(3.) Summary of the legal basis of the claim, including applicable law and the specific clause or section under the contract under which the claim is made.

(4.) Documents relating to the claim, including:

(a.) Specifications

(b.) Drawings

(c.) Clarifications (RFI's)

(d.) Other relevant information

(5.) Analysis of claim merit.

(6.) Analysis of claim cost.

(7.) Certification.

(8.) Chronology of events and correspondence.

f. Certification: The contractor (and subcontractors, if applicable) shall submit with the claim a certification that:

(1.) The claim is made in good faith;

(a.) Supporting data are accurate and complete to the best of the contractor's knowledge and belief;

(b.) The amount requested accurately reflects the amount of compensation for which the contractor believes the owner is liable.

g. Signature of Certification: If the contractor is not an individual, the certification shall be executed by an officer or general partner of the contractor having overall responsibility for the conduct of the contractor's affairs.

h. False Claims: If a false claim is submitted, it will be considered fraud, and the contractor may be subject to criminal prosecution.

i. Mandatory Claim Procedure: The contractor's claim will be denied if it fails to provide the written basis of the claim and certification as set forth herein.

j. Owner May Request Additional Information: Within thirty days of receipt of the formal claim detailed information, the owner may request in writing any additional documentation supporting the claim or documentation relating to defenses to the claim which the owner may assert.

k. Public contract code Section 20104: For claims of $375,000 or less, Section 20104 of the Public Contract Code shall apply. Claims shall not be subject to arbitration, except as expressly required in Section 20104 et seq. of the Public Contract Code as stated below:
Section 20104

a. (1) This article applies to all public works claims of three hundred seventy-five thousand dollars ($375,000) or less which arise between a contractor and a local agency.

(2) This article shall not apply to any claims resulting from a contract between a contractor and a public agency when the public agency has elected to resolve any disputes pursuant to Article 7.1 (commencing with Section 10240) of Chapter I of Part 2.

b. (1) “Public work” has the same meaning as in Sections 3100 and 3106 of the Civil Code, except that “public work” does not include any work or improvement contracted for by the State or the Regents of the University of California.

(2) “Claim means a separate demand by the contractor for (A) a time extension, (B) payment of money or damages arising from work done by or on behalf of the contractor pursuant to the contract for a public work and payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled to, or (C) an amount the payment of which is disputed by the local agency.

c. The provisions of this article or a summary thereof shall be set forth in the plans or specifications for any work which may give rise to a claim under this article.

d. This article applies only to contracts entered into on or after January 1, 1991.

Section 20104.2 For any claim subject to this article, the following requirements apply:

a. The claim shall be in writing and include the documents necessary to substantiate the claim. Claims must be filed on or before the date of final payment. Nothing in this subdivision is intended to extend the time limit or supersede notice requirements otherwise provided by contract for the filing of claims.

b. (1) For claims of less than fifty thousand dollars ($50,000), the local agency shall respond in writing to any written claim within 45 days of the receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses or claims the local agency may have against the claimant.

(2) If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the local agency and the claimant.

(3) The local agency's written response to the claim as further documented, shall be submitted to the claimant within 15 days after receipt of the further documentation or within a period of time no greater than that taken by the claimant in producing the additional information, whichever is greater.

c. (1) For claims of over fifty thousand dollars ($50,000) and less than or equal to three hundred seventy-five thousand dollars ($375,000), the local agency shall respond in writing to all written claims within 60 days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses or claims the local agency may have against the claimants.

(2) If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the local agency and the claimant.

(3) The local agency's written response to the claim, as further documented, shall be submitted to the claimant within 30 days after receipt of the further documentation, or within a period of time no greater than that taken by the claimant in producing the additional information or requested documentation, whichever is greater.

d. If the claimant disputes the local agency's written response, or the local agency fails to respond within the time prescribed, the claimant may so notify the local agency, in writing, either within 15 days of receipt of the local agency's response or within 15 days of the local agency's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a demand, the local agency shall schedule a meet-and-confer conference within 30 days for settlement of the dispute.
e. If following the meet-and-confer conference the claim or any portion remains in dispute, the claimant may file a claim pursuant to Chapter 1 (commencing with Section 900) and Chapter (commencing with Section 900) of Part 3 of Division 3.6 of Title I of the Government Code. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time the claimant submits his or her written claim pursuant to subdivision (a) until the time the claim is denied, including any period of time utilized by the meet-and-confer conference.

Section 20104.4 The following procedures are established for all civil actions filed to resolve claims subject to this article.

a. Within 670 days, but no earlier than 30 days, following the filing or responsive pleadings, the court shall submit the matter to nonbonding mediation unless waived by mutual stipulation of both parties. The mediation process shall provide for the selection within 15 days by both parties of a disinterested third person as mediator, shall be commenced within 30 days of the submittal, and shall be concluded within 15 days from the commencement of the mediation unless a time requirement is extended upon a good cause showing to the court.

b. (1) If the matter remains in dispute, the case shall be submitted to judicial arbitration pursuant to Chapter 2.5 (commencing with Section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, not-withstanding Section 1141.11 of that code. The Civil Discovery Act of 1986 (Article 3 (commencing with Section 2016) of Chapter 3 of Title 3 of Part 4 of the Code of Civil Procedure) shall apply to any proceeding brought under this subdivision consistent with the rules pertaining to judicial arbitration.

(2) In addition to Chapter 2.5 (commencing with Section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, (A) arbitrator shall, when possible, be experienced in construction law, and (b) any party appealing an arbitration award who does not obtain a more favorable judgment shall, in addition to payment of costs and fees under that chapter, also pay the attorney's fees on appeal of the other party.

Section 20104.6

a. No local agency shall fail to pay money as to any portion of a claim which is undisputed except as otherwise provided in the contract.

b. In any suite filed under Section 20104.4, the local agency shall pay interest at the legal rate on any arbitration award or judgment. The interest shall begin to accrue on the date the suit is filed in a court of law.

Section 20104.8

a. This article shall remain in effect only until January 1, 1994, and as of that date is repealed, unless a later enacted statute, which is enacted before January 1, 1994, deletes or extends that date.

b. As stated in subdivision (c) of Section 20104, any contract entered into between January 1, 1991, and January 1, 1994, which is subject to this article shall incorporate this article. To that end, these contracts shall be subject to this article even if this article is repealed pursuant to subdivision (a).
PART 1 - GENERAL

A. Day to Day Operation
   1. Contractor is advised that project is a tenant improvements work effort at 1868 E. Hazleton Avenue, Stockton, CA. The project facility is vacant; however, occupied County facilities are located adjacent to the project site. Construction activities must not impede the day-to-day operations and emergency response to or from these adjacent, occupied facilities.

B. Occupied Site
   1. Clients and staff of San Joaquin County will use the adjacent facilities and parking areas. Access around the construction site will continue to be used and must be kept open at all times.

C. Constrained Hours
   1. Hours of work will be from 8:00 AM – 5:00 PM. Contractor must provide planning, scheduling and prevention activities in prosecuting the work to achieve required progress and accommodate normal area activities.

D. Utility Interruptions
   1. Utility interruptions are anticipated under this contract. Any required utility interruptions must be scheduled, and may need to be performed during “off” hours. Utility work that impacts these systems must be addressed through coordination with the Owner’s representative. “Hot Taps” and other “on-line” methods may be required to maintain uninterrupted service. Any work which may affect existing utilities shall be pre-planned and approved by the Owner’s representative and the facility.

E. Fire Lane Access
   1. The Contractor is required to maintain emergency vehicle access to the project. All thoroughfares must be kept free of obstructions at all times.

F. Phasing
   1. Contractor will address phasing needs of the tenant improvements, return of construction site to Owner, beneficial occupancy, etc. Significant pre-planning with owner approval will be required to properly coordinate the work. Cost and schedule impacts should be anticipated to facilitate the pre-planning work.

G. Permits/Fees
   1. Building permits and service fees for permanent utility connections will be acquired and paid for by the Owner. In addition, work performed directly by utility providers on permanent connections will be commissioned and paid for by the Owner. All other costs are by the Contractor. This Project is under the jurisdiction of San Joaquin County Community Development Department.

H. Safe Environment
   1. Contractor is to secure site to protect pre-purchased Owner equipment to be installed by the Contractor, the general public, staff, and clients of the San Joaquin County. The Contractor will be required to maintain the adequate protective measures around the site.

I. Parking
1. Contractor laydown and parking areas are to be coordinated with the Owner’s Representative and is restricted to the limits of work shown on the drawings. Adjacent properties shall not be disturbed without written consent of the Owner’s Representative.

J. Deportment

1. The Contractor and all of the Contractor’s employees and Subcontractors and their employees shall conduct themselves in a professional manner, avoid using profanity, playing loud music and shall be fully clothed while on the work site. The contractor may be requested to remove employees who refuse to comply.

K. Multi-Jurisdictional

1. Project conforms to rules and regulations of San Joaquin County, the City of Stockton Municipal Utilities Department, Pacific Gas & Electric, AT&T, and local fire district.

L. Entrances

1. Contractor shall not impede existing vehicular or pedestrian entrances. Coordinate required traffic disruptions with Owner.

M. Power

1. Power point of connections are available to Contractor.

N. Address

1. Bidding address is 44 North San Joaquin Street, Suite 590, Stockton, CA, 95202.

END OF SECTION
PART 1 - GENERAL

1.1 DESCRIPTION

A. Summary of Work: Remodel of existing office space to include the removal and addition of interior walls; new finishes, ceilings, and lighting; replacement of all exterior windows; upgrade of interior and exterior accessibility features and parking; installation of new boiler and air handlers, new or modified ducting and coordination with recently installed new HVAC units; and installation of new plumbing fixtures in restrooms.

1.2 CONTRACTOR’S GENERAL DUTIES

A. The following provides a general list of duties, which is not all-inclusive. Should there be a conflict with other Contract requirements the more restrictive will apply.

B. Unless specifically noted otherwise, provide and pay for all of the following:

1. Labor, materials, and equipment. Note is made that this is a prevailing wage job.

2. Tools, construction equipment, and machinery.

3. Transportation, quality control, and other facilities and service necessary for the proper completion of the work in accordance with the Contract Documents.

4. Pay legally required sales, consumer, and use taxes.

5. Water, heat, utilities required during construction period.

6. Enforce offsite parking provisions for employees, vendors, suppliers, etc. as required. Monitor and enforce traffic and parking in areas off limits to contractors.

7. Legal disposal of hazardous and non-hazardous wastes

C. Give required notices.

D. Comply with codes ordinances, rules, regulations, orders, and other legal requirements of public authorities, which govern the performance of the work.

E. Promptly submit written notice to the Owner’s Representative of any observed variances of the Contract Documents from legal requirements.

F. Enforce strict discipline and good order among employees. Do not employ persons on the job who are unfit or unskilled in their assigned tasks.

G. Seek clarifications in accordance with RFI procedures established by the Owner’s Representative.
H. Prepare a Schedule describing in detail the Contractor’s approach and methods of prosecuting the work in accordance with the construction and time constraints. The Schedule should show the interdependence of construction activities and shall be cost and resource loaded.

I. Be responsible for the overall coordination of the work. Prepare coordination drawings to indicate how work shown by separate subcontractor shop drawings will be interfaced and sequenced for installation.

J. Submit a Schedule of Values, Construction Schedule, and Requests for Payment in accordance with the General Conditions, the Supplemental Conditions, and these specifications.

K. Revise and refine the Schedule to reflect authorized changes as they occur.

L. Maintain appropriate accounting records (including separate accounts for changes).

M. Recommend necessary or desirable changes in the work for the review of the Owner’s Representative. Review subcontractors’ requests for changes and submit recommendations to the Owner’s Representative. Submit requests for substitutions in accordance with these specifications.

N. Consult with the Owner’s Representative to obtain interpretations of the Contract Documents. Assist in resolutions of questions and transmit written interpretations to concerned parties.

O. Attend Project meetings and special meetings as necessary.

P. Be responsible for the quality of the work performed under the Contract and for the materials, equipment, and supplies to be incorporated in the work.

Q. Provide temporary facilities and controls.

R. Provide site security and safety.

S. Maintain accurate Project records which will be turned over to the Owner at termination of the work.

T. Verify that the jobsite is maintained in a clean, neat and orderly manner during the progress of the work and at the completion of the work. Maintain access point in a clean condition daily.

U. Direct the checkout of utilities, operation systems, and equipment, including the initial start-up and testing and provide operating instructions.

V. Submit maintenance manuals, operating data, warranties, bonds, etc., to the Owner’s Representative.

W. Perform all other work described in the Contract Documents to complete the work.

X. Submit copies of all subcontractor agreements (including pricing) within thirty (30) days of Notice to Proceed. Also, provide the original bid estimate of the General Contractor and major subcontractors within seven (7) days of the Notice to Proceed or payment may be withheld.

Y. Prevent any impact to the adjacent facilities or their operations.

1.3 WORK BY OTHERS

A. The County may have other Contractors performing work outside of this contract within the same general area, and mutual coordination with that Contractor will be required.
B. Contractor understands that this project connects to existing utilities and will become familiar with and coordinate to integrate with the previous work.

1.4 PROGRESS AND COMPLETION

A. All work shall be done under the Contract and shall be completed within 90 calendar days beginning on the date stipulated in the written Notice to Proceed.

B. Actual, physical work shall commence no later than one day after the date stipulated on the Notice to Proceed, and shall be performed in complete accordance with the Contractor’s Work Plan and Progress Schedule. The Contractor shall perform his work in an expedient manner furnishing enough equipment and workforce to maintain at all times Contractor’s program of work.

C. It is expressly agreed that time is of the essence of this Contract, and Contractor agrees to perform the work within the time and in the manner specified, or within the time of such extensions as may be granted. Contractor shall be liable for liquidated damages for failure to meet the completion date.

D. In the event that the rate of actual progress of the work falls ten (10) days behind the estimated progress indicated on the Contractor’s Progress Schedule, the Contractor shall accelerate the work by placing additional forces and equipment on the Project or any other means so that the project will be completed within the Contract time irrespective of the Contractor’s claim for time extensions.

E. The Contractor shall continuously staff the job with no interruption of work. The Contractor shall keep the Owner’s Representative advised of his work schedule with weekly work plans, progress reports, and photographs or video documentation of Contractor progress transmitted to the Owner.

F. The Contractor will provide the necessary crews and workforce to meet the schedule requirements for constructing all facilities within the Contract duration.

1.5 ADJACENT SITE CONDITION SURVEY

A. Prior to commencement of Work, the Contractor, the Owner and the Owner’s Representative shall jointly survey the site and existing buildings, paving, plant life and other items, noting and recording existing damage such as cracks, sags, loose masonry, unhealthy plant life and other damage.

B. This record shall serve as a basis for subsequent determination of damage to these items due to settlement or movement caused by demolition and construction operations.

C. Such damage, as noted, shall be suitably marked on the item if possible, and the parties making the survey shall sign the official record of existing damage.

D. Cracks, sags or other damage to the site and adjacent buildings, paving, plant life and other items not noted in the original survey but subsequently observed shall be reported immediately to the Owner.

1.6 PROTECTION OF EXISTING UTILITIES

A. The Drawings show approximate locations of existing above and below grade structures, drainage line, storm drains, sewers, water, gas, electrical lines, and other items as they are known to exist in the area of the work.

B. Verify the horizontal location and vertical elevation of these known existing installations before proceeding with excavation or other operations which may cause damage, maintain them in service where appropriate, and repair damage caused by the performance of the work, at no increase in the Contract Sum. The existing buildings, facilities, and utilities must be kept in continuous operation throughout the term of this Contract.
Special consideration should be given to work being performed near the existing building foundations. Contractor shall contact underground service alert in accordance with their protocol, prior to any excavation.

C. Additional utilities and portions of structures whose locations are unknown may exist. If such utilities are encountered, immediately notify the Owner’s Representative.

D. In addition to notification, if a structure or utility is damaged, take appropriate action as specified in the General Conditions.

1.7 PROTECTIVE MEASURES

A. The Contractor shall provide and maintain substantial and adequate protection as may be required to protect new and existing work, adjacent facilities, the Owner's clients and employees, the public at large, their possessions (such as cars) and all items of equipment and furnishing for the duration of work.

B. The Contractor shall repair or make good any and all damage that it may cause to the building's facilities and utilities, (including landscaping, roads, fencing, etc.) or property (such as cars) to the full satisfaction of the Owner's Representative and at no cost to the Owner.

1.8 PROJECT ADMINISTRATION

A. The Owner’s Representative is an agent of General Services Department-Capital Projects and has exclusive authority in all matters concerning this project. Contractor shall take direction from the Owner's Representative or his designee only. Any directions, suggestions or proposed changes from any other entity not associated with construction administration or inspection shall be disregarded and immediately reported to the Owner's Representative.

B. All materials supplied and all work done by the Contractor shall be under the general administration of the Owner’s Representative and in accordance with the Drawings and Specifications.

C. The County has the right but not the duty to maintain a duly authorized representative on the work, full or part-time, who will perform observation and administration during the construction phase.

D. Code Inspection will be by personnel of City of Stockton, County Building Department, County Public Works, and Owner's Representative. General Services Department-Capital Projects Inspectors will monitor quality control and specification compliance.

E. Contractor to procure all plans and specifications needed for its use of its subcontractors, etc. at its own cost. Plans and specifications may be purchased from ARC Stockton Blue (formerly Stockton Blueprint) Plan Well at www.stocktonblue.com, or at the ARC Stockton Blue Office, 1421 N. El Dorado Street, Stockton, CA 95202, (209) 464-6012.

1.9 CONTRACTOR MANAGEMENT

A. The Contractor will provide a Project Manager and/or Superintendent who have previously constructed projects of similar size and scope. If requested by the Owner, the Contractor will provide the resumes for Project Manager and/or Superintendent for approval by the County. In addition, the Contractor's Superintendent and Project Manager will be available for interview with the County if requested as part of the approval process. If requested by the Owner the Contractor will also provide references from previous owners who have worked with the Project Manager and/or Superintendent. The Project Manager and/or Superintendent shall personally attend the jobsite each day work is ongoing and be available by direct phone contact when not on site.
B. County reserves the right to replace Superintendent or Project Manager during the project. If the County finds the performance of the Superintendent or Project Manager unacceptable, the Contractor will be required to replace the staff.

1.10 CHANGES AND CLARIFICATIONS

A. Contractor and subcontractors by submission of a bid acknowledge and waive right to claim extended overhead, delay, impact, disruption, etc., due to:

1. The multiplicity of changes issued within ten percent (10 %) of the award amount, and
2. The multiplicity of requests for information (RFI) (clarifications) if they do not exceed 100 in number.
3. If the changes exceed ten percent (10 %) of the Contract amount and the RFIs exceed 100 in number, the Contractor must demonstrate on a case-by-case basis the effect on the Contract as a whole with detailed Schedule and Cost Analysis.
4. Should any unforeseen condition be discovered that necessitates a work stoppage, Owner is not liable for any claim of extended overhead, delay, disruption, remobilization or related restrictions of contractor activities.

1.11 PARTNERING

A. The County of San Joaquin is committed to the concept of partnering in its construction projects. County staff believes that through open communication, fair negotiation and group problem solving a superior construction project can be realized. To this end, the successful contractor and subcontractors may be invited to join with the designers and County personnel to develop a partnering approach for use throughout the life of the Project.

END OF SECTION
PART 1- GENERAL

1.1 GENERAL

A. It is expressly agreed that time is of the essence of this Contract, and the Contractor agrees to perform the work within the time and in the manner specified, or within the time of such extensions as may be granted. The Contractor shall be liable for liquidated damages for failure to meet the final completion date specified herein.

B. The Contractor's scheduling of work crews, equipment, and materials will be of utmost importance for completing the work within the time allowed. The Contractor may be required to employ one or more of the following measures to build the project within the time constraints:

1. Utilize extra equipment and manpower.

2. Work more than one normal 8-hour shift per day; work more than the normal 5-day week. Overtime, two or three 8-hour shifts per day, 6 to 7 days per week may be required.

3. Employ extra staff to plan, schedule, coordinate, and expedite the work.

C. In addition to employing additional resources as described above, the Contractor will be expected to take whatever additional steps are necessary to ensure timely completion of the Project.

D. Submission of a bid by the Contractor constitutes acknowledgement that the foregoing requirements have been taken into account in the Contractor's bid price.

END OF SECTION
PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included in this Section: The procedures to be followed by the Contractor upon discovery of any apparent conflicts, omissions, or errors in the Contract Documents, or upon having any questions concerning interpretation.

1.2 PROCEDURES

A. Notification by Contractor: Should the Contractor discover conflicts, omissions, or errors in the Contract Documents, or have any questions concerning interpretation or clarification of the Contract Documents, or if it appears to the Contractor that work to be done or any matter relative thereto are not sufficiently detailed or explained in the Contract Documents, then, before proceeding with the work affected, the Contractor shall immediately notify the Owner’s Representative in writing and request interpretation, clarification, or additional detailed instructions concerning the work. The Contractor shall ask for any clarification or request for information immediately upon discovery, but no less than seven (7) working days prior to the start date of the activities related to the clarification, based on the latest updated version of the official Contract Schedule. It should be noted that the Contractor must use an RFI for any change made on a Submittal, but that an RFI does not replace the Submittal process.

B. The Contractor shall submit all requests for clarification and/or additional information in writing to the Owner’s Representative using the Request for Information (RFI) form included in this section. An electronic version is available.

C. Number: The Owner’s Representative will assign blocks of numbers for the Contractor, Engineer, Owner’s Representative, and for substitutions. The Contractor will use the block of numbers consecutively with the date of issue, except for reissuance of a respective RFI in which the subscript a, b, c, etc., will be added until the RFI is resolved. Contractor shall number all attachments with RFI number followed by .1, .2, .3 etc. in the lower right hand corner of the attachment.

D. Response Time: The County, or its representative whose decision will be final and conclusive, shall resolve such questions and issue instruction to the Contractor within a reasonable amount of time, but no more than fourteen (14) calendar days. In some cases, this time may need to be lengthened or shortened for emergency situations as mutually agreed upon by all parties. Should the Contractor proceed with the work affected before receipt of a response from the Owner’s Representative within the response time described above, any portion of the work which is not done in accordance with the Owner’s interpretation, clarifications, instructions, or decisions subject to removal or replacement and the Contractor shall be responsible for all losses.

E. Reason for Submission: The Contractor may submit RFIs if one of the following conditions occur:

1. The Contractor discovers an unforeseen condition or circumstance that is not described in the Contract Documents.

2. The Contractor discovers an apparent conflict or discrepancy between portions of the Contract Documents that appears to be inconsistent or is not reasonably inferred from the intent of the Contract Documents.
3. The Contractor discovers what appears to be an omission from the Contract Documents that cannot be reasonably inferred from the intent of the Contract Documents.

F. Rejections: RFIs will not be recognized or accepted if, in the opinion of the County, one of the following conditions exists:

1. The Contractor submits an RFI as a Submittal.

2. The Contractor submits the RFI under the pretense of a Contract Documents discrepancy or omission without thoroughly reviewing the documents.

3. The Contractor submits the RFI in a manner that suggests that specific portions of the Contract Documents are assumed to be excluded, or by taken as an isolated portion of the Contract Documents in part rather than whole.

4. The Contractor submits an RFI in an untimely manner without proper coordination and scheduling of work or related trades.

G. Subject: Each RFI shall be limited to one (1) subject.

H. Additional Detailed Instructions (Clarifications): The Owner may furnish additional detailed written instructions to further explain the work, and such instructions shall be a part of the Contract Documents. Clarifications will be issued using the above RFI system. Should additional detailed instructions in the opinion of the Contractor constitute work in excess of the Scope of the Contract, the Contractor shall submit notification immediately and written notification thereof to the Owner’s Representative no more than seven (7) calendar days following receipt of such instruction, and in any event prior to the commencement of work thereon. The Owner’s Representative will then consider such notice, and if the Owner’s Representative considers it justified the instructions of the Owner will be revised or a proposed Change Order will be issued. The Contractor shall have no claim for additional compensation or extension of the Schedule because of any such additional instructions unless the Contractor provides the Owner’s Representative written notice thereof within the time frame specified above. In addition, the Contractor shall within fourteen (14) days from the date of notification provide detailed justification and analysis as well as complete pricing and schedule CPM fragmentary network to support any request for time extension. See the Changes Clause of the General Conditions for more details.

END OF SECTION
### SAN JOAQUIN COUNTY GENERAL SERVICES DEPARTMENT-CAPITAL PROJECTS
### ENVIRONMENTAL HEALTH BUILDING TENANT IMPROVEMENTS PROJECT
### REQUEST FOR INFORMATION

**RFI:** ________

<table>
<thead>
<tr>
<th>CONTRACTOR:</th>
<th>TRANSMITTAL RECORD</th>
<th>ATTN/FIRM</th>
<th>SENT</th>
<th>REC'D</th>
<th>DUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFORMATION REQUESTED BY:</td>
<td>CONTRACTOR TO CM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUBJECT:</td>
<td>CM to A/E</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A/E CM TO CONSULTANT(S)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DRAWING REF:</td>
<td>CONSULTANT(S) TO A/E</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPEC REF:</td>
<td>A/E TO CM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONTRACT NO:</td>
<td>CM TO CONTRACTOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**INFORMATION NEEDED:**

DATE:____________________ SIGNATURE:________________________

REPLY:

DATE:____________________ SIGNATURE:________________________

You are authorized to proceed with the work identified in the reply to this RFI on the assumption that no change in the contract amount or completion date is required. If the RFI involves a change in the work affecting your contract amount or completion date, notify the CM immediately.
PART 1 - GENERAL

1.1 DESCRIPTION

A. Monthly Progress Payment request preparation, approval and payment shall conform to the provisions of this Section and will supersede the General Conditions. In case of conflict, the more restrictive shall apply.

B. Related provisions specified elsewhere include:
   1. Bid Form
   2. Construction Agreement (Contract)
   3. General Conditions
   4. Summary of Work (Section 01010)
   5. Progress Schedules (Section 01310)
   6. Schedule of Values (Section 01370)

1.2 SUBMITTAL PROCEDURE

A. Upon notification of acceptance of the bid by the County, the apparent successful bidder shall, within five (5) calendar days, submit a cost breakdown of his/her bid allocated to each of the Specification Divisions. This information shall be consistent with the data in the Schedule of Values. The cost breakdown shall be in conformance with the CSI format and with subcontract values. Breakdown shall include separating all costs by building area or site work.

B. Submit a Schedule of Values based on the Cost-Loaded Schedule for each activity of work thirty (30) days after Notice to Proceed for approval by the Owner’s Representative. Payment will not be made until the Schedule of Values and Cost-Loaded Schedule have been approved. The Schedule of Values shall be in conformance with the CSI format and roll up from the Cost-Loaded Schedule.

C. The Contractor will break out itemized payments for any and all stored materials as individual activities on the Cost-Loaded CPM.

D. An updated rough draft payment request based on the Cost-Loaded Schedule will be presented to the Owner’s Representative at the billing meeting on or about the twenty-fifth (25th) of each month.

E. On or about the first of each month and after the billing meeting with the Owner’s Representative, submit an Application for Payment on a copy of the form provided by the Owner. Include the Monthly Progress Payment and the Cost Report. The monthly invoice will be based on work completed through the twenty-fifth (25th) day of the previous month.

F. Using the Monthly Progress Payment and Cost Report, fill in or mark up quantities/percentages/dollars requested, including that of approved Change Orders executed prior to the date of submittal of Monthly Progress Payment and Cost Report, and submit to the Owner’s Representative for review. Include such substantiating data as the Owner’s Representative or Owner may request. The Monthly Progress Payment and Cost Report shall show the value of work completed, by each of the Specification Divisions as well as by each activity. The stipulated retainage shall be included in the invoice. The Contractor shall provide a sort by CSI format. The Monthly Progress and Cost Report will have the following format:
   1. Activity and Specification Division number
   2. Cost
3. Percent Complete
4. Cost of Previous Period
5. Previous percent complete
6. Cost This Period
7. Total Cost to Date

G. After review and when agreement is reached with the Owner’s Representative on the Progress Payment Estimate, the Contractor shall generate the revised Application for Payment with Monthly Progress Payment and Cost Report for signature by the Contractor, Owner’s Representative, and the Architect. The Owner’s Representative will make the final determination if agreement cannot be reached on the Contractor’s Payment Request.

H. The Contractor shall execute certification with signature of a responsible officer of the Contractor’s firm, as the first signature on the Application for Payment with Monthly Progress Payment and Cost Report.

I. The Application for Payment with Monthly Progress payment and Cost Report shall be in electronic format.

J. The Application for Payment with Monthly Progress Payment and Cost Report shall be supported with conditional releases from subcontractors.

K. Unconditional lien releases due ten (10) days after payment.

1.3 STORED MATERIALS/EQUIPMENT

A. Payment for stored material and equipment is at the discretion of the Owner. Submit separate Schedule of Prices of material and equipment to be stored on or off the work site. The schedule will show the quantities, prices, and types of materials to be stored. Stored material prices shall be shown separately on the Cost Loaded CPM based on the Schedule of Prices.

B. Payment Request may include the value of acceptable material/equipment not yet incorporated into the work, provided that all of the following conditions are met:

1. Payment will only be made for major individual material/equipment which have a value PER ITEM in excess of $10,000.00.

2. Such acceptable materials/equipment is either furnished and delivered to the site or furnished and stored for use on the Contract and such storage is within a bonded and insured warehouse located within San Joaquin County.

3. Forty-eight (48) hours prior, written approval by the Owner’s Representative shall be obtained for each delivery to the warehouse.

4. Title to stockpiled material/equipment shall be vested in the Owner at the time of delivery to the site or warehouse.

5. Stockpiled material/equipment shall be inventoried and accounted for by the Contractor by an independent firm and available for inspection by the Owner’s authorized agents and shall be segregated and marked as the property of Owner.

6. After delivery of the material/equipment, if any inherent or acquired defects are discovered, defective material shall be removed and replaced with suitable material at the Contractor’s expense.

7. At his/her expense, the Contractor shall insure material/equipment against theft, fire, vandalism, and malicious mischief and shall deliver the policy or certificate of such insurance to the Owner’s Representative naming the Owner as the insured. Insurance shall not be cancelable for at least thirty (30) days and cancellation shall not be effective until certificate thereof is given to the Owner. Present proof of insurance with each Request for Payment.
8. Submit bills of sale or paid invoices for all stored material/equipment on which payment is requested. Payment for stored materials will only be approved for individual major equipment or materials in excess of $10,000.00.

9. Nothing in the above conditions shall relieve the Contractor of his/her responsibility for incorporating material/equipment into the work in conformity with the Contract Documents.

10. Maximum payment for stored material/equipment will be the cost of the item plus applicable taxes. Submit supplier’s invoice and receipt as evidence of purchase and payment, and provide supplier’s executed Lien Release. Such payment shall in no case exceed the bid price for the item of work for which the material/equipment is furnished and shall not be greater than the Cost Loaded Activity.

1.4 TIMING AND TURNAROUND OF PROGRESS PAYMENTS

A. The end date for each monthly pay period shall be established as the twenty-fifth (25th) day of each month and a formal payment request on or about the first (1st) of the following month. The payment request will be accompanied by Certified Payrolls and complete As-Builts. Deducts may be taken for defective work, untimely Submittals, Stop Notices, etc.

B. It is the intention of the Owner to make Progress Payments to the Contractor thirty (30) days after receipt of the approved Monthly Progress Payment Application and all backup data including but not limited to payrolls, material inventories, releases of liens, certifications, and invoices.

C. Final payment shall be in accordance with the Construction Agreement and General Conditions after all of the requirements of Specification Section 01700 - Project Closeout have been met.

1.5 SPECIAL REQUIREMENTS

A. The items outlined below are to be included within the Schedule of Values. The below quantities and/or percentages are separate of the retention amounts specified elsewhere.

B. One percent (1.0%) of the total Contract value will be allocated to activities for turn-on, testing and inspection of plumbing (0.25%), mechanical (0.25%), electrical (0.25%), and access/security controls (0.25%).

<table>
<thead>
<tr>
<th>Accomplishment</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Rough-In: All conduit, wiring, piping, including hangers, supports, insulation, etc. completely installed, inspected and tested for conformance to applicable Specification sections.</td>
<td>25%</td>
</tr>
<tr>
<td>2. Trim/Finish: All equipment certified by manufacturer (if applicable), installed and inspected in accordance with applicable Specification section.</td>
<td>50%</td>
</tr>
<tr>
<td>3. Operational: Entire system is checked out, inspected, approved, and fully operational in accordance with applicable Specification. All test reports delivered to Owner’s Representative.</td>
<td>100%</td>
</tr>
</tbody>
</table>

C. One-half percent (0.5%) of the total Contract value will be allotted to punch list activities.
D. Cleanup: For administrative and payment purposes, allocate as a minimum one-quarter percent (0.25%) of the total Contract value for cleanup. (The actual amount required may be more or less). The 0.25% will be pro-rated as follows:

<table>
<thead>
<tr>
<th>Job Completion</th>
<th>Clean Up Paid</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 25</td>
<td>10</td>
</tr>
<tr>
<td>2. 50</td>
<td>25</td>
</tr>
<tr>
<td>3. 75</td>
<td>50</td>
</tr>
<tr>
<td>4. 100</td>
<td>100</td>
</tr>
</tbody>
</table>

E. One tenth percent (0.10%) of the total Contract value will be allocated for accepted record documents for each subcontractor and the General Contractor.

F. If schedule updates are not complete and/or not completed by the last day of the month, payment or a portion thereof may be withheld.

G. If Submittals are not provided in the time proscribed by the Contract, payment or a portion may be withheld.

H. If As-Builts are not maintained on a consistent basis ten percent (10%) of the payment may be withheld.

I. One tenth percent (0.10%) of the total Contract will be withheld if all Guaranties/Warranties are not provided. This amount will be allocated for each Subcontractor.

J. Submittals: a maximum of five percent (5%) of the subcontract amount may be included for engineering and shop drawings for deferred submittals. Payment will be allowed after those submittals are completely approved.

END OF SECTION
## SAN JOAQUIN COUNTY GENERAL SERVICES DEPARTMENT-CAPITAL PROJECTS

**CONTRACTOR:**

**Project:** Environmental Health Building Tenant Improvements Project

<table>
<thead>
<tr>
<th>Pay Estimate No:</th>
<th>Date:</th>
<th>Period From:</th>
<th>To:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Schedule Amount</th>
<th>Previous Work Complete</th>
<th>Work This Period</th>
<th>Work to Date</th>
<th>% Complete</th>
<th>Balance to Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### SUMMARY:

- Base Contract Amount
- Approved PCO's & CO's
- Total Contract Amount

<table>
<thead>
<tr>
<th>Gross Earnings (Attachment B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retention 10%</td>
</tr>
<tr>
<td>Withhold Due To Stop Notice</td>
</tr>
<tr>
<td>Withhold For Defective As-Builts</td>
</tr>
<tr>
<td>Withhold For Notice to Withhold</td>
</tr>
<tr>
<td>Net Earnings</td>
</tr>
<tr>
<td>Less Previous Earnings</td>
</tr>
<tr>
<td>Net Payment This Period</td>
</tr>
</tbody>
</table>

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(Contractor)</td>
<td>Date:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Siegfried Engineering, Inc. (Engineer)</td>
<td>Date:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Joaquin County General Services Department-Capital Projects (Owner)</td>
<td>Date:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### REMIT PAYMENT TO:

Environmental Health Building Tenant Improvements Project  
Payment  
01150-5
PART 1 - GENERAL

1.1 DESCRIPTION

A. Progress Schedule preparation, submittal, update, and changes shall conform to the provisions of this Section. This will supersede the General Conditions Clause 22. Note equipment required by Part 2 of this section.

B. Related provisions
   1. Payment (Section 01150)
   2. Schedule of Values (Section 01370)

1.2 REQUIREMENTS:

A. Submit a preliminary Critical Path Method (CPM) Progress Schedule within five (5) calendar days of the Notice to Proceed. This can be an activities only four (4) week look ahead.

B. Submit a Critical Path Method (CPM) Progress Schedule with preliminary cost loading within fifteen (15) days of the NTP covering the first ninety (90) calendar days of the Contract.

C. Submit a CPM Schedule for the entire project duration with cost and man-loading no later than thirty (30) days after the Notice to Proceed.

D. Schedule submittals are subject to review and acceptance by the Owner's Representative. The Owner's Representative retains the right to withhold Progress Payments until the Contractor submits a Progress Schedule acceptable to the Owner's Representative.

E. Submit monthly progress review and update of the schedule with each Progress Payment. Schedule revisions, as requested by the Owner's Representative, are specified in Paragraph 1.6 of this Section.

F. Utilize computer scheduling system for producing CPM Progress Schedule Drawings and Network Reports.
   1. Reports sorted by area, phase or activity shall be provided as approved by the Owner's Representative. The reports shall indicate activities, duration, early start & finish, man-days, unit cost, quantities and float.
   2. Computer scheduling software used by the Contractor shall be Microsoft Projects 2003 or later.

1.3 PREPARATION GUIDELINES

A. The Progress Schedule shall represent a practical plan to complete the work within the Contract time. The Progress Schedule shall be consistent in every way with the Contractor's Work Plan submitted previously.
   1. A schedule extending beyond the Contract time will not be acceptable.
   2. A schedule showing the work completed in less than the Contract time may be found by the Owner's Representative to be impractical.
   3. Any schedule found to be impractical for the preceding reason or any other reason shall be revised by the Contractor and resubmitted.
   4. A schedule showing the work completed in less than the Contract time, which is found to be practical by the Owner's Representative, shall be considered to have float. The float is the time between the scheduled completion of the work and Contract completion date. In this case and others, float is a resource available to both the Owner's Representative and the Contractor.
   5. The Contractor’s Progress Schedule shall be formulated with written allowance for adverse weather conditions.
conditions normally anticipated. The Contract time has been predicated assuming a normal amount of adverse weather. The weather days will be calculated utilizing NOAA data for the local area and will be based on a ten (10) year average for the number of days per month for which rainfall is greater than ½ of one (1") inch. The Contractor will provide copies of the NOAA data and the summation of the number of weather days per month to the Owner’s Representative with the CPM Schedule. The weather days shall be shown on the Schedule and if not used will become float at the end of the Project Schedule. No less than twenty-two (22) calendar days will be allotted for each winter weather period which is defined as the months of October, November, December, January, February and March. A total of twenty-two (22) days are to be included if the start or completion occurs any time within the defined inclement weather period.

6. The Contractor will provide the following activities for completion of the Project specifically on the critical path:

a. Checkout and performance testing of all mechanical/electrical systems and equipment for not less than ten (10) work days.

b. Checkout and testing of access controls, security controls, intrusion system, P.A. system, etc., not less than ten (10) days.

c. Checkout and testing of fire protection system with the Fire Marshal for not less than four (4) work days.

d. Training on mechanical, electrical and security systems equipment not less than five (5) workdays.

e. Not less than 21 calendar days will be allocated for each O&M submittal review. Accepted O&M Shall precede training sessions.

f. Cleanup of not less than five (5) calendar days.

g. Preparation of Punchlist five (5) calendar days for substantial completion.

h. Correction of Punchlist items for not less than ten (10) calendar days.

7. No more than fifteen (15%) percent of the activities shall be critical or near critical. Near critical is defined as float in the range of one to ten (1-10) work days.

8. The Contractor will provide the necessary crews and manpower to meet the schedule requirements for constructing all facilities within the Contract duration. The Contractor will provide manpower and crewing calculations to support the critical path front.

9. The Contractor will provide all submittals on the Schedule.

B. The Progress Schedule shall clearly show the sequence and interdependence of construction activities and shall specifically indicate:

1. The start and completion of all items of work, their major components, and interim milestone completion dates.

2. Activities for procurement, delivery, installation, and completion of each major piece of equipment, materials, and other supplies, including:
   a. Time for submittals, resubmittals, and review.
   b. Time for fabrication and delivery of manufactured products for the work.
   c. The interdependence of procurement and construction activities.

3. Activities for maintaining Project Record Documents.

C. The Schedule Shall:

1. Be in sufficient detail to assure adequate planning and execution of the work. Activities should generally range in duration from three to ten (3 to 10) calendar days each.
2. Be suitable, in the judgment of the Owner's Representative, to allow monitoring and evaluation of progress in the performance of the work.

3. Show detailed subcontractor work activities. In addition, the Contractor will provide copies of the subcontractor's schedules and/or bid data, and manpower/equipment upon which the CPM was built. Each major subcontractor will submit on his letterhead a statement certifying he/she has concurred with the General Contractor's CPM and that his/her related subcontractors’ schedules and/or data have been incorporated, including the activity duration and cost and manpower loading.

4. Be calendar time-scaled in the form of an activities-on-arrow network diagram.
   a. The activities shall include:
      1. Description: what is to be accomplished and where.
      2. Calendar day duration.
      3. Responsibility code: identifies who performs the activity. One (1) per activity, identified by subcontractor.
      4. The dollar value of each activity on the Schedule for cash flow and payment purposes (cost loading). The total of activity costs shall equal the Contract amount and be in conformance with the bid proposal and Schedule of Values, Section 01370.
      5. The total quantity of manpower (in terms of man days) assigned to each activity.
      6. The total number of full-time workers assigned to work on each activity (man loading).
   b. The network shall show continuous flow from left to right. Constraints will not be allowed without the Owner's Representative's prior approval.
      1. Identify days per week and shifts per day worked.
      2. Include time for the Owner's Representative/Architect to review submittals or observe the work.
      3. Identify the activities which constitute the controlling operations or critical path.

D. All Schedule submittals shall include one (1) 11”x17” size copy of each of the required CPM Drawing(s). Additionally, submit a complete computerized CPM Progress Schedule on data disk(s) in a format which can be read into other computerized scheduling packages. Data disks containing the Contractor’s Schedule shall be readable by a PC compatible with a CD Rom drive. Costs for preparation and reproduction of all Schedule submittals shall be paid for by the Contractor.

E. Submittal of the Progress Schedule shall be understood to be the Contractor’s representation that:
   1. Schedule meets the requirements of the Contract Documents and that work will be executed in the sequence indicated on the Schedule.
   2. Contractor shall distribute Progress Schedule to subcontractors for review and acceptance which will be noted on the subcontractor’s letterhead to the General Contractor and transmitted to the Owner’s Representative for the record.

1.4 SUBMITTALS

A. The Contractor shall provide a copy of his/her Pre-bid Schedule with the along with the preliminary CPM Schedule within five (5) days after Notice to Proceed.

B. Within five (5) days after the Notice to Proceed, provide to the Owner's Representative for review copies of the Preliminary Construction Schedule sufficiently complete in detail so as to indicate sequence of operations and durations of construction for the first four weeks.

C. The Preliminary Schedule will be reviewed by the Owner's Representative. The Contractor shall modify the Preliminary Schedule, when requested by the Owner’s Representative, and resubmit the Schedule for
Approval of the Preliminary Schedule if based on less time than the maximum time allowed does not serve to change the specified time of completion, nor serve as a waiver of the Contractor’s nor the Owner’s right to the full amount of time specified as the time of completion, unless the time of completion is changed by a formal Change Order to this Contract.

D. Within fifteen (15) days after the Notice to Proceed, provide to the Owner’s Representative the CPM Program Schedule with preliminary cost loading covering the first ninety (90) days sufficiently complete in detail so as to indicate sequence of operation and duration of construction. Review will be as in Point C above.

E. Within thirty (30) days after Notice to Proceed, the Contractor shall provide to the Owner’s Representative copies of a complete computer cost and man-loaded construction schedule consisting of required functions or activities, tabulation of activities, and critical path. A Project calendar shall also be submitted. No payments will be considered without this submittal.

F. Not later than the twenty-fifth (25th) day of each month thereafter during duration of the Project, Contractor shall provide the Owner’s Representative with copies of an updated Schedule showing work progress. Submittal of the updated Schedule shall be attached with the Request for Payment and will be a condition of monthly payment.

END OF SECTION
SECTION 01340

SUBMITTALS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section describes the requirements for the deferred approval and submission of a Submittal Schedule, Shop Drawings, calculations, product data, samples, Certificates of Compliance, and other items as specified. This will supersede the General Conditions. Submittal shall be made to the Owner's Representative for review by the Architect. Other miscellaneous submittal include, but are not limited to, bonds, warranties, guarantees, maintenance agreements, project photographs, survey data and reports, quality testing and certifications, copies of industry standards (if requested), record drawings, operating and maintenance manuals and materials, engineer's calculations, and keys.

B. Related work not included in this section:
   1. Specific section reference requiring submittal. Make submittal only where specifically required.
   2. Requirements of other types of submittal including, but not necessarily limited to, test reports, operating instructions, maintenance data, and maintenance materials.

C. In preparing the Submittals, consider the nature and complexity of each submittal item and allow ample time for review, revision, correction, resubmittal, and approval sufficiently in advance of the construction requirements.
   1. Allow at least fifteen (15) calendar days for review by the Owner's Representative for each Submittal or resubmittal.
   2. Allow at least thirty (30) calendar days for review of complex Submittals and resubmittals which require review by both the Architect and his consultants.
   3. No claim for delay will be granted to the Contractor when the delay is caused by his/her failure to make Submittal in a timely manner and in accordance with the accepted Submittal Schedule.
   4. Allow adequate time beyond the required review time for processing and distribution of each Submittal or resubmittal.

D. Schedule Submittal in sequence with the Schedule for work except as required for deferred approval products known to require long lead time. For submittal of items requiring long lead time, submit written verification of the required lead time from the supplier.

E. All substitutions will be submitted and approved prior to Submittal.

1.2 SUBMITTAL NUMBERING SYSTEM

A. Submittals shall be numbered in consecutive ascending order. Resubmittals shall be followed by a subscript "a", "b", "c", etc., as necessary for resubmission. For example, the first Submittal shall be "001". The first resubmittal of "001" shall be "001a". The Contractor shall keep each Submittal and resubmittal intact with the original number and will not add new drawings or information outside the scope of the original Submittal, nor will the Contractor provide a new number for a resubmittal. Submittal will be returned to the Contractor without review if incorrectly numbered.

1.3 SHOP DRAWINGS

A. Submit to the Owner's Representative at least five (5) copies of blueline or blackline prints plus one (1) reproducible paper or mylar of each shop drawing. Only the reproducible will be returned to the Contractor.
After completion of checking, the Owner’s Representative will obtain prints of the transparency for his/her record and will return transparency to the Contractor. The Owner’s Representative will forward only the reproducible to the Contractor. Shop Drawings shall be new drawings prepared by the Contractor responsible for his/her respective work, and not reproduced from the Architect’s drawings and no exceptions will be made.

1. The sheet size of shop drawings shall not exceed 36” x 42”.

2. Each Shop Drawing shall have blank spaces large enough to accept 4” x 10” review stamps of the Contractor, the Architect, or the Architect’s consultants.

3. Shop Drawings shall include plans, sections, and details including complete information for making connections with other work and any other information necessary to adequately describe the unit of work.

4. Materials and finishes shall be clearly identified and, where applicable, Specification Section numbers shall be included as reference.

5. Identify details by reference to sheet and detail numbers shown on the Contract Documents.

6. Identify applicable standards, such as ASTM numbers or Federal Specification numbers, on the drawings.

7. Identify deviations from the Contract Documents by clouding and the words "CONTRACT DEVIATION" in boldface type.

8. Shop Drawings shall be drawn to a minimum scale of 1/8 inch equals one (1’) foot, showing all equipment; with Mechanical and Electrical rooms to a minimum scale of 1/4 inch equals one (1’) foot, showing all equipment, ductwork, and piping to be installed under the Mechanical sections. For critical areas, provide section drawings to a minimum scale of 1/4 inch equals one (1’) foot. Layouts shall show clearances of piping, ducts, etc., above floor.

1.4 CALCULATIONS

A. Where calculations are required by the Specifications, they shall be prepared by a registered professional engineer, licensed in the State of California, who shall sign and stamp each copy of the Submittal prior to submission to the Owner's Representative.

B. Submit five (5) copies of required calculations for the record only. The Owner’s Representative will not be responsible for checking calculations in detail.

C. Indicate all formulae and criteria used in the preparation of calculations.

D. Submit calculations in 8-1/2” x 11” sheets only with the following information on each sheet:
   1. The name and address of the engineer.
   2. The license number, stamp, and signature of the engineer.
   3. The project name and address.
   4. The Contractor’s name and address.

1.5 PRODUCT DATA

A. Product Data shall permit the Owner’s representative to determine which materials, equipment, and systems will be accepted in the Project and shall consist of brochures, catalog cuts, or other data sufficient to clearly identify subject items, optional features to be utilized, performance characteristics, limitations, capacities, schedules, complete engineering information, physical dimensions, conformance with standards, codes, fire ratings, acoustical ratings, appearance characteristics, and any other pertinent data to identify it as either item specified or an equal to that specified. Statements such as "as specified" will not suffice.

B. Submit seven (7) copies of manufacturers’ catalog cuts, brochures, diagrams, schedules, performance charts, illustrations, and other descriptive data as required by the Specification Sections. When manufacturer's printed literature is required to be submitted, it shall be submitted in original form. Heat transfer or other impermanent reproduction method or fading type of reproduction will not be accepted. Make one (1)
coordinated Submittal for each unit of work or system. Two (2) copies will be returned to the Contractor and one (1) copy to the Owner's Representative.

C. Mark the manufacturer's data to clearly indicate the items to be included as a part of the work. Product data submitted with multiple items and no clear indication as to which item is to be used in the work will be returned to the Contractor without being reviewed.

D. Submit manufacturer's standard printed recommendations for application and use. Supplement standard information to provide additional information applicable to the Project.

E. Include dimensions and clearances required. Indicate field dimensions which have been checked and verified.

F. Show performance characteristics and capacities.

G. Show wiring diagrams and controls.

H. Review product data prior to submission to the Architect. Stamp and sign each Submittal to indicate that the Contractor has reviewed the Submittal for compliance with the Drawings and Specifications.

I. Identify deviations from the Contract Documents by clouding and the words "CONTRACT DEVIATION" in boldface print.

1.6 SAMPLES

A. Review of Samples shall permit the Owner's Representative to physically verify conformance of materials, products, fixtures, or devices with Contract Documents either by inspection and to select textures, colors, or other characteristics as stipulated in the Contract Documents.

1. Review of Samples will be only for characteristics or uses named in such review and shall not be taken to change or modify any Contract requirement except as specifically authorized or requested by the Owner's Representative.

2. Samples shall set standards for items or characteristics of which samples are representative; after sample has been reviewed, no further change in brand, make, or quality will be permitted.

B. Submit four (4) samples as specified. Unless otherwise specified, samples shall be sufficient size and quantity to clearly indicate:

1. Functional characteristics of the product or material, with integrally related parts and attachment devices.

2. Full range of color samples.

1.7 CONTRACTOR'S RESPONSIBILITIES

A. Maintain a log of Submittals showing the Submittal number, description, Specification Section, schedule Submittal date, date to the Owner's Representative, requested due date, date received from Owner's Representative, Submittal review action code, and comments. The Contractor shall submit a current copy of the submittal log each month.

B. Do not submit drawings, samples, or data for products that have not been specified unless such products have been formally approved as a substitute in accordance with Section 01660 - Substitutions.

C. Begin no work which requires Submittal until such Submittal have been reviewed by the Architect/Engineer and returned to the Contractor with the Architect/Engineer's stamp and initials.

D. The Contractor will notify the Owner's Representative immediately if he/she considers any comments, notations, instructions, notes, etc., applied to the Submittal by the Owner's Representative to be a change to the Contract requirements. The Contractor will initiate an RFI (Request for Information) identifying the Scope of Work which they consider to be a change to the Contract requirements. The RFI will be submitted in accordance with the RFI processing requirements contained within the Specifications. Failure of the Contractor to issue an RFI within seven (7) days upon receipt of the Submittal will waive the Contractor's right to a Change Order.
E. Submittal "Approved as Noted" will not be resubmitted. The Owner's representative approved or reviewed as noted items will be incorporated in the record drawings.

1.8 REVIEW BY THE OWNER'S REPRESENTATIVE/ARCHITECT/ENGINEER

A. Review Submittal within time frames of 1.1C for design concept and compliance with the Contract Documents.

B. The Owner's Representative/Architect/Engineer review of the Shop Drawings will be for general conformance with design conditions only and will not relieve the Contractor of his/her responsibility for quantity, fit, dimensions, coordination, and full compliance with all of the Contract Documents.

C. The Owner’s Representative/Architect/Engineer reserves the right to reject Submittal which, in his/her opinion, are incomplete and/or lack sufficient information to enable him/her to accomplish a thorough review.

D. The Owner’s Representative/Architect/Engineer may reject resubmittals which do not clearly indicate where revisions have been made to the original Submittal.

E. The Owner’s Representative/Architect/Engineer will reject Submittal for products which have not been specified unless such products have been formally approved as acceptable substitutes in accordance with Section 01660 - Substitutions.

F. The Owner’s Representative/Architect/Engineer review of the Submittal shall not be construed as approving departures from the Contract requirements.

G. The Owner’s Representative/Architect/Engineer review of separate items does not constitute review of an assembly in which the item functions.

H. Indicate action, stamp and initial the Submittal certifying review.

I. Retain one (1) copy for the Owner's Representative file and one (1) copy for each major consultant who has reviewed the Submittal.

J. Return Submittal via the Owner's Representative to the Contractor for distributions.

END OF SECTION
### SAN JOAQUIN COUNTY GENERAL SERVICES DEPARTMENT-CAPITAL PROJECTS

#### ENVIRONMENTAL HEALTH BUILDING TENANT IMPROVEMENTS PROJECT

**SUBMITTAL TRANSMITTAL**

Submittal #_________ Page ____ of ______

**CONTRACTOR:** ____________________________ **SPECIFICATION SECTION:** ___________

**SUBCONTRACTOR/SUPPLIER:** ____________________________ **DRAWING REFERENCE:** __________

<table>
<thead>
<tr>
<th>TRANSMITTAL RECORD</th>
<th>ATTN:</th>
<th>DATE SENT</th>
<th>DATE REC'D</th>
<th>DATE DUE</th>
<th>REPRO.</th>
<th>PRINT</th>
<th>SAMPLE</th>
<th>MFG. LT.</th>
<th>REC'D BY (INT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTRACTOR TO PM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PM TO ARCH/ENGR.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARCH/PM TO CONSULTANT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONSULTANT TO ARCH/ENGR.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARCH/ENGR. TO PM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PM TO CONTRACTOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**REVIEW ACTION CODE:**

1. Reviewed/No Exceptions Taken
2. Make Corrections noted
3. Revise as noted and resubmit
4. Incomplete Submittal, Resubmit
5. Rejected/Resubmit as specified

### DWG/ITEM DATED DESCRIPTION

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### ARCH/ENGR. REMARKS:

**GENERAL SERVICES DEPARTMENT-CAPITAL PROJECTS REMARKS**

### NOTE:

Notations do not authorize changes to Contract sum or time. If you are authorized to proceed with the work identified in this Submittal, it is assumed that no change in the Contract amount or completion date is required. If a change in the work affecting your Contract amount or completion date is involved, notify the PM immediately.

Environmental Health Building Tenant Improvements Project

Submittals

01340-5
SECTION 01370
SCHEDULE OF VALUES

PART 1-GENERAL

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

A. Related Provisions Elsewhere:
   1. Payment (Section 01150)
   2. Schedule (Section 01310)

1.2 Requirements

A. Use Excel spread sheet (Office 97 or newer).

B. Supply Schedule of Values on disk and on paper.

C. When so required by the Owner’s Representative, provide copies of the subcontracts or other data acceptable to the Owner’s Representative, substantiating the sums described.

D. Prior to final schedule submittal or first application for payment and within twenty (20) days of Notice to Proceed, submit a proposed Schedule of Values to the Owner’s Representative.
   1. Meet with the Owner’s Representative and determine additional data, if any, is required to be submitted.
   2. Secure the Owner’s Representative’s approval of the Schedule of Values prior to final schedule submittal or submitting first application for payment.

END OF SECTION
PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section describes the requirements for Quality Control.

1.2 DUTIES AND RESPONSIBILITIES OF OWNER’S REPRESENTATIVE

A. The Owner’s Representative and the Owner have the right, but not the duty, to monitor and inspect all work performed by the Contractor to insure performance of the work to the Contract Documents and Specifications. All work shall be subject to inspection and test by the Owner’s Representative and the Owner at all reasonable times and at all places prior to acceptance. Any such inspection and test is for the sole benefit of the Owner and shall not relieve the Contractor of responsibility for providing Quality Control measures to assure that the work strictly complies with the Contract requirements. No inspection or test by the Owner or Owner’s Representative shall be construed as constituting or implying acceptance.

1.3 CONTRACTOR’S DUTIES AND RESPONSIBILITIES

A. The Contractor is responsible for the quality of the work performed under this Contract as well as the quality of the material, equipment, and supplies furnished by him/her to be incorporated into the work.

B. The Contractor shall designate a Quality Control Representative who will be on site at all times while the respective Contractor’s work is in progress and will have the authority and responsibility to accept or reject items of work. The Contractor’s Quality Control Representative may delegate his/her duties but the primary responsibility and authority rest with him/her.

C. The Contractor’s Quality Control Representative shall coordinate the submittal of all shop drawings, product data, and samples to the Owner’s Representative. Any submittal that is a change to the Contract requirements shall be identified as such and transmitted to the Owner’s Representative. No work requiring submittal of a shop drawing, product data, or sample shall be commenced until the submittal has been reviewed and accepted by the Owner’s Representative.

D. The Contractor shall cooperate with an approved material testing laboratory to perform testing of materials as required by the Contract Drawings and Specifications, or the Owner’s Representative. The Contractor shall provide a one (1) working day; (two (2) working day for nights, weekends, and holidays) notice when testing/inspection are required. The Contractor will request all tests and inspections in accordance with the Specifications and the Owner’s Representative’s request and approval for testing services procedures. The Contractor will utilize the form supplied by the Owner’s Representative for requesting tests and inspections. The Contractor will not contact the testing firms directly without going through the Owner’s Representative.

E. The Contractor’s Quality Control Representative shall review his/her drawings, procurement documents, and Contracts to insure that the technical information provided and all work performed is in accordance with the latest revisions of the Contract Drawings and Specifications.

F. The Contractor’s Quality Control Representative shall perform an inspection upon receipt at the site of all materials, equipment, and supplies. Items which are damaged or not in conformance with the respective submittals, quality standards, Contract Drawings and Specifications will be identified and segregated from accepted items. Items thus identified shall not be incorporated into the work until corrective action acceptable to the Owner’s Representative/Owner is completed. Items determined unsalvageable will be removed from the jobsite.
G. The Contractor will establish a performance testing plan for all equipment and systems for mechanical, electrical, plumbing, heating or air conditioning, security, communications and hardware. The testing plan will include test and report forms for each type of application and will be approved by the Owner's Representative. The performance testing of each equipment and system will be documented and approved by the Owner's Representative. Copies of the approved performance tests will be required for project closeout as required by Section 01700-Project Closeout and by Section 01730-Operation and Maintenance Data/Training.

H. The Contractor's Quality Control Representative and subcontractors will attend a weekly QC Meeting. The Contractor will provide a list of current controlling activities for that week and bring an outlined Specification Section to the meeting noting areas applicable for inspection/testing for the controlling activities.

I. All requests for testing will be provided for the current week and all Notices of Non-Compliance will be reviewed.

J. The Contractor will provide copies of his Quality Control Inspection Reports each day. Format of the report will be approved by the Owner’s Representative.

1.4 INSPECTION AND TESTING

A. The Contractor is responsible to different authorities for the elements of work concerned (Note that this list may not be inclusive):

1. San Joaquin County General Services Department-Capital Projects is the Owner's Representative and will have general Quality Assurance duties.

2. The San Joaquin County Community Development Building Department will have all other code enforcement duties.

3. There will be code required specialty inspections. Fees and responsibilities are covered in relevant Specification Sections.

B. Should the Contractor fail to correct work in a reasonable time, the Owner’s Representative will issue a Notice of Non-Compliance. This is a two (2) part notice/reply form. The Owner’s Representative will specify the non-compliant item on Part One (1) and the Contractor shall respond on Part Two (2) indicating the fix once it has been accomplished. The Contractor will maintain a log of all Notices of Non-Compliance which shall contain the following information: Notice number, description, specification section, date issued, date response from the Contractor, date corrected, number of days to correct, and remarks. The Contractor will present a copy of this log at the weekly meetings and shall keep it currently updated. Upon compliance with the Notice of Non-Compliance, the Owner’s Representative will officially notify the Contractor of the release of Notice on Non-Compliance.

C. Operation and Check-out Testing: The Contractor shall provide personnel and equipment to perform the operational tests and checkout of the equipment, facilities, or equipment constructed, fabricated, or installed under this Contract. **The Owner's Representative will coordinate and witness all such tests, at final project location, in California.** Inspection request will be made forty eight (48) hours in advance of the scheduled tests. Refer also to requirements for operating and maintenance data and training specified in Section 01730.
D. Substantial and Final Inspection: The Owner’s Representative will coordinate all final inspections of the work. Requests for finalizing portions of the work performed under this Contract shall be made to the Owner’s Representative at least fifteen (15) days in advance of the inspection. Prior to requesting a substantial completion inspection, all tests of the equipment and systems and training shall be completed. Refer to Section 01700 for detailed requirements for substantial completion and final completion inspections for Project Closeout. The Contractor will be provided with a punchlist from the Owner indicating items over and above those shown on the Contractor’s punchlist. The Owner will only provide two (2) inspections: substantial completion and final completion. Others will be at the Contractor’s expense. The Owner will provide a hand-written punchlist to the Contractor. The Contractor will enter and maintain a computerized punchlist based on the Owner’s punchlist in a format approved by the Owner’s Representative. The Contractor will provide the Owner’s Representative with one (1) copy, paper and electronic (Excel), of the computerized list within five (5) working days upon receipt of the Owner’s list and update it on a weekly basis.

E. The Contractor will at each weekly meeting during the closeout period provide an annotated punchlist indicating those items which have been completed and are ready for inspection. The Contractor will maintain and keep this list current and provide a copy to the Owner’s Representative each week until all items are complete. Prior to the request for substantial completion and throughout the life of the Project, the Contractor will maintain a Testing and Inspection Schedule. This Schedule will be provided at each weekly meeting indicating the tests or inspections which will be required during the following week. Based on this Schedule, the Contractor will provide the Required Request for Testing forms.

1.5 VERIFICATION OF TEST REPORTS

A. The Testing Laboratory will submit a report in duplicate covering all of the tests which are done during the progress of the Project. Such report shall be furnished each time that Work on the Project is performed, covering the tests up to that time, and at the completion of the Project, covering all tests.

1.6 OWNER’S INSPECTORS

A. Inspectors employed by the Owner in accordance with the requirements referenced in these specifications, will be assigned to the Work. Their duties are specifically defined in California Buildings Code chapter seventeen A (17A), and section seven (7) of Title 24, Part 1 of the California Building Standard Code.

B. The tenant improvements, in all stages of progress, will be subject to the personal, continuous observation of the Inspector. He/she shall have free access to any and all parts of the Work at any time. Furnish the Inspector reasonable facilities for obtaining such information as necessary to keep him/her fully informed regarding the progress and manner of the Work and the character of the materials. Inspection of the Work shall not relieve the Contractor from any obligation to fulfill this Contract.

1.7 SPECIFIC TESTS AND INSPECTIONS

A. Applicable tests and inspections may be required to the extent that the Work represented thereby is required by the Contract. The testing and inspection requirements are stipulated in each particular Specification Section addressing the corresponding work.

END OF SECTION
REQUEST FOR INSPECTION
PUBLIC HEALTH SERVICES
ENVIRONMENTAL HEALTH BUILDING TENANT IMPROVEMENTS PROJECT

This section to be completed by the Contractor:

I have personally checked for compliance with Contract Documents and certify this to be ready for inspection.

**CONTRACTOR’S SIGNATURE:** ____________________________  **DATE:** ________________

<table>
<thead>
<tr>
<th>TYPE OF TEST OR INSPECTION</th>
<th>LOCATION</th>
<th>TIME &amp; DESIRED DATE</th>
<th>RESULTS</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This section to be completed by the Special Inspector:

**INSPECTION AGENCY:** ____________________________  **PRINT**

- To the best of my knowledge the work is in conformance with the approved plans and specifications.
- Work is non-conforming. See Below.

**SIGNATURE:** ____________________________  **DATE:** ________________

**SPECIAL INSPECTOR**

**COMMENTS:**
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

**APPROVED**  **TOTAL HOURS:**

**NOTE:** BILLINGS WILL NOT BE APPROVED FOR ANY SERVICES W/O HOURS & SIGNATURES
SECTION 01410

TESTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section summarizes which tests and inspections will be performed by the Contractor, and which will be performed by the Owner’s Representatives. The detailed tests and inspections required to be performed by the Contractor may be found in the individual Sections of Divisions 2 through 16 of these Specifications.

1.2 OWNER’S TESTING AGENCY

A. For the purpose of meeting A/E and County requirements the Owner will employ and pay a testing agency, identified in the various Specification Sections as “the Owner’s Testing Agency” and “Owner’s Soils Engineer” to perform tests, inspections, and sampling of the following work after start of construction:
   1. Earthwork.
   2. Concrete, reinforcement, ingredients and quality control.
   3. Asphalitic Concrete

B. The Owner’s employment of the testing agency shall in no way relieve the Contractor of his obligations to perform the work in accordance with Contract requirements nor to retain their own testing firm for Quality Control.

C. The Owner will back-charge the Contractor for costs incurred in the event the Contractor’s poor Quality Control of any material requires excessive repeated testing by the Owner’s Testing Agency.

1.3 QUALITY ASSURANCE

A. Qualifications of Testing Agents: Agencies, bureaus, or laboratories shall be acceptable to the Owner’s Representative.

B. Failure of Materials and Equipment Tested or Inspected:
   1. The Contractor shall be charged for retesting and reinspection resulting from the Contractor’s noncompliance with the Contract as evidenced by tests and inspections by the Owner’s Testing Agency.
   2. Previous acceptance may be withdrawn and material of which tested samples are representative or equipment may be subject to removal and replacement by the Contractor at his/her expense with material or equipment meeting Specification requirements.
   3. The Owner’s Representative may refuse consideration of further samples of same brand or make for testing.
   4. At the Owner’s discretion, defective material and equipment may be permitted to remain in place subject to adjustment of Contract price.

1.4 TESTING AGENCY’S DUTIES

A. Cooperate with Owner’s Representative and the Contractor. Provide qualified personnel promptly upon notice.

B. Perform required inspecting, sampling, and testing of materials and methods of construction.
   1. Comply with specified standards, other recognized authorities as specified.
   2. Check for compliance with Contract Documents.
C. Promptly notify the Owner’s Representative and the Contractor of observed irregularities or deficiencies in the work.

D. Promptly submit reports to the following:

1. One (1) copy each to the Contractor’s office
2. One (1) copy to the Owner’s Representative.
3. One (1) copy to the Architect.
4. One (1) copy to the appropriate Engineer.
5. One (1) copy to San Joaquin County Community Development Department.

E. Reports shall include the date issued and date of test, Project title and number, testing agency’s name and address, name and signature of inspector, date of inspection or sampling, record of temperature and weather, identification of product and Specification Section, location in project, type of inspection or test, reference to applicable standards and codes and observation regarding compliance with Contract Documents.

F. Perform additional services as required by the Owner.

G. The testing agency is not authorized to release, revoke, alter, or enlarge on the requirements of the Contract Documents, approve or accept any portion of the work, and perform any of the Contractor’s duties.

1.5 CONTRACTOR’S RESPONSIBILITIES

A. Initiate and coordinate tests and inspections required by Contract Documents and public authorities having jurisdiction of the work.

B. Notify the Owner’s Testing Agency through the Owner’s Representative a sufficient time in advance (but no less than five (5) days) of the manufacture of materials to be supplied which, by requirements of the Contract Documents, must be tested at the source of supply so that the Laboratory may arrange for testing. Request on site testing twenty-four (24) hours in advance through General Services Department-Capital Projects (Forty-eight (48) hours for weekends or nights).

C. When changes of construction schedule are necessary during construction coordinate all such changes with the County’s Testing Agency as required.

D. When the Owner’s Testing Agency is ready to test according to the established schedule, but is prevented from testing or taking specimens due to incompleteness of the work, all extra charges for testing attributable to the delay may be back-charged to the Contractor and shall not be borne by the Owner.

E. Provide access, facilities, tools, and labor necessary for duties to be performed at the site by Owner’s Testing Agency and Inspector including furnishing ladders, hoisting, lighting, water supply, and like services.

F. Completed Work: Should the Owner require tests and inspections for work completed before final acceptance of entire work, furnish necessary facilities, labor, and materials to uncover or remove work in question to extent necessary.

1. If such work is found defective due to fault of the Contractor, the Contractor shall defray expense of removal, test, and inspections, and satisfactory reconstruction. Time extension may not be granted.

2. If such work is found to conform to requirements of the Contract, the Contractor shall be reimbursed by the Owner for facilities, labor, and materials required for removal, and costs of satisfactory reconstruction in accordance with Contract amounts for extra work. Reasonable time extension shall be granted.

G. Furnish and deliver samples of materials to be tested at no extra cost to County. Test samples will be selected by the Inspector or County’s Testing Agency and not by the Contractor.

H. Reports:
1. Furnish copies of each test and inspection report (if provided per Section 01410.1.9), signed and certified by the Contractor’s Testing Agency supervising engineer as follows:
   a. Owner’s Representative: one copy.
   b. Architect: one copy.
   c. Engineer: one copy.
   d. Contractor: As required.
2. Promptly process and distribute required copies of test reports and related instructions to assure necessary retesting and replacement of materials with the least possible delay in progress of the work.
3. The reports shall include detailed information relative to progress and condition of work including variances from the Contract Documents, and stipulating dates, hours and locations of the tests and inspections, as applicable.

I. Records:
1. Maintain correct records on an appropriate form for all inspections and tests performed, instructions received from the County or testing agency, and actions taken as a result of those instructions.
2. These records shall include evidence that the required inspections or tests have been performed (including type and number of inspections or tests, nature of defects, causes for rejections, etc.), proposed or directed remedial action, and corrective action taken.
3. Document inspections and tests as required by each Section of the Specifications.

J. If laws, ordinances, rules, regulations, or orders of public agency having jurisdiction require work to be inspected, tested, or approved by some authority other than the County or Contractor, the Contractor shall give required notices and make arrangements, deliver to the County the certificates of inspections, test, or approval of such public agency, and pay costs therefore unless otherwise provided in the Contact Documents.

1.6 TEST PROCEDURES

A. Testing:
1. Owner’s testing agency will perform tests according to method(s) of test specified in these Specifications.
2. If no procedure or test method is specified, testing shall conform to material specification references unless otherwise directed by the Owner.
3. The Owner’s testing agency will tag, seal, label, record, or otherwise suitably identify the materials for testing. No materials shall be used in the work until the test reports are submitted and approved, excepting only the materials specified to be placed or installed prior to testing.

B. Retesting:
1. Repeat applicable tests at specified intervals, when:
   a. The source of supply is changed.
   b. The characteristics of the materials change or vary.
   c. Unsatisfactory test results are received.
2. Quantity and nature of additional testing, if required, will be determined by the Owner.
3. Additional tests shall be taken in the presence of the Owner’s Engineer.
4. Proof of non-compliance will make the Contractor liable for any corrective action which the Owner feels is prudent, including complete removal and replacement of defective materials.

5. Nothing contained herein is intended to imply that the Contractor does not have the right to have tests performed on any material at any time for his/her own information and job control so long as the Owner does not assume responsibility for costs or for giving them consideration when appraising quality of materials.

1.7 PAYMENT FOR TESTING

A. Initial Services:

1. The Owner will pay for initial testing services requested by the Owner.

2. When initial tests indicate non-compliance with the Contract Documents, the costs of initial tests associated with that non-compliance will be deducted by the Owner from the Contract Sum.

B. When initial tests indicate non-compliance with the Contract Documents, subsequent retesting occasioned by the non-compliance shall be performed by the same testing agency, and costs thereof will be deducted by the Owner from the Contract Sum.

C. Reimburse the Owner all or any part, as the Owner may deem just and proper, of the inspection costs incurred by the Owner due to:

1. Failure of materials to pass initial tests.

2. Contractor’s failure to complete the work within the Contract time and any previously authorized extensions thereof.

3. Claims between separate contractors.

4. Covering of work before the required inspections or tests are performed.

5. Additional inspections required for the Contractor’s correction of defective work.

6. Overtime costs for acceleration of work done for Contractor’s convenience.

1.8 CODE COMPLIANCE TESTING

A. Inspections and tests required by California codes or ordinances, or by a plan approval authority, and which are made by a legally constituted authority, shall be the responsibility of and shall be back-charged to the Contractor, unless otherwise provided in the Contract Documents.

1.9 CONTRACTOR’S CONVENIENCE TESTING

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

1.10 REQUEST FOR TESTING PROCEDURES

A. Testing will be performed as ordered by the Owner’s Representative. The Contractor will follow the Owner’s Representative’s procedures for requests for tests and inspections.

END OF SECTION
SECTION 01500

CONSTRUCTION FACILITIES & TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included in this Section: Provision, maintenance, and removal of facilities and controls required to execute work of this Project efficiently and successfully including, but not necessarily limited to, the following:

1.2 Utilities

1.3 Roads/Temporary Access

1.4 Construction Aids

1.5 Barriers and Enclosures

1.6 Security

1.7 Temporary Controls

1.8 Water Pollution Control

1.9 Clean-up

1.10 Project Identification

1.11 Field offices and sheds

1.12 Shoring and Underpinning

1.13 Traffic Control

B. Related Work Not Included in this Section:

1. Provision of protective measures described with respect to specific unit of work.

2. Provision of progressive and final cleaning.

1.2 UTILITIES-TEMPORARY & PERMANENT

A. General:

1. Contractor to furnish, install, pay for and maintain temporary utilities as required including power, water and phone service.

2. Materials, installation, and maintenance of temporary utilities shall be in compliance with applicable regulatory requirements.

3. Remove temporary utilities, including associated materials and equipment when no longer required unless otherwise directed by Owner’s Representative. Restore and recondition areas of the site damaged by temporary utilities or their installation. Remove and properly dispose of debris resulting from removal and reconditioning operations.

B. Temporary Electric Power and Lighting:
1. Arrange as required to provide services required for Contractor's power. Distribute electric power and lighting as required for performance of the work. The Contractor will provide and maintain sufficient lighting to properly apply finishes and allow for accurate inspection by Owner’s Representative.

2. Provide adequate lighting and convenience outlets in temporary structures and as otherwise required for the performance of the work. Do not use permanent lighting for construction operation.

C. Temporary Water:

1. Arrange with the utility company to provide water for construction purposes. Pay all costs for service and for water used. Contact utility company for specific requirements.

2. Install branch piping with taps located so that water for construction purposes is available throughout the work area by use of hoses.

3. If the Contractor uses water connected to the County/City system, the capacity will be limited in order not to affect the pressure and volume being utilized by existing Owner facilities.

D. Temporary Sanitary Facilities:

1. Provide approved temporary sanitary facilities and locate them on the site in locations approved by the Owner’s Representative.

2. Regularly maintain the facilities in a neat, sanitary condition, adequately supplied.

3. Comply with CAL/OSHA 1526 as a minimum.

E. Temporary Fire Protection: Provide and maintain fire extinguishers, fire hoses, and other equipment necessary for proper fire protection during the progress of the work.

F. Quality Assurance:

1. Structural Engineer, Civil Engineer and Surveyor: Where required for engineering temporary facilities or aiding in construction, employ a structural engineer, civil engineer and surveyor licensed in the State of California.

2. Temporary Facilities: Adequate for the intended use and for the loads imposed without excessive settlement, deflection, or deformation. Parts shall be properly supported, wedged, and secured to prevent displacement or failure.

G. Temporary telephone service, is the responsibility of the Contractor and subcontractors. Arrange and pay for all service charges or additional line charges as required by the Contractors operation.

H. Temporary Weather Protection:

1. Provide and maintain adequate temperature weather protection for all exposed points of connection to the existing structure until protected by new weather tight construction.

2. Provide and maintain adequate temperature weather protection for permanent interior finishes during construction until protected by new weather tight construction.

1.3 TEMPORARY ACCESS

A. Maintain temporary lay down areas designated for Contractor trailers and equipment. Protect fencing from damage. Contractor shall restore or repair damaged road or parking areas and fencing resulting from his/her operations. Provide temporary access to all areas of the Project throughout all weather conditions.

B. Access: Maintain free and unimpeded access to and egress from site and the existing facilities at all times.
1. The Contractor’s access to the construction area will be permitted only through designated approaches in such manner that traffic will not interfere with the Owner’s activities.

2. Whenever interference with normal street and sidewalk traffic becomes necessary for proper and convenient performance of the Work, and no satisfactory detour route exists, before beginning the interference provide satisfactory detour, temporary bridge, or other proper facility for traffic to pass around or over interference, and maintain in satisfactory condition as long as interference continues. Owner’s Representative’s approval is required.

C. Grading: The Contractor will grade where necessary to provide temporary positive drainage and seal graded areas to prevent soil saturation in accordance with its approved storm water pollution control plan. The Contractor will protect all storm sewer lines from silty or polluted run-off.

D. Maintain existing paving and parking lots free of mud and construction debris.

1.4 CONSTRUCTION AIDS

A. Construction aids shall be in compliance with applicable regulatory requirements.

1. Install and maintain construction aids as required for the performance of the work.

2. Relocate construction aids as required by the progress of the work.

3. Remove construction aids when no longer required. Clean and repair damage caused by installation and use.

4. Restore permanent facilities used for temporary purposes to a condition satisfactory to the Owner’s Representative.

B. Construction Hoists:

1. Furnish, operate, and maintain a complete facility for handling, conveying, installing, and erecting work and materials required under the Contract. Include hoists and conveyances for transporting workers and transporting and placing materials; debris chutes; and tools, appliances, power equipment, and other required items. Furnish, arrange, and set up the plant to facilitate the proper and timely performance of the work.

2. Maintain plant and equipment in safe operating condition. Repair damages due to the use of defective plant and equipment, at no increase in Contract Sum.

C. Scaffolds and Platforms:

1. Furnish, erect, and maintain scaffolds, guardrails, platforms, and similar temporary construction necessary for the performance of the work.

2. Connect the levels of the structure by means of suitable ladders, ramps, and temporary stairs, as necessary; permanent stairways may be used as specified. Enclose open wells and shafts.

D. Temporary Enclosures and Protection of Work in Place: Provide temporary, weathertight enclosures as required for acceptable working conditions, weather protection for interior materials, effective temporary heating, and to prevent entry of unauthorized persons.

1.5 BARRIERS AND ENCLOSURES

A. General:

1. Materials and construction shall be in compliance with applicable regulatory requirements.

2. Provide and maintain suitable temporary barriers as required to prevent public entry; protect the work and existing facilities, persons, and trees and plants from damage or injury from construction operations.
3. Should work and/or regulatory requirements necessitate construction of temporary barriers, barricades, or pedestrian walkways not indicated or specified, construct at no increase in Contract Sum. If required, paint such items in a color selected by the Owner’s Representative at no cost to Owner.


5. Relocate as required by progress of the work.

6. Restore and recondition site areas damaged or disturbed.

B. Barricades: Erect where required to prevent accidents and losses, and provide adequate warning lights.

C. Fences and Gates:

1. Construction site is to be securely fenced and gated during construction. With Owner’s pre-approval, Utilize existing fencing if applicable. Maintain entrance and exit control so to keep members of the public and/or clients of the existing facility from the premises. Provide Owner’s Representative with keys for padlocks.

D. Tree and Plant Protection: Provide adequate protection of existing landscaping against damage from construction operations. Employ methods at the Contractor’s discretion.

1. Where barricades are necessary, make four (4') feet high and locate at or beyond drip lines of item so protected.

2. Especially protect roots, trunk, and foliage of existing and new shrubs and trees.

3. Do not permit following conditions:
   a. Using trees as support posts, power poles, sign posts, or anchorage for ropes, guy wires, and power lines or other similar functions.
   b. Poisoning items by disposing of paint, petroleum products, dirty water, or other deleterious materials on or around roots.
   c. Burning of trash under or near shrubs or trees.
   d. Compaction of root area by moving trucks, grading machine, storage of equipment, gravel, earth fill, supplies, etc.
   e. Damage to trunk or limbs caused by maneuvering vehicles or stacking material and equipment too close to the item.

4. Compensation for Planting Loss: Any tree or shrub to remain, damaged or destroyed due to the Contractor’s negligence or failure to provide adequate protection shall be compensated for in accordance with following schedule of values, using “tree caliper” method (greatest trunk diameter measured 30 inches above ground):
   a. For trees or shrubs with diameters up to and including six (6”) inches, the actual cost of replacement with item similar in species, size, and shape, including:
      1. Actual out-of-ground cost for boxed item.
      2. Transportation or delivery of boxed item to site.
      3. Planting and staking.
      4. Maintenance in watering, fertilizing, pruning, pest control, and other care to bring replacement to same general condition of original item.
   b. For trunks up to:
<table>
<thead>
<tr>
<th>Diameter</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 inches</td>
<td>$1,000</td>
</tr>
<tr>
<td>8 inches</td>
<td>1,400</td>
</tr>
<tr>
<td>9 inches</td>
<td>1,800</td>
</tr>
<tr>
<td>10 inches</td>
<td>2,200</td>
</tr>
<tr>
<td>11 inches</td>
<td>2,600</td>
</tr>
<tr>
<td>12 inches</td>
<td>3,000</td>
</tr>
<tr>
<td>13 inches</td>
<td>3,400</td>
</tr>
<tr>
<td>14 inches</td>
<td>3,800</td>
</tr>
<tr>
<td>15 inches</td>
<td>4,200</td>
</tr>
<tr>
<td>16 inches</td>
<td>4,600</td>
</tr>
<tr>
<td>17 inches</td>
<td>5,000</td>
</tr>
<tr>
<td>18 inches and over</td>
<td>Add 500 for each caliper inch</td>
</tr>
</tbody>
</table>

1.6 SECURITY

A. Maintain temporary enclosure of partially completed construction areas to prevent unauthorized entrance, vandalism, and theft.

B. Secure temporary storage areas as required to prevent theft.

C. Be responsible for construction period security measures.

D. Project Inspector’s Access: Provide the Owner’s Project Inspector with keys necessary to gain access to locked areas of the Work. The Project Inspector will be responsible for such keys and will return them to the Contractor at the time of final inspection.

1.7 TEMPORARY CONTROLS

A. NOISE AND VIBRATION CONTROL:

1. Comply with all applicable state and local laws, ordinances, and regulations relative to noise control. Due to the close proximity of this work to within an existing public facility, equipment to be employed on this site shall not produce a noise level exceeding the following limits in Db(A) at a distance of fifty (50’) feet from the equipment under test.

   a. Earthmoving Equipment
      
      Front loader 79  
      Backhoes 85  
      Dozers 80  
      Tractors 80  
      Scrapers 88  
      Graders 85  
      Truck 91  
      Paver 89

   b. Materials Handling Equipment
      
      Concrete Mixer 85  
      Concrete Pump 82  
      Crane 83
c. Stationery Equipment

- Pumps 76
- Generators 78
- Compressors 81

d. Impact Equipment

- Pile Drivers Not permitted
- Jack Hammers 88
- Rock Drills 98
- Pneumatic Tools 86

e. Other Equipment

- Saws 78
- Vibrators 76

2. This equipment shall not be operated before 6:00 a.m. or after 5:00 P.M.

3. Equipment and impact tools shall have intake and exhaust mufflers.

4. Secure written permission from the Owner’s Representative at least three (3) working days prior to using noisy and vibratory equipment, such as jack hammers, concrete saws, impact tools, and high-frequency electrical equipment.

5. Cooperate with Owner if the use of noisy equipment becomes objectionable.

6. Idling diesel engines shall be turned off.

B. Dust and Dirt Control:

1. Conduct construction operations to prevent windblown dust and dirt from interfering with the progress of the work, ongoing operations, and vehicular traffic. See Section 01562.

2. Periodically water construction area as required to minimize the generation of dust and dirt. Dust must be controlled to a level compliant with the Valley Joint Air Pollution Control District standards.

3. Hauling equipment and trucks carrying loads of soil and debris shall have their loads sprayed with water or covered with tarpaulins.

4. Prevent dust and dirt from accumulating on walks, roadways, parking areas and plantings, and from washing into sewer and storm drains.

5. Water for compaction and dust control:

   a. Water for compaction and dust control shall be fresh, clean, and free from injurious amounts of oil, acid, and organic matter.

   b. If the Contractor wishes to use reclaimed water for compaction and dust control purposes, a CCR Title 22 water quality analysis shall be submitted to the Owner. The Owner reserves the right to prohibit the use of reclaimed water.

   c. If water is drawn from fire hydrants, back flow prevention, meters and usage accounts must be secured from water agency and all costs are to be paid by the Contractor.

   d. If the Contractor elects to use chemical additives in water for compaction or dust control, it shall be at his/her sole expense. The Architect/Engineer reserves the right to prohibit the use of a particular type of additive.
e. The Contractor shall construct and install connections to water systems, air gap devices, back flow prevention devices, meters, storage tanks, truck fill risers, or other equipment as required by the utility company or as shown on the plans.

f. The Contractor shall pay for all costs in conjunction with connecting to the water system as well as utility company charges for water used.

g. The Contractor shall have at least one (1) mobile unit with a minimum capacity of 1,000 gallons available for applying water on the Project at all times.

h. The Owner’s Representative has the right to require the Contractor to apply a dust palliative if, in the opinion of the Owner’s Representative, the dust control plan in insufficient. The cost of application of dust palliative shall be at the Contractor’s sole expense.

C. Water Control: Do not permit surface or subsurface water and other liquids to accumulate on or in areas adjacent to the Project site. Should such conditions be encountered or develop, control the water or other liquid, and suitably dispose of by means of temporary pumps, piping, drainage lines, troughs, ditches, dams or other Owner’s Representative approved methods. Also reference “F” below.

D. Pollution Control:

1. No burning of refuse, debris, or other materials will be permitted on or in the vicinity of the Project site.

2. Comply with regulatory requirements and anti-pollution ordinances during the performance of construction and disposal operations, including the disposal of solid, liquid, and gaseous contaminants.

3. Reference Section 1.8 below.

E. Soil Disposal: Dispose of excess soil on site as directed by Owner’s Representative. Excess soil may be stockpiled during construction for reuse as directed by the Owner.

F. Erosion Control: Erosion control shall consist of, but not be limited to, constructing such facilities and taking such measures as are necessary to prevent, control, and abate water, mud, and erosion damage to public and private property as a result of the construction of this Project, including the stockpiling of excavated material. Temporary erosion control measures included, but are not limited to the following:

1. The Contractor shall conduct his/her operations in such a manner that storm runoff will be contained within the project or channeled into the storm drain system which services the runoff area using Best Management Practices.

2. Temporary drainage structures and other devices shall be provided to channel storm runoff water into the respective permanent storm drainage systems during construction. Mud and silt shall be settled out of the storm runoff before said runoff enters the storm drainage system using Best Management Practices.

3. Embankment, graded and excavation areas shall be protected from erosion and the resulting siltation of downstream facilities and adjacent areas by use of temporary erosion control measures.
1.8 WATER POLLUTION CONTROL

All construction sites less than one acre and in National Pollutant Discharge Elimination System (NPDES) Phase 1 Area must comply with San Joaquin County’s Small Site Storm Water Pollution Prevention Plan (SWPPP). This project is within the NPDES Phase 1 Area. Please review and evaluate the Small Site SWPPP located at the following Internet location:
http://www.sjcleanwater.org/PDF%20Documents/SJCO_small_site_SWPPP07_10.pdf

1.9 CLEANING AND PROTECTING

A. General: During handling and installation of work at Project site, clean and protect work in progress and adjoining work on a basis of perpetual maintenance. Apply suitable protective covering on newly installed work where reasonably required to ensure freedom from damage or deterioration at time of substantial completion; otherwise, clean and perform maintenance on newly installed work as frequently as necessary through remainder of construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

B. Limiting Exposures of Work: To extent possible through reasonable control and protection methods, supervise performance of work in a manner and by means which will ensure that none of the work whether completed or in progress, will be subjected to harmful, dangerous, damaging, or otherwise deleterious exposures during construction period. Such exposures include (where applicable, but not by way of limitation) static loading, dynamic loading, internal pressures, external pressures, high or low temperatures, thermal shock, high or low humidity, air contamination or pollution, water, solvents, chemicals, light, radiation, puncture, abrasion, heavy traffic, soiling, bacteria, insect infestation, combustion, electrical current, high-speed operation, improper lubrication, unusual wear, misuse, incompatible interface, destructive testing, misalignment, excessive weathering, unprotected storage, improper shipping/handling, theft, and vandalism.

1.10 PROJECT IDENTIFICATION AND SIGNS

A. Provide at least four (4) “Hard Hat Area” signs stating the danger of the construction project and stating that all unauthorized personnel must keep off the site. These signs shall be approximately 2 x 2 feet and shall consist of design, text, and colors as compliant with OSHA Regulations and made up of exterior grade plywood. Provide four (4) 2x2 foot signs designating “Construction Entrance” and/or “No Construction Vehicles”.

1.11 CONTRACTOR FIELD OFFICES AND SHEDS

A. Contractor may provide a field office for housing of the Contractor’s project manager or superintendent.

B. Furnish, install and maintain additional field offices and sheds as required.

C. Construct, install and maintain field offices and sheds in accordance with applicable regulatory requirements.

D. Construction shall be structurally sound, weathertight, with floors raised above the ground. Doors shall be sturdy and shall be provided with provisions for dead bolt locking, temperature transmission resistance compatible with occupancy and storage requirements, and painted as directed by the Owner’s Representative.

E. Portable or mobile buildings complying with the specified requirements may be used.

F. Storage sheds:
   1. Number and Sizes: Adequate for material storage and handling requirements.
   2. Ventilation: Comply with specified and regulatory requirements for stored products.
   3. Heating: Adequate to maintain temperatures specified in the Specification Sections for the products to be stored.
4. Lighting: As required to facilitate product handling and inspection.

G. Obtain Owner’s Representative approval of locations for field offices and sheds prior to commencing site preparations for the structures.

H. Construct field offices and sheds on proper foundations, and provide connections and utility services.

I. Remove field offices and sheds from the site as soon as the progress of the work permits and as approved by the Owner's Representative. Remove foundations, steps, landings, and contents. Retain or remove utility services as directed by Owner’s Representative. Grade and restore portions of the site occupied by the temporary structures to a condition acceptable to the Owner's Representative.

J. Maintain the telephone, electrical, water, and sanitary systems to the existing facilities at all times. Relocate the utility poles and other utility lines as necessary during construction to maintain construction work at no additional cost to the Owner.

K. Provide location, grading, utility distribution for Owner’s Representatives trailer if required.

L. Maintain all utility distribution, structures, services, etc. for Phase II work if so directed.

1.12 SHORING AND UNDERPINNING

A. Provide temporary shoring, underpinning, or whatever other measures, including their structural engineering, necessary to prevent movement, settlement, or collapse of the Owner's or adjacent property.

B. Determine methods and procedures to be used, construct and maintain such measures, and be fully responsible for both their design and execution to the extent of making good damage caused by neglect or failure of these measures.

C. Employ a Structural Engineer licensed in the State of California, and pay costs of engineering design and inspection of shoring, underpinning, and such measures.

D. Remove entirely from excavations shoring and lagging within ten (10') feet from finished grade prior to completion of backfilling unless shoring or lagging is steel, wood treated in accordance with American Wood Preservers’ recommendations, or tieback system.

E. Be responsible for preventing overloading portions of structure beyond calculated safe carrying capacities during and after erection.

1.13 TRAFFIC CONTROL

A. All work in streets to be per City of Stockton requirements as regards permitting, notice, days and hours of work, warning and barricading, flagging, etc.

B. Contractor is to keep streets free of mud, dirt, debris, etc.

C. **No equipment, materials, etc. may be unloaded while parked on East Hazelton Avenue.**
SECTION 01540
SECURITY AND SAFETY

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section describes the requirements for providing site security and safety. The Contractor understands that the work will take place adjacent to other operating County facilities and the utmost care must be taken to provide a secure and safe workplace. The Public Health Office/Lab facility has its own security staff with whom the contractor will be required to cooperate.

1.2 SECURITY

A. Advise Owner's Representative of any disruptions planned or not.

B. Provide protection for materials, tools, and equipment being employed on the Project, including the tools of workers. The Owner shall not be held to have incurred any liability for loss of, and damage to, materials, tools, and equipment of the Contractor or of those employed by him/her, by Contract or otherwise.

C. The Contractor shall employ such watchman service as he/she may deem necessary to protect and safeguard the work. The Owner shall not in any way be liable for the damage or loss to the work due to trespass or theft.

D. The Owner may expand its watchman service as he/she deems necessary to protect his/her interest during the progress of the work. Any protection provided by the Owner shall not in any way relieve the Contractor of the responsibility for the safety of the work and acceptance thereof.

E. As indicated in the drawings, Contractor shall make use of existing fencing or provide temporary fencing to secure the areas of work, laydown, and office areas.

1.3 PROTECTION

A. Continuously maintain protection as necessary to protect the work as a whole and in part, and adjacent property and improvements from accidents, injuries and damage.

B. Properly protect the work:
   1. With lights, guard rails, temporary covers, and barricades.
   2. Enclose holes and trenches with proper barricades.
   3. Brace and secure all parts of the work against storm and accident.
   4. Provide traffic control devices and flagmen as necessary for work in, on or associated with the adjoining streets.
   5. Provide steel plating for open trenching as required or directed.
   6. Provide such additional forms of protection which may be necessary under existing circumstances.

C. Provide and maintain in good condition all protective measures required to adequately protect the public from hazards resulting from the work and to exclude unauthorized persons from the work. When regulated by Building Code or other authority, such legal requirements for protection shall be considered as minimum requirements; be responsible for the protection in excess of such minimum requirements as required.

1.4 CONTROL OF SITE

A. The Contractor shall ensure that no alcohol, firearm, weapon, or controlled substance enters or is used at the Project site. The Contractor shall immediately remove from the site and terminate the employment of any employee found in violation of this provision.
1.5 SAFETY PROGRAM

A. Within five (5) days after Notice to Proceed, Contractor shall submit a Safety Program to the Owner's Representative for review. The Contractor shall be required to comply with the Safety Program and all applicable Federal, State, and local regulation codes, rules, laws, and ordinances.

B. It is essential that the Contractor and each Subcontractor implement an effective and vigorous Safety and Health Program to cover his/her portion of the work. It shall be understood that the full responsibility for providing a safe place to work with respect to his/her portion of the work rests with each individual Contractor.

C. The Contractor and Subcontractors further agree to indemnify and hold the County, the Architect and the Owner's Representative harmless for, of, and from any loss including but not limited to fines, legal fees, penalties and corrective measures.

D. Review of the Safety Program shall not relieve the Contractor of any responsibility for complying with all applicable safety regulations nor, by reviewing the Safety Program, will the Owner's Representative assume any of the Contractor's responsibilities for compliance with the said safety regulations.

E. The wearing of hard hats will be mandatory at all times for personnel on this site. The Contractor shall supply sufficient hard hats to properly equip all employees.

1.6 SAFETY REQUIREMENTS

A. Standards: Maintain the Project in accordance with the State and local safety and insurance standards.

B. Hazards Control:
   1. Store volatile wastes in covered metal containers, and remove from premises daily.
   2. Prevent accumulation of wastes which create hazardous conditions.
   3. Provide adequate ventilation during use of volatile or noxious substances.

C. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
   1. Do not burn or bury rubbish and waste materials on Project site.
   2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains, building sewers.
   3. Do not dispose of wastes into storm drains, sewers, streams or waterways.

D. Maintain an MSDS library at Contractors’ Trailer or alternative Owner approved site at project location.

E. Provide accident information on the Contractor's forms to the Owner's Representative. This information will be provided on the same day as the occurrence of said incident.

F. The Owner will identify safety issues as they become apparent and will issue Notices of Non-Compliance to the Contractor. These notices, however, do not relieve the Contractor of the sole responsibility for safety on the job site.

END OF SECTION
PART 1 - GENERAL

1.1 DESCRIPTION

A. The work to be performed under this Section shall consist of furnishing all labor, materials, tools, transportation, supplies, equipment, appurtenances, fuel and power, unless specifically excepted, necessary or required for the clean-up of the work as described in these specifications.

PART 2 - EXECUTION

2.1 GENERAL CLEAN UP

A. Throughout all phases of construction, including suspension of work, and until final acceptance of the project, the Contractor shall keep the premises occupied by him in a clean and orderly condition, disposing of construction debris and refuse in a manner approved by the Owner’s Representative. The cost of providing clean-up throughout the life of the contract shall be deemed to be included in the other items of work and no separate allowance will be made therefor.

2.2 EXCESS MATERIALS

A. Excess or unsuitable backfill material, broken pipe, or other waste material shall be removed from the jobsite and disposed of by the Contractor.

2.3 CONSTRUCTION DEBRIS

A. Trash, construction debris, packaging, refuse, or other waste material shall be stored in approved containers and be removed from the job site and disposed of by the Contractor.

2.4 ROADWAY MAINTENANCE

A. Spills resulting from hauling operations along or across existing streets, roads, or ramps shall be removed immediately by the Contractor. All gutters and roadside ditches shall be kept clean and free from obstructions. The Contractor shall immediately remove spills by sweeping or flushing the areas.

2.5 DUST CONTROL

A. In areas where excessive dust caused by construction operations is a nuisance to property owners, the Contractor shall frequently wet down the area to control the dust in accordance with other Sections of these Specifications.

2.6 DRAINAGE STRUCTURES

A. The contractor shall provide dams, settling ponds, or filtering structures as may be required to keep construction debris and soil erosion from entering drainage systems. Upon completion of all grading and after establishment of all landscaping, the Contractor shall clean and remove all soil, debris, etc., from drainage structures and systems.

2.7 FINAL COMPLETION

A. As a condition of final acceptance of the work, the Contractor shall carefully clean up the work and the premises, remove all temporary structures built by or for him, remove all surplus construction materials, debris, and rubbish of all kinds from the grounds which he has occupied and leave them in a neat condition.

END OF SECTION
PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section describes the procedures to be followed in requesting substitutions to specified items.

B. Definitions:

1. The manner of Specification shall determine whether a Submittal shall be considered a substitution, to be accepted or rejected according to criteria stated in this section.

2. Where Specification is by manufacturer’s trade name or model designation, an item which bears different trade name or model designation will be considered a substitution.

3. Where Specification is by reference to standards of trade, industry, or governmental organizations, and the item not in compliance with standards referenced, it shall be considered a substitution.

4. An item which does not conform with descriptive, performance, or dimensional requirements shown or noted will be considered a substitution.

5. Where Specification is by combination of descriptive material, reference to standards, performance criteria, or manufacturer’s trade names and there are discrepancies or conflicts between requirements specified, the Owner's Representative reserves the right to consider item a substitution which fails to satisfy one or more requirements of the Specification. Bidders who discover such discrepancies should request clarification by addendum during the bidding period.

C. “Or-Equal” products will be submitted in accordance with the substitution procedures herein to determine if they are in fact equal to the specified product or system. “Or-Equal” shall qualify as such where material, product, or system proposed “as equal” conforms with descriptive, performance, or proprietary requirements of the Specifications and requirements shown or noted in the drawings. In determining equals, the Owner's Representative/Architect/Engineer's judgment shall be final and he/she reserves the right to consider unequal any material, product, or system which, though in conformity with Contract requirements, exhibits features which the Owner's Representative deems objectionable even though not specifically disallowed by the Contract Documents.

D. Failure by the Contractor to order materials or equipment in a timely manner will not constitute justification for a substitution.

1.2 PRODUCT

A. The term “product” includes materials, systems, and equipment. Products shall be new, undamaged, of the types specified, and furnished in ample quantities to facilitate proper execution of the work.

B. An “equal” product is any material, product, thing, or service which is in all respects equal to the item specified, including, but not limited to, size, quantity, guarantees, and materials. The final determination of whether or not a proposed product is “equal” to the specified product rests with the Owner's Representative/Architect/Engineer.

C. A “substitution” is any material, product, thing, or service which may or may not be equal, as determined by the Owner's Representative/Architect/Engineer in all respects to the specified item but which is proposed by the Contractor to be used in lieu of the specified item.

D. Where available, provide standard products or types which have been produced and used previously and successfully on other Projects and in similar applications.

1.3 LIST OF PRODUCTS
A. Not later than five (5) days after the receipt of the Notice to Proceed, provide a list to the Owner’s Representative showing the names of the manufacturers proposed to be used for each of the products identified in the Specifications, including substitutions and, where applicable, the name of the installer.

B. All substitution requests will be submitted in writing in a time satisfactory to the Owner’s Representative, but not to exceed forty five (45) days after NTP.

C. The Owner’s Representative will reply, in writing, to the Contractor stating whether after due investigation there is reasonable objection to any such proposal. If adequate data on any proposed manufacturer or installer is not available, the Owner’s Representative may state that action will be deferred until the Contractor provides further data. The reply by the Owner’s Representative cannot be construed as waiver of any requirement of the substitution process.

1.4 CONTRACTOR’S OPTIONS

A. The Contractor has the following options:

1. For products specified only by reference standards, select any product meeting those standards, by any manufacturer.

2. For products specified by naming several products or manufacturers, select one (1) of the specified products or manufacturers or submit a request, as required by this Section, for substitution, for any product not specifically named.

3. For products specified by naming one or more products, but indicating the option of selecting equivalent products by stating “or equal”, “equal to”, “or approved equal”, or “equivalent to”, submit a request, as required by this Section, for substitution, for any product not specifically named.

4. If it is known that a specified product is not a feasible or acceptable selection, notify the Owner’s Representative in writing before proceeding with the purchase of the product.

5. Where only compliance with an imposed standard, code, or regulation is required, select any product satisfying the requirement.

6. Where matching with an existing sample is required, the final decision whether a proposed product matches the sample satisfactorily is the Owner's Representative/Architect/Engineer.

7. Except as otherwise indicated, where Specifications include the statement, “... as selected from manufacturer's standard colors, patterns, textures...” or words of similar effect, the selection of manufacturer and basic product (complying with Specifications) is the Contractor’s option, and the selection of color, pattern, and texture shall be the Owner's Representative/Architect/Engineer selection.

1.5 REQUIREMENTS FOR SUBSTITUTIONS

A. Products proposed for substitution shall comply with specific performances indicated and/or specified, and which are recommended by the manufacturer (in published product literature or by individual certification) for application indicated. Overall performance of a product is implied where product is specified with only certain specific performance requirements.

B. Products proposed for substitution shall have been produced in accordance with prescriptive requirements, using specified ingredients and components, and complying with specified requirements for fabricating, finishing, testing, and similar operations in manufacturing process.

C. A proposed substitution shall not be purchased or installed by the Contractor without written acceptance from the Owner's Representative/Architect/Engineer. Acceptance of any substitution shall not relieve the Contractor from responsibility for the proper execution of the work and any other requirements specified in the Contract Documents.

D. The Contractor shall be responsible for the effect of a substitution on related work in the Project, and shall pay additional costs generated by a substitution, including the costs of the Owner's Representative/Architect/Engineer’s additional services and all costs for required approvals and calculations.
E. The burden of proving that the proposed substitution is “equal” to the specified product is upon the Contractor and such proof shall include sufficient factual and comparative data and information necessary to establish that the requested substitution is equal in quality, utility, structural strength, mechanical and technical performance, finish, arrangement of plan, repair and maintenance, compatibility with other existing or specified items, and any other relevant data.

F. Adjacent materials have been designed and detailed to accommodate the established standard manufacturer’s products. If one of the other approved manufacturers is selected by the Contractor, the Contractor shall design and detail all changes in all adjacent materials necessary to accommodate the selected products, shall submit such changes for review by the Owner’s Representative/Architect/Engineer, shall pay for all changes to the Contract Documents (including A/E fees) to accommodate the selected products, and when approved shall make such changes to the work at no cost to the Owner.

G. The Contractor agrees to pay all Owner’s Representative/Architect/Engineer or Consultant costs for reviewing the substitute product specified herein.

H. Substitutions will not be considered if:

1. They are indicated or implied on Shop Drawings or Product Data Submittals without formal request submitted in accordance with this Section.
2. Acceptance will require substantial revision of the Contract Documents.
3. The proposed product is inferior to the specified product as judged by the Owner’s Representative/Architect/Engineer.
4. Request does not include sufficient data for the Owner's Representative/Architect/Engineer to make a reasonable judgement regarding the acceptability of the proposed substitution.
5. Proposed substitutions increase the cost of work or Contract time.

I. The Owner’s Representative will be judge of the acceptability of proposed substitutions, and his/her determination will be final.

J. Approval of a substitution shall not relieve the Contractor from responsibility for the proper execution of the work and other requirements of the Contract Documents.

K. If a substitution is rejected, provide the product originally specified.

1.6 REQUESTS FOR SUBSTITUTIONS

A. Submit four (4) copies of a written request for a substitution and data substantiating the request to the Owner’s Representative within 45 days after NTP and sufficiently in advance of need to allow a thorough evaluation by the Owner's Representative/Architect/Engineer. Use the form at the end of this section. Each item on form must be included.

1.7 REQUESTS FOR SUBSTITUTIONS AFTER TIME SPECIFIED

A. No substitutions of materials, products, or equipment will be considered after the time described in the above paragraphs unless the specified material cannot be delivered or incorporated into the work in the time allowed due to conditions beyond the control of the Contractor.

1.8 SUBSTITUTION PROCESSING

A. Submit substitutions with a Request for Information form provided by the Owner’s Representative. Follow the Request for Information processing requirements.

1.9 DOCUMENTATION

A. The Contractor shall support his/her proposal with sufficient information, test data, certificates, samples, or other means to permit the Owner’s Representative/Architect/Engineer's to make fair, equitable, and informed judgment.
B. The burden of proof that a substitution is equal or otherwise acceptable shall be upon the Contractor. The Owner’s Representative may withhold or refuse approval for reason of insufficient documentation. The Owner’s Representative may also require additional tests and inspections for which cost the Contractor shall be responsible.

C. Where agencies such as State Fire Marshal or International Conference of Building Officials exercise jurisdiction over use of specific material or method, the Contractor shall submit calculations, designs and certification of their approval of proposed substitution.

1.10 THE CONTRACTOR’S RESPONSIBILITY FOR ACCEPTED SUBSTITUTIONS

A. Acceptance of substitutions shall not relieve the Contractor from responsibility for complying with requirements of the Contract Documents.

B. The Contractor shall be responsible for changes in other parts of the work occasioned by his/her substitutions and shall bear their expense, including the cost of the Owner’s Representative’s additional services.

1.11 THE OWNER’S REPRESENTATIVE/ARCHITECT/ENGINEER’S REVIEW

A. The Owner's Representative/Architect/Engineer, acting as the Owner’s designated agent for construction of this Project, shall be the judge of whether the Contractor’s proposed substitution is equal and shall make his/her judgement in accordance with the following criteria: whether the substitution proposed conforms with description or performance specified; is equal in quality; affords comparable operation, maintenance, and performance; will provide equal longevity and service; is otherwise in the Owners interest, offering advantages in cost and time.

B. A determination by the Owner's Representative/Architect/Engineer that the Contractor’s proposed substitution is not equivalent for any single characteristic, figure, or quality as described in the above is sufficient ground for rejection.

1.12 REQUEST FOR SUBSTITUTION FORM

A. Required form is attached.

END OF SECTION
REQUEST FOR SUBSTITUTION FORM

<table>
<thead>
<tr>
<th>Request No.</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environmental Health Building Tenant Improvements Project</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contractor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subcontractor:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specification Section:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>General Description of Substitute Item:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specified Item:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reason for Substitution Request:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

**A.** By making this Request for Substitution, the Contractor:

1. Represents that he/she has personally investigated the proposed substitute product and certifies that it is equal or superior in all respects to the specified product.

2. Represents that he/she will provide the same warranty for the substitution that he/she would have for the specified product.

3. Certifies that the cost data presented is complete and includes all related costs under the Contract.

4. Waives all claims for additional costs or schedule impact related to the substitution which subsequently become apparent, regardless of trade or project component affected.

5. Will coordinate the installation of the substitute, making changes as may be required for the work to be complete in all respects.

6. Represents and certifies that the proposed substitute complies with all applicable regulatory requirements. The Contractor is solely responsible for securing regulatory approvals for substitutions.

**B.** This request includes the following information (see attachments and enclosures):

1. Complete technical data of all characteristics of the originally specified item, including drawings, reference standards, performance specifications, cost data, samples, and test reports of the product proposed for substitution. Additional information will be submitted if requested by the Architect and/or its consultants (see Attachment No. ________).

2. Data similar to that specified for the item for which the substitution is proposed (see Attachment No. ________).

3. A line-by-line comparison of characteristics between specified item and proposed substitute documenting equivalent
status. Characteristics that are different from those of the specified item are noted by highlighting or other means (see Attachment No. ________). 

4. Effect on progress schedule (see Attachment No. ________). 

5. Complete breakdown of costs indicating the cost amount to be added to or deducted from the Contract Sum if the proposed substitution is accepted (see Attachment No. ________). 

6. List of other work, if any, which may be affected by the substitution (see Attachment No. ________). 

7. Availability of maintenance service and source of replacement materials (see Attachment No. ________). 

8. Sample of both the originally specified product and the proposed substitute product (see Attachment No. ________). 

9. Names and addresses of at least four (4) similar projects on which the proposed substitute product has been in service for at least two (2) years following final acceptance of each project by the Project’s Owner and Architect. Clearly documented dates shall show compliance (see Attachment No. ________). 

10. Sample of standard form of guarantee or warranty offered by the manufacturer for the substitute product proposed (see Attachment No. ________). 

11. The Contractor certifies that the proposed substitution is in compliance with the Contract Documents and applicable regulatory requirements. Documentation demonstrating code compliance (see Attachment No. ________). 

C. Certifying Signatures (type in names, titles, and dates): 

**CONTRACTOR:**

Signature: ____________________________________________________________

Name/Title/Company: __________________________________________________

Date: __________________________________________________________________

**SUBCONTRACTOR:**

Signature: ____________________________________________________________

Name/Title/Company: __________________________________________________

Date: __________________________________________________________________

**MANUFACTURER (where required):**

Signature: ____________________________________________________________

Name/Title/Company: __________________________________________________

Date: __________________________________________________________________

END OF REQUEST FOR SUBSTITUTION FORM
PART 1- GENERAL

1.1 DESCRIPTION

A. This Section describes the requirements and the administrative procedures for closing out the work, which includes but is not limited to Substantial Completion, Final Completion, and Acceptance.

1.2 PREPARATION FOR SUBSTANTIAL COMPLETION

A. When the work is substantially complete, submit the following to the Owner's Representative:
   1. A written notice that the work is substantially complete.
   2. A detailed, complete, and comprehensive list of items to be completed or corrected.
   3. Certification that all civil, mechanical, electrical, plumbing, and equipment has been tested and is operational. The Contractor will provide copies of all test results and reports including a binder by division fully indexed, outlining all equipment and performance tests. In addition, the Contractor will certify the Owner's maintenance and operational personnel have received the specified training (see Section 01730).
   4. Local, State and/or Fire Marshal approvals, if applicable.
   5. All warranties, certifications, etc.
   6. As built.

B. After receipt of the above items, the Owner's Representative shall set up an inspection to determine whether or not the Project, or portion of the Project if required by the Owner's Representative, is ready for Punch List Inspection.

C. Should the Owner's Representative determine that the work is so incomplete that it does not warrant a Punch List Inspection, the Owner's Representative will:
   1. Within a reasonable amount of time notify the Contractor in writing that the work is incomplete. Charges may be assessed for reinspection.
   2. Instruct the Contractor to promptly remedy the deficiencies in the work, and send a second notice of Substantial Completion to the Owner's Representative.

1.3 PUNCH LIST (OMISSIONS AND DEFECTS)

A. When the Owner's Representative determines that the work is ready for the Punch List Inspection to determine Substantial Completion, the Owner's Representative will arrange for the inspection by the Owner's Representative and others as necessary.

B. The Owner's Representative and representatives of the Architect/Engineer shall prepare a Punch List.

C. The Owner's Representative will transmit the handwritten Punch Lists to the Contractor. The Contractor will within five (5) working days upon receipt computerize the Punch Lists with software (Excel) and format approved by the Construction Manager and provide three (3) copies. The Contractor will add items to the computerized Punch List as they are provided by the Owner's Representative. The Contractor will update the Punch List status weekly as provided by the Owner's Representative.

D. The Contractor will provide an updated Punch List and provide status each week indicating progress until all items are complete. When all items are complete, the Contractor will request a second Punch List Inspection. The Owner and the Owner's Representative will inspect to verify completion by the Contractor and will advise items to be completed to reach Substantial Completion.
E. Beneficial Occupancy and Substantial Completion are not one and the same. The Owner has the right to beneficially occupy any portion of the Project, or the Project as a whole, at any time in accordance with the General Conditions.

1.4 SUBSTANTIAL COMPLETION

A. When the specific Punch List items have been completed and accepted, the Owner’s Representative will provide a letter documenting the date of Substantial Completion. The Owner’s Representative will provide a Punch List to be completed for final completion. Other items which do not conform to the Contract Documents may be added to the list at any time.

B. At Substantial Completion, the Owner has the right to move in furnishings and equipment, and initiate its transition. On all final Punch List work after the Substantial Completion, the Contractor’s work force, equipment, and material may be subject to security procedures, including searches. Any delay associated with this process is part of the base Contract and will not be considered as an extra cost under the Contract.

1.5 FINAL COMPLETION

A. When the Contractor considers the work to be complete for final inspection, he/she shall submit written certification that:

1. Contract Documents have been reviewed.
2. Work has been inspected for compliance with the Contract Documents.
3. Work has been completed in accordance with the Contract Documents.
4. Work is completed and ready for final inspection.
5. Submit certified copy of final Punch List of itemized work to be completed or otherwise resolved for acceptance, endorsed and dated by the Owner’s Representative and the Contractor.
7. Submit energy code certificates of compliance.

B. After receipt of the above, the Owner’s Representative will set up a final inspection to determine whether or not the Project is ready for final inspection. The review shall consist of verifying that the remaining Punch List items from the Substantial Completion inspection have been completed.

C. Should the Owner’s Representative find the work to be incomplete, the Owner’s Representative shall advise the Contractor in writing that the work is not acceptable. The Contractor may be assessed for additional inspection costs.

D. The Contractor shall send another Certificate when the work is complete.

E. After the Owner’s Representative has completed the final inspection and when the Owner’s Representative finds that the work is complete under the Contract Documents, the Owner’s Representative shall determine the “Date of Final Completion” and shall notify the Contractor, and the Owner. The Contractor shall proceed to prepare for final Close-Out/acceptance and shall make final Close-Out Submittals.

1.6 CLOSE-OUT/ACCEPTANCE

A. Prior to acceptance by the Owner, the Contractor shall:

1. Submit a statement showing accounting of changes to the Contract Sum.
2. Submit warranties, maintenance agreements, final certifications, and similar documents required by the Contract Documents.
3. Advise the Owner’s Representative of pending insurance change-over requirements.
4. Obtain and submit releases enabling the Owner's full and unrestricted use of the work and access to services and utilities, including where required occupancy permits, operating certificates, and similar releases. Provide all release of liens and claims from subcontractors and suppliers. List all outstanding claim issues that will be litigated (see below).

5. Submit final record documents, maintenance manuals, damage or settlement surveys, property surveys, and similar final record information as required by the Contract Documents.

6. Deliver tools, spare parts, extra stocks of materials, and similar physical items to the Owner's Representative.

7. Make final change-over of locks and forward keys to the Owner's Representative. Advise the Owner's personnel of change-over in security provisions.

8. Remove all temporary facilities and services, along with construction tools and equipment, mock-ups, and similar elements.

9. Prepare final Application for Payment in accordance with the General Conditions and these Specifications.

10. The Contractor shall provide a Final Completion Report which shall consist of the following:
   a. A summary time analysis providing a justification for any time extensions being requested which have not been approved.
   b. A summary of all potential claims from the Contractor against the Owner. Attach copies of all claims made to date and new claims which are being submitted.
   c. A copy of all Record Documents and/or transmittals of Record Documents previously submitted.
   d. A copy of Operation and Maintenance Manuals and/or Transmittals of Operation and Maintenance Manuals previously provided.
   e. A copy of all training information and information establishing dates training was provided to the Owner.
   f. All materials, parts, and keys and/or a copy of transmittals of items previously provided to the Owner.
   g. A summary of all Change Requests which the Contractor believes are outstanding and are not included in the aforementioned claims.
   h. A copy of the Punch List with all items initialed off by the Owner's Representative.
   i. A release of all liens from the subcontractors and suppliers.
   j. Contractor's request for Final Payment.
   k. Additional copies of all Warranties and Guarantees
   l. Documents confirming all final testing and start-up operations which were conducted.

B. After acceptance of the work by the Owner and Notice of Completion has been filed by the county, and the proper time has elapsed, the Final Payment will be made (less any outstanding items).

END OF SECTION
SECTION 01720

RECORD DOCUMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section describes the requirements for maintaining records of actual conditions in the field and for changes in the work as contained on the As-Built Drawings and transcribed to become the Record Documents.

B. The purpose of final Project Record Documents is to provide factual information regarding all aspects of the work, both concealed and visible, to enable future modifications of the work to proceed without lengthy and expensive site measurement, investigation, and examination.

1.2 DOCUMENTS REQUIRED

A. Maintain at the site the following Record Documents to be turned over to the Owner upon request for Substantial Completion:

1. Drawings
2. Specifications
3. Change Orders and other modifications to the Contract
4. Field Instructions and other written instructions from the Owner’s Representative
5. Reviewed shop drawings, product data, and samples
6. Test reports
7. Requests for Information
8. Claims
9. Training

1.3 RECORDINGS

A. Label each document "PROJECT RECORD" in neat, large, printed letters.

B. Record information concurrently with the construction process.

1. Do not conceal any work until required information is recorded.

2. Completely, accurately, and legibly record, to the satisfaction of the Owner's Representative, all deviations in construction, especially pipe and conduit locations, and any deviations caused by approved changes and/or clarifications to the work.

3. Use additional copies of prints, if necessary, to insure legible recording of data.

4. Date all entries.

5. Call attention to the entry by drawing a "cloud" around the area affected.

6. In the event of overlapping changes, use different colors for each change.

C. Legibly mark drawings to record actual construction:

1. Depths of various elements of foundation in relation to finish first floor datum.
2. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permit surface improvements.

3. Locations of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.

4. Field changes of dimension and detail.

5. Changes made reflecting approved changes to the work.

6. Details not on original Contract Drawings.

D. Legibly mark each Section of the Specifications to record changes made reflecting approved changes to the work.

E. Maintain shop drawings as record drawings. Legibly annotate shop drawings to record changes made after approval.

F. Prior to submitting each request for payment, secure approval from the Owner's Representative of the current status of record documents.

G. Periodic payments or portions thereof to the Contractor may be withheld until the Owner's Representative verifies that all As-Built information to date has been properly recorded on Project Record Documents.

1.4 CONVERSION OF SCHEMATIC LAYOUTS

A. The drawings, arrangements of conduits, circuits, piping, ducts, and similar items are shown schematically and are not intended to portray precise physical layout. The final physical arrangement is determined by the Contractor, subject to the approval of the Architect/Engineer, and shall be accurately recorded by the Contractor on the record documents.

B. Show on the job set of record drawings, by dimension accurate to one inch, the centerline of each run of all items specified in the preceding paragraph.

1. Clearly identify the item by accurate note such as "cast iron drain" or "galvanized flashing", etc.

2. Show by symbol or note the vertical location of the item ("6 inches below slab", "in ceiling plenum", "exposed", etc).

3. Make all identification sufficiently descriptive that it may be related reliably to the Specifications.

C. Coordinate with the Coordination Drawings.

1.5 FINAL PROJECT RECORD DOCUMENTS

A. At a time nearing Substantial Completion of the work, obtain from the Architect/Engineer through the Owner's Representative the original CADD files of the Contract Documents. The Contractor shall provide three full sized sets from the new CADD files and two CDs containing all CADD files in AutoCAD 2007 DWG format.

B. Obtain approval from the Owner's Representative of all data recorded on the record set of prints.

C. After Substantial Completion, carefully transfer all data shown on the job set of Record Drawings to new CADD files, coordinating the information as required.

D. Clearly indicate at each affected detail and other drawings a full description of changes made during construction, and the actual location of items as previously specified.

E. "Cloud" all affected areas.

F. Identify each record drawing with the following information:

1. Project Record Document.
2. Prepared by: Contractor's name, permanent address
3. Date prepared:
4. Contractor's signature.

1.6 SUBMITTALS

A. Submit the complete set of As-Built Project Record Documents to the Owner's Representative upon request for Substantial Completion.

B. Participate in review meetings with the Owner's Representative and the Architect as required.

C. Make the required changes and promptly deliver the final Project Record Documents and the original field marked-up sets to the Owner's Representative.

END OF SECTION
SECTION 01730
OPERATING AND MAINTENANCE DATA/TRAINING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section describes the requirements for furnishing product data and related information appropriate for Owner maintenance and operation of products furnished under the Contract. Prepare operating and maintenance data as specified in this Section and as referenced in other Sections. Check other Specification Sections for special requirements. The more restrictive will govern.

B. Instruct Owner's personnel in the maintenance of products and in the operation of equipment and systems.

1.2 QUALITY ASSURANCE

A. Preparation of data shall be done by personnel trained and experienced in maintenance and operation of the described products, completely familiar with specified requirements, skilled as a technical writer to the extent required to communicate essential data, and skilled as a draftsman competent to prepare required drawings.

1.3 FORM OF O & M SUBMITTAL

A. Prepare a detailed training plan agenda for each instructional session for all mechanical, electrical, plumbing, hardware, communications, and systems to be approved by the Owner. Each training session will be divided into two (2) parts: classroom training and on-the-job operational instructions of the equipment. Prepare data in the form of an instruction manual for use by Owner's personnel and the Contractor's instructors for classroom and job site training. The instructional/users manual will be prepared to organize and synthesize documents along with operating instruction and functional information. The manual will be used as the single source of information about the equipment and systems, operations, and functions.

B. Format:
   1. Size: 8-1/2 inch x 11 inches.
   2. Paper: Twenty (20) pound minimum, white, for typed pages.
   3. Text: Manufacturers' printed data, or neatly typewritten.
   4. Drawings: Provide reinforced punched binder tab, bind in with text.
   5. Fold larger drawing to the size of the text pages.
   6. Provide fly-leaf for each separate product, or each piece of operating equipment. Provide typewritten description of product, and major component parts of equipment. Provide indexed tabs.

C. Binders:

1.4 CONTENT OF MANUAL

A. Neatly typewritten table of contents for each volume, arranged in a systematic order by Specification number.

B. For each Specification Section provide:
   1. Contractor, name of responsible principal, address and telephone number.
2. A list of each product and certification Warranty/Guarantee required be including, indexing to the content of the volume.

3. List, with each product, the name, address, and telephone number of:
   a. Subcontractor or installer.
   b. Maintenance Contractor, as appropriate.
   c. Identify the source of responsibility of each.
   d. Local source of supply for parts and replacements.

4. Identify each product by product name and other identifying symbols as set forth in the Contract Documents.

5. Product data, drawings, written text, etc. Include description of equipment, operating procedures, maintenance procedures, service schedule, etc. For materials and finishes give product information, instruction for care, etc.

C. Copy of each Warranty, Bond and Service Contract issued.
   1. Provide information sheet for Owner's personnel; include:
      a. Proper procedures in the event of failure.
      b. Instances which might affect the validity of Warranties or Bonds.

D. Provide copies of performance tests.

1.5 O & M SUBMITTAL SCHEDULE

A. Submit two (2) copies of completed data in final form at least thirty (30) days prior to the estimated date of Substantial Completion for the Architect's review. Make all corrections noted by the Owner and agents prior to their use for training and return for review. Submit two (2) hard copies of approved data in final form prior to training. Data will be used by the Inspectors and for training of Owner's personnel. Upon approval provide training prior to Substantial Completion. One (1) copy will be returned after the Substantial Completion.

1.6 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to Owner's Representative's inspection for Substantial Completion, fully instruct Owner designated operating and maintenance personnel in the operation, adjustment and maintenance of all products, equipment and systems including mechanical, electrical, plumbing, heating, or air conditioning, security, communications, and hardware systems based on the reviewed maintenance manuals.

B. The user's operating and maintenance manual, training plan and agenda shall constitute the basis of instruction with the Contractor for each piece of equipment and/or system. The Contractor will provide training schedules fourteen (14) days in advance of all training for approval by Owner.

C. The Contractor will arrange for on-site training and review of each piece of equipment and system to explain the "hands-on" operation of the systems. The Contractor will provide at least two (2) hours for the on-site instruction for the mechanical, electrical, plumbing, heating or air conditioning, security, communications, and hardware systems and equipment. In addition, the Contractor will provide at least two (2) hours of classroom instruction for the mechanical, electrical, plumbing, heating or air conditioning, communications, and hardware systems and equipment. The on-site and classroom instructions as contained in this Section are considered a minimum requirement. If conflict exists between this requirement and the Technical Specifications, Divisions 2 through 16, the more restrictive requirement will be followed.

D. Review contents of Owner's O&M Manual with personnel in full detail to explain all aspects of operation and maintenance both in the field and in the classroom.
E. The Contractor will provide, in addition to the three (3) copies of the Operation and Maintenance Manuals required for the official file, as many additional copies as are necessary for instructing the Owner's personnel (10 maximum).

F. Submit six (6) copies of the training plan and agendas for each training session for each piece of equipment and system for mechanical, electrical, plumbing, heating or air conditioning, communications, and hardware seven (7) days prior to the estimated date of Substantial Completion for review and approval by the Owner and the Owner's Representative.

G. The User's Operating and Maintenance/User's Manual, which will be used for instruction purposes, shall provide for each system the theory of operation, detailed diagrams and parts lists, preventive maintenance instruction and corrective maintenance. Narrative descriptions and diagrams will be provided in addition to standard manufacturers' data to explain systems for this Project.

END OF SECTION
SECTION 01740

GUARANTEES/WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 DESCRIPTION

A. General: Except for specifically modified for major mechanical equipment specified elsewhere, all work shall be warranted as follows:

1. Manufacturers’ warranties notwithstanding, the Contractor and Subcontractors warrant the entire Work against defects in materials and workmanship for twenty-four (24) months from the date of substantial completion.

2. Guarantee/Warrant or Bond Work as required in the individual Specification Sections and the General Conditions.

3. Warranties between the Contractor and manufacturers, and the Contractor and suppliers shall not affect Guarantees/Warranties between the Contractor and the Owner.

4. The Contractor will not be held responsible for defects due to misuse, negligence, willful damage, improper maintenance or accident caused by Others, nor shall he/she be responsible for defective parts whose replacement is necessitated by failure of the Owner’s maintenance forces to properly clean and service them, provided the Contractor has furnished complete maintenance instructions to the Owner.

5. Compile specified Guarantees/Warranties and Bonds.

6. Coexecute as required.

7. Review Guarantees/Warranties and Bonds to verify compliance with Contract Documents.

8. Transmit to the Architect/Engineer for review. The Architect/Engineer will forward Guarantees/Warranties and Bonds to the Owner after acceptance of Work.

1.2 FORM OF GUARANTEE/WARRANTY

A. Submit the Guarantees/Warranties, typed on the Contractor’s letterhead if for the entire Work, or on the Subcontractor’s letterhead if for the Work of a Specification Section.

B. Use the attached Guarantee/Warranty form.

1.3 SUBMITTAL REQUIREMENTS

A. Time of Submittal:

1. For equipment or component parts of accepted equipment put into service for the Owner’s benefit during the progress of the Work, submit Guarantees/Warranties within ten (10) days of request for acceptance of work.

2. Otherwise submit Guarantees/Warranties prior to and within seven (7) days of request for Substantial Completion.

B. Forms:

1. Assembled in durable, three-ring plastic binders sized for 8 ½” x 11” sheets. Fold larger sheets to fit into binders.

2. Identification on or readable through the front cover with the Project name and address, the Contractor’s name and address, and the title GUARANTEE/WARRANTIES AND BONDS.

C. Number of Original Signed Copies required: Two (2) each.
1.4 REVIEW MEETING
   A. Twenty-three (23) months following date of acceptance, hold a meeting for the purpose of review of, and action upon Guarantees/Warranties, Bonds, and Service and Maintenance Contracts, as specified in Section 01200, “Project Meetings”.

1.5 SERVICE AND MAINTENANCE CONTRACTS
   A. Compile, review and transmit specified Service and Maintenance Contracts as specified for Guarantees/Warranties and Bonds.

1.6 CORRECTION OF GUARANTEED/WARRANTED WORK
   A. Unless repair is agreed to by Owner's Representative and Architect/Engineer, Contractor shall correct failed work by removal and replacement of the failed portions with new materials.
   B. In connection with Contractor’s correction of warranted work which has failed, remove and replace other work of Project which has been damaged as a result of such failure, or which must be removed and replaced to provide access for correction of warranted work.
   C. Except as otherwise indicated or required by governing regulations, special Project warranties and product warranties are not extended to cover damage to building contents (other than work of Contract) which occurs as a result of failure of warranted work.
   D. Except as otherwise indicated, when costs of replacing or restoring failing warranted units or products is Contractor’s obligation, without regard for whether Owner has already benefited from use through a portion of anticipated useful service lives.
   E. Except as otherwise indicated, costs of replacing or restoring failing warranted units or products is Contractor’s obligation, without regard for whether Owner has already benefited from use through a portion of anticipated useful service lives.
   F. Do not purchase, subcontract for, or allow others to purchase or sub-subcontract for materials or units of work for Project where a special Project warranty, specified product warranty, certification, or similar commitment is required, until it has been determined by the Contractor that entities required to countersign such commitments are willing to do so.

END OF SECTION
Guarantee/Warranty for __________________________________________________
(Phase or portion of work under warranty identified by Specification Section).

Project: Environmental Health Building Tenant Improvements Project

Address: 1868 East Hazelton Avenue, Stockton CA

Date: ____________________________________________________________

We hereby warrant and the Contractor guarantees that the ____________________ which we have installed in the
______________________________has been performed in accordance with the Drawings and Specifications and that the work
as installed will fulfill the requirements of the Guarantee/Warranty included in the Specifications.

We agree to repair or replace any or all of our work, together with any or all other work which may be damaged or
displaced by so doing, that may prove to be defective in its workmanship, materials, or failure to conform to Contract
provisions and requirements within a period of two (2) years from the substantial completion of the above named structure
by the Owner without expenses whatever to the said Owner, ordinary wear and tear and unusual abuse or neglect
accepted.

In the event of our failure to comply with the foregoing conditions within ten (10) days after being notified in writing by the
Owner, we collectively or separately do hereby authorize the Owner to proceed to have said defects repaired and made
good at our expense and we will honor and pay the costs and charges therefor upon demand.

Signed: ___________________________ Date: ___________________________

(Contractor)

or

Signed: ___________________________ Date: ___________________________

(Subcontractor)

Countersigned: ___________________________ Date: ___________________________

(Contractor)

Include the following if specified:

Countersigned: ___________________________ Date: ___________________________

(Manufacturer)
SECTION 02 41 19 – SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY: Demolish and remove from the site those items so indicated on the Drawings.

1.2 GENERAL REQUIREMENTS: This Section shall be performed in accordance with the General Conditions, Supplementary Conditions and all Sections in Division 1 of these Specifications. These documents must be read with the other Contract Documents and Sections as a whole to complete the intent of the contract.

1.3 SECTION REQUIREMENTS:
   A. Demolished material shall be considered the property of the Contractor and shall be completely removed from the job site.
   B. Items indicated on the Drawings to be removed and salvaged remain Owner’s property. Remove, clean and deliver to Owner’s designated storage area.
   C. Comply with EPA regulations and hauling and disposal regulations of authorities having jurisdiction.
   D. It is not expected that hazardous materials will be encountered in the Work. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.

PART 2 - PRODUCTS
Not applicable

PARET 3 - EXECUTION

3.1 EXISTING CONDITIONS:
   A. Prior to all work of this Section, examine the areas and conditions under which work will be performed. If conditions detrimental to timely and proper completion of the work exist, notify the Architect. Do not proceed until unsatisfactory conditions are corrected.
   B. Visit the site and verify the extent and location of selective demolition required. Carefully identify limits of selective demolition. Mark interface surfaces as required to enable workmen also to identify items to be removed and items to be left in place intact.
   C. By careful study of the Contract Documents, determine the location and extent of selective demolition to be performed.
   D. The Drawings do not purport to show all objects existing on the site or in the building.
3.2 DEMOLITION

A. Maintain services / systems indicated to remain and protect them against damage during selective demolition operations. Before proceeding with demolition, provide temporary services / systems that bypass area of selective demolition and that maintain continuity of services / systems to other parts of the building.

B. Locate, identify, shut off, disconnect and cap off utility services and mechanical / electrical systems serving areas to be selectively demolished.

C. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

D. Provide and maintain shoring, bracing and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain or construction being demolished.

E. Provide temporary weather protection to prevent water leakage and damage to structure and interior areas.

F. Protect walls, ceilings, floors and other existing finish work that are to remain. Erect and maintain dustproof partitions. Cover and protect furniture, furnishings and equipment that have not been removed.

G. Neatly cut openings and holes plumb, square and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction.

H. Promptly removed demolished materials from Owner’s property and legally dispose of them. Do not burn demolished materials.

3.3 REPLACEMENT:

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

END OF SECTION 024119
SECTION 03 30 00 – CAST IN PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY:
Provide and install all reinforcement, forms, concrete and associated items required for all cast-in-place concrete as shown on the Drawings and specified herein.

1.2 GENERAL REQUIREMENTS:
This Section shall be performed in accordance with the General Conditions, Supplementary Conditions and all Sections in Division 1 of these Specifications. These documents must be read with the other Contract Documents and Sections as a whole to complete the intent of the contract.

1.3 SUBMITTALS:
A. Make submittals to the Owner’s Representative in accordance with the provision of Section 013323 of these specifications.

B. Shop Drawings; Reinforcement:
Submit shop drawings for fabrication, bending and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars and arrangement of concrete reinforcement. Include special reinforcement required at openings through concrete structures.

C. Concrete Design Mixes:
1. The preparation of design mixes will be the responsibility of the Contractor.
2. Written reports will be submitted to the Owner Representative of each proposed mix for review. Submit mix designs for each prepared mix. Submit designs in compliance with Section 013323 Submittals. Do not begin concrete production until mixes have been reviewed by the Owner Representative.
3. Adjustment of Concrete Mixes:
Mix design adjustments may be requested by the Contractor when characteristics of materials, job conditions, weather, test results and other circumstances warrant; at no additional cost to the Owner and as accepted by the Owner Representative. Provide submittals as in A above. Submit adjustment designs a minimum of 48 hours ahead of schedule for concrete production.

D. Related Materials:
1. Joint filler
2. Curing compound

1.4 CODES AND STANDARDS:
Comply with the provisions of the following codes, specifications and standards, except as otherwise shown or specified:

A. ACI 301 "Specifications for Structural Concrete for Buildings".
B. ACI 311 "Recommended Practice for Concrete Inspection".
C. ACI 318 "Building Code Requirements for Reinforced Concrete".
D. ACI 347 "Recommended Practice for Concrete Formwork".
E. ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete".
F. Concrete Reinforcing Steel Institute, "Manual of Standard Practice".
G. 2010 California Building Code

PART 2 - PRODUCTS

2.1 FORM MATERIALS:

A. Forms for Exposed Finish Concrete:
   Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed, plywood-faced or other acceptable panel-type materials, to provide continuous, straight, smooth exposed surfaces. Furnish in largest practicable sizes to minimize number of joints, and to conform to joint system shown on Drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.

B. Forms for Unexposed Finish Concrete:
   Form concrete surfaces that will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least two (2) edges and one (1) side for tight fit.

C. Form Coatings:
   Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

D. Earth Forms:
   Unless otherwise indicated or required by the Structural Drawings, concrete for continuous footings may be placed directly against vertical excavated surfaces provided the material will stand without caving and provided the minimum reinforcing steel clearances indicated on the Drawings are maintained and suitable provisions are taken to prevent raveling of top edges or sloughing of loose material from walls of excavation. Dimensions for continuous footings given on Drawings are based on formed surfaces; if placed against excavated surfaces, increase minimum clearances for reinforcing to 3 inches. Sides of excavation shall be made with a neat cut and the width made as detailed on the Drawings.

E. Form Ties:
   Metal, spreader type or snap tie, removable to 1/4" from concrete face, designed to prevent concrete spalling upon removal. Ties for exposed concrete shall be of the same type throughout the project.
2.2 REINFORCING MATERIAL:

A. Reinforcing Bar:
   ASTM A615/A 615M, Grade 60, deformed, free of loose rust.

B. Steel Wire:
   ASTM A82, plain, cold-drawn, steel.

C. Tie Wire:
   #16 minimum, black and annealed.

D. Anchor Bolts: ASTM F1554. Contractor may substitute post installed anchors, Simpson SET-XP, or an approved equal subject to the approval of the Engineer or Architect of Record.

E. Accessories:
   Metal or plastic spacers, supports, ties, etc., concrete chairs, required for spacing, assembling and supporting reinforcing in place. Legs of accessories to be of the type that will rest on forms without embedding into forms. Galvanize metal items where exposed to moisture, or use approved other non-corrodible, non-staining supports.

2.3 CONCRETE MATERIALS:

A. Portland Cement:
   Type II conforming to requirements of ASTM C150, Type I or II. Use only one brand of cement throughout the project, unless otherwise acceptable to Owner Representative.

B. Normal Weight Aggregates:
   Conform to requirements of ASTM C33. Fine aggregate shall be clean, sharp, natural sand free from loam, clay, lumps or other deleterious substances. Maximum size shall be as indicated for each type of concrete.

C. Water:
   Clean, fresh, potable.

D. Water-Reducing Admixture:
   ASTM C494, Type A. Do not use calcium chloride or admixtures containing calcium chloride.

2.4 RELATED MATERIALS:

A. Joint Filler:
   ASTM D1751 and C1752 - preformed, non-extruding asphalt saturated cellulosic fiber, Burke or equal.

B. Joint Sealer:
   ASTM D1190, hot pour rubber type. Manufacturer - Burke or equal, color as approved by Owner Representative. Silicone sealant or one part Urethane Sealant or two parts Urethane - pour grade.
Curing Compound:
ASTM C309, Type I, Class B, Burke Aqua Resin Cure, or equal.

2.5 PROPORTIONING AND DESIGN OF MIXES:

A. Mixes will be designed to provide concrete with the following properties:
Slab-on-grade, sidewalks, ramps and ramp walls; 3,000 psi 28-day compressive strength. 1" maximum aggregate size. Maximum slump = 4 inches. Maximum water-cement ratio of 0.55. Minimum cement content of 517 lbs. per cubic yard. Flyash shall not be used for the purposes of meeting the minimum cement quantities.

B. Admixtures:
1. Use admixtures for water-reducing in strict accordance with the manufacturer's directions, if desired by Contractor and approved by Owner Representative.
2. Use amounts of admixtures as recommended by the manufacturer for climatic conditions prevailing at the time of placing. Adjust quantities and types of admixtures as required to maintain quality control.

C. Slump Limits:
Proportion and design mixes to result in concrete slump at the point of placement with maximum variance of 1" for a specified slump provided concrete remains properly workable.

2.6 READY-MIX CONCRETE MIXING:

A. Comply with requirements of ASTM C94, and as herein specified. Delete the references for allowing additional water to be added to the batch for material with insufficient slump. Addition of water to the batch will not be permitted.

B. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required.
1. When the air temperature is between 85°F and 90°F, reduce the mixing and delivery time from 1½ hours to 75 minutes.
2. When the air temperature is above 90°F, reduce the mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMS:

A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied, until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.

B. Design formwork to be readily removable without impact, shock or damage to cast-in-place surfaces and adjacent materials.

C. Form Ties:
Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to
prevent form deflection, and to prevent spalling concrete surfaces upon removal.

D. Provisions for Other Trades:
Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.

E. Wetting:
Keep forms sufficiently wetted to prevent joints opening up before concrete is placed.

3.2 PLACING REINFORCEMENT:

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for details and methods of reinforcement placement and supports, and as herein specified.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

C. Accurately position, support and secure reinforcement against displacement by formwork, construction or concrete placement operations. Locate and support reinforcing by metal chairs, runners, spacers and hangers as required.

D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

E. All reinforcing in slabs to be supported by concrete chairs; hooking reinforcement in position not allowed. Place chairs immediately prior to concrete pour to prevent reinforcing from being deformed by being walked on.

3.3 JOINTS:

A. Construction Joints:
1. Locate and install construction joints as shown on the Drawings, so as not to impair the strength or appearance of the structure, as acceptable to the Owner Representative. The maximum slab area between construction joints shall be 650 square feet.

B. Control Joints:
Provide weakened plane sawcut joints as shown on the plans.

3.4 CONCRETE PLACEMENT:

A. Pre-Placement Inspection:
Before placing concrete, inspect and complete the formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other trades to permit the installation of their work; cooperate with other trades in setting such work, as required. Thoroughly wet
wood forms immediately before placing concrete, as required where form coatings are not used. Coordinate the installation of joint materials and vapor barriers with placement of forms and reinforcing steel.

B. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete as nearly as practicable to its final location to avoid segregation due to rehandling or flowing.

C. Placing Concrete in Forms:
1. Deposit concrete in forms in horizontal layers not deeper than 24” and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
2. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with the recommended practices of ACI 304, to suit the type of concrete and project conditions.
3. Do not use vibrators to transport concrete inside of forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate the placed layer of concrete and at least 6” into the preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit the duration of vibration to the time necessary to consolidate the concrete and complete embedment of reinforcement and other embedded items without causing segregation of the mix.

D. Placing Concrete Slabs:
1. Deposit and consolidate concrete slabs in a continuous operation, within the limits of construction joints, until the placing of a panel or section is complete.
2. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Bring slab surfaces to the correct level with a straightedge and strikeoff. Use bull floats or darbies to smooth the surface, leaving it free of humps or hollows. Do not sprinkle water on the plastic concrete surface. Do not disturb the slab surfaces prior to beginning finished operations.
4. Maintain reinforcing in the proper position during concrete placement operations by placing concrete chairs immediately prior to pour. Hooking reinforcing in position is not allowed.

E. Cold Weather Placing:
1. Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306.
2. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in writing by the Owner Representative.

F. Hot Weather Placing:
1. When hot weather conditions exist that would seriously impair the quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

2. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90°F.

3. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

4. Wet forms thoroughly before placing concrete.

5. Do not use retarding admixtures unless otherwise accepted in mix designs.

3.5 FINISH OF FORMED SURFACES:

A. Smooth Form Finish:
For above-grade formed concrete surfaces covered by cement plaster or otherwise not exposed-to-view. This is the as-cast concrete surface as obtained with selected form facing material arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with all fins or other projections completely removed and smoothed.

B. Related Unformed Surfaces:
At tops of walls, horizontal offsets and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

C. Sacking Finish:
1. At all exposed concrete, provide a sacked finish by coating the concrete wall with sacking mix.
2. Coat entire surface with sacking mortar as soon as surface of concrete approaches surface dryness.
3. Thoroughly and vigorously rub mortar over area with clean burlap pads to fill all voids.
4. Trowel with a sponge rubber float to a uniform, level surface.
5. While mortar is still plastic but partially set (so it cannot be pulled from voids), sack-rub surface with dry mix of sacking mortar (leave out water). There should be no discernible thickness of mortar on concrete surface, except in voids, all surfaces should be uniformly textured.
6. Immediately begin a continuous moist cure for 72 hours.

3.6 SIDEWALK FINISHES:

A. All horizontal surfaces shall have a medium broom finish.
After screeding and consolidating concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance not exceeding ¼" in 10' when tested with a 10' straightedge. Cut down high spots and fill low spots. Uniformly slope
surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

3.7 CONCRETE CURING AND PROTECTION

A. Duration:
   1. Protect freshly placed concrete from premature drying and excessive cold or hot temperature, and maintain without drying at a relatively constant temperature for a period of time necessary for hydration of cement and proper hardening.
   2. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 24 hours.
   3. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least seven (7) days and in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

B. Curing Methods:
   1. Moisture Curing:
      Provide moisture curing by keeping surface continuously wet by covering with water or a continuous water-fog spray.
   2. Membrane Curing:
      a. Apply membrane-forming curing compound to damp concrete surfaces at immediately upon completion of water-fog spray application. Apply uniformly in 2-coat continuous operation by power-spray equipment in accordance with manufacturer’s directions. Recoat areas which are subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
      b. Do not use curing compounds on surfaces which are to be covered with a coating material applied directly to concrete or with a covering material bonded to concrete, such as flooring, painting, and other coatings and finish materials, unless otherwise acceptable to Owner Representative.

C. Curing Formed Surfaces:
   Initially cure unformed surfaces, such as slabs and other flat surfaces by moist curing. Final cure unformed surfaces by membrane or moist curing, as applicable, for full curing period.

3.8 REMOVAL OF FORMS:
Formwork not supporting weight of concrete, such as sides of footings, walls, and similar parts of the work, may be removed after cumulatively curing at not less than 50°F (10°C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

3.9 CONCRETE SURFACE REPAIRS:

A. Repair and patch defective areas with cement mortar immediately after removal of forms, but only when acceptable to Owner Representative.
B. Cut out honeycomb, rock, pockets, voids over \( \frac{1}{2} \)" diameter, and holes left by tie rods and bolts, down to solid concrete, but in no case to a depth of less than 1". Make edges of cuts, perpendicular to the concrete surface. Before placing cement mortar, thoroughly clean, dampen with water and brush-coat the area to be patched with neat cement grout. Proprietary patching compounds may be used when acceptable to Owner Representative.

END OF SECTION 03 30 00
SECTION 06 10 00 – ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY:  
Provide and install rough carpentry work as shown on the Drawings and specified herein

1.2 GENERAL REQUIREMENTS:

This Section shall be performed in accordance with the General Conditions, Supplementary Conditions and all Sections in Division 1 of these Specifications. These documents must be read with the other Contract Documents and Sections as a whole to complete the intent of the contract.

1.3 SUBMITTALS:

Make submittals to the Architect in accordance with the provisions of Section 013323 of these specifications.

1.4 PRODUCT HANDLING:

A. Delivery and Storage:  Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.
   1. For lumber and plywood pressure treated with waterborne chemicals, sticker between each course to provide air circulation.

1.5 PROJECT CONDITIONS:

Coordination:  Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow attachment of other work.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL:

A. Lumber Standards:  Manufacture lumber to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee’s (ALSC) Board of Review.

B. Inspection Agencies:  Inspection agencies and the abbreviations used to reference with lumber grades and species include the following:
   1. RIS   Redwood Inspection Service.
   2. WCLIB  West Coast Lumber Inspection Bureau.
   3. WWPA  Western Wood Products Association.

C. Grade Stamps:  Factory-mark each piece of lumber with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency,
grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber apply grade stamps to ends or back of each piece, or omit grade stamps entirely and issue certificate of grade compliance from inspection agency in lieu of grade stamp.

D. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.

1. Provide dressed lumber, S4S, unless otherwise indicated.
2. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes 2” or less in nominal thickness, unless otherwise indicated.

2.2 DIMENSION LUMBER:

A. For light framing provide material complying with the following requirements:
1. Douglas Fir, grade as shown on drawings.

B. For exposed framing lumber provide material complying with the following requirements:
1. Definition: Exposed framing refers to dimension lumber which is not concealed by other work and is indicated to receive a stained or natural finish.
2. Grading: Hand select material at factory from lumber of species and grade indicated below for compliance with "Appearance" grade requirements of ALSC National Grading Rule; issue inspection certificate of inspection agency for selected material.
3. Same species and grade as indicated for structural framing.

2.3 TIMBERS:

A. For timbers (5” and thicker), provide material complying with the following requirements:
1. Douglas Fir Select, grade as shown on drawings.
2. Free of heart center.

2.4 BOARDS:

A. Exposed Boards: Where boards will be exposed in the finished work, provide the following:
1. Moisture Content: 15 percent maximum, "MC-15".
2. Where painted finish is indicated, provide Select Merchantable Boards per WCLIB rules, or No. 2 Common Boards & Better per WWPA rules.

2.5 MISCELLANEOUS LUMBER:

A. Provide wood for support or attachment of other work including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping and similar members. Provide lumber of sizes indicated, worked into shapes shown, and as follows:

B. Moisture content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.

C. Grade: Standard Grade light framing size lumber of any species or board size lumber as
required. No. 3 Common or Standard grade boards per WCLIB or WWPA rules or No. 3 boards per SPIB rules.

2.6 CONSTRUCTION PANELS:


B. Trademark: Factory-mark each construction panel with APA trademark evidencing compliance with grade requirements.

C. Concealed APA Performance-Rated Panels: Where construction panels will be used for the following concealed types of applications, provide APA Performance-Rated Panels complying with requirements indicated for grade designation, span rating, exposure durability classification, edge detail (where applicable) and thickness.

1. Subflooring: APA RATED SHEATHING.
   b. Span Rating: As required to suit joist spacing indicated.

2. Wall Sheathing: APA RATED SHEATHING.
   b. Span Rating: As required to suit stud spacing indicated.

3. Roof Sheathing: APA RATED SHEATHING.
   b. Span Rating: As required to suit rafter spacing indicated.

D. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant treated plywood panels with grade designation, APA C-D PLUGGED INT with exterior glue, in thickness indicated, or, if not otherwise indicated, not less than 15/32".

E. Plywood Underlayment for Resilient Flooring: For underlayment under 19/32" in indicated thickness, provide plywood panels with fully sanded face complying with the following requirements:

1. Grade Designation: APA UNDERLAYMENT INT with exterior glue.

2.7 FASTENERS AND ANCHORAGE:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering metal connectors which may be incorporated in the work include, but are not limited to, the following:

1. Simpson Company
2. Silver Metal Products
3. K C Metals

B. All fasteners coming in direct contact with treated wood in exterior applications subject to liquid water shall be “ZMAX” by Simpson Company or equal

C. Use common wire nails throughout. Pre-drill if required to prevent wood from splitting. Hot
dip galvanize all wire nails that are exposed to weather and/or treated wood.

D. Machine bolts: Hexhead conforming to ASTM A307 with malleable washers under head and/or nut when bearing against wood unless otherwise noted.

E. Power Driven Fasteners: RAMSET, Drive-it, or HILTI installed as details and in size, number, and type shown or recommended in manufacturer's printed literature for use intended.

F. Wood Screws: Bright Steel.

G. Lag Screws: Hexhead with gimlet point.

2.8 WOOD TREATMENT BY PRESSURE PROCESS:

A. Preservative Treatment: Where lumber or plywood is indicated as "PT" or "Treated," or is specified herein to be treated, comply with applicable requirements of AWPB Standards listed below. Mark each treated item with the AWPB Quality Mark Requirements.

1. Pressure-treat above-ground items with water-borne preservatives to comply with AWPB U1. After treatment, kiln-dry lumber and plywood to a maximum moisture content, respectively, of 19 percent and 15 percent. Treat indicated items and the following:
   a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers and waterproofing.
   b. Wood sills ledgers, sleepers, blocking, furring, stripping and similar members in contact with masonry or concrete.
   c. Wood framing members less than 18" above grade.
   d. Wood floor plates installed over concrete slabs directly in contact with earth.

2. Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment and. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL:

A. Discard units of material with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.

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

C. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards. Countersink nail heads on exposed carpentry work and fill holes.

D. Use common wire nails, except as otherwise indicated. Use finishing nails for finish work.
Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as required.

E. Do not cut or notch structural members except as shown on drawings.

3.2 WOOD GROUNDS, NAILERS, BLOCKING AND SLEEPERS:

A. Provide wherever shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.

B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

3.3 WOOD FURRING:

A. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finished work.
   1. Firestop furred spaces on walls at each floor level and at ceiling line of top story, with wood blocking or noncombustible materials, accurately fitted to close furred spaces.

B. Furring to Receive Plywood Paneling: Unless otherwise indicated, provide 1" x 3" furring at 2' o.c., horizontally and vertically. Select furring for freedom from knots capable of producing bent-over nails and resulting damage to paneling.

C. Furring to Receive Gypsum Drywall: Unless otherwise indicated, provide 1" x 2" furring at 16" o.c., vertically.

D. Suspended Furring: Provide size and spacing shown, including hangers and attachment devices. Level to a tolerance of 1/8" in 10'.

3.4 WOOD FRAMING, GENERAL:

A. Provide framing members of sizes and on spacings shown, and frame openings as shown, or if not shown, comply with recommendations of "Manual for House Framing" of National Forest Products Association (N.F.P.A). Do not splice structural members between supports.

B. Anchor and nail as shown, and to comply with Building Code.

C. Firestop concealed spaces of wood framed walls and partitions at each floor level and at the ceiling line of the top story. Where firestops are not automatically provided by the framing system used, use closely-fitted wood blocks of nominal 2" thick lumber of the same width as framing members.

3.5 STUD FRAMING:
A. General: Provide stud framing of size and spacing indicated or, if not otherwise indicated, of the following sizes and spacings. Arrange studs so that wide face of stud is perpendicular to direction of wall or partition and narrow face is parallel. Provide single bottom plate and double top plates using 2" thick members with widths equaling that of studs; except single top plate may be used for non-load-bearing partitions. Nail or anchor plates to supporting construction.

B. Sills:
1. Set level to 1/16 inch in 6 feet. Grout shall be used when necessary to achieve full bearing.
2. Secure sills with 5/8 inch anchor bolts embedded in the structural slab a minimum of 8 inches, spaced a maximum of 4 feet on center. Locate one bolt 6 inches minimum and 12' maximum from each end and 9 inches to each side of notches for pipes. Two bolts minimum per sill piece. Provide additional or other anchorage as required on they drawings.
3. Sills shall be set to the exact dimensions shown on the drawings with a tolerance of 1/2 inch in either direction. The Architect shall be immediately notified if this condition would be violated.
4. Allow no crooks or waves in sills that will not provide a straight line for stud work.

C. Construct corners and intersections with not less than 3 studs. Provide miscellaneous blocking and framing as shown and as required for support of facing materials, fixtures, specialty items and trim.
1. Provide continuous horizontal blocking row at mid-height of single-story partitions over 8' high and at midpoint of multi-story partitions, using 2" thick members of same width as wall or partitions.

3.6 TIMBER FRAMING:

A. Provide wood beams and girders of the size and spacing shown. Install with crown edge up and provide not less than 4" bearing on supports. Provide continuous members unless shown; tie together over supports if not continuous.

B. Where beams or girders are framed into pockets of exterior concrete or masonry walls, provide 1/2" air space between sides and ends of wood members and supporting wall.

C. Where built-up beams or girders of nominal 2" dimension lumber on edge are shown, fasten together with 2 rows of 20d nails spaced not less than 32" o.c. Locate one row near top edge and other near bottom edge. Locate end joints in members over supports; for continuous members, stagger ends at quarter points between supports.

D. Provide wood posts of the sizes shown. Provide metal anchoring and attachment devices as shown.

3.7 ROUGH HARDWARE:

A. Nails and Spikes:
1. Nailing of wood members shall conform to UBC Table 25-Q as indicated. Box nails are not permitted.
2. Penetration: Half length of nail into piece receiving point.
3. Do not drive nails closer together than half their length, nor closer to edge of piece of lumber than 1/4 their length.
4. Spacing and size of nails to be such that splitting will not occur. Prebore holes for nails wherever necessary to prevent splitting. Bore diameter of holes smaller than diameter of nail or spike (3/4 dia.).
5. Use galvanized staples throughout.
6. Use galvanized nails where exposed to weather.
7. Use hot-dipped galvanized or stainless steel nails where in contact with treated wood.

B. Screws:
1. Screws are to be turned into place, not driven. Use self-tapping screws where required for fastening to metal framing.
2. Countersink where heads will interfere or as required.
3. Screw bore holes the same diameter and depth as shank; bore holes for threaded portion of screws with bit no larger than base of thread.
4. Use galvanized or cadmium plated screws on all fastenings exposed to weather.
5. Use hot-dipped galvanized or stainless steel screws where in contact with treated wood.

C. Bolts:
1. Install bolts in drilled holes the diameter of the bolt, plus 1/16 inch oversize.
2. Bolting of wood members shall conform to UBC requirements and as called for on Drawings.
3. Washers: Provide all bolts bearing on wood, unless noted otherwise on at Drawings, with malleable iron washers under heads and nuts.
4. Use hot-dipped galvanized bolts, nuts and washers where exposed to weather and/or treated wood.

D. Lag Bolts:
1. Install lag bolts in lead holes. Drill holes same diameter and depth as shank. Then drill hole same diameter as at base thread for the threaded portion. Use malleable iron washers as required for same bolt size.
2. The threaded portion of the screw shall be inserted in its lead hole by turning with a wrench, not by driving with a hammer. Malleable iron washers shall be provided under heads of lag bolts which bear on wood.
3. Use hot-dipped galvanized or stainless steel lag bolts where in contact with treated wood.

E. Powder Driven Pins:
1. Sill plate of interior non-bearing partitions bearing directly on the concrete floor may be attached with powder driven pins.
2. Diameter of pin shall be 1/4 inch; use 2 inch diameter 12 gauge washer under head and minimum penetration of 1-1/2 inches into concrete, spaced not more than 32 inches apart.
3. There shall be a minimum of two pins for each piece of sill plate.

F. Pneumatic gun nailing:
1. Pneumatic gun nails shall be nails with the same diameter as common nails with penetration into framing as follows:
   a. 6d 1-1/4 inches
   b. 8d 1-1/2 inches
   c. 10d 1-5/8 inches
   d. 16d 1-3/4 inches
2. Minimum edge distance of nail from edge of plywood and framing shall be 3/8".
3. Spacing of nails shall be as specified for common nails.
4. "Shiners" or nails which do not penetrate into framing or blocking shall be removed and replaced.
5. Underdriving of pneumatic gun nail will require nail to be driven with hammer so that head of nail is flush with top surface of plywood.
6. Overdriving of pneumatic gun nails such that the head of nail is more than 1/32" below the top surface of plywood shall not be permitted and will result in rejection of that portion of the work.
7. Walls with structural plywood on both faces shall have pneumatic gun nailing one face only.

END OF SECTION 06 10 00
SECTION 06 20 00 – FINISH CARPENTRY

PART - GENERAL

1.1 SUMMARY
Provide and install all wood trims and finish and other items not specifically described as being installed under other sections of these specifications as shown on the Drawings and specified herein.

1.2 GENERAL REQUIREMENTS:
This Section shall be performed in accordance with the General Conditions, Supplementary Conditions and all Sections in Division 1 of these Specifications. These documents must be read with the other Contract Documents and Sections as a whole to complete the intent of the contract.

1.3 SUBMITTALS:
Make submittals to the Architect in accordance with the provision of Section 013323 of these specifications. Fabrication (shop) drawings shall meet the standards set forth by the Woodwork Institute. A sample of shop drawings meeting these requirements can be found here: http://woodworkinstitute.com/pdfdocs/Shop%20Drawing%20Sample%20revised.pdf

1.4 INDOOR AIR POLLUTANT CONTROL REQUIREMENTS:
A. Hardwood plywood, particle board and medium density fiberboard composite wood products shall meet the requirements for formaldehyde as specified in ARB’s Air Toxics Control Measure for Composite Wood (17 CCR 93120 et. seq.) by or before the dates specified in those sections.
   1. Documentation: Verification of compliance shall be include one of the following:
      a. Product certifications and specifications
      b. Chain of custody certifications
      c. Other methods acceptable to the local enforcement agency

1.5 QUALITY CONTROL:
Install work in this section in accordance with the latest published edition of Architectural Woodwork Standards published by AWI/WI.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL:
A. Lumber: DOC PS 20 and grading rules of inspection agencies certified by American Lumber Standards Committee Board of Review.

B. Softwood Plywood: DOC PS 1.

2.2 INTERIOR STANDING AND RUNNING TRIM:
A. Interior Softwood Lumber Trim: [C Select (Choice), eastern white, Idaho white, lodgepole, ponderosa, or sugar pine.
   1. Maximum Moisture Content: 15 percent.
PART 3 - EXECUTION

3.1 INSTALLATION:

A. Condition finish carpentry in installation areas for 24 hours before installing.

B. Install finish carpentry level, plumb, true, and aligned with adjacent materials. Scribe and cut to fit adjoining work. Refinish and seal cuts.

C. Install standing and running trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Stagger joints in adjacent and related trim. Cope at returns and miter at corners.

END OF SECTION 06 20 00
SECTION 07 21 00 – THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY:
Provide and install building insulation as shown on the Drawings and specified herein including but not necessarily limited to batts in interior walls.

1.2 GENERAL REQUIREMENTS:
This Section shall be performed in accordance with the General Conditions, Supplementary Conditions and all Sections in Division 1 of these Specifications. These documents must be read with the other Contract Documents and Sections as a whole to complete the intent of the contract.

1.3 SUBMITTALS:
Make submittals to the Architect in accordance with the provisions of Section 013323 of these specifications.

1.4 CODES AND STANDARDS
All building insulation materials shall conform to the certified requirements and shall be installed to meet flame and smoke spread density requirements of State of California Title 24.

PART 2 - PRODUCTS

2.1 BUILDING INSULATION:
   A. All building insulation except as noted herein shall be the product of Owens/Corning Fiberglas, or an equal approved in advance by the Architect.
   B. Interior walls:
      1. In all new framed interior walls furnish and install 3-1/2 inch thick unfaced "Noise Barrier Batts" in 2 x 4 walls and 5-1/2 inch batts in 2 x 6 walls in each of the stud cavities.

2.2 OTHER MATERIALS:
All other materials such as fasteners and retainers, not specifically described but required for a complete and proper installation of building insulation, shall be as recommended by the manufacturer; selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 INSTALLATION:
   A. Except as otherwise specifically directed by the Architect, install building insulation in accordance with the current edition of the Owens/Corning Fiberglas publication BL-4992 "Fiberglas Building Insulation Application Instructions" where applicable.
   B. Install insulation in areas and in thicknesses indicated or required to produce R-values indicated. Cut and fit tightly around obstructions and fill voids with insulation.

3.2 INSPECTION:
Upon completion of the installation, visually inspect each insulated area and verify that all insulation is complete and properly installed.

END OF SECTION 072100
SECTION 07 92 00 – JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY:
Provide a positive barrier against penetration of air and moisture at joints between items where sealing is essential to continued integrity of the barrier. Such sealing will normally be performed under the work of various Sections of these Specifications but shall be performed in strict accordance with the provisions of this Section. Install as shown on the Drawings and specified herein.

1.2 GENERAL REQUIREMENTS:
This Section shall be performed in accordance with the General Conditions, Supplementary Conditions and all Sections in Division 1 of these Specifications. These documents must be read with the other Contract Documents and Sections as a whole to complete the intent of the contract.

1.3 SUBMITTALS:
Make submittals to the Architect in accordance with the provisions of Section 013323 of these specifications.

1.4 AIR POLLUTANT CONTROL REQUIREMENTS:
A. Per Table 5.504.4.1 of the 2010 California Green Building Standards Code, adhesives, sealants and caulks used on the project shall meet the requirements of the following standards:

   1. Adhesives, adhesive bonding primers adhesive primers, sealants, sealant primers and caulks shall comply with local or regional air pollution control or air quality management district rules where applicable, or SCAQMD Rule 1168 VOC limits, as shown in Tables 5.504.4.1 and 5.504.4.2 of the 2010 California Green Building Standards Code. Such products also shall comply with the Rule 1168 prohibition on the use of certain toxic compounds (chloroform, ethylene dichloride, methylene chloride, perchloroethylene and trichloroethylene)

PART 2 - PRODUCTS

2.1 SEALANT MATERIALS:
All materials, unless otherwise specifically approved by the Architect, shall be a single or double component, primerless, non-sagging type in color approved by the Architect where exposed to view, and shall be one of the following or an equal approved in advance by the Architect:

   A. Building Horizontal and Vertical Surfaces: Sonolastic 150 with VLM Technology as manufactured by Sonneborn Building Products, or equal.

2.2 SEALANT EQUIPMENT:
All equipment shall be only such equipment as is specifically recommended by the manufacturer of the sealant material being installed.
PART 3 - EXECUTION

3.1 CHOICE OF SEALANT MATERIAL:
Use only that sealant material which is best suited to the installation and is so recommended by the sealant material manufacturer.

3.2 BACK-UP MATERIALS:

A. General:
   1. All joints over 3/8" wide shall have back-up filler.
   2. Verify the compatibility of filler material with sealant before installation.
   3. Use back-up filler about 1/3 to ½ wider than width of joint so sufficient pressure is exerted by filler to provide substantial resistance to displacement.

B. Acceptable materials:
   All filler materials shall be non-oily, non-staining back-up filler such as polyethylene foam rod, expanded polyurethane, neoprene, or other filler completely compatible with the sealant material.

3.3 APPLICATION OF SEALANT:

A. General: Do not seal under weather conditions or sun conditions potentially harmful to the set and curing of the sealant material.

B. Installation: Install sealant in strict accordance with the manufacturer's recommendations, taking care to produce beads of proper width and depth, tool as recommended by the manufacturer, and immediately remove all surplus sealant.

3.4 SEALANT SCHEDULE:
Carefully study the Drawings and furnish and install the proper sealant at each point where called for on the Drawings plus at all other points where sealing is essential in maintaining the continued integrity of the water-tight barrier.

END OF SECTION 07 92 00
SECTION 08 14 16 – DOOR FRAMES

PART 1 - GENERAL

1.1 SUMMARY:
Provide and install door frames as shown on the Drawings and specified herein.

1.2 GENERAL REQUIREMENTS:
This Section shall be performed in accordance with the General Conditions, Supplementary Conditions and all Sections in Division 1 of these Specifications. These documents must be read with the other Contract Documents and Sections as a whole to complete the intent of the contract.

1.3 SUBMITTALS:
Make submittals to the Architect in accordance with the provisions of Section 013323 of these specifications.

1.4 REFERENCES AND REGULATORY REQUIREMENTS:
A. UBC 7-2, latest edition
B. Quality Standards:

1.5 QUALITY ASSURANCE:
Meet or exceed WDMA I.S. 1-A Premium Grade, AWI Version 7 Custom Grade and/or WIC Custom Grade.

1.7 DELIVERY STORAGE AND HANDLING AND SITE CONDITIONS:
Deliver, store, protect and handle products under provisions of WDMA, AWI, WIC and manufacturer’s care and handling instructions.

1.8 COORDINATION:
Coordinate the work with door opening construction, door frame and door hardware installation with a pre-installation conference.

PART 2 - PRODUCTS

2.1 MANUFACTURER:
Shop fabricated ¾” door frames with ½” x 1-1/2” door stops and ½” door trims to match existing frames.

2.2 MATERIALS, DOOR FRAMES AND CASINGS:
All wood frames and casings shall be 1-1/2” thick rabbeted design select Eastern White, Idaho White, Lodge Pole, Ponderosa or Sugar Pine, width as required by wall conditions.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify substrate opening conditions.

B. Verify that opening sizes and tolerances are acceptable and ready to receive this work.

3.2 INSTALLATION

A. Fabricate all wood frames at the factory in strict accordance with all pertinent codes and regulations, the original design, and the referenced standards. Install in rough openings, hanging square, plumb, straight and firmly anchored into position with minimum of three shims per jamb for standard height door.

B. Clearances: As follows, unless otherwise indicated:
   1. 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors.
   2. 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering.
   3. 1/4 inch (6.4 mm) from bottom of door to top of threshold.
   4. Comply with NFPA 80 for fire-rated doors

3.3 WARRANTY TOLERANCES:
Conform to WDMA standards and testing methods for warp, cup, bow and telegraphing.

3.4 ADJUSTING
Adjust doors for smooth and balanced door movement.

END OF SECTION 08 14 16
SECTION 08 53 13 – VINYL WINDOWS

PART 1 - GENERAL

1.1 SUMMARY:
Provide and install vinyl windows required for this work as shown on the Drawings and specified herein.

1.2 GENERAL REQUIREMENTS:
This Section shall be performed in accordance with the General Conditions, Supplementary Conditions and all Sections in Division 1 of these Specifications. These documents must be read with the other Contract Documents and Sections as a whole to complete the intent of the contract.

1.3 SUBMITTALS:
Make submittals to the Architect in accordance with the provisions of Section 013323 of these specifications.

1.4 QUALITY ASSURANCE:
The Owner will select a pre-qualified independent testing laboratory. Testing, when required, will be in accordance with all pertinent codes and regulations and with selected standards of the American Society for Testing and Materials.

1.5 PRODUCT HANDLING:
Promptly process and distribute all required copies of test reports and related instructions to ensure all necessary retesting and/or replacement of materials with the least possible delay in progress of the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURER:
Milgard Vinyl Windows

A. Series 5320 Classic Picture Windows with 5/8” flat grids, mulled as shown on Drawings.

B. Series 5371 Classic Z-Bar Picture Window Retrofit with 5/8” flat grids.

2.2 FRAME:
High performance polyvinyl chloride. Frame width is 3-3/8”.

2.3 SASH:
High performance polyvinyl chloride.

2.4 GLAZING:
All glass is of a select quality complying with Federal Specification DD-G-451D, ASTM, C 1036-85. Provide double glazed Sun Coat Max low “e” tinted D.S. glass tempered as indicated on Drawings or as required. Insulating glass is manufactured and tested to pass IGCC, CBA, ASTM E-774-83.

2.5 GLAZING SEAL:
Butyl sealing with extruded vinyl glazing “snap-in” bead.

2.6 FINISH:
PART 3 - EXECUTION

3.1 FABRICATION:
Fabricate all products in this Section in complete accordance with the standards referenced in the published literature of the selected manufacturer.

3.2 INSTALLATION:
A. Surface conditions:
   1. Prior to installation of the work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
   2. Verify that vinyl windows may be installed in complete accordance with the original design and the manufacturer's recommendations.
   3. In the event of discrepancy, immediately notify the Architect.
   4. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

B. Installation:
Install all vinyl windows in strict accordance with the original design, all pertinent codes and regulations, and the manufacturer's recommendations, installing the locks specified in Section 08700 of these Specifications, and anchoring all components firmly into position for long life under hard use.

C. Set units level, plumb, and true to line, without warp or rack of frames and panels. Provide proper support and anchor securely in place.

D. Set sill members in bed of sealant or with gaskets, as indicated, to provide weathertight construction.

E. Adjust operating panels, screens, and hardware to provide a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

F. Clean glass and vinyl surfaces immediately after installing windows. Remove nonpermanent labels from glass surfaces.

END OF SECTION 085313
GENERAL

1.1 SUMMARY:
"Hardware groups" have been assigned to the various doors required for this work. Provide and install all finish hardware described in the Hardware Schedule and all other finish hardware not described but required for a complete and operable facility.

1.2 GENERAL REQUIREMENTS:
This Section shall be performed in accordance with the General Conditions, Supplementary Conditions and all Sections in Division 1 of these Specifications. These documents must be read with the other Contract Documents and Sections as a whole to complete the intent of the contract.

1.3 SUBMITTALS:
Make submittals to the Architect in accordance with the provisions of Section 013323 of these specifications.

PRODUCTS

2.1 FASTENERS:
A. Furnish all finish hardware with all necessary screws, bolts, and other fasteners of suitable size and type to anchor the hardware in position for long life under hard use.
B. Furnish fastenings where necessary with expansion shields, toggle bolts, sex bolts, and other anchors approved by the Architect, according to the material to which the hardware is to be applied and the recommendations of the hardware manufacturer.
C. All fastenings shall harmonize with the hardware as to material and finish.

2.2 LOCKS AND LATCHES:
A. All locksets and latchsets shall be existing.
B. At doors to remain in place (non-operating) remove both handles and install cover plates over the core holes; latch to remain in place.
C. At the end of the project, the Contractor shall provide the services of a professional locksmith who shall key all locks as directed by the Owner.

2.3 FINISHES:
The finish of all hardware shall match the finish of the existing locksets. Special care shall be given to coordinate all the various manufactured items furnished on this Work, to ensure an acceptable uniform finish.

2.4 PROPRIETARY PRODUCTS:
References to specific proprietary products are used to establish minimum standards of utility and quality. Unless otherwise approved by the Architect, provide only the specific products. Design is based on the materials specified; other materials may be considered by the Architect in
accordance with the provisions of Section 01300 of these Specifications.

2.5 ACCEPTABLE MANUFACTURERS AND PRODUCTS:

Automatic Door Opener, outside door:
LCN 9700 Series Middle Swing electrically powered operator with 8310 Series 4-1/2” actuators and accessories including wall mounted actuators (flush inside, surface outside), transmitters, receivers, etc. as required for complete operating system.

Automatic Door Opener, inside door:
LCN 9700 Series Middle Swing electrically powered operator with 8310 Series 4-1/2” actuator and accessories including wall mounted actuator (one side), transmitter, receiver, etc. as required for complete operating system.

2.6 OTHER MATERIALS:
All other materials, not specifically described but required for a complete and proper finish hardware installation, shall be as selected by the Contractor subject to the approval of the Architect.

EXECUTION

3.1 DELIVERIES:
Stockpile all items sufficiently in advance to ensure their availability and make all necessary deliveries in a timely manner to ensure orderly progress of the total Work.

3.2 INSPECTION OF INSTALLATION:
Upon completion of the installation, and as a condition of its acceptance, deliver to the Architect a report signed by the approved hardware suppliers stating that his inspection was made, that all adjustments recommended by him have been completed, and that all finish hardware furnished under this Section has been installed and is in optimum working condition.

3.3 HARDWARE SCHEDULE:

Refer to Drawings.

END OF SECTION 08 71 00
SECTION 08 80 00 – GLAZING

PART 1 - GENERAL

1.1 SUMMARY:
Provide and install glazing required for this Work as shown on the Drawings and specified herein including bulletproof transaction window.

1.2 GENERAL REQUIREMENTS:
This Section shall be performed in accordance with the General Conditions, Supplementary Conditions and all Sections in Division 1 of these Specifications. These documents must be read with the other Contract Documents and Sections as a whole to complete the intent of the contract.

1.3 SUBMITTALS:
Make submittals to the Architect in accordance with the provisions of Section 013323 of these specifications.

1.4 Fire-Resistance-Rated Assemblies: Provide products that comply with NFPA 80 and are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for applications indicated.

1.5 Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.

1.6 Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated.
   1. GANA Publications: GANA Laminated Division’s “Laminated Glass Design Guide” and GANA’s “Glazing Manual.”

PART 2 - PRODUCTS

2.1 MANUFACTURER:
Pittsburg Plate Glass Co. for Glazing:
Total Security Systems, 577-223-7807 for transaction window

2.2 GLASS:
All glass shall bear the label of its manufacturer and shall conform in all respects with the pertinent requirements of Federal Specification DD-G-451c, shall be relatively distortion-free with all distortion shown in the horizontal direction, shall be in the thicknesses and types shown on the Drawings: Pittsburg Plate Glass Co., or an equal approved in advance by the Architect.

2.3 GLAZING:
All glazing accessories shall be new, first quality of their respective kinds, and subject to the approval of the Architect, type, thickness and tinting as indicated in the glazing schedule on the Drawings.

2.4 BULLETPROOF TRANSACTION WINDOW:
Window by Total Security Windows, or equal. 36” wide x 42” high, protection level 1, ¾” laminated glass, 18 ga brushed stainless steel transaction tray, plastic laminate countertop (provide manufacturer’s standard colors), powder coated dark bronze aluminum frame, stainless steel speaker hole.

PART 3 - EXECUTION

3.1 GLAZING:
Set all glass in a true plane, tight and straight, with proper and adequate clearance, firmly anchored to prevent rattling and looseness, with all edges cleanly cut; do not nip or seam the edges.

3.2 BULLETPROOF TRANSACTION WINDOW:
Install in frame wall per manufacturer’s standard details; set countertops at +34” off finish floor.

3.3 CLEANING UP:
Upon completion of glazing, thoroughly clean all glass surfaces, correct all imperfections, replace all damaged glass, and leave all labels on the glass until they have been inspected and approved by the Architect and/or Building Official but remove all labels immediately thereafter.

END OF SECTION
SECTION 09 29 00 – GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY:
Provide and Install gypsum board where shown on the Drawings and as specified herein.

1.2 GENERAL REQUIREMENTS:
This Section shall be performed in accordance with the General Conditions, Supplementary Conditions and all Sections in Division 1 of these Specifications. These documents must be read with the other Contract Documents and Sections as a whole to complete the intent of the contract.

1.3 SUBMITTALS:
Make submittals to the Architect in accordance with the provisions of Section 013233 of these specifications.

1.4 STC-RATED ASSEMBLIES:
Provide materials and construction identical to those tested in assemblies per ASTM E 90 and classified per ASTM E 413 by a qualified independent testing and inspecting agency.

PART 2 - PRODUCTS

2.1 PANEL PRODUCTS:
A. Provide in maximum lengths available to minimize end-to-end butt joints.
B. Interior Gypsum Board: ASTM C 1396/C 1396M, in thickness indicated, with manufacturer's standard edges. Regular type unless otherwise indicated.
C. Water-Resistant Gypsum Backing Board: Use at all plumbing wet walls in toilet rooms. ASTM C 1396/C 1396M, in thickness indicated. Regular type unless otherwise indicated.
D. Cementitious Backer Units: ANSI A118.9.
E. Preparation Coat:
   1. Product: Hamilton Drywall Products; Prep Coat Plus
   2. Product: CertainTeed Gypsum; ProRoc Level V Primer/Surfacer

2.2 ACCESSORIES:
A. Trim Accessories: ASTM C 1047, formed from galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet. For exterior trim, use accessories formed from hot-dip galvanized-steel sheet, plastic, or rolled zinc.
   1. Provide cornerbead at outside corners unless otherwise indicated.
   2. Provide LC-bead (J-bead) at exposed panel edges.
   3. Provide control joints where indicated.
B. Joint-Treatment Materials: ASTM C 475/C 475M.
   1. Joint Tape: Paper unless otherwise recommended by panel manufacturer.
   2. Joint Compounds: Setting-type taping compound and drying-type, ready-mixed, compounds for topping
PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install all panels plumb, level, and with all vertical joints on bearing. Panels/patches smaller than 144 square inches may not be used without prior approval of Architect.

B. Cutting:
   1. When cutting gypsum drywall is required, cut by scoring and breaking or by sawing, working from the face side.
   2. When cutting by scoring, cut through the face paper and then snap the panel back away from the cut face; then break the back paper by snapping the gypsum board in the reverse direction or by cutting the back paper.
   3. Smooth all cut ends and edges of panels as necessary to obtain a smooth joint.
   4. For cut-outs in panels for pipes, fixtures, and other small openings, make holes and cut-outs by sawing or by such other method as will not fracture the core or tear the covering and with such accuracy that plates, escutcheons, or trim will cover the edges.
   5. The use of "score-and-knockout" method will not be permitted.

C. Fastening:
   1. Properly space all fasteners in careful accordance with the manufacturer's recommendations and code requirements, with heads driven slightly below the surface for proper cementing but without breaking the paper cover.
   2. Loosely butt all joints to be taped; firmly butt all joints to be left untreated.
   3. Stagger all end joints and the joints between panels to achieve a maximum of bridging and a minimum of continued joints.

D. Ceilings:
   1. At those areas where gypsum drywall ceiling is indicated on the Drawings, and where it is possible to do so, install the ceiling prior to installing walls.
   2. Where possible, and where permitted by code, float the interior ceiling angles.

3.2 INSTALLING METAL TRIM:

A. Carefully inspect the Drawings and verify location of all metal trim required. Install all trim in strict accordance with the manufacturers' recommendations, paying particular attention to make all trim installation plumb, level, and true to line, with firm attachment to supporting members.

3.3 TAPING AND FINISHING LEVEL 4 FINISH:

A. Control heating and ventilating during finishing operations to ensure the maintenance of
55° F. minimum temperature.

B. First coat - Level 2 Finish:
1. Spread compound evenly over all joints, using suitable tools designed for that purpose.
2. Fill all joint recesses and metal trim.
3. Center the reinforcing tape on the joint and press into the fresh compound, wiping down with sufficient pressure to remove excess compound but leaving sufficient compound under the tape for proper bond.
4. Feather all edges and leave the surface free from blisters and tape wrinkles.
5. Apply compound to all fastener heads, leaving flush with the adjacent surfaces.
6. Fold reinforcing tape along its centerline and apply to all interior angles, following the same procedure as for joints.

C. Second coat – Level 3 Finish:
1. Lightly sand the dry compound with fine sandpaper to remove all irregularities.
2. Apply a second coat of compound to all joints, feathering approximately three inches beyond edges of tape.
3. Apply a second coat of compound to all fastener heads.

D. Third coat – Level 4 Finish:
1. Lightly sand the dry compound with fine sandpaper to remove all irregularities.
2. Apply final skim coat, feathering out approximately two inches beyond second coat.
3. Third coat all fastener heads and metal trim and all interior angles; allow to dry.

F. Preparation Coat:
Apply one uniform coat of preparation coat product in accordance with manufacturer’s recommendations for application.

G. Texture Coat:
Apply a spray applied texture finish to match existing on all walls and ceilings, except those designated for smooth finish or wall covering.

3.4 CLEANING UP:
Do not allow the accumulation of scraps and debris arising from the work of this Section but maintain the premises in a neat and orderly condition at all times; in the event of spilling or splashing compound onto other surfaces, immediately remove the spilled or splashed material and all trace of the residue to the approval of the Architect.

END OF SECTION 09 29 00
SECTION 09 30 00 - TILING

PART 1 - GENERAL

1.1 SUMMARY:
Provide ceramic tile to match existing where shown on the Drawings, as specified herein, and as needed for a complete and proper installation. Patch existing floor and wall tile.

1.2 GENERAL REQUIREMENTS:
This Section shall be performed in accordance with the General Conditions, Supplementary Conditions and all Sections in Division 1 of these Specifications. These documents must be read with the other Contract Documents and Sections as a whole to complete the intent of the contract.

1.3 SUBMITTALS:
Make submittals to the Architect in accordance with the provisions of Section 013323 of these specifications.

1.4 ADDITIONAL STOCK:
Deliver to Owner stock tile in the amount of five percent (5%) of the installed amount.

PART 2 - PRODUCTS

2.1 CERAMIC TILE:
A. Provide ceramic tile and accessories complying with Tile Council of America Specification 137.1, in colors and patterns as noted on the drawings from standard colors and patterns of the approved manufacturers. Match existing tile in toilet rooms.

B. Floor Tile:
   1. Provide coefficient of friction not less than 0.50 when tested in accordance with ASTM F489, ASTM F609, and the National Bureau of Standards Technical Note 895.

2.2 SETTING MATERIALS:
A. Comply with pertinent recommendations contained in the Tile Council of America "Handbook for Ceramic Tile Installation".

B. Latex – Portland cement complying with ANSI A118.4 by Laticrete or equal.

C. Special tile setting mortars will be considered by the Architect when complete technical data is submitted in advance.

2.3 GROUT:
A. Comply with pertinent recommendations contained in the Tile Council of America "Handbook for Ceramic Tile Installation" in colors selected by the Architect from standard colors available from the approved manufacturers.

B. Sanded Grout:
TILING

1. Provide a commercially prepared sanded grouting composition Laticrete 1500 Series or equal, with high flexibility and stain resistance.

D. Grout Color:
   As selected by Architect from manufacturer’s standards, Mapei or equal, to match existing.

2.4 GROUT SEALER:
   Provide commercially prepared grout sealer designed to be used directly from the container; Bostik CeramaSeal Grout Sealer, or equal.

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

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General:
      a. Interior concrete floor, thin set, F113.
      b. Interior frame wall, gypsum board, W243.
   2. Maintain minimum temperature limits and installation practices recommended by materials manufacturers.

B. Limits of tile:
   1. Patching as required.
   2. Terminate tile neatly at obstructions, edges, and corners, without disruption of pattern or joint alignment.

C. Joining pattern:
   1. Lay tile in grid pattern unless otherwise indicated on the Drawings or directed by the Architect.
   2. Align joints when adjoining tiles on floor, base, trim, and walls are the same size.
   3. Layout tile work, and center the tile fields both directions to each space or on each wall area.
   4. Adjust to minimize tile cutting.
   5. Provide uniform joint widths.

D. Provide expansion and control joints where shown on the Drawings, and where otherwise recommended by the "Handbook for Ceramic Tile Installation" of the Tile Council of America.

E. Cleaning:
   1. Upon completion of placing and grouting, clean the existing and new tile in accordance with recommendations of the manufacturers of the materials used.
   2. Protect metal surfaces, cast iron, and vitreous items from effects of acid cleaning.
   3. Flush surfaces with clean water before and after cleaning.
F. Provide tile surfaces clean and free from cracked, broken, chipped, unbonded, and otherwise defective units.

G. Seal grout using Grout Sealer in coverage per manufacturer’s specifications. Apply with clean, white cloth, brush or spray applicator. Avoid puddling to obtain maximum coverage. Once dry, wipe off remaining residue with clean, white cotton cloth. Porous surfaces may require multiple applications. Allow to cure 4 hours after application.

H. Provide required protection of tile surfaces to prevent damage and wear prior to acceptances of the Work by the Owner.

END OF SECTION 09 30 00
SECTION 09 51 13 – SUSPENDED ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY:
Provide and install suspended acoustical ceiling as shown on the Drawings and specified herein.

1.2 GENERAL REQUIREMENTS:
This Section shall be performed in accordance with the General Conditions, Supplementary Conditions and all Sections in Division 1 of these Specifications. These documents must be read with the other Contract Documents and Sections as a whole to complete the intent of the contract.

1.3 SUBMITTALS:
Make submittals to the Architect in accordance with the provisions of Section 013323 of these specifications.

1.4 STANDARDS:
Suspended acoustical ceiling systems shall be installed in accordance with the provisions of ASTM C635 and ASTM C636 as modified by ASCE 7 Section 13.5.6.2.2 for Seismic Design Categories D, E, and F.

1.5 QUALITY ASSURANCE:
A. Special Inspection: suspended ceilings are subject to periodic special inspection. Contractor shall coordinate scheduling of inspection with Owner’s testing agency.

B. Anchor Pull Tests: Refer to details on the Drawings for required frequency and loading for wire anchor pull tests.

1.6 ADDITIONAL STOCK:
Provide to Owner new, boxed, unopened ceiling tiles in the amount of two percent (2%) of the installed square footage area.

PART 2 - PRODUCTS

2.1 SUSPENDED GRID SYSTEM:
A. Manufacturers:
All suspended grid systems shall be in the pattern indicated on the Drawings and shall be one of the following or an equal approved in advance by the Architect. All grids shall be factory finished white, 15/16" face width and one hour rated. Main beam shall be Heavy Duty Class rated.
1. USG / Donn Products, Inc.
2. Armstrong Corporation
3. Chicago Metallic

B. Perimeter support:
1. Provide nominal 1" (min. 7/8") perimeter support closure angle with seismic clip attaching runners to perimeter angle. Seismic clip shall be the product of the grid
manufacturer and shall be installed in accordance with the applicable ICC-ES report:
   a.  USG / Donn ASM7 Clip; ICC-ES ESR 1222
   b.  Armstrong BERC-2 Clip; ICC-ES ESR 1308
   c.  Chicago Metallic 1496 Clip; ICC-ES ESR 2282

C.  General:
    The system shall be complete with all support members, anchors, wall cornices, and
    adapters for light fixtures and ceiling grilles, plus all accessories of every nature required for
    a complete installation.

2.2 ACOUSTICAL CEILING BOARDS:

A.  Manufacturers:
    All acoustical ceiling boards shall be as specified on the Finish Schedule or an equal
    approved in advance by the Architect.

B.  All ceiling boards shall be the product of one manufacturer, nominally sized lay-in panels
    and shall be fire rated where indicated on the Drawings.

2.3 OTHER MATERIALS:
    All other materials not specifically described but required for a complete and proper installation of
    suspended acoustical ceiling shall be as selected by the Contractor subject to the approval of the
    Architect.

PART 3 - EXECUTION

3.1 INSTALLATION OF "T" GRID:

A.  General:
    1.  Erect metal "T" members in the pattern shown on the Drawings, spacing members
        symmetrically about the centerline of areas in both directions and/or as shown on the
        Drawings.
    2.  Space hanger wires a maximum of four feet on centers along main runners.
    3.  Accurately level all main runners; space main runners a maximum of four feet on
        centers.
    4.  Space cross "T" members as shown on the Drawings and secure to main runners and
        wall angles in accordance with the approved Shop Drawings.
    5.  Securely anchor all wall angle members in place.
    6.  Provide and install suspension wires for electrical fixtures.

B.  Make all grid level within a tolerance of one in 500 and straight within a tolerance of one in
    1000.

3.2 LATERAL AND COMPRESSION BRACING:

A.  Furnish and install lateral bracing consisting of at least twelve gage wire, splayed at 45
    degrees, in the following locations:
    1.  At the midpoint of all unsupported partitions exceeding twelve linear feet.
    2.  At twelve feet on center each way in all large ceiling areas not restrained by partitions.
B. Secure all lateral bracing to structural members; secure at right angles to the direction of the partition and four way in large ceiling areas.

C. Furnish and install vertical compression bracing as required by the U.B.C., latest edition. Use the system as detailed on the drawings or factory built components to comply with the code requirements.

3.3 INSTALLATION OF ACOUSTICAL CEILING BOARDS:
Install all acoustical ceiling boards in the exposed "T" grid system so that linearity of facing is in one direction only, and to the approval of the Architect.

3.4 CLEANING UP:
Completely remove all finger prints and traces of soil from the surfaces of grid and acoustical ceiling boards, using only those cleaning materials specifically recommended for the purpose by the manufacturers of the materials cleaned.

END OF SECTION 09 51 13
SECTION 09 65 13 – RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY:
Provide and install resilient base and accessories as shown on the Finish Schedule in the Drawings and specified herein, including, but not necessarily limited to resilient wall base and resilient accessories.

1.2 GENERAL REQUIREMENTS:
This Section shall be performed in accordance with the General Conditions, Supplementary Conditions and all Sections in Division 1 of these Specifications. These documents must be read with the other Contract Documents and Sections as a whole to complete the intent of the contract.

1.3 SUBMITTALS:
Make submittals to the Architect in accordance with the provisions of Section 013323 of these specifications.

1.4 ADDITIONAL STOCK:
Deliver to Owner of each type and color of resilient wall base in the amount of five percent (5%) of the installed linear feet.

1.5 QUALITY ASSURANCE:
A. Flooring Contractor’s Qualifications:
Flooring Contractor shall be an established firm, experienced in the installation of the specified product, and shall have access to all manufacturer’s required technical, maintenance, specification and related documents.
   1. The flooring contractor shall be a firm experienced in the field and recognized as such by the manufacturer and/or distributor (supplier).
   2. The flooring contractor shall have completed at least three (3) projects of similar magnitude, material and complexity. Must submit three (3) reference projects.
   3. Submit three (3) copies each of manufacturer’s installation and maintenance recommendations for correct jobsite conditions, applicable jobsite testing, preparation, finishing and detailing for resilient floor covering.
   4. If the flooring contractor does not qualify under Item 2, a manufacturer’s trained technician may be required to be on site to supervise a pre-determined test area of installation for approval by specifier. The flooring contractor to be responsible for cost of and providing adequate lead time for scheduling manufacturer’s technician.

PART 2 - PRODUCTS

2.1 WALL BASE
A. Products:
   1. Mannington rubber base, or equal.

B. Color and Pattern: See Drawings

C. ASTM F 1861, Type TS (rubber, vulcanized thermoset).
D. Style: Cove (with top-set toe) at resilient flooring and carpeting.

E. Height: 4 inches (101.6 mm), 6 inches (152.4 mm) at wet areas.

F. Lengths: Coils in manufacturer's standard lengths.

G. Outside Corners: Premolded.

H. Inside Corners: Job formed.

2.2 RESILIENT ACCESSORY

A. Products:
   1. Mannington Optimum Edge (Type TS) rubber base or equal.

B. Color: See Drawings.

C. Description: Nosing for carpet, Nosing for resilient floor covering, Joiner for tile and carpet, Mannington Carpet to Resilient Reducer #165, or equal.

D. Material: Rubber.

2.3 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement- or blended hydraulic cement-based formulation provided or approved by flooring manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit products and substrate conditions.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Prepare concrete substrates according to ASTM F 710. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

B. Adhesively install resilient wall base and accessories.

C. Install wall base in maximum lengths possible. Apply to walls, columns, pilasters, casework, and other permanent fixtures in rooms or areas where base is required.

END OF SECTION 09 65 13
SECTION 09 65 19 – RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY:
Provide and install underlayment board where missing as indicated on the Drawings, prepare | | float all existing floors to receive resilient tile and install resilient tile flooring required for this work | as shown on the Finish Schedule on the Drawings and includes and specified herein.

1.2 GENERAL REQUIREMENTS:
This Section shall be performed in accordance with the General Conditions, Supplementary Conditions and all Sections in Division 1 of these Specifications. These documents must be read with the other Contract Documents and Sections as a whole to complete the intent of the contract.

1.3 SUBMITTALS:
Make submittals to the Architect in accordance with the provisions of Section 013323 of these specifications.

1.4 ADDITIONAL STOCK:
Deliver to Owner 1 box for every 50 boxes or fraction thereof, of each type and color of resilient floor tile installed.

1.5 QUALITY ASSURANCE:

A. Flooring Contractor’s Qualifications:
Flooring Contractor shall be an established firm, experienced in the installation of the specified product, and shall have access to all manufacturer’s required technical, maintenance, specification and related documents.
1. The flooring contractor shall be a firm experienced in the field and recognized as such by the manufacturer and/or distributor (supplier).
2. The flooring contractor shall have completed at least three (3) projects of similar magnitude, material and complexity. Must submit three (3) reference projects.
3. Submit three (3) copies each of manufacturer’s installation and maintenance recommendations for correct jobsite conditions, applicable jobsite testing, preparation, finishing and detailing for resilient floor covering.
4. If the flooring contractor does not qualify under Item 2, a manufacturer’s trained technician may be required to be on site to supervise a pre-determined test area of installation for approval by specifier. The flooring contractor to be responsible for cost of and providing adequate lead time for scheduling manufacturer’s technician.

1.6 PROJECT CONDITIONS
Environmental Requirements/Conditions: In accordance with manufacturer’s recommendations, Areas to receive flooring should be clean, fully enclosed and weathertight with the permanent HVAC system operational and set at a minimum of 68°F (20°C) for a minimum of 7 days prior to, during, and 7 days after the installation. The flooring material should be conditioned in the same manner for at least 48 hours prior to the installation.

1.7 WARRANTY
Manufacturer’s standard five (5) year limited warranty commencing on the Date of Substantial Completion.
PART 2 - PRODUCTS

2.1 VINYL COMPOSITION FLOOR TILE

A. Products:
   1. All vinyl composition floor tile shall be of one manufacturer and batch number.

B. Color and Pattern: All vinyl composition floor tile shall be as specified on the Drawings.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement- or blended hydraulic cement-based formulation provided or approved by flooring manufacturer for applications indicated.

B. For wood subfloors where indicated on Drawings - Underlayment board: Sanded plywood, Performance Category ¼, APA A-D, Group 1, Exposure 1. Stagger panel joints relative to subfloor panels.

C. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

D. Metal Edge Strips: Extruded aluminum in maximum available lengths to minimize joints.

PART 3 - EXECUTION

3.1 INSTALLATION – VINYL COMPOSITION TILES

A. Install underlayment board to subfloor in areas missing underlayment. Nail or screw per manufacturer’s installation procedures.

B. Trowel leveling | patching compound over all areas to receive resilient tile to provide smooth surface acceptable to resilient manufacturer's standards.

C. Place units in strict compliance with the manufacturer’s recommendations as approved by the Architect.
   1. Butt units tightly to vertical surfaces, nosings, edgings and thresholds.
   2. Scribe as necessary around obstructions and to produce neat joints.
   3. Place tiles tightly laid, even, and in straight parallel lines.
   4. Extend tiles into toe spaces, door reveals, and in closets and other similar adjoining spaces.

D. Lay units from center marks established with principal walls, discounting minor offsets, so that units at opposite sides of the room are of equal width.
   1. Adjust as necessary to avoid use of cut widths less than 3” wide at room perimeters.
   2. Lay units square to the axis of the room or space unless otherwise shown on the Drawings.

E. Match units for color and pattern by using materials from cartons in the same sequence as manufactured and packaged.
F. Lay in ashlar pattern with grain in all units running the same direction, unless otherwise directed by the Architect.

G. Place edge strips tightly butted to units and secured with adhesive; provide at all unprotected edges unless otherwise shown on Drawings.

3.2 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.
   1. Remove visible adhesive and other surface blemishes using cleaning methods recommended by tile floor manufacturer.
   2. Sweep and vacuum floor after installation.
   3. Do not wash floor until after time period recommended by flooring manufacturer.
   4. Damp-mop flooring to remove black marks and soil.

3.3 SEALING:
Seal all resilient tile floors with acrylic based sealer | wax as recommended by tile manufacturer. Let cure and buff. Protect floors from traffic until project completion.

3.4 PROTECTION
Protection: Protect installed product and finish surfaces from damage during construction. Remove and legally dispose of protective covering at time of Substantial Completion.

END OF SECTION 096519
SECTION 09 68 13 – TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY:
Provide and install tile carpeting required for this work as shown on the Finish Schedule of the Drawings and specified herein.

1.2 GENERAL REQUIREMENTS:
This Section shall be performed in accordance with the General Conditions, Supplementary Conditions and all Sections in Division 1 of these Specifications. These documents must be read with the other Contract Documents and Sections as a whole to complete the intent of the contract.

1.3 SUBMITTALS:
Make submittals to the Architect in accordance with the provisions of Section 013323 of these specifications.

1.4 INDOOR AIR POLLUTANT CONTROL REQUIREMENTS:
A. All Carpet shall meet the testing and product requirements of one of the following:
   2. California Department of Public Health Standard Practice for the testing of VOCs (Specification 01350)
   3. NSF/ANSI 140 at the Gold Level
   4. Scientific Certification Systems sustainable Choice

B. All Carpet cushion installed in the building interior shall meet the requirements of the carpet and Rug Institute Green Label Program.

C. Per Table 5.504.4.1 of the 2010 California Green Building Standards Code, all carpet adhesives used on the project shall meet the requirements of the following standards:
   1. Adhesives, adhesive bonding primers adhesive primers, sealants, sealant primers and caulks shall comply with local or regional air pollution control or air quality management district rules where applicable, or SCAQMD Rule 1168 VOC limits, as shown in Tables 5.504.4.1 and 5.504.4.2 of the 2010 California Green Building Standards Code. Such products also shall comply with the Rule 1168 prohibition on the use of certain toxic compounds (chloroform, ethylene dichloride, methylene chloride, perchloroethylene and trichloroethylene)

1.5 ADDITIONAL STOCK:
Deliver to Owner carpet tiles equal to 5 percent of each type and color carpet tile installed, packaged with protective covering for storage.
PART 2 - PRODUCTS

2.1 CARPET TILE:

A. Products: The design for this work requires one type of carpeting, each of which shall be the specified materials as shown on the Drawings.

B. Primary Backing: Manufacturer's standard material.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with CRI 104.

B. Installation Method: Partial glue down; install periodic tiles with releasable, pressure-sensitive adhesive.

C. Place units in strict compliance with the manufacturer’s recommendations as approved by the Architect.
   1. Butt units tightly to vertical surfaces, nosings, edgings and thresholds.
   2. Scribe as necessary around obstructions and to produce neat joints.
   3. Place tiles tightly laid, even, and in straight parallel lines.
   4. Extend tiles into toe spaces, door reveals, and in closets and other similar adjoining spaces.

D. Lay units from center marks established with principal walls, discounting minor offsets, so that units at opposite sides of the room are of equal width.
   1. Adjust as necessary to avoid use of cut widths less than 3” wide at room perimeters.
   2. Lay units square to the axis of the room or space unless otherwise shown on the Drawings.

E. Match units for color and pattern by using materials from cartons in the same sequence as manufactured and packaged.

F. Lay in ashlar pattern with grain in all units running the same direction, unless otherwise directed by the Architect.

G. Place edge strips tightly butted to units and secured with adhesive; provide at all unprotected edges unless otherwise shown on Drawings.

END OF SECTION 09 68 13
PART 1 - GENERAL

1.1 SUMMARY:
Provide painting as shown on the Finish Schedule in the Drawings and specified herein. The type of material to be used and the number of coats to be applied are listed in the "Painting Schedule" in Part 3.00 of this Section of these Specifications. The term "paint", as used herein, includes enamels, epoxies, paints, sealers, fillers, emulsions, and other coatings, whether used as prime, intermediate, or finish coats.

1.2 GENERAL REQUIREMENTS:
This Section shall be performed in accordance with the General Conditions, Supplementary Conditions and all Sections in Division 1 of these Specifications. These documents must be read with the other Contract Documents and Sections as a whole to complete the intent of the contract.

1.3 SUBMITTALS:
Make submittals to the Architect in accordance with the provisions of Section 013323 of these specifications.

1.4 PROJECT CONDITIONS:
The General Contractor is responsible to ensure all materials used in this Section meet current California V.O.C. (volatile organic compounds/chemicals) Regulations. The Architect shall be immediately notified of all V.O.C. conflicts. Work shall not proceed until conflicts are resolved.

1.5 EXTRA STOCK:
Upon completion of this portion of the Work, deliver to the Owner an extra stock of one gallon of each color and gloss used in each coating material used, with all such extra stock tightly sealed in clearly labeled containers.

PART 2 - PRODUCTS

2.1 PAINT MATERIALS:

A. Manufacturer:
1. All paint materials selected for coating systems for each type of surface shall be the product of a single manufacturer.
2. Paint materials listed herein, unless otherwise designated in the "Painting Schedule", are the product of Kelly Moore and require no further approval as to manufacturer or catalog number.
3. Equivalent products of other major paint manufacturers may be used subject to approval by the Architect of the materials list and manufacturers' recommendations required to be submitted under Article 1.03 above. Equivalent product manufacturers must provide a manufacturers product reference guide demonstrating the equivalence of the product substituted to the one specified.

B. Compatibility:
1. All paint materials and equipment shall be compatible in use; finish coats shall be compatible with prime coats; prime coats shall be compatible with the surface to be
coated; all tools and equipment shall be compatible with the coating to be applied.

2. Thinners, when used, shall be only those thinners recommended for that purpose by the manufacturer of the material to be thinned.

C. Colors and glosses:
   All colors and glosses shall be indicated on the Painting Schedule and Finishes Schedule.

PART 3 - EXECUTION

3.1 PREPARATION OF SURFACES, GENERAL:
A. Prior to all surface preparation and painting operations, completely mask, remove or otherwise adequately protect all hardware, accessories, machined surfaces, plates, lighting fixtures, and similar items in contact with painted surfaces but not scheduled to receive paint.

B. Spot prime all exposed nails and other metals which are to be painted with emulsion paints, using a primer recommended by the manufacturer of the coating system.

C. Before applying paint or other surface treatment, thoroughly clean all surfaces involved. Schedule all cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

3.2 PREPARATION OF WOOD SURFACES:
A. Clean all wood surfaces until they are free from dirt, and all other foreign substance.

B. Unless specifically noted to be left rough, smooth all finished wood surfaces exposed to view, using the proper sandpaper. Where so required, use varying degrees of coarseness in sandpaper to produce uniformly smooth and unmarred wood surfaces.

C. Knots:
   1. On small, dry, seasoned knots, thoroughly scrape and clean the surface and apply one coat of good quality knot-sealer before application of the priming coat.
   2. On large, open, unseasoned knots, scrape off all pitch and thoroughly clean the area, followed by an application of one coat of good quality knot-sealer.
   3. Remove and treat all pitch surfaces as required for large knots.

D. Dryness:
   Unless specifically approved by the Architect, do not proceed with the painting of wood surfaces until the moisture content of the wood is 12% or less as measured by a moisture-meter approved by the Architect.

3.3 PREPARATION OF METAL SURFACES:
A. Galvanized metal:
   1. Clean all surfaces thoroughly with solvent until they are completely free from dirt, soil, and grease.
   2. Thoroughly treat the cleaned surface with phosphoric acid etch.
   3. Remove all excess etching solution and allow to dry completely before application of
B. Other metals:

1. Thoroughly clean all surfaces until they are completely free from dirt, oil, grease and old paint.
2. Allow to dry thoroughly before application of paint.

3.4 PAINT APPLICATION:

A. General:
1. Paint all surfaces, except glass, flat concrete, and similar items, not prefinished and not called out as unfinished.
2. Paint all grilles and other prefinished items where the factory prefinish is not in accordance with the Painting Schedule and color selection or where a prefinished item is not the same color as the adjacent surface. Paint to match adjacent surface.

B. Drying:
1. Allow sufficient drying time between coats.
2. Modify the period as recommended by the material manufacturer to suit adverse weather conditions.

C. Environmental conditions:
1. Comply with the manufacturer's recommendations as to environmental conditions under which the coating systems may be applied.
2. Do not apply paint in areas where dust is being generated.

D. Defects:
Sand and dust between coats to remove all defects visible to the unaided eye from a distance of five feet.

E. Color of undercoats:
Slightly vary the color of succeeding coats.

3.5 INSPECTION:

A. Do not apply additional coats until completed coat has been inspected and approved by the Architect.

B. Only inspected and approved coats of paint will be considered in determining the number of coats applied.

3.6 RE-INSTALLATION OF REMOVED ITEMS:
Following completion of painting in each space, promptly reinstall all items removed for painting, using only workmen skilled in the particular trade.

3.7 CLEANING UP:

A. During progress of the Work, do not allow the accumulation of empty containers or other excess items except in areas specifically set aside for that purpose. Prevent accidental
spilling of paint materials and, in event of such spill, immediately remove all spilled material and the waste or other equipment used to clean up the spill, and wash the surfaces to their original undamaged condition, all at no additional cost to the Owner.

B. Upon completion of this portion of the Work visually inspect all surfaces and remove all paint and traces of paint from surfaces not scheduled to be painted.

3.8 PAINTING SCHEDULE:

Apply the following finishes to the areas designated:

Type 1: **Interior Wood Paint – Trims and Doors (Semi-Gloss)**
- First Coat: Pittsburg Seal Grip Latex Enamel Undercoater
- Second Coat: Pittsburg Pure Performance Minimal Odor 100% Acrylic Interior Latex Semi-Gloss
- Third Coat: Pittsburg Pure Performance Minimal Odor 100% Acrylic Interior Latex Semi-Gloss

Type 2: **Exterior Metal (Ferrous)**
- First Coat: Pittsburg Seal Grip Acrylic Primer
- Second Coat: Pittsburg Sun Proof 100% Acrylic Latex House Paint Semi-Gloss
- Third Coat: Pittsburg Sun Proof 100% Acrylic Latex House Paint Semi-Gloss

Type 3: **Exterior Metal (Galvanized)**
- First Coat: Jasco Prep-N-Prime Pretreatment
- Second Coat: Pittsburg Seal Grip Acrylic Primer
- Third Coat: Pittsburg Sun Proof 100% Acrylic Latex House Paint Semi-Gloss
- Fourth Coat: Pittsburg Sun Proof 100% Acrylic Latex House Paint Semi-Gloss

Type 4: **Interior Drywall (Semi-Gloss)**
- First Coat: Pittsburg Seal Grip Acrylic Primer
- Second Coat: Pittsburg Pure Performance Minimal Odor 100% Acrylic Interior Latex Semi-Gloss
- Third Coat: Pittsburg Pure Performance Minimal Odor 100% Acrylic Interior Latex Semi-Gloss

Type 5: **Interior Drywall (Eggshell)**
- First Coat: Pittsburg Seal Grip Acrylic Primer
- Second Coat: Pittsburg Pure Performance Minimal Odor 100% Acrylic Interior Latex Eggshell
- Third Coat: Pittsburg Pure Performance Minimal Odor 100% Acrylic Interior Latex Eggshell

Type 6: **Exterior Wood Paint (Wood, Trim, Doors – Semi-Gloss)**
- First Coat: Pittsburg Seal Grip Acrylic Primer
- Second Coat: Pittsburg Sun Proof 100% Acrylic Latex House Paint Satin
- Third Coat: Pittsburg Sun Proof 100% Acrylic Latex House Paint Satin

Type 7: **Exterior Stucco**
- Previously painted surfaces: spot prime bare or patched areas
SJC Environmental Health Building T.I.
Stockton, California

First Coat: Pittsburg Seal Grip Acrylic Primer
Second Coat: Pittsburg Pittflex 4-110 100% Acrylic Latex Elastomeric
Third Coat: Pittsburg Pittflex 4-110 100% Acrylic Latex Elastomeric

END OF SECTION 099100
SECTION 10 14 00 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY:
Provide and install all signage as shown on the Drawings and as specified herein.

1.2 GENERAL REQUIREMENTS:
This Section shall be performed in accordance with the General Conditions, Supplementary Conditions and all Sections in Division 1 of these Specifications. These documents must be read with the other Contract Documents and Sections as a whole to complete the intent of the contract.

1.3 SUBMITTALS:
Make submittals to the Architect in accordance with the provisions of Section 013323 of these specifications.

1.4 REGULATORY REQUIREMENTS:
Comply with applicable provisions in the State of California Building Code (CBC).

1.5 ELECTRICAL COMPONENTS, DEVICES, AND ACCESSORIES:
Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Castings: Alloy recommended by sign manufacturer for casting process used and for use and finish indicated.

B. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).

C. Plastic Laminate: High-pressure laminate engraving stock with face and core in contrasting colors.

D. Applied Vinyl: Die-cut characters from vinyl film of nominal thickness of 3 mils (0.076 mm) with pressure-sensitive adhesive backing, suitable for exterior applications.

2.2 SIGNS

A. Exterior Signage Dimensional Characters: Cast-aluminum characters, Helvetica style.
   1. Finish and Color: Clear anodized finish with satin finish face. Size per drawings.

B. Interior Panel Signs: Matte-finished opaque acrylic with adhesively applied vinyl film copy with square-cut corners.
   1. Finishes and Colors: As selected from manufacturer's full range.
   2. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch (0.8 mm) above surface with contrasting colors.
   3. Provide signs for all rooms as indicated on the Drawings.
      a. Restroom Identification Signs:

b. Room Occupancy Signs:
Colored plexiglas with white contrasting lettering meeting State of California standards. Color to be selected by Architect. Sign size and wording to be approved by local Fire Department prior to fabrication.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate signs where indicated or directed by Architect. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.

B. Wall-Mounted Signs:
1. Two-Face Tape: Mount signs to smooth, nonporous surfaces, other than vinyl.
2. Silicone-Adhesive Mounting: Attach signs to irregular, porous, or vinyl-covered surfaces.
3. Mechanical Fasteners: Use non-removable mechanical fasteners placed through predrilled holes.

C. Dimensional Characters: Mount characters with backs in contact with wall surface.

END OF SECTION 10 14 00
SECTION 10 28 00 – TOILET ACCESSORIES

PART 1 - GENERAL

1.1  SUMMARY:
Provide and Install toilet accessories as shown on the Toilet Accessories Schedule on the Drawings and specified herein.

1.2  GENERAL REQUIREMENTS:
This Section shall be performed in accordance with the General Conditions, Supplementary Conditions and all Sections in Division 1 of these Specifications. These documents must be read with the other Contract Documents and Sections as a whole to complete the intent of the contract.

1.3  SUBMITTALS:
Make submittals to the Architect in accordance with the provisions of Section 013323 of these specifications.

PART 2 - PRODUCTS

2.1  MATERIALS:
   A. Stainless Steel:  ASTM A 666, Type 304, No. 4 finish (satin), 0.0312-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.
   B. Brass:  ASTM B 19, ASTM B 16 (ASTM B 16M), or ASTM B 30.
   C. Aluminum:  ASTM B 221 (ASTM B 221M), Alloy 6063-T6 or 6463-T6.
   D. Sheet Steel:  ASTM A 1008/A 1008M, 0.0359-inch (0.9-mm) minimum nominal thickness.
   E. Galvanized-Steel Sheet:  ASTM A 653/A 653M, G60 (Z180).
   F. Chromium Plating:  ASTM B 456, Service Condition Number SC 2 (moderate service).
   G. Tempered Glass:  ASTM C 1048, Kind FT (fully tempered).
   H. Mirrors:  ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
   J. Fasteners:  Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.
   K. Keys:  Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Architect.

2.2  TOILET ACCESSORIES:
All toilet accessories shall be as scheduled on the Drawings.
2.3 FASTENINGS:
All toilet accessories shall be complete with all required fastenings for installation on the wall surface and structure to be mounted to, and all fastenings shall harmonize with the item being fastened.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install all toilet accessories where indicated on the Drawings and in full accordance with the manufacturer's recommendations, anchoring all components fully in place for long life under hard use.

B. Install accessories using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
   1. Install grab bars to withstand a downward load of at least 250 lbf (1112 N), when tested according to method in ASTM F 446.

C. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items. Remove temporary labels and protective coatings.

END OF SECTION 102800
SECTION 10 44 13 – FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY:
Provide and install hand portable fire extinguishers as shown on the Drawings and specified herein.

1.2 GENERAL REQUIREMENTS:
This Section shall be performed in accordance with the General Conditions, Supplementary Conditions and all Sections in Division 1 of these Specifications. These documents must be read with the other Contract Documents and Sections as a whole to complete the intent of the contract.

1.3 SUBMITTALS:
A. Make submittals to the Architect in accordance with the provisions of Section 013323 of these specifications.
B. Provide literature and/or drawings of fire extinguisher cabinets including lettering, colors and finish.

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHERS:
All fire extinguishers shall have a minimum UL rating of 2A:10BC and shall be Potter-Roemer Inc., Model #3005, or an equal approved in advance by the Architect, with #3903 wall-mounted bracket.

PART 3 - EXECUTION

3.1 INSTALLATION:
Install the firefighting devices where indicated on the Drawings and in full accordance with all pertinent regulations and the manufacturer's recommendations, setting the top of the cabinet as shown on the Drawings, anchoring all components firmly in place for long life under hard use.

3.2 SERVICE:
Determine the approximate completion date of the Work and then inspect, charge, and tag the fire extinguishers at a date not more than ten days before actual completion date of the work.

END OF SECTION 10 44 13
SECTION 12 21 16 – VERTICAL LOUVER BLINDS

PART 1 - GENERAL

1.1 SUMMARY:
Provide and install vertical louver blinds as shown on the Drawings and specified herein.

1.2 GENERAL REQUIREMENTS:
This Section shall be performed in accordance with the General Conditions, Supplementary Conditions and all Sections in Division 1 of these Specifications. These documents must be read with the other Contract Documents and Sections as a whole to complete the intent of the contract.

1.3 SUBMITTALS:
Make submittals to the Architect in accordance with the provisions of Section 013323 of these specifications.

1.4 SECTION REQUIREMENTS:
A. Provide blinds passing flame-resistance testing according to NFPA 701.
B. Product Standard: Unless otherwise indicated, comply with WCMA A 100.1.

PART 2 - PRODUCTS

2.1 VERTICAL LOUVER BLIND
A. Products:
   1. Louverdrape, Levelor Lorentzen, Hunter Douglas, or equal
B. Rail System: Headrail.
   1. Rails: Manufacturer’s standard; long edges returned or rolled; channel-shaped, enclosing operating mechanisms.
C. PVC Louver Vanes: Extruded PVC (vinyl), UV-stabilized and integrally colored.
D. Vane Profile: Crowned.
E. Nominal Vane Width: 2 inches (50 mm).
F. Vane Direction Control: Manual with wand.
G. Traversing Control: Manual with wand.
H. Draw and Stack Position: Center split, controls right.
I. Valance: One vane insert.
J. Mounting: Window head recess.
K. Colors, Textures, and Patterns: As indicated on Finish schedule on the Drawings.

L. Fabrication:
   1. Fabricate concealed components from non-corrodible or corrosion-resistant-coated materials.
   2. Provide directional and traversing mechanisms with permanently lubricated moving parts.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install blinds level, plumb, and located not closer than 1 inch to interior face of glass.
   1. Jamb Mounted: Install headrail flush with face of opening jamb and head.

B. Adjust vertical louver blinds to operate smoothly and easily throughout entire operational range.

END OF SECTION 122116
SECTION 22 00 50 - BASIC PLUMBING MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Electric motors.
B. Motor starters.
C. Valves and fittings.
D. Strainers.
E. Valve boxes.
F. Gauges.
G. Thermometers.
H. Access Doors.
I. Expansion loops.
J. Flexible joints.
K. Insulation.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. This Section is a part of each Division 22 Section.

1.3 ADDITIONAL REQUIREMENTS

A. Furnish and install any incidental work not shown or specified which is necessary to provide a complete and workable system.
B. Make all temporary connections required to maintain services during the course of this Contract without additional cost to the Owner. Notify the Owner seven days in advance before disturbing any service.

1.4 REFERENCED STANDARDS

A. Where material or equipment is specified to conform to referenced standards, it shall be assumed that the most recent edition of the standard in effect at the time of bid shall be used.
1. CSA – Canadian Standards Association International
2. ANSI - American National Standards Institute
3. ASTM - American Society for Testing and Materials
4. CCR - California Code of Regulations
   a. Title 8 - Division of Industrial Safety, Subchapter 7; General Industry Safety Orders, Articles 31 through 36
5. NCPWB - National Certified Pipe Welding Bureau
6. CEC - California Electrical Code
7. NEMA - National Electrical Manufacturers' Association
8. NFPA - National Fire Protection Association
9. OSHA - Occupational Safety and Health Act
10. UL - Underwriters' Laboratories, Inc.

1.5 DRAWINGS

A. Examine Contract Documents prior to bidding of work and report discrepancies in writing to Architect.

B. Contractor shall visit Project site and examine existing conditions in order to become familiar with Project scope. Verify dimensions shown on Drawings at Project site. Bring discrepancies to the attention of Architect. Failure to examine Project site shall not constitute basis for claims for additional work because of lack of knowledge or location of hidden conditions that affect Project scope.

C. Drawings showing location of equipment and materials are diagrammatic and job conditions will not always permit installation in location shown. The Plumbing Drawings show general arrangement of equipment and materials, etc., and shall be followed as closely as existing conditions, actual building construction, and work of other trades permit.
   1. Architectural and Structural Drawings shall be considered part of the Work. These Drawings furnish Contractor with information relating to design and construction of the Project. Architectural Drawings take precedence over Plumbing Drawings.
   2. Because of the small scale of Plumbing Drawings, not all offsets, fittings, and accessories required are shown. Investigate structural and finish conditions affecting the Work and arrange Work accordingly. Provide offsets, fittings, and accessories required to meet conditions. Inform Architect immediately when job conditions do not permit installation of equipment and materials in the locations shown. Obtain the Architects approval prior to relocation of equipment and materials.
   3. Relocate equipment and materials installed without prior approval of the Architect. Remove and relocate equipment and materials at Contactors’ expense upon Architects’ direction.
   4. 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.

D. Execute work mentioned in Specifications and not shown on Drawings, or vice versa, the same as if specifically mentioned or shown in both.
1.6 REQUIREMENTS OF REGULATORY AGENCIES

   A. The publications listed below form part of this specification; comply with provisions of 
      these publications except as otherwise shown or specified.
      1. California Electrical Code, 2010
      2. National Fire Protection Association
      3. CAL-OSHA
      4. California Code of Regulations, Title 24
      5. Occupational Safety and Health Administration
      6. California State Fire Marshal, Title 19 CCR
      7. California Building Code, 2010
      9. California Fire Code, 2010
      10. California Mechanical Code, 2010
      11. California Plumbing Code, 2010
      12. California Green Building Standards Code, 2010 (For projects permitted after 
          Jan. 1, 2011)
      14. Other applicable state laws

   B. Nothing in Drawings or specifications shall be construed to permit work not conforming to 
      these codes, or to requirements of authorities having jurisdiction. It is not the intent of 
      Drawings or specifications to repeat requirements of codes except where necessary for 
      clarity.

   C. Comply with State of California 2010 Energy Code for all systems, equipment, and 
      construction.

   D. When Contract Documents differ from governing codes, furnish and install larger size or 
      higher standards called for without extra charge.

   E. No material installed as part of this Work shall contain asbestos.

1.7 FEES AND PERMITS

   A. Arrange for utility connections and pay charges incurred, including excess service 
      charges.

   B. Prior to the start of construction, contact local gas company representative and 
      coordinate location of gas meter and piping. In addition, coordinate time required for 
      installation, in order to avoid delay to the Project.

1.8 UTILITY CONNECTIONS

   A. Bear the cost of construction related to utility services, from point of connection to utility 
      services shown on Contract Documents. This includes piping, excavation, backfill, 
      meters, boxes, check valves, backflow prevention devices, general service valves, 
      concrete work, and the like, whether or not Work is performed by Contractor, local 
      water/sanitation district, public utility, other governmental agencies or agencies’ assigns.

1.9 FRAMING, CUTTING AND PATCHING
A. Special framing, recesses, chases and backing for Work of this Section, unless otherwise specified, are covered under other Specification Sections.

B. Contractor is responsible for placement of pipe sleeves, hangers, inserts, supports, and location of openings for the Work.

C. Cutting, patching, and repairing of existing construction to permit installation of equipment, and materials is the responsibility of Contractor. Repair or replace damage to existing work with skilled mechanics for each trade.

D. Cut existing concrete construction with a concrete saw. Do not utilize pneumatic devices.

E. Core openings through existing construction for passage of new piping and conduits. Cut holes of minimum diameter to suit size of pipe and associated insulation installed. Coordinate with building structure, and obtain Structural Engineer's approval prior to coring through existing construction.

1.10 SUBMITTALS

A. Provide submittal of materials proposed for use as part of this Project. Product names in Specifications and on Drawings are used as standards of quality. Furnish standard items on specified equipment at no extra cost to the Contract regardless of disposition of submittal data. Other materials or methods shall not be used unless approved in writing by Architect. Architect's review will be required even though "or equal" or synonymous terms are used. Refer to Division 1 for complete instructions.

1. Partial or incomplete submittals will not be considered.
2. Quantities are Contractor's responsibility and will not be reviewed.
3. Provide materials of the same brand or manufacturer for each class of equipment or material.
4. Identify each item by manufacturer, brand, trade name, number, size, rating, or other data necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.
5. Identify each submittal item by reference to items' Specification Section number and paragraph, by Drawing and detail number, and by unit tag number.
6. Organize submittals in same sequence as in Specification Sections.
7. Show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance, access requirements for installation and maintenance, physical size, mechanical characteristics, foundation and support details, and weight.
   a. Submit Shop Drawings, performance curves, and other pertinent data, showing size and capacity of proposed materials.
   b. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of Contract Documents.
   c. Drawings shall be drawn to scale and dimensioned (except schematic diagrams). Drawings may be prepared by vendor but must be submitted as instruments of Contractor, thoroughly checked and signed by Contractor before submission to Architect for review.
   d. Catalog cuts and published material may be included with supplemental scaled drawings.
B. Review of submittals will be only for general conformance with design concept and
genral compliance with information given in Contract Documents. Review will not
include quantities, dimensions, weights or gauges, fabrication processes, construction
methods, coordination with work of other trades, or construction safety precautions,
which are sole responsibility of Contractor. Review of a component of an assembly does
not indicate acceptance of an assembly. Deviations from Contract Documents not clearly
identified by Contractor are Contractor’s responsibility and will not be reviewed by
Architect.

C. Within reasonable time after award of contract and in ample time to avoid delay of
construction, submit to Architect Shop Drawings or submittals on all items of equipment
and materials provided. Provide submittal in at least seven copies and in complete
package.
1. Shop Drawings and submittals shall include Specification Section, Paragraph
number, and Drawing unit symbol or detail number for reference. Organize
submittals into booklets for each Specification section and submit in loose-leaf
binders with index. Deviations from the Contract Documents shall be
prominently displayed in the front of the submittal package and referenced to the
applicable Contract requirement.

D. Provide details for design and installation of seismic bracing of ductwork systems, piping
systems, plumbing and hydronic systems, including in-line equipment and mechanical
equipment. Indicate location of each seismic brace.

E. Furnish to the Project Inspector complete installation instructions on material and
equipment before starting installation.

F. Product Data for California Green Building Standards Code Compliance: For adhesives
and sealants, including primers, documentation of compliance including printed statement
of VOC content and chemical components.

G. Pipe, pipe or plumbing fittings, fixtures, solder and flux installed in a system providing
water for human consumption shall comply with lead free requirements of the California
Health and Safety Code Section 11 68 75. Provide submittal information for products
third-party certified by an approved laboratory as complying with California Health and
Safety Code Section 11 68 75.

1.11 SUBSTITUTIONS

A. Refer to Division 1 for complete instructions. Requirements given below are in addition to
or are intended to amplify Division 1 requirements. In the case of conflict between
requirements given herein and those of Division 1, Division 1 requirements shall apply.

B. It is the responsibility of Contractor to assume costs incurred because of additional work
and or changes required to incorporate proposed substitute into the Project. Refer to
Division 1 for complete instructions.

C. Substitutions will be interpreted to be all manufacturers other than those specifically listed
in the Contract Documents by brand name, model or catalog number.
D. Only one request for substitution will be considered for each item of equipment or material.

E. Substitution requests shall include the following:
   1. Reason for substitution request.
   2. Complete submittal information as described herein; see “Submittals.”
   3. Coordinated scale layout drawings depicting position of substituted equipment in relation to other work, with required clearances for operation, maintenance and replacement.
   4. List optional features required for substituted equipment to meet functional requirements of the system as indicated in Contract Documents.
   5. Explanation of impact on connected utilities.
   6. Explanation of impact on structural supports.

F. Installation of reviewed substitution is the Contractors’ responsibility. Any mechanical, electrical, structural, or other changes required for installation of reviewed substituted equipment or material must be made by the Contractor without additional cost to the Owner. Review by the Architect of the substituted equipment or material, including dimensioned Drawings will not waive these requirements.

G. Contractor may be required to compensate the Architect for costs related to substituted equipment or material.

1.12 OPERATION AND MAINTENANCE MANUAL

A. Instruct Owner’s authorized representatives in operation, adjustment, and maintenance of mechanical equipment and systems. Provide three copies of certificate signed by Owner’s representatives confirming that instruction is completed.

B. Furnish three complete sets of Operation and Maintenance Manual bound in hardboard binder, and one compact disc containing complete Operation and Maintenance Manual in searchable PDF format. Provide Table of Contents. Provide index tabs for each piece of equipment in binder and disc. Start compiling data upon approval of submittals.
   1. Sets shall incorporate the following:
      a. Service telephone number, address and contact person for each category of equipment or system.
      b. Complete operating instructions for each item of plumbing equipment.
      c. Copies of guarantees/warrantees for each item of equipment or systems.
      d. Test data and system balancing reports.
      e. Typewritten maintenance instructions for each item of equipment listing lubricants to be used, frequency of lubrication, inspections required, adjustment, etc.
      f. Manufacturers’ bulletins with parts numbers, instructions, etc., for each item of equipment.
      g. Control diagrams and literature.
      h. A complete list or schedule of all scheduled valves giving the number of the valve, location and the rooms or area controlled by the valve. Identify each valve with a permanently attached metal tag stamped with number to match schedule. Post list in frame under plastic on wall in mechanical room or where directed by Architect.
i. Check test and start reports for each piece of plumbing equipment provided as part of the Work.

j. Commissioning and Preliminary Operation Tests required as part of the Work.

C. Post service telephone numbers and/or addresses in an appropriate place as designated by the Architect.

1.13 SITE CONDITIONS

A. Information on Drawings relative to existing conditions is approximate. Deviations from Drawings necessary during progress of construction to conform to actual conditions shall be approved by the Architect and shall be made without additional cost to the Owner. The Contractor shall be held responsible for damage caused to existing services. Promptly notify the Architect if services are found which are not shown on Drawings.

1.14 EXISTING MATERIALS

A. Remove existing equipment, piping, wiring, construction, etc., which interferes with Work of this Contract. Promptly return to service upon completion of work in the area. Replace items damaged by Contractor with new material to match existing.

B. Removed materials which will not be re-installed and which are not claimed by Owner shall become property of Contractor and shall be removed from Project site. Consult Owner before removing any material from Project site. Carefully remove materials claimed by Owner to prevent damage and deliver to Owner-designated storage location.

C. Existing piping and wiring not reused and are concealed in building construction may be abandoned in place and all ends shall be capped or plugged. Remove unused piping and wiring exposed in Equipment Rooms or occupied spaces. Material shall be removed from Project premises. Disconnect power, water, gas, pump or any other active energy source from piping or electrical service prior to abandoning in place.

D. Existing piping, ductwork, and equipment modified or altered as part of this Work shall comply with the most recent applicable code requirements.

1.15 WARRANTY

A. Refer to Division 1 for warranty requirements, including effective date of warranty. Refer to specific items of equipment specified herein for warranty duration if different from that specified in Division 1.

B. Repair or replace defective work, material, or part that appears within the warranty period, including damage caused by leaks.

C. On failure to comply with the above warranty within a reasonable length of time after notification is given, the Architect/Owner shall have the repairs made at the Contractor's expense.

1.16 RECORD DRAWINGS
A. Refer to Division 1, Record Documents, for requirements governing Work specified herein.

B. Upon completion of the work and as precedent to final payment, deliver to Architect the following:
   1. Originals of drawings showing the Work exactly as installed.
   2. One complete set of reproducible drawings showing the Work exactly as installed.
   3. One compact disc with complete set of drawings in PDF format showing the Work exactly as installed.

C. Provide Contractor’s signature, verifying accuracy of record drawings.

D. Obtain the signature of the Project Inspector for all record drawings.

1.17 DELIVERY AND STORAGE

A. Protect equipment, ductwork and piping delivered to Project site from weather, humidity and temperature variations, dirt, dust and other contaminants.

1.18 COORDINATION

A. General:
   1. Coordinate Work in this Section with trades covered in other Specifications Sections to provide a complete, operable and sanitary installation of the highest quality workmanship.

B. Electrical Coordination:
   1. Refer to the Electrical Drawings and Specifications, Division 26, for service voltage and power feed wiring for equipment specified under this section. Contractor has full responsibility for the following items of work:
      a. Review the Electrical Drawings and Division 26 Specifications to verify that electrical services provided are adequate and compatible with equipment requirements.
      b. If additional electrical services are required above that indicated on Electrical Drawings and in Division 26, such as more control interlock conductors, larger feeder, or separate 120 volt control power source, include cost to furnish and install additional electrical services as part of the bid.
      c. Prior to proceeding with installation of additional electrical work, submit detailed drawings indicating exact scope of additional electrical work.

C. Mechanical Coordination:
   1. Arrange for pipe spaces, chases, slots and openings in building structure during progress of construction, to accommodate mechanical system installation.
   3. Coordinate requirements for access panels and doors for mechanical items requiring access where concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section “Access Doors and Frames.”
PART 2 - PRODUCTS

2.1 GENERAL

A. Materials or equipment of the same type shall be of the same brand wherever possible. All materials shall be new and in first class condition.

B. All sizes, capacities, and efficiency ratings shown are minimum, except that gas capacity is maximum available.

C. Refer to Division 22 10 00 and 23 80 00 for specific system piping materials.

2.2 ELECTRIC MOTORS

A. U.S. Motors, Century Electric, General Electric, Lincoln, Gould or equal. The minimum efficiencies shall be as defined by IEEE 112 Test Method B and NEMA MG1. Provide NEMA 3R enclosure where exposed to outdoors.

2.3 MOTOR STARTERS

A. Square D, Allen Bradley, or equal, in NEMA Type 1 enclosure, unless otherwise specified or required. Minimum starter size shall be Size 1. Provide NEMA 3R enclosure where exposed to outdoors.

B. Where three phase motors are provided for two-speed operation, provide two speed motor starters.
   1. All three-phase starters shall have the following:
      a. Provide magnetic motor starters for all equipment provided under the Mechanical Work. Starters shall be non-combination type. Provide part winding or reduced voltage start motors where shown or as hereinafter specified. Minimum size starter shall be Size 1.
      b. Cover mounted hand-off-automatic switch. Starters installed exposed in occupied spaces shall have key operated HOA switch.
      c. Three ambient compensated thermal overload.
      d. Fused control transformer (for 120 or 24 volt service).
      e. Pilot lights, integral with the starters. Starters located outdoors shall be in NEMA IIIIR enclosures.

2.4 VALVES AND FITTINGS FOR POTABLE WATER SYSTEMS

A. General:
   1. Provide valves and fittings conforming to lead-free requirements of California Health and Safety Code Section 11 68 75.
   2. Provide valves listed to NSF-61.

B. Gate Valves:
   1. General: Furnish valves in copper lines with adapters to suit valve/line requirements.
   2. 1-1/2 inches and smaller: Minimum 200 psi CWP, bronze body, threaded bonnet, rising or non-rising stem, solid wedge, threaded or solder ends,
conforming to MSS SP-80. Milwaukee UP148, UP149, Nibco T-113-LF, S-113-LF, or equal.
3. J2 inches through 3 inches: Minimum 200 psi CWP, bronze body, threaded bonnet, non-rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Nibco T-113-LF, S-113-LF, or equal.
4. Main distribution gate valves underground outside building above 1-1/2 inches: Use underground gate valves as specified for non-potable water systems.

C. Ball Valves:
1. 2 inches and smaller: 600 psi CWP, cast bronze or brass body, full port, two piece, threaded ends, and reinforced PTFE seal, conforming to MSS SP-110. Nibco T-685-80-LF, Milwaukee UPBA400, Apollo 77C-LF10, Kitz 868, or equal.
2. 2-1/2 inches: Apollo 77C-LF10, or equal.

D. Swing Check Valves:
1. Minimum 200 psi CWP, bronze or brass body, suitable for regrinding, threaded ends, conforming to MSS SP-80. Milwaukee UP509, Nibco T-413LF, Kitz 822T, or equal.

E. Butterfly Valves:
1. General: Tight closing, full lug type, with resilient seat suitable for minimum working pressure of 200 psig, conforming to MSS SP-67. Bi-direction dead end service with downstream flange removed.
2. Provide valves with the following:
   a. Seats: suitable for 40 degrees F for cold water service and 250 degrees F for hot water service. Seats shall cover inside surface of body and extend over body ends.
   b. Bodies: ductile iron or cast iron.
   c. Discs: Bronze or stainless steel.
   d. Stems or Shafts: Stainless steel. Install valves with stems horizontal.
   e. Control Handles: Suitable for locking in any position or with 10 degree or 15 degree notched throttling plates to hold valve in selected position. Provide extended necks to compensate for insulation thickness. Provide gear operator for valves 5 inches and larger.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   a. 2 through 12 inches: Watts Regulator Co., model DBF-03.

F. Silent Check Valves (for use on pump discharge):
1. General: Provide spring loaded check valves at pump discharge of all pumps.
   a. 2 inches and smaller: Minimum 300 psi CWP, bronze body, Apollo 61LF, Milwaukee UP548-T, or equal.
   b. 2-1/2 inches and larger: Class 250, cast iron body, suitable for regrinding, Mueller 103MAP, or equal.

G. Calibrated Balancing Valves:
1. General: Calibrated orifice ball type rated for 400 psig maximum operating pressure and 250 degrees F. maximum operating pressure.
   b. Ball: 304 Stainless Steel.
c. Seat: Glass and Carbon filled TFE.
d. End Connections: Threaded.
e. Pressure Gage connections: Integral capped readout valves with internal check valves and drain port, for use with portable pressure differential meter.
f. Handle Style: Dial, with memory stops to retain set position.

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
a. 1 inch and smaller: Bell & Gossett model CB, “LF” series.

2.5 VALVES AND FITTINGS FOR NON-POTABLE WATER, COMPRESSED AIR, AND GAS SYSTEMS

A. Gate Valves:
1. 2-1/2 inches and smaller: Class 150, bronze body, union bonnet, rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Hammond IB641, IB648, Nibco T-134, S-134, Milwaukee 1151, 1169, or equal.
2. 3 inches and larger: Class 125, iron body, bronze mounted, bolted bonnet, non-rising stem, solid wedge, flanged ends, conforming to MSS SP-70. Hammond IR-1138, Nibco F619, Milwaukee F2882A, Stockham G-612, or equal.
3. Underground valves 2 inches thru 12 inches: 250 psi, iron body, Non-rising stem, bolted bonnet, resilient wedge valves, conforming to AWWA C509, equipped with operating nuts, Mueller Series 2360, Nibco F-619-RW-SON, or equal.
   a. Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.
   b. Furnish and deliver to Owner one wrench of each size required for operating underground valves.

B. Ball Valves:
1. 2 inches and smaller: 600 psi CWP, 150 psi SWP, cast bronze body, full port, two piece, threaded ends, and reinforced PTFE seal, conforming to MSS SP-110. Nibco T585-70, Milwaukee BA-400, Stockham T-285, or equal.
2. 2-1/2 inches and larger: Class 150, carbon steel body, full port, two piece, stainless steel vented ball, flanged ends, and reinforced PTFE seal, conforming to MSS SP-72. Nibco F-515-CS-F-66-FS, Milwaukee F20-CS-15-F-02-GO-VB, or equal.

C. Swing Check Valves: Class 125 or 150, bronze body, suitable for regrinding, threaded ends, conforming to MSS SP-80. Stockham B-321, Milwaukee 509, Nibco T-433, or equal.

D. Butterfly Valves:
1. General: Tight closing, full lug type, with resilient seat suitable for minimum working pressure of 200 psig, conforming to MSS SP-67. Bi-direction dead end service with down stream flange removed.
2. Provide valves with the following:
a. Seats: Suitable for 40 degrees F for cold water service and 250 degrees F for hot water service. Seats shall cover inside surface of body and extend over body ends.
b. Bodies: Ductile iron or cast iron.
c. Discs: Bronze or stainless steel.
d. Stems or Shafts: Stainless steel.
e. Control Handles: Suitable for locking in any position or with 10 degree or 15 degree notched throttling plates to hold valve in selected position.
   Provide extended necks to compensate for insulation thickness. Provide gear operator for valves 5 inches and larger.

3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   a. 2 through 12 inches: Milwaukee Valve, CL series, Nibco, Inc., Model LD2000-3, or equal.

E. Silent Check Valves (for use on pump discharge):
   1. General: Provide spring loaded check valves at pump discharge of all pumps.
   2. 2 inches and smaller: 250 psi CWP, bronze body, Nibco Model T-480, Milwaukee 548-T, or equal.
   3. 2-1/2 inches and larger: Class 250, cast iron body, wafer style, suitable for regrinding. Nibco Model F960, Milwaukee 1400, Mueller 103MAP, or equal.

F. Calibrated Balance Valves (Symbol CBV): Provide globe style valves foil precision regulation and control rated 175 psi for sizes 2-1/2 inches through 12 inches and rated 240 psi for bronze sizes 2 inches and below. Each valve shall have two metering/test ports with internal check valves and protective caps. All valves must be equipped with visual position readout and concealed memory stops for repeatable regulation and control.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
      a. Bell & Gossett Circuit Setter Plus
      b. Armstrong CBV
      c. Flow Design Inc. Accusetter
      d. Tour & Andersson
      e. Circuit Sensor with butterfly valve above 3 inches.
      f. Illinois Series 5000 through 2 inches.

G. Flow Control Valve: Automatic pressure compensating flow control valves shall be Griswold, Flow Design, Inc., or equal.

H. Building Gas Shut-Off Valve:
   1. 2 inches and smaller: Provide 175 psi SWP ball valve, CSA listed, full port, lockwing type, with AGA painted grey finish. Jomar 175-LWN, or equal.
   2. Above 2 inches: Provide ReSun D-126, Key Port, or equal, lubricated plug cock, CSA listed, rectangular port, full pipe area, 125 psi SWP, flanged ends. Provide T-Handle socket wrench and adapter fittings as required for operation of valves. Provide one package of spare lubricant sticks, sizes as required for valve sizes. Lubricant shall be the product recommended by valve manufacturer for use with type of gas conveyed by the piping system.
BASIC PLUMBING MATERIALS AND METHODS

3. Provide valves same size as upstream piping. Make any reduction in size of gas piping downstream of shutoff valves.

I. Gas Shut-off Valve Above Grade:
1. 2 inches and smaller: Provide Milwaukee BB2-100, Jomar T-100NE, or equal, ball valve, CSA listed, full port, with tee handle.
2. Above 2 inches: Provide ReSun D-126, Key Port, or equal, CSA listed, rectangular port, full pipe area, 125 psi SWP, flanged ends. Provide T-Handle socket wrench and adapter fittings as required for operation of valves. Provide one package of spare lubricant sticks, sizes as required for valve sizes. Lubricant shall be the product recommended by valve manufacturer for use with type of gas conveyed by the piping system.

J. For Gas Service Below Grade:
1. Lubricated plug cocks: ReSun Model D-126, Key Port, or equal, lubricated plug cock, CSA listed, rectangular port, full pipe area, 125 psi SWP, flanged ends. Provide extended lubrication stem, arranged to allow for lubrication of the valve from grade. The extension must be constructed to allow for lubrication of the valve and for operation of the valve from grade. Provide T-Handle socket wrench and adapter fittings as required for operation of valves. Provide one package of spare lubricant sticks, sizes as required for valve sizes. Lubricant shall be the product recommended by valve manufacturer for use with type of gas conveyed by the piping system.
   a. Provide flanged ends on valves installed below grade. Connect to polyethylene piping with flanges and stainless steel bolts.
   b. Anchor each valve flange to valve box with welded angle iron, or provide vertical stiff leg, minimum 18 inches into earth.
   c. Provide Central Double O Seal Transition Fittings, or equal, flanged style for connection between valve and piping system.
   d. Wrap valve, flanges and exposed pipe with Pabco, or equal tape wrap, installed in accordance with requirements listed under “Pipe Protection”.
2. Molded polyethylene body ball valve: Nordstrom Valves - Polyvalve II for sizes 1-1/4 inches to 2 inches, and Polyvalve for sizes 2 inches and larger, or equal. Valves 1 inch and smaller shall be listed lubricated plug cocks, with transition fittings.
   a. Provide stub ends to match SDR of the piping, arranged for butt fusion welding. Provide valve body material to suit the adjacent piping system.
   b. Provide wrench to suit the valve operator.

K. Seismic Gas Shut-Off Valve: Pacific Seismic Products, Inc., California model, or equal, high pressure style.

L. Quick Coupling Valve:
1. Provide quick coupling valves, heavy duty brass construction with yellow thermoplastic rubber cover, stainless steel internal valve spring, one piece body.

2.6 JOINING MATERIALS

A. Refer to Division 22 and 23 piping sections for special joining materials not listed below.
B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
   1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated
      a. Full-Face Type: For flat-face, Class 125, cast iron and cast bronze flanges.
      b. Narrow-Face Type: For raised-face, Class 250, cast iron and steel flanges.
   2. AWWA C111, rubber, flat face, 1/8-inch (3.2mm) thick, unless otherwise indicated; and full-face or ring type, unless other indicated.
   3. Flange Bolts and Nuts: AWWA C111, carbon steel, unless otherwise indicated.
   4. Plastic, Pipe-Flange Gasket, Bolts and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, Grade 5A, lead free alloys. Sil-Fos 15, or equal. Include water-flushable flux according to ASTM B813.

D. Brazing Filler Metals: AWS A5.8, BCup-3 Series, copper-phosphorus unless otherwise indicated.

E. Welding Filler Metals: Comply with ASME B31.1 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

F. Solvent Cements for Joining CPVC Piping: ASTM F 493.
   1. CPVC solvent cement shall have VOC content of 490 g/L or less.
   2. Adhesive primer shall have VOC content of 550 g/L or less.
   3. Solvent cement and adhesive primer shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
   4. Solvent cement and adhesive primer shall comply with testing and product requirements of California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

G. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
   1. PVC solvent cement shall have VOC content of 510 g/L or less.
   2. Adhesive primer shall have VOC content of 550 g/L or less.
   3. Solvent cement and adhesive primer shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
   4. Solvent cement and adhesive primer shall comply with testing and product requirements of California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 STRAINERS FOR POTABLE WATER SYSTEMS

A. Strainers: Full line size, conforming to lead-free requirements of California Health and safety Code Section 11 68 75. “Y” pattern, 125 psi SWP minimum, with 304 stainless steel screens. Install all strainers with a blow-off hose valve with hose adapter. Strainer shall have gasketed cover with straight thread.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   a. 3 inches and smaller: bronze or brass body, threaded ends, with 20 mesh screen. Watts LF777SI, Wilkins SXL.
   b. 4 inches and larger: Cast iron body, flanged ends, 1/16 inch or 1/8 inch screen as normally supplied for each size. Watts 77F-DI-125, Mueller 758.

2.8 STRainers For Non-potable Water Systems
A. Charles M. Bailey #100A, Armstrong, Muessco, or equal, Fig. 11 "Y" pattern, 125 psi WP minimum, with monel screens with 20 square mesh for 2 inches and smaller and 3/64 inch perforations for 2-1/2 inches and larger. Install all strainers with a blow-off hose valve with hose adapter. Strainer shall have gasketed cover with straight thread.

2.9 Valve BoXes
A. General:
   1. Where several valves or other equipment are grouped together, provide larger boxes of rectangular "vault" type adequately sized for condition and similar in construction to those specified above.
   2. Provide valve box extensions as required to set bottom of valve box tight up to top of piping in which valve is installed.
   3. Provide a tee handle wrench for each size, Alhambra Foundry Co. #A-3008, or equal.

B. Valve Boxes in Traffic Areas: Provide Christy No. G5 traffic valve box, Brooks, or equal, 10-3/8 inches inside diameter with extensions to suit conditions, with cast iron locking cover. Provide Owner with set of special wrenches or tools as required for operation of valves.

C. Valve Boxes in Non-Traffic Areas: Provide Christy No. F22, Brooks, or equal, 8 inches inside diameter by 30 inches long, with cast iron locking cover. Provide Owner with set of special wrenches or tools as required for operation of valves. Cut bottom of plastic body for operation of valves.

D. Valve Box (Rectangular Vault Type): Precast concrete or cast iron with cast iron locking type covers lettered to suit service – Brooks No. 3-TL, Christy No. B3, Fraser No. 3, Alhambra A-3004 or A-3005, Alhambra E-2202, or E-2702, or equal, with extension to suit conditions.

2.10 Gauges
A. Marsh "series J", U.S. Gage, Danton 800, or equal, with bronze bushed movement and front recalibration. Dials shall be white with black numerals, 3-1/2 inch dial face. Normal reading shall be at mid-scale. Provide a needle valve on each gauge connection. Supply a gauge piped with branch isolation valves across the inlet and outlet of each pump and where shown on the Drawings.
B. Provide Pete's Plug II, Sisco P/T, or equal, test plug with Nordel core {and gasketed cap}, on inlet and outlet of each coil, boiler, condenser, chiller and heat exchanger and where shown on Drawings.

2.11 THERMOMETERS

A. Marsh, Taylor, Palmer, or equal, 5 inch diameter bimetal dial, adjustable from face, with adjustable positioner, located to be easily read from normal personnel approach. Normal reading shall be at mid-scale.
   1. Provide extension for insulation.
   2. Provide thermometers with steel bulb chambers and brass separable sockets.

B. Provide Pete's Plug II, Sisco P/T, or equal, test plug with Nordel core, on inlet and outlet of each coil, boiler, and heat exchanger and provide two digital electronic test thermometers for each range of fluid temperature and where shown on Drawings.

2.12 ACCESS DOORS

A. Where floors, walls, or ceilings must be penetrated for access to mechanical equipment, provide access doors, 14 inch by 14 inch minimum size in usable opening. Where entrance of a serviceman may be required, provide 20 inch by 30 inch minimum usable opening. Locate access doors/panels for non-obstructed and easy reach.
   1. All access doors less than 7'-0" above floors and exposed to public access shall have keyed locks.

B. Access doors shall match those supplied in Division 8 in all respects, except as noted herein.

C. Provide stainless steel access doors for use in toilet rooms, shower rooms, kitchens and other damp areas. Provide steel access doors with prime coat of baked-on paint for all other areas.

D. Do not locate access doors in highly visible public areas such as lobbies, waiting areas, and primary entrance areas. Coordinate with the Architect when access is required in these areas.

E. Where specific information or details relating to access panels different from the above is shown or given on the Drawings or other Divisions of work, then that information shall supersede this specification.

F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products which may be incorporated into the Work include Milcor, Karp, Nystrom, or Cesco, equal to the following:
   1. Milcor
      a. Style K (plaster)
      b. Style DW (gypsum board)
      c. Style M (Masonry)
      d. Style “Fire Rated” where required

2.13 EXPANSION LOOPS
A. Manufactured assembly consisting of inlet and outlet elbow fittings, two sections of flexible metal hose and braid, and 180-degree return bend or center section of flexible hose. Flexible hose shall consist of corrugated metal inner hose and braided outer sheath.

B. Provide expansion loops listed for 4 inches of movement for use in natural or propane gas piping systems.

C. Where used in potable water systems, provide expansion loops of all stainless steel construction.

D. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

E. Metraflex Inc., Metraloop series,
Unisource Manufacturing, Inc., V series.

2.14 FLEXIBLE JOINTS

A. Where indicated on Drawings, provide Metraflex Metrasphere, Style R, Mason Industries, or equal, Spherical Expansion Joints. Provide control units at each expansion joint, arranged to limit both expansion and compression.

B. Flexible joints at entry points to building shall be Barco Ductile iron, Advanced Thermal Systems, or equal, threaded style with stainless ball and mineral filled seal.

2.15 PIPE GUIDES

A. Where flexible connections are indicated on Drawings, provide Metraflex style IV, B-Line, or equal, pipe guides in locations recommended by manufacturer. Maximum spacing from flexible connection to first pipe guide is 4 pipe diameters, and maximum spacing from second pipe guide is 14 pipe diameters.

2.16 EQUIPMENT IDENTIFICATION

A. Identify each piece of equipment with a permanently attached engraved bakelite plate, 1/2 inch high white letters on black background.

2.17 PIPE IDENTIFICATION

A. Identify each piping system and indicate the direction of flow by means of Seton, Inc., Marking Services Inc., Reef Industries, Inc., or equal, pre-tensioned, coiled semi-rigid plastic pipe labels formed to circumference of pipe, requiring no fasteners or adhesive for attachment to pipe.

B. The legends and flow arrows shall conform to ASME A13.1.

2.18 INSULATION WORK

A. General:
1. Adhesives and sealants shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.

2. Adhesives and sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

3. The term "piping" used herein includes pipe, valves, strainers and fittings.

4. Apply insulating cement to fittings, valves and strainers and trowel smooth to the thickness of adjacent covering. Cover with jacket to match piping. Extend covering on valves up to the bonnet. Leave strainer cleanout plugs accessible.

5. Provide pre-formed PVC valve and fitting covers.

6. Provide Calcium Silicate rigid insulation and sheet metal sleeve, 18 inch minimum length at each pipe hanger. Seal ends of insulation to make vapor tight with jacket.

7. Urethane insulation will not be allowed above ground or on hot water piping.

8. Test insulation, jackets and lap-seal adhesives as a composite product and confirm flame spread of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with UL723 or ASTM E84.

9. Clean thoroughly, test and have approved, all piping and equipment before installing insulation and/or covering.

10. Repair all damage to existing pipe and duct insulation whether or not caused during the work of this contract, to match existing adjacent insulation for thickness and finish, but conforming to flame spread and smoke ratings specified above.

B. Insulation of Piping:

1. Insulate domestic hot and tempered water with 1 inch thick 3-1/2# minimum density fiberglass with ASJ-SSL jacket for sizes up to and including 2 inches. For larger sizes, provide 1-1/2 inch thick 3-1/2# minimum density fiberglass insulation and ASJ-SSL jacket.

2. Insulate domestic hot water piping under slab on grade and cold water piping exposed to the weather with 3/4" thick Therma-Cel, Armaflex, or equal; seal water tight per manufacturer's directions.

3. Insulate horizontal, overhead rainwater leaders and condensate drains within the building envelope with 1 inch thick, 3-1/2# density fiberglass, with ASJ-SSL jacket.

4. Insulate domestic cold water piping outside of insulation envelope in outside walls, vented attic spaces, and unheated spaces, including equipment rooms and below raised floor with 1 inch thick molded fiberglass, minimum density 3-1/2# per cubic foot, with ASJ-SSL jacket.

5. Exposed insulated piping within the building shall have a Zeston 2000 25/50, Proto Lo-Smoke, or equal, PVC jacket and fitting cover installed over the insulation, applied per manufacturer's instructions. Verify suitability with manufacturer of insulation. Insulation with pre-applied polymer jacket may be substituted at Contractor's option.

6. Insulate condensate drain piping in freezer with 3/4 inch thick Therma-Cel, Armaflex, or equal. Seal water tight per manufacturer's directions. Install heat tape prior to insulation of piping, in accordance with manufacturer's directions.

7. On insulated piping exposed to the weather apply .016 aluminum jacket (.014 for 12" and larger pipes) secured with 1/2 inch aluminum bands on 12 inch centers. Cover fittings with glass cloth and two coats of Foster's Sealfas 30-36, Zeston.
2000, or equal, PVC fitting covers. Insulation shall be vapor tight before applying metal jacket or PVC covers.

PART 3 - EXECUTION

3.1 PLUMBING DEMOLITION

A. Refer to Division 1 Sections “Cutting and Patching” and “Selective Demolition” for general demolition requirements and procedures.

B. Disconnect, dismantle and remove mechanical systems, equipment, and components indicated to be removed. Coordinate with all other trades.
   1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
   2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping to remain with same or compatible piping material. Refrigerant system must be evacuated per EPA requirements.
   3. Equipment to Be Removed: Drain down and cap remaining services and remove equipment.
   4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
   5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. 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.

3.2 ELECTRICAL REQUIREMENTS

A. Provide adequate working space around electrical equipment in compliance with the California Electrical Code. Coordinate the Mechanical Work with the Electrical Work to comply.

B. Furnish necessary control diagrams and instructions for the controls. Before permitting operation of any equipment which is furnished, installed, or modified under this Section, review all associated electrical work, including overload protection devices, and assume complete responsibility for the correctness of the electrical connections and protective devices. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers’ Association. All equipment and connections exposed to the weather shall be NEMA IIIR with factory-wired strip heaters in each starter enclosure and temperature control panel where required to inhibit condensation.

C. All line voltage and low voltage wiring and conduit associated with the Temperature Control System are included in this Section. Wiring and conduit shall comply with Division 26.

D. Electric Motors:
   1. All motors shall be rated for continuous operation at 115% of nameplate amperage but shall be selected to operate at less than nameplate amperage
throughout the entire operating cycle. Motors found exceeding the nameplate amperage shall be promptly replaced at no cost to the Owner. Horsepower shown is minimum and shall be increased as necessary to comply with above requirements. Furnish motors with splash-proof or weatherproof housings, where required or recommended by the manufacturer. Match the nameplate voltage rating with the electrical service supplied. Check Electrical Drawings. Provide a transformer for each motor not wound specifically for system voltage.

E. Motor Starters:
1. Provide magnetic motor starters for all equipment provided under the Mechanical Work. Starters shall be non-combination type. Provide part-winding or reduced voltage start motors on all motors 50 – HP and larger, or where shown or as hereinafter specified. Minimum size starter shall be Size 1. All three-phase starters shall have the following:
   a. Cover-mounted hand-off-automatic switch. Starters installed exposed in occupied spaces shall have key operated HOA switch.
   b. Three ambient compensated thermal overload.
   c. Fused control transformer (for 120 or 24 volt service).
   d. Pilot lights, integral with the starters. Starters located outdoors shall be in NEMA IIIR enclosures.
2. Starters for single-phase motors shall have thermal overloads, Westinghouse Type MSTOLS, Square D, or equal, toggle-operated with pilot light, NEMA I enclosure for starters located indoors, NEMA IIIR enclosure for starters located outdoors.
3. Provide OSHA label indicating the device starts automatically.

3.3 PIPING SYSTEM REQUIREMENTS
A. Drawing plans, schematic and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

3.4 PRIMING AND PAINTING
A. Perform all priming and painting on the equipment and materials as specified herein.
B. Priming:
1. Exposed ferrous metals, including piping, which are not galvanized or factory-finished shall be primed. Black steel pipe exposed to the weather shall be painted one coat of Rust-Oleum #1069 primer for black steel piping or Rust-Oleum #5260, Kelly Moore, or equal, primer for galvanized piping.
2. Metal surfaces of items to be jacketed or insulated except ductwork and piping shall be given two coats of primer unless furnished with equivalent factory finish. Items to be primed shall be properly cleaned by effective means free of rust, dirt, scale, grease and other deleterious matter and then primed with the best available grade of zinc rich primer. After erection or installation, all primed surfaces shall be properly cleaned of any foreign or deleterious matter that might impair proper bonding of subsequent paint coatings. Any abrasion or other damage to the shop or field prime coat shall be properly repaired and touched up with the same material used for the original priming.
3. Where equipment is provided with nameplate data, the nameplate should be masked off prior to painting. When painting is completed, remove masking material.

C. See Painting Section for detailed requirements.

3.5 EXCAVATING

A. Perform all excavating required for work of this Section. Provide the services of a pipe/cable locating service prior to excavating activities to determine location of existing utilities.

B. Unless shown otherwise, provide a minimum of 2'-6" cover above top of pipe to finished grade for all service piping, unless otherwise noted. Trim trench bottom by hand or provide a 4 inch deep minimum bed of sand to provide a uniform grade and firm support throughout entire length of pipe. For all PVC pipe and for PE gas pipe, bed the pipe in 4 inch sand bed. Pipe bedding materials should be clean crushed rock, gravel or sand of which 100 percent will pass a 1 inch sieve. For pipes that are larger than 10 inches in diameter, at least 95 percent should pass a 3/4 inch sieve, and for pipes 10 inches in diameter or smaller, 100 percent should pass a 1/2 inch sieve. All other materials should have a minimum sand equivalent of 50. Only a small proportion of the native soils will meet these requirements without extensive processing; therefore, importation of pipe bedding materials should be anticipated. Pipe bedding materials shall be compacted in lifts not exceeding 6 inches in compacted thickness. Each lift shall be compacted to not less than 90 percent relative compaction at or above the optimum moisture content, in accordance with ASTM Specification D2940, except that bedding materials graded such that less than 100 percent will pass a No. 200 sieve shall be compacted in 6 inch lifts using a single pass of a flat-plate, vibratory compactor or vibratory drum. Pipe bedding materials should extend at least to the spring line.

C. Maintain all warning signs, barricades, flares, and red lanterns as required.

D. For all trenches 5 feet or more in depth, submit copy of permit detailed drawings showing shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trenches. Obtain a permit from the Division of Industrial Safety prior to beginning excavations. A copy of the permit shall be available at the site at all times.

3.6 BACKFILLING

A. Backfill shall comply with applicable provisions of DIVISION 31 of these Specifications.

B. Except under existing or proposed paved areas, walks, roads, or similar surfaces, backfill for other types of pipe shall be made using suitable excavated material or other approved material. Place backfill in 8 inch layers, measured before compaction, and compact with impact hammer to at least 90 percent relative compaction per ASTM D2940.

1. Backfill plastic pipe and insulated pipe with sand for a minimum distance of 12 inches above the top of the pipe. Compact using mechanical tamping equipment.
C. Entire backfill for excavations under existing or proposed pavements, walks, roads, or similar surfaces, under new slabs on grade, shall be made with clean sand compacted with mechanical tamping equipment vibrator to at least 90 percent relative compaction per ASTM D2940. Remove excess earth. Increase the minimum compaction within the uppermost two feet of backfill to 95 percent.

D. Replace or repair to its original condition all sod, concrete, asphalt paving, or other materials disturbed by the trenching operation. Repair within the guarantee period as required.

3.7 INSTALLATION OF VALVES

A. Install valves as indicated on Drawings and in the following locations:
   1. Shutoff Valves: Install on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.
   2. Drain Valves: Install on each plumbing equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere indicated or required to completely drain potable water system.
   3. Provide gate or globe valves on inlet and outlet of each water heater or pump.

B. General:
   1. Valves shall be full line size unless indicated otherwise on Drawings.
   2. Install horizontal valves with valve stem above horizontal, except butterfly valves.
   3. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
   4. Locate valves for easy access and provide separate support where necessary.
   5. Install valves in position to allow full stem movement.
   6. Install exposed polished or enameled connections with special care showing no tool marks or exposed threads.
   7. Butterfly valves conforming to the paragraph “Butterfly Valves” may be used in lieu of gate or globe valves for locations above grade.
   8. Ball valves conforming to the paragraph “Ball Valves” may be used in lieu of gate valves for locations above grade for services 2-1/2 inches and smaller.
   9. Valves 2-1/2 inches and smaller (except ball valves) in nonferrous water piping systems may be solder joint type with bronze body and trim.
   10. Rigidly fasten hose bibbs, hydrants, fixture stops, compressed air outlets, and similar items to the building construction.

C. Gate Valves:
   1. Furnish valves in copper lines with adapters to suit valve / line requirements.
   2. Underground gate valves:
      a. Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.
      b. Furnish and deliver to Owner one wrench of each size required for operating underground valves.

D. Swing Check Valves: Install in horizontal position with hinge pin level.

E. Butterfly Valves: Install with stems horizontal.
F. Silent Check Valves: Install in horizontal or vertical position between flanges.

G. Calibrated Balancing Valves: Install calibrated balancing valves per manufacturers’ recommendations, including requirements for straight pipe lengths at valve inlet and outlet.

H. Gas Shut-Off Valves:
   1. Provide line size ball valve in gas line to each appliance.
   2. Provide line size ball valve in gas line, to be used as emergency shut-off for science classrooms. Install valve in locking box where indicated on the drawings.
   3. Provide line size electric solenoid gas valve in gas line to kitchen equipment (if not supplied with appliance) under Type 1 hood. Interlock with hood fire alarm system.

I. Valve Adjustment: Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.8 INSTALLATION OF PIPING SYSTEMS

A. At time of final connection, and prior to opening valve to allow pressurization of water and gas piping from existing systems, on site or off site, perform a pressure test to indicate static pressure of existing systems. If pressure on water piping is greater than 80 psi, or gas pressure is not as indicated on Contract Documents, inform Architect immediately. Do not allow piping systems to be pressurized without written consent of the Architect.

B. General:
   1. All piping shall be concealed unless shown or otherwise directed. Allow sufficient space for ceiling panel removal.
   2. Installation of piping shall be made with appropriate fittings. Bending of piping will not be accepted.
   3. Install piping to permit application of insulation and to allow valve servicing.
   4. Where piping or conduit is left exposed within a room, the same shall be run true to plumb, horizontal, or intended planes. Where possible, uniform margins are to be maintained between parallel lines and/or adjacent wall, floor, or ceiling surfaces.
   5. Horizontal runs of pipes and/or electrical conduit suspended from ceilings shall provide for a maximum headroom clearance. The clearance shall not be less than 6’-6” without written approval from the Architect.
   6. Close ends of pipe immediately after installation. Leave closure in place until removal is necessary for completion of installation.
   7. Each piping system shall be thoroughly flushed and proved clean before connection to equipment.
   8. Pipe the discharge of each relief valve, air vent, backflow preventer, and similar device to floor sink or drain.
   9. Install exposed polished or enameled connections with special care showing no tool marks or threads at fittings.
   10. Install horizontal valves with valve stem above horizontal.
   11. Use reducing fittings; bushings shall not be allowed. Use eccentric reducing fittings wherever necessary to provide free drainage of lines and passage of air.
12. Verify final equipment locations for roughing-in.

13. Service Markers: Mark the location of each plugged or capped pipe with a 4 inch round by 30 inch long concrete marker, set flush with finish grade. Provide 2-1/2 inch diameter engraved brass plate as part of monument marker.

14. Furnish and install anchors or thrust blocks on PVC water lines in the ground, at all changes in direction of piping, and at all connections or branches from mains 1-1/2 inch and larger. Form anchors or thrust blocks by pouring concrete between pipe and trench wall. Thrust blocks shall be of adequate size and so placed as to take thrusts created by maximum internal water pressure. Sizing and placement shall be per manufacturer's recommendations, 2010 CPC, and IAPMO installation standards. Anchor piping to building construction.

15. Sanitary Sewer and Storm Drain: Grade piping inside building uniformly 1/4 inch per foot if possible but not less than 1/8 inch per foot. Run piping as straight as possible. Make piping connections between building piping and outside service pipe with cast iron reducers or increasers. Slope sewers uniformly between given elevations where invert elevations are shown.

16. Where piping is installed in walls within one inch of the face of stud, provide a 16 gauge sheet metal shield plate on the face of the stud. The shield plate shall extend a minimum of 1-1/2 inches beyond the outside diameter of the pipe.

C. Expansion Loops:
   1. Install expansion loops where piping crosses building expansion or seismic joints, between buildings, between buildings and canopies, and as indicated on Drawings.
   2. Install expansion loops of sizes matching sizes of connected piping.
   3. Install grooved-joint expansion joints to grooved-end steel piping.
   4. Materials of construction and end fitting type shall be consistent with pipe material and type of gas or liquid conveyed by the piping system in which expansion loop is installed.

D. Sleeves:
   1. Install AMI Products, Adjus-to-Crete, Pipeline Seal and Insulator, or equal, pipe sleeves of sufficient size to allow for free motion of pipe, 24 gauge galvanized steel. The space between pipe and sleeves through floor slabs on ground, through outside walls above or below grade, through roof, and other locations as directed shall be caulked with oakum and mastic and made watertight. The space between pipe and sleeve and between sleeve and slab or wall shall be sealed watertight.
   2. At Contractor's option, Link-Seal, Metraflex Metraseal, or equal, casing seals may be used in lieu of caulking. Wrap pipes through slabs on grade with 1 inch thick fiberglass insulation to completely isolate the pipe from the concrete.

E. Floor, Wall, and Ceiling Plates:
   1. Fit all pipes with or without insulation passing through walls, floors, or ceilings, and all hanger rods penetrating finished ceilings with chrome-plated or stainless escutcheon plates.

F. Firestopping:
   1. Pack the annular space between the pipe sleeves and the pipe through all floors and walls with UL listed fire stop, and sealed at the ends. All pipe penetrations shall be UL listed, Hilti, 3M Pro-Set, or equal.
a. Install fire caulking behind mechanical services installed within fire rated walls, to maintain continuous rating of wall construction.

2. Provide SpecSeal Systems UL fire rated sleeve/coupling penetrators for each pipe penetration or fixture opening passing through floors, walls, partitions or floor/ceiling assemblies. All Penetrators shall comply with UL Fire Resistance Directory (Latest Edition), and in accordance with Chapter 7, CBC requirements.

3. Sleeve penetrators shall have a built in anchor ring for waterproofing and anchoring into concrete pours or use the special fit cored hole penetrator for cored holes.

4. Copper and steel piping shall have SpecSeal plugs on both sides of the penetrator to reduce noise and to provide waterproofing.

5. All above Systems to be installed in strict accordance with manufacturer’s instructions.

6. Alternate firestopping systems are acceptable if approved equal. However, any deviation from the above specification requires the Contractor to be responsible for determining the suitability of the proposed products and their intended use, and the Contractor shall assume all risks and liabilities whatsoever in connection therewith.

G. Flashing:

1. Flashing for penetrations of metal or membrane roof for mechanical items such as flues and pipes shall be coordinated with the roofing manufacturer and roofing installer for the specific roofing type. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for the mechanical work.
   a. Furnish and install flashing and counterflashing in strict conformance with the requirements of the roofing manufacturer. Submit shop drawing details for review prior to installation.
   b. Furnish and install counterflashing above each flashing required. Provide Stoneman, or equal, vandalproof top and flashing combination. Provide vandalproof top for each plumbing vent through roof. Elmdor/Stoneman Model 1540, 1550, 1570, or equal.
   c. Flues and ducts shall have 24 gauge galvanized sheet metal storm collar securely clamped to the flue above the flashing.

2. For all other types of roofing system, furnish and install around each pipe, where it passes through roof, a flashing and counterflashing. All flashing shall be made of four pound seamless sheet lead with 6 inch minimum skirt and steel reinforced boot. Counterflashing shall be cast iron. For vents, provide vandalproof top and flashing combination. Elmdor/Stoneman Model 1100-4, 1100-5, 1100-7, or equal.

H. Hangers and Supports:

1. General: Support all equipment and piping so that it is firmly held in place by approved iron hangers and supports and special hangers as required. All components shall support weight of equipment and pipe, fluid, and pipe insulation based on spacing between supports with minimum factor of safety of five based on ultimate strength of material used. Do not exceed manufacturer’s load rating. Pipe attachments or hangers, of same size as pipe or tubing on which used, or nearest available. Rigidly fasten hose faucets, fixture stops, compressed air outlets, and similar items to the building construction. The Architect shall approve all hanger material before installation. Do not support
piping with plumbers’ tape, wire rope, wood, or other makeshift devices. Where building structural members do not match piping support spacing, provide all “bridging” support members as required firmly attached to building structural members in a fashion approved by the Structural Engineer.

a. Materials, design, and type numbers per Manufacturers' Standardization Society (MSS), Standard Practice (SP)-58.

2. All hanger components shall be provided by one manufacturer B-Line, Grinnell, Uni-Strut, Badger, or equal.

3. Hanger and Support Spacing:

a. Vertical piping support spacing: B-line #B3373 clamps attached to the pipe above each floor to rest on the floor. Provide with lead or Teflon liners on copper tubing. Provide additional support at base of cast iron risers and support at unsupported riser joints and horizontal offsets per 2007 Mason Industries Seismic Restraint Guidelines. Provide intermediate support for vertical piping, spaced at or within the following maximum limits.

<table>
<thead>
<tr>
<th>Pipe Diameter</th>
<th>Steel Fluid</th>
<th>Steel Vapor</th>
<th>Copper Fluid</th>
<th>Copper Vapor</th>
<th>CPVC &amp; PVC (Note 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 - 1”</td>
<td>12</td>
<td>6</td>
<td>10</td>
<td>6</td>
<td>Base and Each Floor</td>
</tr>
<tr>
<td>1-1/4 - 2”</td>
<td>12</td>
<td>Each Floor</td>
<td>10</td>
<td>6</td>
<td>Base and Each Floor</td>
</tr>
<tr>
<td>2-1/2 - 3”</td>
<td>12</td>
<td>Each Floor</td>
<td>10</td>
<td>10</td>
<td>Base and Each Floor</td>
</tr>
<tr>
<td>Over 4”</td>
<td>12</td>
<td>Each Floor</td>
<td>10</td>
<td>10</td>
<td>Base and Each Floor</td>
</tr>
<tr>
<td>Note 1: Provide mid-story guides.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Note 2: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b. Vertical cast iron piping support spacing: Base and each floor not to exceed 15 feet.

c. Horizontal piping, hanger and support spacing: Locate hangers and supports at each change of direction, within one foot of elbow, and spaced at or within following maximum limits.

<table>
<thead>
<tr>
<th>Pipe Diameter</th>
<th>Steel Fluid</th>
<th>Steel Vapor</th>
<th>Copper Fluid</th>
<th>Copper Vapor</th>
<th>CPVC &amp; PVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 - 1”</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>1-1/4 - 2”</td>
<td>7</td>
<td>10</td>
<td>6</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>2-1/2 - 3”</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>Over 4”</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>4</td>
</tr>
</tbody>
</table>
d. Horizontal cast iron piping support spacing:
   1) Support piping at every other joint for piping length of less than 4 feet.
   2) For piping longer than 4 feet, provide support on each side of the coupling, within 18 inches of each joint.
   3) Hanger shall not be installed on the coupling.
   4) Provide support at each horizontal branch connection.
   5) Provide sway brace at 40 foot maximum spacing for all suspended pipe with no-hub joints, except where a lesser spacing is indicated in the 2007 Mason Industries Seismic Restraint Guidelines. Provide a brace on each side of a change in direction of 90 degrees or more. Brace riser joints at each floor and at 15 foot maximum intervals.

4. Individually Suspended Piping:
   a. Individually suspended piping: B-Line B3690 J-Hanger or B3100 Clevis, complete with threaded rod, or equal. All hangers on supply and return piping handling heating hot water or steam shall have a swing connector at point of support.

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Rod Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&quot; and Smaller</td>
<td>3/8&quot;</td>
</tr>
<tr>
<td>2-1/2&quot; to 3-1/2&quot;</td>
<td>1/2&quot;</td>
</tr>
<tr>
<td>4&quot; to 5&quot;</td>
<td>5/8&quot;</td>
</tr>
<tr>
<td>6&quot;</td>
<td>3/4&quot;</td>
</tr>
</tbody>
</table>

b. Provide 3/8 inch rod for support of PVC and CPVC and provide continuous support.

c. Trapeze Suspension: B-Line 1-5/8 inch width channel in accordance with manufacturer's published load ratings. No deflection to exceed 1/180 of a span.

d. Trapeze Supporting Rods: Shall have a safety factor of five; securely anchor to building structure.

e. Pipe Clamps and Straps: B-Line B2000, B2400; isolate copper pipe with two thicknesses of 2 inches wide 10-mil polyvinyl tape. Where used for seismic support systems, provide B-Line B2400 series pipe straps.

f. Concrete Inserts: B-line B221 continuous insert or B2500 spot insert. Do not use actuated fasteners for support of overhead piping unless approved by Architect.

5. Support to Structure:
   a. Wood Structure: Provide and install wood blocking as required to suit structure. Provide lag screws or through bolts with length to suit requirements, and with size (diameter) to match the size of hanger rods required.
      1) Do not install Lag screws in tension without written review and acceptance by Structural Engineer.

      Side Beam Angle Clip       B-Line B3062       MSS Type 34
2) Blocking for support of piping shall be not less than 2 inch thick for piping up to 2 inch size (water filled) or 3 inch size (vapor filled). Provide 3 inch blocking for piping up through 5 inch size, and 4 inch blocking for larger piping. Provide support for blocking in accordance with Structural Engineers requirements.

3) Where lag screws are used, length of screw shall be 1/2 inch less than the wood blocking. Pre-drill starter holes for each lag screw.

b. Steel Structure: Provide and install additional steel bracing as required to suit structure. Provide through bolts with length to suit requirements of the structural components. Burning or welding on any structural member may only be done if approved by the Architect.

6. Rubber Neoprene Pipe Isolators:
   a. Pipe isolators shall comprise an internal rubber or neoprene material that isolates pipe from hanger and structure. Install at all piping located in acoustical walls. Refer to Architectural Drawings for location of acoustical walls.
   b. Isolation material shall be either a rubber or neoprene material that prevents contact between the pipe and the structure. The rubber shall have between a 45 to 55 durometer rating and a minimum thickness of 1/2 inch.
   c. Acceptable Suppliers:
      1) Vertical runs: Acousto-Plumb or equal.
      2) Horizontal runs: B-Line, Vibraclamp; Acousto-Plumb or equal.

7. Provide continuous V channel support for all horizontal plastic piping.

8. Provide support for piping through roof, arranged to anchor piping solidly in place at the roof penetration.

9. Provide rigid insulation and a 12 inch long, 18 gauge galvanized sheet iron shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering.

10. Insulate copper tubing from ferrous materials and hangers with two thicknesses of 3 inch wide, 10 mil polyvinyl tape wrapped around pipe.

11. Provide a support or hanger close to each change of direction of pipe either horizontal or vertical and as near as possible to concentrated loads.

12. Suspend rods from concrete inserts with removable nuts where suspended from concrete decks. Power actuated inserts will not be allowed.

3.9 PIPE JOINTS AND CONNECTIONS

A. General:
   1. Cutting: Cut pipe and tubing square, remove rough edges or burrs. Bevel plain ends of steel pipe.
   2. Remove scale, slag, dirt and debris from inside and outside of pipe before assembly.
   3. Boss or saddle type fittings or mechanically extracted tube joints will not be allowed.
B. Threaded Pipe: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
1. Apply thread compound to external pipe threads: Rectorseal No. 5, Permatex No. 1, or equal.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

C. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

D. Joint Construction for Solvent-Cemented Plastic Piping: Clean and dry joining surfaces. Join pipe and fittings according to the following:
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
3. PVC Piping: Join according to ASTM D 2855.

E. Copper Pipe and Tubing (Except pneumatic control piping): All joints shall be brazed according to ASME Section IX, Welding and Brazing Qualifications, except domestic water piping 1-1/4 inches and smaller when not buried in the ground or concrete and type DWV plumbing piping may be soldered.

F. Cast Iron Soil Pipe:
1. No-Hub fittings shall be made with a torque wrench.
2. Hub joints shall be with Ty-Seal couplings.
3. Wrought iron, steel, or copper pipe shall have a ring or part of a coupling screwed on to form a spigot end if caulked into a joint.
4. Connect cast iron sewer piping to outside service pipe with cast iron or vitrified clay reducers or increasers as required. Caulking of smaller pipe into the larger without a reducer or increaser will not be permitted.

G. Clay Sewer Pipe: Joints in bell and spigot clay sewer pipe shall comply with ASTM C-425, made with an approved type of interlocking, resilient mechanical compression joint, formed on the pipe at the factory. Lubricate inside of bells and outside of spigots with a solution as recommended by the pipe manufacturer.

H. Welded Pipe:
1. Make up with oxyacetylene or electric arc process.
2. All welding shall conform to the American Standard Code for Power Piping ASME B-31.1. When requested by the Architect, furnish certification from an approved testing agency or National Certified Pipe Welding Bureau that the welders performing the work are qualified.
3. All line welds shall be of the single "V" butt type. Welds for flanges shall be of the fillet type.
4. Where the branch is two pipe sizes smaller than the main or smaller, Bonney Weldolets, Threadolets, Nibco, or equal, may be used in lieu of welding tees.
I. PVC Sewer and Drainage Pipe (outside building as allowed only): Four inches and larger shall be bell and spigot, assembled in accordance with manufacturer's recommendations. Joint shall be tested in accordance with ASTM D3212. Solvent weld joints below 4 inches in size, schedule 40 PVC with matching fittings, assembled per manufacturers instructions.

J. PVC Pool Pipe: Assemble with flanged joints. Assemble joints in strict accordance with manufacturer's instructions. PVC Drain Pipe: Make joints with PVC couplings and rubber rings, except deck drain pipe shall be solvent welded.

K. Polyethylene Pipe: Assemble with fusion joints in strict accordance with manufacturer's instructions.

L. Make joints in PVC water pipe with PVC couplings and rubber rings, Manville Ring-Tite, PW Pipe, or equal. Check final location of rubber rings with the couplings with gauge or as recommended by the manufacturer. Make joints between PVC pipe and cast iron pipe or fittings using cast iron or PVC adapter fittings, installed as recommended by the manufacturer. Ring-Tite PVC or cast iron pipe fittings may be used in lieu of standard fittings. Make connection to valves with cast iron adapters connected to the water pipe with PVC couplings.

M. Flexible Connections:
   1. Furnish and install Thermo Tech., Inc. F/J/R, Metraflex, or equal, flexible couplings with limiter bolts on piping connections to all equipment mounted on anti-vibration bases, except fan coil units under 2000 cfm, on each connection to each base mounted pump and where shown. Couplings shall be suitable for pressure and type of service.
   2. Anchor piping securely on the system side of each flexible connection.

3.10 UNIONS AND FLANGES

A. Install Watts, Epco, Nibco, or equal, dielectric unions or flanges at points of connection between copper or brass piping or material and steel or cast iron pipe or material except in drain, waste, vent, or rainwater piping. Bushings or couplings shall not be used. Dielectric unions installed in potable water systems shall conform to the lead-free requirements of the California Health and Safety Code Section 11 68 75.

B. Install unions in piping NPS 2” and smaller, and flanges in piping NPS 2-1/2” and larger whether shown or not at each connection to all equipment and tanks, and at all connections to all automatic valves, such as temperature control valves. Unions installed in potable water systems shall conform to the lead-free requirements of the California Health and Safety Code Section 11 68 75.

C. Locate the unions for easy removal of the equipment, tank, or valve.

3.11 ACCESS DOOR

A. Furnish and install access doors wherever required whether shown or not for easy maintenance of mechanical systems; for example, at concealed valves, strainers, traps, cleanouts, dampers, motors, controls, operating equipment, etc. Access doors shall provide for complete removal and replacement of equipment.
3.12 CONCRETE WORK

A. Concrete work required for work of this Section shall be included under another section of the Specification, unless otherwise noted, including poured-in-place concrete work for installing precast manholes, catch basins, etc., and shall include reinforced concrete bases for pumps, tanks, compressors, fan units, boilers, unless the work is specifically indicated on the Drawings to be furnished under this Section.

B. Thrust blocks, underground anchors, and pads for cleanouts, valve access boxes and washer boxes are included under this Section of the Specification. Concrete shall be 3000 psi test minimum. Refer to Division 3 for concrete types.

3.13 PIPE PROTECTION

A. Wrap bare galvanized and black steel pipe buried in the ground and to 6" above grade, including piping in conduit, with one of the following, or equal:
   1. Polyspan Coating: Pressure sensitive polyethylene coating, "X-Tru-Coat" as manufactured by Pipe Line Service Corporation or "Green Line" wrap as manufactured by Royston Products, or equal.
      a. Field Joints and Fittings: Protecto Wrap #1170 tape as manufactured by Pipe Line Service Corporation, or Primer #200 tape by Royston Products, or equal. Installation shall be as per manufacturer's recommendation and instructions.
   2. Tape Wrap: Pressure-sensitive polyvinyl chloride tape, "Transtex #V-10 or V-20", "Scotchwrap 50", Slipknot l00, Pabco, or equal, with continuous identification. Tape shall be a minimum of 20 mils thick for fittings and irregular surfaces, two wraps, 50 percent overlap, 40 mils total thickness. Tape shall be laminated with a suitable adhesive; widths as recommended by the manufacturer for the pipe size. Wrap straight lengths of piping with an approved wrapping machine.

B. Field Joints: Valves and Fittings: double wrap polyvinyl chloride tape as above. Provide at least two thicknesses of tape over the joint and extend a minimum of 4 inches over adjacent pipe covering. Build up with primer to match adjacent covering thickness. Width of tape of fittings shall not exceed 3 inches. Tape shall adhere tightly to all surfaces of the fittings without air pockets.

C. Testing: Test completed wrap of piping, including all epoxy painted piping with Tinker and Rasor Co. test machine (San Gabriel, CA - 818-287-5259), Pipeline Inspection Company (Houston, TX - 713-681-5837), or equal.

D. Cleaning: Clean all piping thoroughly before wrapping.
   1. Inspection: Damaged or defective wraps shall be repaired as directed. No wrapped pipe shall be covered until approved by Architect.

E. Sleeve copper piping/tubing installed below slab with "Polywrap-C" polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 6 mils thick, colored blue for domestic water piping and orange for other piping. Install sleeve per manufacturer's recommendations and instructions.

F. Sleeve copper piping/tubing installed outside building below grade with "Polywrap-C" polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal.
Sleeve shall be a minimum of 6 mils thick, colored blue for domestic water piping. Install sleeve per manufacturer’s recommendations and instructions.

G. Covering: No rocks or sharp edges shall be backfilled against the wrap. When backfilling with other than sand, protect wrap with an outer wrapping of Kraft paper; leave in place during backfill.

3.14 PIPE IDENTIFICATION

A. Provide temporary identification of each pipe installed, at the time of installation. Temporary identification shall be removed and replaced with permanent identification as part of the work.

B. Apply the legend and flow arrow at all valve locations; at all points where the piping enters or leaves a wall, partition, cluster of piping or similar obstruction, at each change of direction and at approximately 20'-0" intervals on pipe runs. Variations or changes in locations and spacing may be made with the approval of the Architect. There shall be at least one marking in each room. Markings shall be located for maximum visibility from expected personnel approach.
   1. Apply legend and flow arrow at approximately 10'-0" intervals in science classrooms and science prep rooms.

C. Wherever two or more pipes run parallel, the markings shall be supplied in the same relative location on each.

D. Each valve on non-potable water piping shall be labeled with a metal tag stamped “DANGER -- NON-POTABLE WATER” in 1/4 inch high letters.

E. Apply markings after painting and cleaning of piping and insulation is completed.

3.15 SPECIAL SEISMIC REQUIREMENTS

A. Supports, anchorage and restraints for all piping, ductwork and equipment shall be an OSHPD pre-approved system such as ISAT, Badger, Mason, or equal. All pipes, ducts and equipment shall be seismically restrained in accordance with the requirements of the current edition of the California Building Code. System shall have a current OPA number and shall meet any additional requirements of the authority having jurisdiction. Provide all supporting documentation required by the reviewing authority and the Architect and Engineer. Provide layout drawings showing piping, ductwork and restraint locations.

B. In lieu of the above or for non-standard installations not covered in the above pre-approved systems, Contractor shall provide layout drawings showing piping and restraint locations, and detail supports, attachments and restraints, and furnish supporting calculations and legible details with a stamp by a California registered structural engineer, in accordance with 2010 California Building Code. Contractor shall use the Seismic Design Category indicated in Structural Contract Documents.

C. Bracing of piping: Specifically state how the bracing attachment to structure is accomplished. Provide shop drawings indicating all seismic restraints, including details of anchorage to the building. All in-line equipment must be braced independently of the piping and in conformance with all applicable building codes. Provide calculations to
show that the pre-approval numbers have been correctly applied in accordance with general information notes of the pre-approval documentation.

D. Additional Requirements: In addition to the above, conform to all state and local requirements.

3.16 EXPANSION ANCHORS IN HARDENED CONCRETE

A. Refer to Structural Drawings.

B. Qualification Tests: The specific anchor shall have a current ICC-ES report and evaluated in cracked concrete in accordance with Acceptance Criteria AC193. The design shear and withdrawal load shall not be more than 80% of the allowable load listed in the current ICC-ES report and manufacturer’s recommendations for the specific anchor.

C. Installation: The anchors must be installed in accordance with the requirements given in ICC Research Committee Recommendations for the specific anchor.

D. Testing: Fifty percent of the anchors shall be load-tested on each job to twice the allowable capacity in tension, except that if the design load is less than 75 pounds; only one anchor in ten need be tested. If any anchor fails, all anchors must be tested. The load test shall be performed in the presence of the project inspector.

E. The load may be applied by any method that will effectively measure the tension in the anchor, such as direct pull with a hydraulic jack, a torque wrench calibrated using the specific anchor or calibrated spring-loading devices. Anchors in which the torque is used to expand the anchor without applying tension to the bolt may not be verified with a torque wrench.

3.17 TESTS AND ADJUSTMENTS

A. Test the installations in accordance with the following requirements and all applicable codes:
   1. Inspector of Record should witness all tests of piping systems.
   2. Notify the Architect at least seven days in advance of any test.
   3. All piping shall be tested at completion of roughing-in, or at other times as directed by the Architect.
   4. Furnish all necessary materials, test pumps, gases, instruments and labor required for testing.
   5. Isolate from the system all equipment that may be damaged by test pressure.
   6. Make connections to existing systems with flanged connection. During testing of the new work, provide a slip-in plate to restrict test pressure to new systems only. Remove plate and complete connection to existing system at completion of testing.
      a. Inspector of record shall witness final connection to system.

B. Test Schedule: No loss in pressure or visible leaks shall show after four hours at the pressures indicated.
C. Testing of Sanitary Sewer, Drain, Vent, Storm Drain may be done in segments in order to limit pressure to within manufacturer’s recommendations. Test to 10 feet above the highest point in the system.

<table>
<thead>
<tr>
<th>System Tested</th>
<th>Test Pressure PSI</th>
<th>Test With</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sanitary Sewer, Drain, Vent</td>
<td>10 Ft. Hd.</td>
<td>Water</td>
</tr>
<tr>
<td>Storm Drain, Condensate Drains</td>
<td>10 Ft. Hd.</td>
<td>Water</td>
</tr>
<tr>
<td>Domestic Water</td>
<td>125</td>
<td>Water</td>
</tr>
<tr>
<td>Natural Gas (PE)</td>
<td>60</td>
<td>Air &amp; Non-corrosive Leak Test Fluid</td>
</tr>
<tr>
<td>Natural Gas (Steel)</td>
<td>100</td>
<td>Air &amp; Non-corrosive Leak Test Fluid</td>
</tr>
<tr>
<td>Compressed Air, Acetylene and Oxygen</td>
<td>200 lb.</td>
<td>Air &amp; Non-corrosive Leak Test Fluid</td>
</tr>
<tr>
<td>Gases and Vacuum</td>
<td>100</td>
<td>Air &amp; Non-corrosive Leak Test Fluid</td>
</tr>
<tr>
<td>PVC Irrigation Piping</td>
<td>100</td>
<td>Water</td>
</tr>
<tr>
<td>Fuel Oil</td>
<td>1-1/2 x WP &amp; 20&quot;</td>
<td></td>
</tr>
<tr>
<td>Distilled Deionized Water</td>
<td>50</td>
<td>Water</td>
</tr>
</tbody>
</table>

1. Flush distilled deionized water lines with distilled deionized water after test and approval.
2. Non-corrosive leak test fluid shall be suitable for use with the piping material specified, and with the type of gas conveyed by the piping system.

D. Perform operational tests under simulated or actual service conditions, including one test of complete plumbing installation with all fixtures and other appliances connected, and one test of complete installation of 48 hours each for heating and cooling with all equipment connected and operating.

E. Should any material or work fail in any of these tests, it shall be immediately removed and replaced for new material, and portion of the work replaced shall again be tested by Contractor at his own expense.

F. Lubricate each item of equipment, including motors, before operation.

3.18 TRACER WIRES

A. Provide tracer wire for non-metallic gas and water pipe in ground outside of buildings. Use AWG #12 tracer wire with low density high molecular weight polyethylene insulation,
and lay continuously on pipe so that it is not broken or stressed by backfilling operations. Secure wire to the piping with tape at 18 inch intervals. Solder all joints. Tracer wire insulation shall be colored yellow for gas piping, blue for water piping.

B. Terminals: Precast concrete box and cast iron locking traffic cover, Brooks 3TL, or equal; cover marked with name of service; 6 inches of loose gravel below box. Plastic terminal board with brass bolts; identify line direction with plastic tags. Test for continuity between terminals, after backfilling, in presence of Inspector.

C. Alternate (use of this alternate material requires approval of authority having jurisdiction): Use electronically detectable plastic tape with metallic core, Terra Tape D, manufactured by Reef Industries, Inc., Seton, Inc., Marking Services, Inc., or equal; tape 2 inches wide, continuously imprinted "CAUTION WATER (GAS, etc.) LINE BELOW". Install, with printed side up, directly over pipe, 18 inches below finish grade. Backfill material shall be as specified for the particular condition where pipe is installed, but avoid use of crushed rock or of earth with particles larger than 1/2 inch within the top 12 inches of backfill. Take precautions to insure that tape is not damaged or misplaced during backfill operations. Terminal boxes not required.

3.19 OPERATION OF SYSTEMS

A. Do not operate any plumbing equipment for any purpose, temporary or permanent, until all of the following has been completed:
1. Complete all requirements listed under “Check, Test and Start Requirements.”
2. Piping has been properly cleaned. Piping systems shall be flushed and treated prior to operation.
3. Filters, strainers etc. are in place.
4. Bearings have been lubricated, and alignment of rotating equipment has been checked.
5. Equipment has been run under observation, and is operating in a satisfactory manner.

B. Provide test and balance agency with one set of Contract Drawings, Specifications, Addenda, Change orders issued, applicable shop drawings and submittals and temperature control drawings.

3.20 CHECK, TEST AND START REQUIREMENTS

A. An authorized representative of the equipment manufacturer shall perform check, test and start of each piece of plumbing equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the check test and start of the equipment.
1. As part of the submittal process, provide a copy of each manufacturer’s printed startup form to be used.
2. Some items of specified equipment may require that check, test and start of equipment must be performed by the manufacturer, using manufacturer’s employees. See specific equipment Articles in these Specifications for this requirement.
3. Provide all personnel, test instruments, and equipment to properly perform the check, test and start work.
4. When work has been completed, provide copies of reports for review, prior to final observation of work.

B. Provide copies of the completed check, test and start report of each item of equipment, bound with the Operation and Maintenance Manual.

C. Upon completion of the work, provide a schedule of planned maintenance for each piece of equipment. Indicate frequency of service, recommended spare parts (including filters and lubricants), and methods for adjustment and alignment of all equipment components. Provide a copy of the schedule with each operating and maintenance manual. Provide a copy of certification from the Owner's representative indicating that they have been properly instructed in maintenance requirements for the equipment installed.

3.21 COMMISSIONING AND PRELIMINARY OPERATIONAL TESTS

A. Prior to observation to determine final acceptance, put all mechanical systems into service and check that work required for that purpose has been done, including but not limited to the following condensed check list. Provide indexed report to tabulating the results of all work.
   1. All equipment has been started, checked, lubricated and adjusted in accordance with the manufacturer's recommendations.
   2. Correct rotation of motors and ratings of overload heaters are verified.
   3. Specified filters are installed and spare filters have been turned over to Owner.
   4. All manufacturers' certificates of start-up specified have been delivered to the Owner.
   5. All equipment has been cleaned, and damaged painted finishes touched up.
   6. Missing or damaged parts have been replaced.
   7. Flushing and chemical treatment of piping systems has been completed and water treatment equipment, where specified, is in operation.
   8. Equipment labels, pipe marker labels, ceiling markers and valve tags are installed.
   9. Valve tag schedules, corrected control diagrams, sequence of operation lists and start-stop instructions have been posted.
   10. Preliminary test and balance work is complete, and reports have been forwarded for review.
   11. Automatic control set points are as designated and performance of controls checks out to agree with the sequence of operation.
   12. Operation and maintenance Manuals have been delivered and instructions to the operating personnel have been made.

B. Prior to the observation to determine final acceptance, operate all mechanical systems as required to demonstrate that the installation and performance of these systems conform to the requirements of these specifications.
   1. Operate and test all mechanical equipment and systems for a period of at least five consecutive 8 hour days to demonstrate the satisfactory overall operation of the project as a complete unit.
   2. Commence tests after preliminary balancing and adjustments to equipment have been checked. Immediately before starting tests, install air filters and lubricate all running equipment. Notify the Architect at least seven calendar days in advance of starting the above tests.
3. During the test period, make final adjustments and balancing of equipment, systems controls, and circuits so that all are placed in first class operating condition.

4. Where Utility District rebates are applicable, demonstrate that the systems meet the rebate program requirements.

C. Review of Contractor's Tests:
   1. All tests made by the Contractor or manufacturers' representatives are subject to observation and review by the Owner. Provide timely notice prior to start of each test, in order to allow for observation of testing. Upon the completion of all tests, provide a letter to confirm that all testing has been successful.

D. Test Logs:
   1. Maintain test logs listing the tests on all mechanical systems showing dates, items tested, inspectors' names, remarks on success or failure of the tests.

E. Preliminary Operation:
   1. The Owner reserves the right to operate portions of the plumbing system on a preliminary basis without voiding the guarantee.

3.22 OWNER TRAINING

A. An authorized representative of the equipment manufacturer shall train Owner-designated personnel in maintenance and adjustment of equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the Owner training for the equipment installed.
   1. As part of the submittal process, provide a training agenda outlining major topics and time allowed for each topic.
   2. Some items of specified equipment require that training must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
   3. Contractor shall provide three copies of certification by Contractor that training has been completed, signed by Owner's representative, for inclusion in Operation and Maintenance Manual. Certificates shall include:
      a. Listing of Owner-designated personnel completing training, by name and title.
      b. Name and title of training instructor.
      c. Date(s) of training.
      d. List of topics covered in training sessions.
   4. Refer to specific equipment Articles for minimum training period duration for each piece of equipment.

END OF SECTION 22 00 50
SECTION 22 10 00 - PLUMBING PIPING SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pipe and fittings.

B. Water hammer arrestors.

C. Hose bibbs.

D. Gas pressure regulating valve.

E. Relief valves.

F. Trap primer.

G. Cleanouts.

H. Floor drains.

I. Floor sinks.

J. Hopper drains.

1.2 RELATED DOCUMENTS

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

B. Section 22 00 50 Basic Plumbing Materials and Methods.

1.3 ADDITIONAL REQUIREMENTS

A. Furnish and install any incidental work not shown or specified which is necessary to provide a complete and workable system.

B. Coordinate all of work in this Section with all of the trades covered in other Sections of the Specifications to provide a complete, operable and sanitary installation of the highest quality workmanship.

C. All plumbing work required in the course of this contract shall be performed in strict accordance with all codes and regulations. Plumbing work done under this contract shall not adversely affect the operation of the existing plumbing systems. All materials shall be new and shall match existing.
1.4 DESCRIPTION OF WORK

A. Furnish and install all plumbing work indicated on the drawings and described herein.

1.5 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of plumbing piping systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Contractor's Qualifications: Firm with at least 5 years of successful installation experience on projects with piping systems work similar to that required for project.

C. Requirements of Regulatory Agencies: The publications listed below form a part of this specification; comply with provisions of these publications except as otherwise shown or specified.

1. Plumbing Code Compliance: Comply with applicable portions of California Plumbing Code pertaining to selection and installation of plumbing materials and products.
   a. NSF Compliance:
      1) Pipe, tube, and fittings used in potable water systems intended to supply drinking water shall meet the requirements of NSF-61 2004, "Drinking Water System Components – Health Effects."
      2) Plastic potable water-service piping shall meet the requirements of NSF 14 2004, "Plastic Piping Components and Related Materials."

2. California Health and Safety Code Compliance: For products covered under the scope of HSC 116875 for potable water service. Products for potable water service shall be third-party certified by an approved laboratory as complying with California Health and Safety Code Section 11 68 75.


4. Utility Compliance: Fabricate and install natural gas systems in accordance with local gas utility company requirements.

5. CPC Compliance: Fabricate and install natural gas systems in accordance with 2010 California Plumbing Code.

6. Provide certified gas welder as defined in California Plumbing Code to weld all joints in welded gas piping.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing piping systems materials and products.

B. Provide welding certificate for all gas pipe welders.

C. Record Drawings: At project closeout, submit Record Drawings of installed piping systems, in accordance with requirements of Division 1.
D. Maintenance Data: Submit maintenance data and parts lists for plumbing piping systems materials and products. Include this data, product data, shop drawings, and record drawings in Operation and Maintenance Manual; in accordance with requirements of Division 1.

E. Pipe, pipe or plumbing fittings, fixtures, solder and flux installed in a system providing water for human consumption shall comply with lead free requirements of the California Health and Safety Code Section 116875. Provide submittal information for products third-party certified by an approved laboratory as complying with California Health and Safety Code Section 116875.

1.7 JOB CONDITIONS

A. Cooperation with other trades: Coordinate Work of this Section with that of other Sections to ensure that Work is carried out in an orderly fashion.

B. Coordinate with other trades all equipment locations, pipe, duct and conduit runs, electrical outlets and fixtures, air inlets and outlets, and structural and architectural features. Provide information on location of piping and seismic bracing to all other trades as required for a completely coordinated project.

PART 2 - PRODUCTS

2.1 MATERIALS AND PRODUCTS

A. Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Provide materials and products complying with California Plumbing Code. Where more than one type of material or product is indicated, selection from materials or products specified is Contractor’s option.

2.2 PIPE AND FITTINGS INSIDE BUILDINGS AND BELOW COVERED WALKS AND CORRIDORS

A. Drain and Waste Pipe: Cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301 and so marked. Pipe and fittings shall be as manufactured by AB&I, Charlotte, Tyler Pipe, or equal. Pipe and fittings shall be the products of a single manufacturer.

1. Joints above ground: No-Hub conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301. Stainless steel bands by Anaco, Tyler, Ideal or equal. Provide sway brace at 20'-0" maximum spacing for suspended pipe with No-Hub joints. Provide a brace on each side of a change in direction of 90 degrees or more. Brace riser joints at each floor and at 15 foot maximum intervals (also see Specification Section 22 00 50).

2. Joints located over critical areas including food preparation, food storage, food serving, and eating areas shall be Husky SD 4000, Husky HD 2000, Clamp-All 125, Clamp-All 80, Mission Heavyweight, or equal, meeting the requirements of FM 1680, SD Class I or ASTM C1540.

3. Piping below grade shall be ASTM A-74 joined with neoprene gaskets conforming to ASTM C564, Ty-Seal, Dual-Tite, or equal. No-Hub pipe and fittings conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301 may be used underground and assembled with Husky SD 4000, Husky HD 2000, Clamp-All 125, Clamp-All 80, Mission Heavyweight, or equal couplings and
No-Hub fittings, meeting the requirements of FM 1680, SD Class I or ASTM C1540.

4. At Contractor's option, vertical piping above floor from lavatories, sinks, and drinking fountains may be Schedule 40 galvanized steel pipe with black cast iron drainage fittings, or DWV copper pipe and fittings.

B. Vent Pipe:
1. Service weight cast iron soil pipe and fittings.
   a. At Contractor's option, piping 2-1/2" and smaller may be Schedule 40 galvanized steel pipe with black cast iron drainage fittings, or DWV copper pipe and fittings.
2. Vent pipe buried in ground and to 6 inches above ground: Service weight cast iron soil pipe and fittings. Joints in cast iron vent pipe shall be the same as specified for cast iron waste pipe below ground.

C. Water Pipe (Tempered Water, Tempered Water Return, Hot Water, Hot Water Return and Cold Water): Type L copper tubing, hard-temper, with wrought copper fittings. Provide full solder cup for all fittings. Capped or plugged outlets shall be Schedule 40 screwed brass. Water piping below slab: Type K copper tubing, hard temper, with wrought copper fittings. At Contractor's option, pipe runs below slab having no branches may be Type K annealed copper tubing without joints. See Section 22 00 50 for pipe protection requirements for below slab copper piping.

D. Temperature and Pressure Relief Valve Piping: Type L copper tubing, hard-temper, with wrought copper fittings. Provide full solder cup for all fittings. Capped or plugged outlets shall be Schedule 40 screwed brass.

E. Gas Pipe: Schedule 40 black steel with malleable iron screwed fittings above grade for piping 2 inch and smaller; welded piping below grade and for above grade piping larger than 2 inches, with Class 150 welding fittings.
1. Appliance fuel connectors, as defined in 1203 of the CPC, are not acceptable for connection of equipment, except where specifically indicated on the Contract Documents.
2. Where Drawings indicate installation of mechanical equipment on spring isolation rails or spring mounted curbs, provide flexible connection, Metraflex, Metraloop, Unisource Mfg. Co. "V" connector, or equal, CSA listed for 4 inches of movement.
   a. Provide CSA certification for gas connections.

F. Compressed Air Pipe: Type K copper tubing, hard temper, with wrought copper fittings. Capped or plugged outlets shall be screwed brass.

G. Condensate Drain Piping:
1. Inside buildings provide Type L copper tubing and fittings. Provide Wye fittings with capped cleanout plug for tubing up to 1 inch size. Provide wrought or cast DWV fittings for sizes 1-1/4 inch and larger.
2. Connect condensate drains to mechanical equipment per equipment manufacturer's recommendations; provide P-trap where required. Slope piping to drain, with 1 inch in 10 foot minimum pitch. Provide di-electric couplings or unions at connections to dissimilar materials.
3. Where Drawings indicate installation of mechanical equipment on spring isolation rails or spring mounted curbs, provide threaded metal connector at mechanical equipment, Metraflex Model SST or BST, Unisource Mfg. Co. "V" connector, or equal, CSA listed for 4 inches of movement. Arrange flexible connection to insure drainage of condensate under all installation conditions, and arrange for support of flexible connection at each end of the connector, to insure alignment at all times.

4. Where condensate drain P-traps are required, install trap using Wye fitting on inlet and outlet of trap. Provide cap on top of each Wye, made removable for cleaning and inspection. Drill 1/8 inch diameter hole in cap at outlet of the trap to allow venting of the system. Minimum depth of trap should be 4 inches, or as recommended by the manufacturer in printed literature.

5. Provide cleanout tees or "Y" at each change in direction.

2.3 PIPING AND FITTINGS OUTSIDE BUILDINGS AND BEYOND COVERED WALKS

A. Gas Piping Underground: Performance Pipe, "DriscoPlex" 6500 PE 2708 (yellow), Polypipe, Inc., "Polypipe", or equal, polyethylene gas distribution pipe, ASTM D2513, ASTM D3261, and ASTM D2683 fittings with fusion welded joints. Provide piping labeled for natural gas in accordance with CPC.

1. Electrically isolate underground ferrous gas piping from the rest of the gas system with listed or approved isolation fittings installed a minimum of six inches above grade.

2. Provide Central Plastics Corp., Perfection, or equal, anodeless, single seal riser for transition from below grade polyethylene to schedule 40 steel piping above grade. Minimum horizontal length shall be 30 inches. Minimum vertical length shall be 30 inches, or greater as required. Provide fusion connection to polyethylene pipe below grade, and screwed connection to steel pipe above grade.

B. Gas Piping Aboveground to 30 inches Belowground: Schedule 40 black steel with beveled ends for welding, with Class 150 welding fittings. Mitering to form elbows or tees will not be permitted; where branch tee connections of welded piping are required, Bonney "Weldolet" Allied Pipe Fittings, or equal fittings may be used if the branch is one-half of the diameter of the main or less.

2.4 WATER HAMMER ARRESTORS

A. Provide water hammer arrestors conforming to lead-free requirements of California Health and Safety Code Section 11 68 75, with nesting type bellows contained within a casing having sufficient displacement volume to dissipate the calculated kinetic energy generated in the piping system. Water hammer arrestors shall be sized for type and number of fixtures served. Provide all stainless steel shell construction with stainless steel bellows and threaded connection to water system.

B. Water hammer arrestors shall be certified under P.D.I. Standard WH201 and by ASSE Standard 1010.

C. Select units in accordance with the requirements of Plumbing and Drainage Institute Standard P.D.I. WH201. Install above ceilings or behind wall access door at each
plumbing fixture, or where plumbing fixtures are installed in groups, at each group of fixtures.

D. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   Josam Company, series 75000
   Smith (Jay R.) Mfg. Co., Hydrotrol 5005-5050
   Mifab, series WHB

2.5 HOSE BIBBS

A. Hose Bibb - Interior Wall Mounted: Integral vacuum breaker protected cartridge operated hose valve with lock shield bonnet and removable key handle. Polished chrome plated finish. Acorn model 8121CP or Woodford model 24PC, or equal.

2.6 GAS PRESSURE REGULATING VALVES

A. Provide single-stage, steel-jacketed, and corrosion-resistant gas pressure regulators. Provide atmospheric vent, elevation compensator, threaded ends for 2 inches and smaller, flanged ends for 2-1/2 inches and larger, for inlet and outlet gas pressures, specific gravity, and volume flow indicated on Drawings.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   American Meter Series 1813B or 1813C
   Equimeter (Rockwell) Series 143-80-2 or 243-12-2

2.7 RELIEF VALVES

A. Provide relief valves as indicated, of size and capacity as selected by Contractor for proper relieving capacity, in accordance with ASME Boiler and Pressure Vessel Code.

B. Combined Pressure-Temperature Relief Valves: Bronze body, test lever, thermostat, complying with ANSI A21.22 listing requirements for temperature discharge capacity. Provide temperature relief at 210 degrees F, and pressure relief at 150 psi.

C. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   Watts Regulator Company
   Cash (A.W.) Valve Manufacturing Corporation
   Zurn Industries, Inc.; Wilkins-Regulator Division
2.8 TRAP PRIMER

A. Provide trap primers as indicated 1/2 inch size, with built-in air gap. Install trap primer piping with 1/4 inch per foot slope, to insure that the line will drain fully to the floor drain or floor sink. PVC trap primer bodies will not be acceptable.
   1. Provide ball valve to the inlet at each trap primer location.

B. Install trap primer and distribution unit exactly as called for in manufacturers printed installation instructions. Connect to domestic water piping from the top of the water line, in order to prevent foreign material from entering directly into primer assembly.

C. Mount trap primer in wall, in sheet metal box, with Karp or equal access door. Size access door and box to suit valve operation, and solder all seams of box. Seal all penetrations to box with non-hardening waterproof sealant. Provide locking door where installed in occupied spaces.

D. Where one trap primer will be used for more than one trap, provide a distribution unit with feeder piping for a maximum of four traps sized for equal pressure drop to each trap.

E. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   MiFab “M-500 Series”
   Precision Plumbing Products “Prime-Rite”
   Sioux Chief Manufacturing Company “Prime Perfect”

2.9 CLEANOUTS

A. General: Install cleanouts of same diameter as pipe (4 inch maximum) in all horizontal soil and waste lines where indicated and at all points of change in direction. Cleanouts shall be located not less than 18 inches from building construction so as to provide sufficient space for rodding. No horizontal run over 50 feet inside buildings or 100 feet outside buildings shall be without cleanout, whether shown on Drawings or not. Provide two-way cleanouts where indicated on drawings, and where required for satisfactory use.
   1. Provide cleanouts in waste drop from each sink and urinal.
   2. Provide one wrench for each size and type of cleanout used. Turn over to Owner at completion of the project, and obtain receipt. Place receipt in Operation and Maintenance Manuals.

B. Cleanouts in floor and in concrete sidewalks: Ducco Cast Iron with nickel bronze top, clamping collar and ABS plastic plug: Zurn ZN-1400-KC, or equal, with square or round top to suit floor construction.

C. Cleanouts in composition floors: Zurn ZN-1400-X-DX, or equal (nickel bronze top).

D. Cleanouts in concealed, aboveground cast-iron soil or waste lines: Zurn Z-1440A, or equal, with ABS plastic plug.
E. Cleanouts in walls: Zurn Z-1441 or Z-1443, or equal, with stainless steel cover. Provide long sweep elbow or combination wye at connection to riser and install with surface of cleanout within 1/2 inch of front face of finished wall.
   1. Where space does not permit the above installation, provide Zurn Z-1446, or equal, with stainless steel access cover, and vandal resistant screw.
   2. Install face of cleanout plug within 1/2 inch of front face of finished wall.

F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

   Zurn
   J.R. Smith
   Josam

2.10 FLOOR DRAINS

A. Provide floor drains of size as indicated on Drawings, and type, including features, as specified herein. Provide flashing ring and clamp at floors with water resistant membrane. Set top of drain slightly below floor to insure drainage. Install vented P-trap below each drain. Where trap primers are indicated, install trap primer connection in the P-trap.

B. General Service Floor Drains: Zurn Model Z-415, or equal, with Type “B” strainer for exposed concrete and Type “S” strainer for tile floor. Provide bronze trim.

C. Floor Drains in Composition Type Floors: Zurn Model Z-415, or equal, with Type SL strainer.

D. Floor Drains in Mechanical Service Areas: Zurn Model Z-541, or equal, 12 inch diameter heavy duty drain.

E. Floor Drains at Indirect Drain Locations: Zurn Model Z-415 or equal, with Type “I” strainer, recess rim flush with floor.

F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

   Zurn
   J.R. Smith
   Josam

2.11 HOPPER DRAINS

A. Hopper Drain (HD): Zurn Model Z-1019, J.R. Smith 3822-BS, or equal, funnel drain with 4 inch diameter funnel and P trap. Provide dome type strainer.
B. Install hopper drain in wall, in sheet metal box, with Karp or equal access door.
   1. Size access door and box to suit the size required for hopper drain and trap primer, and solder all seams of box. Seal all penetrations to box with non-hardening waterproof sealant. Provide locking door in occupied spaces.
   2. Grind top and sides of funnel, if required to suit the wall thickness.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which plumbing piping systems are to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected in manner acceptable to Contractor.

B. Make all arrangements for the utilities required. Pay all costs involved in obtaining the services including gas service and meter, water meter, pressure reducing valve, access boxes, street work. Connect to site utilities. Verify the location of all services. No extra cost will be allowed if services are not as shown.

C. Determine sanitary sewer and storm drain location and elevation at all points of connection before installing any piping. Notify Architect immediately if indicated grades cannot be maintained.

D. At time of final connection, and prior to opening valve to allow pressurization of water and gas piping from existing systems, on site or off site, perform a pressure test to indicate static pressure of existing systems. If pressure on water piping is greater than 80 psi, or gas pressure is not as indicated on Contract Documents, inform Architect immediately. Do not allow piping systems to be pressurized without written consent of the Architect.

3.2 INSTALLATION OF WATER PIPING

A. Run all water piping generally level, free of traps or unnecessary bends, arranged to conform to the building requirements, and to suit clearance for other mechanical work such as ducts, flues, conduits, and other work. No piping shall be installed so as to cause unusual noise from the flow of water therein under normal conditions.

B. Provide manufactured water hammer arrestors, sized and installed in accordance with Plumbing and Drainage Institute Standard PDI WH201.
   1. Locate water hammer arrestors at every plumbing fixture, or, where fixtures are located in groups, at every group of fixtures, and as indicated on Drawings.
   2. Install water hammer arresters above accessible ceilings, or install access doors for service.

C. In freezing locations arrange water piping to drain as shown.

D. Install piping on room side of building insulation.

E. Check final location of rubber rings within couplings on PVC water piping with gauge or as recommended by manufacturer. Make connection to valves with cast iron adapters.
connected to water pipe with cast iron couplings. Furnish and install anchors or thrust blocks.

3.3 INSTALLATION OF SANITARY AND STORM DRAINAGE SYSTEMS

A. Make joints in PVC sewer pipe with PVC-type couplings and rubber rings.

B. Check final location of rubber rings within the couplings with gauge or as recommended by the manufacturer. Make joints between PVC pipe and cast iron pipe or fittings using cast iron adapter fittings, installed as recommended by the manufacturer.
   1. Ring-Tite cast iron pipe fittings may be used in lieu of standard fittings. Make connection to valves with cast iron adapters connected to the pipe with PVC couplings.

C. Sewer Piping: Run all horizontal sanitary drain piping inside of building on a uniform grade of not less than 1/4 inch per foot unless otherwise noted or later approved. Unless otherwise noted on the plans, piping shall have invert elevations as shown and slope uniformly between given elevations.

D. Run all drainage piping as straight as possible and provide easy bends with long turns; make all offsets at an angle of 45 degrees or less.

E. Grade all vent piping so as to free itself quickly of any water condensation.

F. Where possible, join groups of vent risers together with one enlarged outlet through roof. Maintain minimum of 10 foot horizontal or 3 foot vertical clearance from air intakes.

G. Hubless Cast Iron Joints: Comply with coupling manufacturer's installation instructions.

3.4 INSTALLATION OF CLEANOUTS

A. Cleanouts: Install in piping as indicated, as required by California Plumbing Code, at each change in direction of piping greater than 45 degrees. Install at maximum intervals of 50 feet for piping 4 inches and smaller and 100 feet for larger piping inside buildings, and at base of each conductor.

B. Flashing Flanges: Install flashing flange and clamping device with each cleanout passing through water resistant membrane.

3.5 INSTALLATION OF FLOOR DRAINS AND FLOOR SINKS

A. Install drains in accordance with manufacturer's written instructions and in locations indicated. Install floor drains and floor sinks with lip of drain slightly below finished floor to ensure drainage. Coordinate with other Contractors to ensure that floor slopes to drain. Provide flashing flange and clamping device with each drain passing through water resistant membrane.

3.6 INSTALLATION OF NATURAL GAS PIPING
A. Install natural gas piping in accordance with Division 22 Basic Plumbing Materials and Methods sections.

B. Use sealants on metal gas piping threads that are chemically resistant to natural gas. Use sealants sparingly, and apply to only male threads of metal joints.

C. Remove cutting and threading burrs before assembling piping.

D. Do not install defective piping or fittings. Do not use pipe with threads that are chipped, stripped, or damaged.

E. Plug each gas outlet, including valves, with threaded plug or cap immediately after installation and retain until continuing piping or equipment connections are completed.

F. Ground gas piping electrically and continuously within project, and bond tightly to grounding connection.

G. Install drip-legs in gas piping where indicated and where required by code or regulation. 1. Install "Tee" fitting with bottom outlet plugged or capped at bottom of pipe risers.

H. Install piping with 1/64 inch per foot (1/8 percent) downward slope in direction of flow.

I. Install piping parallel to other piping.

J. Paint all gas piping installed in exposed exterior locations.

K. Provide exterior shutoff valve at each building. Provide sign affixed to wall at valve location reading: “Gas Shut-Off.” Size and location of the sign shall be as required by the Authority Having Jurisdiction. Where gas piping enters a building in more than one location, exterior shutoff valves shall have a permanently attached metal tag identifying the area served by that valve, in addition to sign on wall.

L. Maintain minimum of 12 inch clearance between gas piping and steam piping above 200 degrees F.

3.7 GAS PRESSURE REGULATING VALVES

A. Install as indicated; comply with utility requirements. In locations where regulators are installed in confined spaces, pipe atmospheric vent to outdoors, full size of outlet. Install gas shutoff valve upstream and downstream of each pressure-regulating valve.

3.8 GAS PIPING EQUIPMENT CONNECTIONS

A. Connect gas piping to each gas-fired equipment item, with union, drip leg and shutoff gas cock full size of supply line shown. Reduce only at connection to equipment. Comply with equipment manufacturer’s instructions.

1. Appliance fuel connectors, as defined in 1203 of the CPC, are not acceptable for connection of equipment, except where specifically indicated on the Contract Documents.

2. Route gas vent and gas relief to outside.
3. Gas shutoff valve shall be placed as close as possible to equipment in a location where it can be serviced. Distance from equipment to valve shall not exceed 6 feet.

3.9 INSTALLATION OF TRAP PRIMERS

A. Install as indicated in manufacturers printed literature, with 1/2 inch, Type L, hard copper piping to trap primer connection on floor drains and floor sinks where indicated on Drawings. At Contractor’s option, Type K annealed copper tubing without joints may be used below slab only. See Section 15050 for pipe protection requirements for below slab copper piping/tubing. Provide valve ahead of each trap primer.

3.10 EQUIPMENT CONNECTIONS

A. Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated.

B. Mechanical Equipment Connections: Connect hot and cold water piping system and gas piping system to mechanical equipment as indicated, and provide with shutoff valve and union for each connection.

3.11 SPARE PARTS

A. Furnish to Owner, with receipt, one valve key for each key operated hydrant, bibb, or faucet installed.

3.12 DOMESTIC WATER SYSTEM STERILIZATION

A. Clean and disinfect all hot and cold water systems connected to domestic water systems in accordance with AWWA Standard C651 and as required by the local Building and Health Department Codes, and EPA. A water treatment company that has a current Cal-EPA license to apply disinfectant chlorine in potable water shall perform the procedure.

1. Disinfect existing piping systems as required to provide continuous disinfection upstream to existing valves. At the option of the contractor, valves may be provided to isolate the new piping systems from the existing systems.

B. Preliminary Preparation: Provide a 1 inch service cock or valve connected to system at a point within 2'-0” of its junction with water supply line and inject disinfecting agent into system through this cock. When project is complete, with all fixtures connected and operable and ready for use and when, by test, system is proved to be free from leaks, it shall be thoroughly flushed by fully opening every outlet and operating every fixture until clear water flows from all of them.

C. Disinfecting Agent: The chlorine shall be a registered product with Cal-EPA for use in California in potable water lines, such as Bacticide, Cal-EPA Registration No. 37982-20001.

D. Disinfecting Procedure: Connect a hand-operated pump, 100 psi rating, minimum to the 1-inch service cock or valve.
1. With system completely full of water and supply valve open, adjust every faucet of system so that a trickle of water flows from each.
2. Inject disinfect to provide a minimum chlorine residual concentration of at least 50 parts per million (ppm) of free chlorine at each outlet.
3. Close all outlets and valves, including valve connecting to water supply line and 1-inch service cock on solution injection connection. Maintain condition for 24 hours and chlorine residual of 50 ppm should be retained in system for this 24 hour period. If, after 24 hours, present/absent test indicates that chlorine residual concentration has decreased below 50 ppm then disinfection procedure must be repeated until an approved result is obtained.
4. When the above procedure has been completed, flush out entire system with fresh water until a "present/absent" test at any outlet shows a residual of not more than 0.2 ppm, or a residual the same as that of the test water.
5. The on-site disinfection shall be performed under the supervision of a licensed applicator.
6. Warning signs shall be provided at all outlets while chlorinating the system.

E. Chemical and bacteriological tests shall be conducted by a state-certified laboratory and approved by the local authorities having jurisdiction. Copies of the tests shall be submitted to the Architect and all governing authorities.

F. Domestic water sterilization shall be performed in accordance with Section 3 of the State of Nevada Division of Health, Water Supply Regulations. Approval of State Health Division shall be obtained prior to placing system in service. Submit written report to Health Department as required by State regulations. Provide a copy of report to Architect prior to completion of project.

3.13 CARE AND CLEANING

A. Repair or replace broken, damaged, or otherwise defective parts, materials, and work. Leave entire work in condition satisfactory to Architect. At completion, carefully clean and adjust equipment, fixtures, and trim that are installed as part of this work. Remove labels from stainless steel sinks, except 316 stainless steel sink labels should be retained to confirm that the correct material has been provided. Leave systems and equipment in satisfactory operating condition.

3.14 OPERATION TEST

A. Test each piece of equipment to show that it will operate in accordance with indicated requirements.

3.15 TESTING AND BALANCING

A. See section 23 80 00 of these specifications for testing and balancing requirements.

3.16 CLEANING UP

A. Upon completion of Work remove materials, equipment, apparatus, tools, and the like, and leave premises clean, neat, and orderly.

END OF SECTION 22 10 00
SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Water supplies and stops.
B. Plumbing fixture hangers and supports.
C. Refrigerator ice maker.
D. Dishwasher air gap fitting.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. Section 22 00 50 Basic Plumbing Materials and Methods.

1.3 ADDITIONAL REQUIREMENTS

A. Furnish and install any incidental work not shown or specified which is necessary to provide a complete and workable system.
B. Coordinate all of work in this Section with all of the Trades covered in other Sections of the Specifications to provide a complete, operable and sanitary installation of the highest quality workmanship.

1.4 DESCRIPTION OF WORK

A. Furnish and install all plumbing work indicated on the Drawings and described herein.

1.5 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of plumbing fixtures of the type, style and configuration required. All companies providing products with warranties must have been engaged in manufacturing of such products for as long as the warranty states.
B. Plumbing Fixture Standards: Comply with applicable portions of the following codes and requirements for all work in this section:
   California Building Code – CBC
   California Plumbing Code – CPC
   California Health and Safety Code
   American National Standards Institute - ANSI
   Federal Standards - F.S.
   National Sanitary Foundation – NSF International

D. PDI Compliance: Comply with standards established by Plumbing and Drainage Institute pertaining to plumbing fixture supports.

E. UL Labels: Provide water coolers that have been listed and labeled by Underwriters' Laboratories.

F. ARI Labels: Provide water coolers that are rated and certified in accordance with applicable Air-Conditioning and Refrigeration Institute Standards.

G. Americans with Disabilities Act (ADA).

H. California Health and Safety Code Compliance: For products covered under the scope of HSC 116875 for potable water service. Products for potable water service shall be third-party certified by an approved laboratory as complying with California Health and Safety Code Section 11 68 75.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's specifications for plumbing fixtures and trim, including catalog cut of each fixture type and trim item furnished.

B. Maintenance Data: Submit maintenance data and parts lists for each fixture type and trim item, including instructions for care of finishes. Include this data in Operation and Maintenance Manual.

C. Pipe, pipe or plumbing fittings, fixtures, solder and flux installed in a system providing water for human consumption shall comply with lead free requirements of the California Health and Safety Code Section 11 68 75. Provide submittal information for products third-party certified by an approved laboratory as complying with California Health and Safety Code Section 11 68 75.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES

A. General: Provide factory fabricated fixtures of type, style and material indicated. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats, and valves as indicated by their published product information; either as designed and constructed, or as recommended by the manufacturer, and as required for a complete, installation. Where more than one type is dedicated, selection is Contractor's option; but, all fixtures of same type must be furnished by single manufacturer.

1. Take special care with the roughing-in and finished plumbing where batteries of fixtures occur.

2. Take location and mounting heights for roughing-in from Architectural Drawings.

3. Follow schedule on Plumbing Drawings for roughing-in connections. Set roughing-in for all fixtures exactly as per measurements furnished by the manufacturers of the fixtures used.
4. Roughing-in for lavatories and sinks shall be brought in through the wall under the centerline of the drain from the fixture wherever possible and as close to the fixture as possible.

2.2 MATERIALS

A. Provide materials that have been selected for their surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, foundry sand holes, stains, discoloration, or other surface imperfections on finished units are not acceptable.

B. Where fittings, trim and accessories are exposed or semi-exposed, provide, chromium plated 17 gauge seamless brass and match faucets and fittings. Provide 17 gauge seamless copper or brass where not exposed.

C. Handles on all faucets and stops shall be all metal chromium plated.

2.3 PLUMBING FITTINGS, TRIM AND ACCESSORIES

A. Water Outlets: At locations where water is supplied (by manual, automatic or remote control), provide commercial quality faucets, valves, or dispensing devices, of type and size indicated, and as required to operate as indicated.
   1. Include manual shutoff valves and connecting stem pipes to permit outlet servicing without shut-down of water supply piping systems.

B. P-Traps: Include IAPMO approved removable P-traps where drains are indicated for direct connection to drainage system. P-Traps shall be less trap screw cleanout, and incorporate a chrome plated cast brass body, brass connection nuts, 17 gauge seamless brass wall return and chrome plated wall escutcheon to match trap finish.

C. Carriers: Provide cast iron supports for fixtures of graphitic gray iron, ductile iron, or malleable iron as indicated. Where the carrier for wall mounted water closets are installed more than 6 inches behind the finished wall, provide water closet support for wide pipe chase.

D. Fixture Bolt Caps: Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.

E. Escutcheons: Where fixture supplies and drains penetrate walls in exposed location, provide chrome-plated cast brass escutcheons with setscrews.

F. Aerators: Provide aerators of types approved by Health Departments having jurisdiction. Delete aerators where not allowed by CPC for health care occupancies.

G. Comply with additional fixture requirements contained in Fixture Schedule shown on the drawings.

2.4 MANUFACTURERS

A. In accordance with California Plumbing Code, provide indelibly marked or embossed manufacturers name or logo, arranged so as to be visible after installation.
B. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following:

1. Vitrified China Plumbing Fixtures:
   - American Standard, U.S. Plumbing Products
   - Crane Plumbing
   - Eljer Plumbingware Div., Wallace-Murray Corp.
   - Kohler Co.
   - VitrA

2. Modular Lavatories:
   - Bradley
   - Acorn
   - Willoughby Industries, inc.

3. Plumbing Trim:
   - McGuire Manufacturing Co., Inc.
   - Delta Commercial
   - Chicago Faucet Co.
   - T&S Brass and Bronze Works, Inc.

4. Flush Valves:
   - Sloan Valve Co.
   - Zurn Industries, Hydromechanics Div.
   - Toto USA, Inc.

5. Faucets:
   - Chicago Faucet Co.
   - Symmons Scott
   - T&S Brass and Bronze Works, Inc.
   - Delta Commercial

6. Fixture Seats:
   - Church Seat Co.
   - Bemis Mfg. Co.
   - Beneke Corp.

7. Water Coolers and Drinking Fountains:
   - Haws Corporation
   - Elkay Mfg. Co.
   - Acorn Aqua

8. Service Sinks:
   - American Standard Kohler Co.
   - Williams Serviceptor
   - Florestone
   - Acorn

9. Stainless Steel Sinks:
   - Elkay Mfg. Co.
   - Just Mfg. Co.
   - Haws Corporation

10. Showers:
    - Acorn
    - Bradley
    - Symmons
    - Powers

11. Emergency Equipment:
Haws Corporation
Gardian
Symmons
Bradley
Encon

12. Fixture Carriers:
Josam Mfg. Co.
J. R. Smith
Tyler Pipe; Wade Div.
Zurn Industries; Hydromechanics Div.
Mifab, Inc.

2.5 FLUSH VALVE REQUIREMENTS

A. Metering flush valves where required and specified shall be non-hold open type with exposed parts chrome plated. Conform to all codes and manufacturers’ recommendations. All diaphragms are to have multiple filtered bypass and be chloramine resistant synthetic rubber with internal components suitable for 180 degree hot water to 150 pounds pressure, plastic or leather diaphragm not acceptable.

B. Electronic flush valves where required and specified shall be non-hold open type with exposed parts chrome plated. Conform to all codes and manufacturers’ recommendations. All diaphragms are to have multiple filtered bypass and be chloramine and resistant synthetic rubber with rubber and internal components suitable for 180 degree hot water to 150 pounds pressure, plastic or leather diaphragm not acceptable. All flush valve solenoids and sensors shall be UL listed.

2.6 FIXTURE CONNECTIONS

A. Make connection between fixtures and flanges on soil pipe absolutely gastight and watertight with neoprene type gaskets (wall hung fixtures) or bowl wax (floor outlet fixtures). Rubber gaskets or putty will not be permitted.

B. Provide fixtures not having integral traps with P-traps of chromium-plated 17 gauge cast brass, with 17 gauge seamless brass wall return, connected to concealed waste in wall and sanitary fittings. Provide IAPMO approval for trap, and provide less trap screw cleanout.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   Dearborn Brass, Commercial series with brass nuts
   Delta Commercial
   McGuire Manufacturing Co., Inc.

C. Connections from stacks or horizontal wastes to wall or floor finish for wastes from lavatories, urinals, sinks, and drinking fountains and connection between floor drains and traps shall be IPS 85 percent red brass pipe.

D. Plumbing fixture traps connected to special waste systems shall be constructed of materials to suit the waste system.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   Orion
   Enfield

E. Unions on waste pipes on fixture side of traps may be slip or flange joints with soft rubber or lead gaskets. Traps shall rough in full size to waste and vent connection, using deep escutcheon plate to cover wall penetration. Compression adaptor extensions or sweat adaptors are not acceptable.

2.7 WATER SUPPLIES AND STOPS

A. Provide 85 percent IPS threaded red brass nipple, conforming to the lead-free requirements of California Health and Safety Code Section 11 68 75, securely anchored to building construction, for each connection to stops, hose bibbs, etc. Each fixture, except hose bibbs, shall have stop valves installed on water supply lines.

B. Provide water supplies to fixtures with compression shut-off stops with IPS inlets and lock shield-loose key handles. Provide combination fixtures with compression stop and IPS inlet on each water supply fitting. Provide lock shield-loose key handle for each stop.

C. Provide 1/2 inch riser tubes with reducing coupling for fixtures, unless otherwise noted.

D. Provide cast brass escutcheon.

E. Furnish shut-off valves on hose bibbs where directly connected to mains with no intervening valves.

F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal: BrassCraft Manufacturing model SR37XC stop with 3-12AC riser and 647 escutcheon. McGuire Manufacturing Company, Inc. model LFH2167LK

2.8 PLUMBING FIXTURE HANGERS AND SUPPORTS

A. Residential type fixture supports are not acceptable.

B. Install wall mounted water closets with combination support and waste fittings, with feet of support securely anchored to floor.

C. Install floor mounted water closets with J.R. Smith, Zurn, or equal government pattern cast iron closet flanges with brass bolts, nuts, washers, and porcelain caps secured with Spackle.

D. Install the following fixtures on concealed support with feet of support securely anchored to floor. Anchor top of support to wall construction in an approved manner.
   Wall hung lavatories
   Wall mounted urinals
   Drinking fountains
Electric water coolers

2.9 PLUMBING FIXTURES

A. Install all plumbing fixtures at height indicated on Architectural Drawings. Where mounting height is not indicated, install at height required by Code.

B. Special Requirements For Accessible Fixtures:
   1. Operating handle or valve for accessible water closets, urinals, lavatories, and sinks shall operate with less than 5 pounds force. Metering faucets shall be adjusted to operate between 10 and 15 seconds.
   2. Insulate exposed waste piping and domestic water supplies below accessible fixtures with CBC access code compliant molded “closed-cell” vinyl covers. Covers shall be installed using vandal resistant fasteners and must be removable. Covers shall meet flame spread rating not to exceed 25 and smoke density not to exceed 450 when tested in accordance with UBC Standard 8-1 (ASTM E-84), and shall comply with the requirements of California Code of Regulations, Title 24. Plumberex – Handy Shield, Johns Manville – Zeston 2000, or equal.

C. Refrigerator Ice Maker, RIM: Provide Guy Gray model MIB1AB, or equal ice maker hook-up box, conforming to lead-free requirements of California Health and Safety Code Section 116875, with 1/2 inch FIP inlet and 1/4 inch compression outlet. Provide 20 gauge box, and 18 gauge stainless steel face plate.

D. Dishwasher, DW-1: Rough-in and connect hot water with stop valve, 2 inch vented P-trap, mount Zurn model CD3P, or equal, air gap in sink ledge.

PART 3 - EXECUTION

3.1 PRODUCT HANDLING AND PROTECTION

A. Deliver packaged materials in their original, unopened wrapping with labels intact. Protect materials from water, the elements and other damage during delivery, storage and handling.

3.2 PREPARATORY PROVISIONS

A. The Contractor is responsible for the examination and acceptance of all conditions affecting the proper construction and/or installation of the Work of this Section. Do not proceed until all unsatisfactory conditions have been corrected. Commencing work will be construed as acceptance of all conditions by the Contractor as satisfactory for the construction and/or installation of the Work.

3.3 INSPECTION AND PREPARATION

A. Examine roughing-in work of domestic water and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Also examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping, and other unsatisfactory conditions for installation of
plumbing fixtures. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Install plumbing fixtures of types indicated where shown and at indicated heights; in accordance with fixture manufacturer's written instructions, roughing-in drawings. Ensure that plumbing fixtures comply with requirements and serve intended purposes. Comply with applicable requirements of the National Standard Plumbing Code pertaining to installation of plumbing fixtures.

C. Fasten plumbing fixtures securely to supports or building structure; and ensure that fixtures are level and plumb. Secure plumbing supplies to blocking behind or within wall construction so as to be rigid, and not subject to pull or push movement.

D. Install CBC accessible fixtures in accordance with Chapter 4 California Plumbing Code, and Chapters 11A and 11B California Building Code.

E. Refer to Division 26 for wiring for electronic flush valves.

3.4 INSTALLATION OF FAUCETS

A. Provide 85 percent IPS red brass pipe, conforming to lead-free requirements of California Health and Safety Code Section 116875, securely anchored to building construction, for each connection to faucets, stops, hose bibbs, etc. Each fixture, except hose bibbs, shall have a stop valve installed on water supply lines to permit repairs without shutting off water mains.

B. Adjust metering faucets to run for 10 to 15 seconds.

3.5 CLEAN AND PROTECT

A. Clean plumbing fixtures of dirt and debris upon completion of installation.

B. Protect installed fixtures from damage during the remainder of the construction period.

C. Grout voids between all fixtures and adjacent surfaces with white Dow Silicone Sealant, arranged to shed water.

3.6 FIELD QUALITY CONTROL

A. Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

3.7 EXTRA STOCK

A. General: Furnish special wrenches and other devices necessary for servicing plumbing fixtures and trim to Owner with receipt. Furnish one device for every ten units.

END OF SECTION 22 40 00
SECTION 22 50 00 – PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Commercial electric water heaters.
B. Instantaneous electric water heaters.
C. Thermal expansion absorbers.
D. In-line domestic hot water recirculation pumps.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. Section 22 00 50 Basic Plumbing Materials and Methods.

1.3 ADDITIONAL REQUIREMENTS

A. Furnish and install any incidental work not shown or specified which is necessary to provide a complete and workable system.
B. Coordinate all of work in this Section with all of the Trades covered in other Sections of the Specifications to provide a complete, operable and sanitary installation of the highest quality workmanship.

1.4 DESCRIPTION OF WORK

A. Furnish and install all plumbing work indicated on the Drawings and described herein.

1.5 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of plumbing equipment of type and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
B. Trade names or catalog numbers stated herein indicates grade or quality of materials desired.
C. Dimensions, sizes, and capacities shown are minimum and shall not be changed without permission of Architect.
D. UL and NEMA Compliance: Provide electric motors and electrical components required as part of plumbing equipment, which have been listed and labeled by Underwriters Laboratories and comply with NEMA standards.
E. CEC Compliance: Comply with California Electrical Code (Title 24, Part 3) as applicable to installation and electrical connections of ancillary electrical components of plumbing equipment.


G. CSA/UL Labels:
   1. Provide gas-fired water heaters that have been listed and labeled by CSA International or Underwriters Laboratories, certifying design according to ANSI Z21.10.1-CSA 4.1 standards governing storage-type water heaters with input ratings of 75,000 BTU/hr. or less.
   2. Provide gas-fired water heaters that have been listed and labeled by CSA International or Underwriters Laboratories, certifying design according to ANSI Z21.10.3-CSA 4.3 standards governing storage-type water heaters with input ratings of greater than 75,000 BTU/hr.

H. ASME Relief Valve Stamps: Provide water heaters with safety relief valves bearing ASME valve markings.

I. ASME Code Symbol Stamps: For the following equipment, comply with ASME Boiler and Pressure Vessel Code for construction, and stamp with ASME Code symbol:
   1. Water Heaters 200 MBH and greater.


K. California Health and Safety Code Compliance: For products covered under the scope of HSC 116875 for potable water service. Products for potable water service shall be third-party certified by an approved laboratory as complying with California Health and Safety Code Section 11 68 75.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's plumbing equipment specifications, installation and start-up instructions, capacity and ratings, with selection points clearly indicated.

B. Maintenance Data: Submit maintenance data and parts lists for each item of plumbing equipment. Include "trouble-shooting" maintenance guides. Include this data in Operation and Maintenance Manual.

C. Pipe, pipe or plumbing fittings, fixtures, solder and flux installed in a system providing water for human consumption shall comply with lead free requirements of the California Health and Safety Code Section 11 68 75. Provide submittal information for products third-party certified by an approved laboratory as complying with California Health and Safety Code Section 11 68 75.

PART 2 - PRODUCTS

2.1 COMMERCIAL ELECTRIC WATER HEATERS
A. General: Provide commercial electric water heaters of size, capacity, and electrical characteristics indicated on Drawings, conforming to lead-free requirements of California Health and Safety Code Section 11 68 75. Comply with ASHRAE 90.1 for energy efficiency. Provide UL listing. Relief valve dip tube shall extend to within 3 inches of tank.

B. Heater: Working pressure of 150 psi, magnesium anode rod; glass lining on internal surfaces exposed to water.

C. Heating Elements: Heavy-duty, medium watt density, with incoloy sheath or zinc plated copper, thermostat stepped through magnetic contactor.

D. Safety Controls: Double-pole, manual-reset, high-limit, probe type electric water low water cutoff; both factory wired.

E. Jacket: Equip with full size control compartments with front panel opening. Insulate tank with vermin resistant polyurethane or glass fiber insulation. Provide outer steel jacket with bonderized undercoat and baked enamel finish.

F. Warranty: Furnish three-year minimum warranty on tank leakage.

G. Provide the following accessories:
   1. Brass drain valve
   2. 3/4 inch temperature and pressure relief valve
   3. Thermometer

H. Provide equal flow manifold for piping entering and leaving the water heaters. Manifold shall be provided as a standard option for the heaters proposed.

I. Controls: Adjustable immersion thermostat or surface mounted therm-o-disc; power circuit fusing.

J. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   PVI Industries, LLC
   A.O. Smith Corporation

2.2 INSTANTANEOUS ELECTRIC WATER HEATERS

A. General: Cabinet mounted stainless steel electric heating style, conforming to lead-free requirements of California Health and Safety Code Section 11 68 75. Flow switch activated, UL listed, 150 PSI rated.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   Chronomite Laboratories, Inc.
   Eemax, Inc.
2.3 THERMAL EXPANSION ABSORBERS

A. Provide thermal expansion absorber tanks of size and number as indicated on Drawings, conforming to lead-free requirements of California Health and Safety Code Section 11 68 75. Construct tank of welded steel for working pressure of 125 psi. Provide specially compounded flexible diaphragm securely sealed into tank to permanently separate air charge from system water, to maintain design expansion capacity.

1. Tanks shall be IAPMO approved and listed for use with domestic water systems.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

- Amtrol, Inc.
- A.O. Smith Water Products Company
- Watts Water Technologies, Inc.

2.4 IN-LINE DOMESTIC HOT WATER RECIRCULATION PUMPS

A. Provide lead-free in-line domestic water recirculation pumps where indicated on Drawings and of capacities as scheduled on Drawings. Pumps shall be third-party certified by an approved laboratory as complying with California Health and Safety Code Section 11 68 75.

B. Pumps shall be of the centrifugal type with non-overloading characteristics and shall not overload the motor above its nameplate horsepower rating under any operating condition. No allowance for service factor shall be used in pump selection. Motor horsepower shown is minimum; furnish larger motors if necessary to meet the non-overloading requirements.

C. Type: Horizontal, designed for 125 thru 150 psi maximum working pressure and 225 degrees F continuous water temperature.

D. Construction: Bronze casing, non-metallic impeller.

E. Shaft: Ceramic, supported by carbon bearings. Bearings shall be lubricated by the pumped water.

F. Motors shall have permanently lubricated ball bearings. Motors shall meet NEMA specifications. Motors shall have built-in thermal overload or impedance protection.

G. Provide control wiring between field-installed controls, indicating devices, and pump control panels as work of this section, complying with requirements of Division 16 sections:

1. Control wiring specified as work of Division 15 for Automatic Temperature Controls is work of that section.

H. Wire pumps to mechanical control circuits to shut down pump when building is not occupied. Where no control system is installed, furnish pump manufacturers standard timer to automatically turn off circulating pump when hot water is not required.
I. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
Grundfos Pumps Corporation
Bell & Gossett, ITT Corporation
Taco Incorporated
Armstrong Pumps, Inc.

PART 3 - EXECUTION

3.1 PRODUCT HANDLING AND PROTECTION
A. Deliver packaged materials in their original, unopened wrapping with labels intact. Protect materials from water, the elements and other damage during delivery, storage and handling.

3.2 PREPARATORY PROVISIONS
A. The Contractor shall be responsible for the examination and acceptance of all conditions affecting the proper construction and/or installation of the Work of this Section and shall not proceed until all unsatisfactory conditions have been corrected. Commencing work shall be construed as acceptance of all conditions by the Contractor as satisfactory for the construction and/or installation of the Work.

3.3 INSTALLATION OF ELECTRIC WATER HEATERS
A. Install electric water heaters as indicated, in accordance with manufacturer's installation instructions and in compliance with applicable codes.
B. Furnish wiring diagram to Electrical Installer. Refer to Division 26 for wiring of units, not work of this section.
C. Connect to hot and cold water lines with shutoff valve, check valve, and dielectric union in the cold water line, and ASME standard pressure and temperature relief valve and dielectric union in the hot water line. Connect drain and relief piping as noted on Drawings.
D. Start-up, test, and adjust electric water heaters in accordance with manufacturer's start-up instructions. Check and calibrate controls.
E. After installation has been completed, seal bottom of heaters without feet to floor with silicone sealer.

3.4 INSTALLATION OF PUMPS
A. Install pumps where indicated, in accordance with manufacturer's published instructions, complying with recognized industry practices to ensure that pumps comply with requirements and serve intended purposes.
B. Provide floor-mounted pumps with a 6 inch high concrete base and anchor bolts as recommended by the pump manufacturer. Pumps shall be carefully shimmed level.
C. Provide access space around pumps for service as indicated, but in no case less than that recommended by manufacturer.

D. Install in-line pumps with support from overhead structure on each side of pump, or as indicated on Drawings.

E. Support piping from the building structure so as to prevent any strain on the pump casings. Provide a final check for perfect alignment of the piping connections after pump has been secured to its base. Provide valves, accessories, gauges, flexible connections, and supports as indicated.

F. Install electrical devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.

G. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 26 sections. Do not proceed with equipment start-up until wiring installation is complete and correct.

H. Check alignment, and where necessary, realign shafts of motors and pumps within recommended tolerances by manufacturer.

I. Lubricate pumps before start-up. Start-up in accordance with manufacturer's instructions.

J. Increase piping immediately at pump suction and discharge; flexible couplings and all valves shall be full line size.

K. Trim pump impeller to obtain the desired water flow after installation, without cost to Owner.

L. Pumps shall not be connected to piping before piping is thoroughly flushed and cleaned of all dirt and grit. After piping connections have been made, systems shall be filled before starting pumps. Pumps shall not be run dry under any circumstances.

3.5 TRAINING

A. Provide a minimum of 8 hours of training and orientation of Owners staff in proper care and operation of Plumbing Equipment.

3.6 CARE AND CLEANING

A. Repair or replace broken, damaged, or otherwise defective parts, materials, and work. Leave entire work in condition satisfactory to Architect. At completion, carefully clean and adjust equipment, fixtures, and trim that are installed as part of this work. Leave systems and equipment in satisfactory operating condition.

3.7 OPERATION TEST

A. Test each piece of equipment to show that it will operate in accordance with indicated requirements.
3.8 CLEANING UP

A. Upon completion of Work remove materials, equipment, apparatus, tools, and the like, and leave premises clean, neat, and orderly.

END OF SECTION 22 50 00
SECTION 23 00 50 - BASIC HVAC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Electric motors.
B. Motor starters.
C. Valves and fittings.
D. Strainers.
E. Valve boxes.
F. Gauges.
G. Thermometers.
H. Access Doors.
I. Expansion loops.
J. Flexible joints.
K. Insulation.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. This Section is a part of each Division 23 Section.

1.3 ADDITIONAL REQUIREMENTS

A. Furnish and install incidental work not shown or specified necessary to provide a complete and workable system.
B. Make all temporary connections required to maintain services, including adequate heat and cooling, during the course of the Contract without additional cost to Owner. Notify Owner seven days in advance before disrupting services.

1.4 REFERENCED STANDARDS

A. Where material or equipment is specified to conform to referenced standards, it shall be assumed that the most recent edition of the standard in effect at the time of bid shall be used.
1. CSA – Canadian Standards Association International
2. ANSI - American National Standards Institute
3. ASTM - American Society for Testing and Materials
4. CCR - California Code of Regulations
   a. Title 8 - Division of Industrial Safety, Subchapter 7; General Industry Safety Orders, Articles 31 through 36
5. NCPWB - National Certified Pipe Welding Bureau
6. CEC - California Electrical Code
7. NEMA - National Electrical Manufacturers’ Association
8. NFPA - National Fire Protection Association
9. OSHA - Occupational Safety and Health Act
10. UL - Underwriters' Laboratories, Inc.

1.5 DRAWINGS

A. Examine Drawings prior to bidding of work and report discrepancies in writing to Architect.

B. Visit Project site and examine existing conditions in order to become familiar with Project scope. Verify dimensions shown on Drawings at Project site. Bring discrepancies to the attention of Architect. Failure to examine Project site shall not constitute basis for claims for additional work because of lack of knowledge or location of hidden conditions that affect Project scope.

C. Drawings showing location of equipment and materials are diagrammatic and job conditions will not always permit installation in location shown. The HVAC Drawings show general arrangement of equipment and materials, etc., and shall be followed as closely as existing conditions, actual building construction, and work of other trades permit.
   1. Architectural and Structural Drawings shall be considered part of the Work. These Drawings furnish Contractor with information relating to design and construction of the Project. Architectural Drawings take precedence over HVAC Drawings.
   2. Because of the small scale of HVAC Drawings, not all offsets, fittings, and accessories required are shown. Investigate structural and finish conditions affecting the Work and arrange Work accordingly. Provide offsets, fittings, and accessories required to meet conditions. Inform Architect immediately when job conditions do not permit installation of equipment and materials in the locations shown. Obtain the Architects approval prior to relocation of equipment and materials.
   3. Relocate equipment and materials installed without prior approval of the Architect. Remove and relocate equipment and materials at Contactors’ expense upon Architects’ direction.
   4. 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.

D. Execute work mentioned in the Specifications and not shown on the Drawings, or vice versa, the same as if specifically mentioned or shown in both.
1.6 REQUIREMENTS OF REGULATORY AGENCIES

A. The publications listed below form part of this Specification; comply with provisions of these publications except as otherwise shown or specified.
   1. California Electrical Code, 2010
   2. National Fire Protection Association
   3. CAL-OSHA
   4. California Code of Regulations, Title 24
   5. Occupational Safety and Health Administration
   6. California State Fire Marshal, Title 19 CCR
   7. California Building Code, 2010
   9. California Fire Code, 2010
   10. California Mechanical Code, 2010
   11. California Plumbing Code, 2010
   13. Other applicable state laws

B. Nothing in Drawings or Specifications shall be construed to permit work not conforming to these codes, or to requirements of authorities having jurisdiction. It is not the intent of Drawings or Specifications to repeat requirements of codes except where necessary for clarity.


D. When Contract Documents differ from governing codes, furnish and install larger size or higher standards called for without extra charge.

E. No material installed as part of this Work shall contain asbestos.

1.7 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 1.

B. Arrange for utility connections and pay charges incurred, including excess service charges.

1.8 UTILITY CONNECTIONS

A. Bear the cost of construction related to utility services, from point of connection to utility services shown on Contract Documents. This includes piping, excavation, backfill, meters, boxes, check valves, backflow prevention devices, general service valves, concrete work, and the like, whether or not Work is performed by Contractor, local water/sanitation district, public utility, other governmental agencies or agencies’ assigns.
1.9 FRAMING, CUTTING AND PATCHING

A. Special framing, recesses, chases and backing for Work of this Section, unless otherwise specified, are covered under other Specification Sections.

B. Contractor is responsible for placement of pipe sleeves, hangers, inserts, supports, and location of openings for the Work.

C. Cutting, patching, and repairing of existing construction to permit installation of equipment, and materials is the responsibility of Contractor. Repair or replace damage to existing work with skilled mechanics for each trade.

D. Cut existing concrete construction with a concrete saw. Do not utilize pneumatic devices.

E. Core openings through existing construction for passage of new piping and conduits. Cut holes of minimum diameter to suit size of pipe and associated insulation installed. Coordinate with building structure, and obtain Structural Engineer's approval prior to coring through existing construction.

1.10 SUBMITTALS

A. Provide submittal of materials proposed for use as part of this Project. Product names in Specifications and on Drawings are used as standards of quality. Furnish standard items on specified equipment at no extra cost to the Contract regardless of disposition of submittal data. Other materials or methods shall not be used unless approved in writing by Architect. Architect's review will be required even though "or equal" or synonymous terms are used. Refer to Division 1 for complete instructions.

1. Partial or incomplete submittals will not be considered.
2. Quantities are Contractor's responsibility and will not be reviewed.
3. Provide materials of the same brand or manufacturer for each class of equipment or material.
4. Identify each item by manufacturer, brand, trade name, number, size, rating, or other data necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.
5. Identify each submittal item by reference to items' Specification Section number and paragraph, by Drawing and detail number, and by unit tag number.
6. Organize submittals in same sequence as in Specification Sections.
7. Show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance, access requirements for installation and maintenance, physical size, mechanical characteristics, foundation and support details, and weight.
   a. Submit Shop Drawings, performance curves, and other pertinent data, showing size and capacity of proposed materials.
   b. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of Contract Documents.
   c. Drawings shall be drawn to scale and dimensioned (except schematic diagrams). Drawings may be prepared by vendor but must be submitted as instruments of Contractor, thoroughly checked and signed by Contractor before submission to Architect for review.
   d. Catalog cuts and published material may be included with supplemental scaled drawings.
B. Review of submittals will be only for general conformance with design concept and general compliance with information given in Contract Documents. Review will not include quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with work of other trades, or construction safety precautions, which are sole responsibility of Contractor. Review of a component of an assembly does not indicate acceptance of an assembly. Deviations from Contract Documents not clearly identified by Contractor are Contractor's responsibility and will not be reviewed by Architect.

C. Within reasonable time after award of contract and in ample time to avoid delay of construction, submit to Architect Shop Drawings or submittals on all items of equipment and materials provided. Provide submittal in at least seven copies and in complete package.
   1. Shop Drawings and submittals shall include Specification Section, Paragraph number, and Drawing unit symbol or detail number for reference. Organize submittals into booklets for each Specification section and submit in loose-leaf binders with index. Deviations from the Contract Documents shall be prominently displayed in the front of the submittal package and referenced to the applicable Contract requirement.

D. Provide coordinated layouts for HVAC Ductwork systems, in accordance with Specification Section 23 80 00.

E. Provide details for design and installation of seismic bracing of ductwork systems, piping systems, plumbing and hydronic systems, including in-line equipment and mechanical equipment. Indicate location of each seismic brace.

F. Furnish to the Project Inspector complete installation instructions on material and equipment before starting installation.

G. Have fire damper and fire smoke damper installation instructions available at Project site during construction for use by Project Inspector.

H. Product Data for California Green Building Standards Code Compliance: For adhesives and sealants, including primers, documentation of compliance including printed statement of VOC content and chemical components.

1.11 SUBSTITUTIONS

A. Refer to Division 1 for complete instructions. Requirements given below are in addition to or are intended to amplify Division 1 requirements. In case of conflict between requirements given herein and those of Division 1, Division 1 requirements shall apply.

B. It is the responsibility of Contractor to assume costs incurred because of additional work and or changes required to incorporate proposed substitute into the Project. Refer to Division 1 for complete instructions.

C. Substitutions will be interpreted to be manufacturers other than those specifically listed in the Contract Documents by brand name, model, or catalog number.
D. Only one request for substitution will be considered for each item of equipment or material.

E. Substitution requests shall include the following:
   1. Reason for substitution request.
   2. Complete submittal information as described herein; see “Submittals.”
   3. Coordinated scale layout drawings depicting position of substituted equipment in relation to other work, with required clearances for operation, maintenance and replacement.
   4. List optional features required for substituted equipment to meet functional requirements of the system as indicated in Contract Documents.
   5. Explanation of impact on connected utilities.
   6. Explanation of impact on structural supports.

F. Installation of reviewed substitution is Contractor's 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.

G. Contractor may be required to compensate Architect for costs related to substituted equipment or material.

1.12 OPERATION AND MAINTENANCE MANUAL

A. Instruct Owner's authorized representatives in operation, adjustment, and maintenance of mechanical equipment and systems. Provide three copies of certificate signed by Owner's representatives confirming that instruction is completed.

B. Furnish three complete sets of Operation and Maintenance Manual bound in hardboard binder, and one compact disc containing complete Operation and Maintenance Manual in searchable PDF format. Provide Table of Contents. Provide index tabs for each piece of equipment in binder and disc. Start compiling data upon approval of submittals.
   1. Sets shall incorporate the following:
      a. Service telephone number, address and contact person for each category of equipment or system.
      b. Complete operating instructions for each item of heating, ventilating and air conditioning equipment.
      c. Copies of guarantees/warrantees for each item of equipment or systems.
      d. Test data and system balancing reports.
      e. Typewritten maintenance instructions for each item of equipment listing lubricants to be used, frequency of lubrication, inspections required, adjustment, etc.
      f. Manufacturers' bulletins with parts numbers, instructions, etc., for each item of equipment.
      g. Temperature control diagrams and literature.
      h. A complete list or schedule of all scheduled valves giving the number of the valve, location and the rooms or area controlled by the valve. Identify each valve with a permanently attached metal tag stamped with number to match schedule. Post list in frame under plastic on wall in mechanical room or where directed by Architect.
i. Check test and start reports for each piece of mechanical equipment provided as part of the Work.

j. Commissioning and Preliminary Operation Tests required as part of the Work.

C. Post service telephone numbers and addresses in an appropriate place designated by Architect.

1.13 SITE CONDITIONS

A. Information on Drawings relative to existing conditions is approximate. Deviations from Drawings necessary during progress of construction to conform to actual conditions shall be approved by the Architect and shall be made without additional cost to the Owner. The Contractor shall be held responsible for damage caused to existing services. Promptly notify the Architect if services are found which are not shown on Drawings.

1.14 EXISTING MATERIALS

A. Remove existing equipment, piping, wiring, construction, etc., which interferes with Work of this Contract. Promptly return to service upon completion of work in the area. Replace items damaged by Contractor with new material to match existing.

B. Removed materials which will not be re-installed and which are not claimed by Owner shall become the property of Contractor and shall be removed from the Project site. Consult Owner before removing any material from the Project site. Carefully remove materials claimed by Owner to prevent damage and deliver to Owner-designated storage location.

C. Existing piping and wiring not reused and are concealed in building construction may be abandoned in place and all ends shall be capped or plugged. Remove unused piping and wiring exposed in Equipment Rooms or occupied spaces. Material shall be removed from the premises. Disconnect power, water, gas, pump or any other active energy source from piping or electrical service prior to abandoning in place.

1.15 WARRANTY

A. Refer to Division 1 for warranty requirements, including effective date of warranty. Refer to specific items of equipment specified herein for warranty duration if different from that specified in Division 1.

B. Repair or replace defective work, material, or part that appears within the warranty period, including damage caused by leaks.

C. On failure to comply with warranty requirements within a reasonable length of time after notification is given, Architect/Owner shall have repairs made at Contractor's expense.

1.16 RECORD DRAWINGS

A. Refer to Division 1, Record Documents, for requirements governing Work specified herein.
B. Upon completion of the work and as precedent to final payment, deliver to Architect the following:
   1. Originals of drawings showing the Work exactly as installed.
   2. One complete set of reproducible drawings showing the Work exactly as installed.
   3. One compact disc with complete set of drawings in PDF format showing the Work exactly as installed.
   4. Provide Contractor’s signature, verifying accuracy of record drawings.

C. Obtain the signature of the Inspector of Record for all Record Drawings.

1.17 DELIVERY AND STORAGE

A. Protect equipment and materials delivered to Project site from weather, humidity and temperature variations, dirt, dust and other contaminants.

1.18 COORDINATION

A. General:
   1. Coordinate Work in this Section with trades covered in other Specifications Sections to provide a complete, operable and sanitary installation of the highest quality workmanship.

B. Electrical Coordination:
   1. Refer to the Electrical Drawings and Specifications, Division 26, for service voltage and power feed wiring for equipment specified under this section. Contractor has full responsibility for the following items of work:
      a. Review the Electrical Drawings and Division 26 Specifications to verify that electrical services provided are adequate and compatible with equipment requirements.
      b. If additional electrical services are required above that indicated on Electrical Drawings and in Division 26, such as more control interlock conductors, larger feeder, or separate 120 volt control power source, include cost to furnish and install additional electrical services as part of the bid.
      c. Prior to proceeding with installation of additional electrical work, submit detailed drawings indicating exact scope of additional electrical work.

C. Mechanical Coordination:
   1. Arrange for pipe spaces, chases, slots and openings in building structure during progress of construction, to accommodate mechanical system installation.
   3. Coordinate requirements for access panels and doors for mechanical items requiring access where concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section “Access Doors and Frames.”
PART 2 - PRODUCTS

2.1 GENERAL

A. Materials or equipment of the same type shall be of the same brand wherever possible. All materials shall be new and in first class condition.

B. All sizes, capacities, and efficiency ratings shown are minimum, except that gas capacity is maximum available.

C. Refer to Division 22 10 00 and 23 80 00 for specific system piping materials.

2.2 ELECTRIC MOTORS

A. U.S. Motors, Century Electric, General Electric, Lincoln, Gould or equal. The minimum efficiencies shall be as defined by IEEE 112 Test Method B and NEMA MG1. Provide NEMA 3R enclosure where exposed to outdoors.

2.3 MOTOR STARTERS

A. Square D, Allen Bradley, or equal, in NEMA Type 1 enclosure, unless otherwise specified or required. Minimum starter size shall be Size 1. Provide NEMA 3R enclosure where exposed to outdoors.

B. Where three phase motors are provided for two-speed operation, provide two speed motor starters.

1. All three-phase starters shall have the following:
   a. Provide magnetic motor starters for all equipment provided under the Mechanical Work. Starters shall be non-combination type. Provide part winding or reduced voltage start motors where shown or as hereinafter specified. Minimum size starter shall be Size 1.
   b. Cover mounted hand-off-automatic switch. Starters installed exposed in occupied spaces shall have key operated HOA switch.
   c. Three ambient compensated thermal overload.
   d. Fused control transformer (for 120 or 24 volt service).
   e. Pilot lights, integral with the starters. Starters located outdoors shall be in NEMA IIIIR enclosures.

2.4 VALVES AND FITTINGS

A. Gate Valves:

1. 2-1/2 inches and smaller: Class 150, bronze body, union bonnet, rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Hammond IB641, IB648, Nibco T-134, S-134, Milwaukee 1151, 1169, or equal.

2. 3 inches and larger: Class 125, iron body, bronze mounted, bolted bonnet, non-rising stem, solid wedge, flanged ends, conforming to MSS SP-70. Hammond IR-1138, Nibco F619, Milwaukee F2882A, Stockham G-612, or equal.

3. Underground valves 2 inches thru 12 inches: 250 psi, iron body, Non-rising stem, bolted bonnet, resilient wedge valves, conforming to AWWA C509, equipped with operating nuts, Mueller Series 2360, Nibco F-619-RW-SON, or equal.
a. Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.

b. Furnish and deliver to Owner one wrench of each size required for operating underground valves.

B. Ball Valves:
1. 2 inches and smaller: 600 psi CWP, 150 psi SWP, cast bronze body, full port, two piece, threaded ends, and reinforced PTFE seal, conforming to MSS SP-110. Nibco T585-70, Milwaukee BA-400, Stockham T-285, or equal.
2. 2-1/2 inches and larger: Class 150, carbon steel body, full port, two piece, stainless steel vented ball, flanged ends, and reinforced PTFE seal, conforming to MSS SP-72. Nibco F-515-CS-F-66-FS, Milwaukee F20-CS-15-F-02-GO-VB, or equal.
3. Compressed Air Services: Class 150, bronze body, full port, three piece, threaded ends, and reinforced PTFE seal, conforming to MSS SP-110. Nibco Model T-595-Y, Milwaukee BA-300, or equal.

C. Calibrated Balance Valves (Symbol CBV): Provide globe style valves for precision regulation and control rated 175 psi for sizes 2-1/2 inches through 12 inches and rated 240 psi for bronze sizes 2 inches and below. Each valve shall have two metering/test ports with internal check valves and protective caps. All valves must be equipped with visual position readout and concealed memory stops for repeatable regulation and control.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   a. Bell & Gossett Circuit Setter Plus
   b. Armstrong CBV
   c. Flow Design Inc. Accusetter
   d. Tour & Andersson
   e. Circuit Sensor with butterfly valve above 3 inches.
   f. Illinois Series 5000 through 2 inches.

D. Flow Control Valve: Automatic pressure compensating flow control valves shall be Griswold, Flow Design, Inc., or equal.

E. Air Vent Valves:
1. Provide Armstrong #1AV, Hoffman Model 78, Metraflex Model MV-15A, or equal, where automatic type air vent is shown.

2.5 JOINING MATERIALS

A. Refer to Division 22 & 23 piping sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated
   a. Full-Face Type: For flat-face, Class 125, cast iron and cast bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast iron and steel flanges.

2. AWWA C111, rubber, flat face, 1/8-inch (3.2mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

3. Flange Bolts and Nuts: AWWA C111, carbon steel, unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, Grade 5A, lead free alloys. Sil-Fos 15, or equal. Include water-flushable flux according to ASTM B813.

D. Brazing Filler Metals:
   1. General Duty: AWS A5.8, BCuP-3 Series, copper-phosphorus unless otherwise indicated.
   2. Refrigerant Piping: AWS A5.8, BAg-1, silver alloy unless otherwise indicated.

E. Welding Filler Metals: Comply with ASME B31.1 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.6 STRAINERS

A. Charles M. Bailey #100A, Armstrong, Muessco, or equal, Fig. 11 "Y" pattern, 125 psi WP minimum, with monel screens with 20 square mesh for 2 inches and smaller and 3/64 inch perforations for 2-1/2 inches and larger. Install all strainers with a blow-off hose valve with hose adapter. Strainer shall have gasketed cover with straight thread.

2.7 VALVE BOXES

A. General:
   1. Where several valves or other equipment are grouped together, provide larger boxes of rectangular "vault" type adequately sized for condition and similar in construction to those specified above.
   2. Provide valve box extensions as required to set bottom of valve box tight up to top of piping in which valve is installed.
   3. Provide a tee handle wrench for each size, Alhambra Foundry Co. #A-3008, or equal.

B. Valve Boxes in Non-Traffic Areas: Provide Christy No. F22, Brooks, or approved equal, 8 inches inside diameter by 30 inches long, with cast iron locking cover. Provide Owner with set of special wrenches or tools as required for operation of valves. Cut bottom of plastic body for operation of valves.

2.8 GAUGES

A. Marsh "Series J", U.S. Gage, Danton 800, or equal, with bronze bushed movement and front recalibration. Dials shall be white with black numerals, 3-1/2 inch dial face. Normal reading shall be at mid-scale. Provide a needle valve on each gauge connection. Supply a gauge piped with branch isolation valves across the inlet and outlet of each pump and where shown on the Drawings.

B. Provide Pete's Plug II, Sisco P/T, or equal, test plug with Nordel core (and gasketed cap), on inlet and outlet of each coil, boiler, condenser, chiller and heat exchanger and where shown on Drawings.
2.9 THERMOMETERS

A. Marsh, Taylor, Palmer, or equal, 5 inch diameter bimetal dial, adjustable from face, with adjustable positioner, located to be easily read from normal personnel approach. Normal reading shall be at mid-scale.
   1. Provide extension for insulation.
   2. Provide thermometers with steel bulb chambers and brass separable sockets.
   3. Thermometers for air temperature shall have 8 inch minimum stem.

B. Provide Ventlock, Durodyne, or equal thermometer test holes at each air conditioning unit, furnace, and make-up air unit, in mixed air and supply air, and at all locations shown or scheduled on the Drawings. Provide two portable thermometers, with sensing connection arranged to suit test connections.

C. Provide Pete's Plug II, Sisco P/T, or equal, test plug with Nordel core, on inlet and outlet of each coil, boiler, condenser, chiller and heat exchanger and provide two digital electronic test thermometers for each range of fluid temperature and where shown on Drawings.

2.10 ACCESS DOORS

A. Where floors, walls, or ceilings must be penetrated for access to mechanical equipment, provide access doors, 14 inch by 14 inch minimum size in usable opening. Where entrance of a serviceman may be required, provide 20 inch by 30 inch minimum usable opening. Locate access doors/panels for non-obstructed and easy reach.
   1. All access doors less than 7'-0" above floors and exposed to public access shall have keyed locks.

B. Access doors shall match those supplied in Division 8 in all respects, except as noted herein.

C. Provide stainless steel access doors for use in toilet rooms, shower rooms, kitchens and other damp areas. Provide steel access doors with prime coat of baked-on paint for all other areas.

D. Where panels are located on ducts or plenums, provide neoprene gaskets to prevent air leakage, and use frames to set door out to flush with insulation.

E. Provide insulated doors where located in internally insulated ducts or casings.

F. Do not locate access doors in highly visible public areas such as lobbies, waiting areas, and primary entrance areas. Coordinate with the Architect when access is required in these areas.

G. Where specific information or details relating to access panels different from the above is shown or given on the Drawings or other Divisions of work, then that information shall supersede this specification.
H. Manufacturers: Subject to compliance with requirements, available manufacturers offering products which may be incorporated into the Work include Milcor, Karp, Nystrom, or Cesco, equal to the following:
1. Milcor
   a. Style K (plaster)
   b. Style DW (gypsum board)
   c. Style M (Masonry)
   d. Style “Fire Rated” where required

2.11 EXPANSION LOOPS
A. Manufactured assembly consisting of inlet and outlet elbow fittings, two sections of flexible metal hose and braid, and 180-degree return bend or center section of flexible hose. Flexible hose shall consist of corrugated metal inner hose and braided outer sheath.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   Metraflex Inc., Metraloop series.
   Unisource Manufacturing, Inc., V series.

2.12 FLEXIBLE JOINTS
A. Where indicated on Drawings, provide Metraf lex Metrasphere, Style R, Mason Industries, or equal, Spherical Expansion Joints. Provide control units at each expansion joint, arranged to limit both expansion and compression.

B. Flexible joints at entry points to building shall be Barco Ductile iron, Advanced Thermal Systems, or equal, threaded style with stainless ball and mineral filled seal.

2.13 PIPE GUIDES
A. Where flexible connections are indicated on Drawings, provide Metraf lex style IV, B-Line, or equal, pipe guides in locations recommended by manufacturer. Maximum spacing from flexible connection to first pipe guide is 4 pipe diameters, and maximum spacing from second pipe guide is 14 pipe diameters.

2.14 EQUIPMENT IDENTIFICATION
A. Identify each piece of equipment with a permanently attached engraved bakelite plate, 1/2 inch high white letters on black background.

2.15 PIPE IDENTIFICATION
A. Identify each piping system and indicate the direction of flow by means of Seton, Inc., Marking Services Inc., Reef Industries, Inc., or equal, pre-tensioned, coiled semi-rigid plastic pipe labels formed to circumference of pipe, requiring no fasteners or adhesive for attachment to pipe.
B. The legend and flow arrow shall conform to ASME A13.1.

2.16 INSULATION WORK

A. General:
1. Adhesives and sealants shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
2. The term "piping" used herein includes pipe, air separators, valves, strainers and fittings.
3. Apply insulating cement to fittings, valves and strainers and trowel smooth to the thickness of adjacent covering. Cover with jacket to match piping. Extend covering on valves up to the bonnet. Leave strainer cleanout plugs accessible.
4. Provide pre-formed PVC valve and fitting covers.
5. Provide Calcium Silicate rigid insulation and sheet metal sleeve, 18 inch minimum length at each pipe hanger. Seal ends of insulation to make vapor tight with jacket.
6. Urethane insulation will not be allowed above ground or on hot water piping.
7. Test insulation, jackets, and lap-seal adhesives as a composite product and confirm flame spread of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with UL723, ASTM E84, or NFPA 255.
8. Clean thoroughly, test and have approved, all piping and equipment before installing insulation and/or covering.
9. Repair all damage to existing pipe and duct insulation whether or not caused during the work of this contract, to match existing adjacent insulation for thickness and finish, but conforming to flame spread and smoke ratings specified above.

B. Insulation of Piping:
1. Exposed insulated piping within the building shall have a Zeston 2000 25/50, Proto Lo-Smoke, or equal, PVC jacket and fitting cover installed over the insulation, applied per manufacturer's instructions. Verify suitability with manufacturer of insulation. Insulation with pre-applied polymer jacket may be substituted at Contractor's option.
2. Insulate refrigerant suction piping and chilled water supply and return piping, including fittings, with 1 inch thick, 3-1/2 pound per cubic foot minimum density fiberglass with factory-applied ASJ-SSL jacket, or equal, 1-1/2 inches thick for chilled water pipes 6 inches and over and refrigerant piping 1-1/4 inches and larger. Insulate valves and irregular surfaces to match adjacent insulation and cover with two layers of Glasfab saturated in Foster Sealfas 30-36, 3M, or equal, carried 3 inches over the adjoining pipe insulation. Finish with a coat of Foster Sealfas 30-36, 3M, or equal. The 3 inch wide SSL end laps furnished with the insulation shall be adhered over the end joints. Seal entire surface of insulation vapor tight, including joints and ends of PVC fitting covers.
3. In lieu of the above, refrigerant suction piping, including fittings, may be insulated with nominal 3/4 inch thick Armaflex LLC; AP Armaflex, or equal. Seal all joints with Armaflex 520 BLV adhesive, or equal. Insulation exposed to the weather shall be finished with two coats of Armaflex white WB finish, or equal. Apply insulation in strict accordance with manufacturer's recommendations.
4. When equipment manufacturers' instructions indicate that refrigerant liquid piping be insulated, insulation thickness shall be as recommended by the manufacturer, and applied as described herein for refrigerant suction piping.
5. On insulated piping exposed to the weather apply .016 aluminum jacket (.014 for 12" and larger pipes) secured with 1/2 inch aluminum bands on 12 inch centers. Cover fittings with glass cloth, two coats of Foster Sealfas 30-36, and Zeston 2000, or equal, PVC fitting covers. Insulation shall be vapor tight before applying metal jacket or PVC covers.

6. Insulate heating hot water piping with 1-1/2 inch thick, 3-1/2# per cubic foot minimum density fiberglass with factory applied ASJ-SSL jacket.

C. Duct Insulation:

1. All duct insulation shall meet minimum R-value of R-8 at 3 inch thickness 3/4 pound per cubic foot density for ductwork installed outside the building insulation envelope. For ductwork installed within the building insulation envelope, duct insulation shall have a minimum R-value of R-4.2 at 2 inch thickness, 3/4 pound per cubic foot density.

2. General: Insulation applied to the exterior surface of ducts located in buildings shall have a flame spread of not more than 25 and a smoke-developed rating of not more than 50 when tested as a composite installation including insulation, facing materials, tapes and adhesives as normally applied. Material exposed within ducts or plenum shall have a flame-spread rating of not more than 25 and a smoke-developed rating of not more than 50.

3. Wrap all unlined concealed supply and return ducts with fiberglass duct wrap, manufactured as a blanket of glass fibers factory laminated to a reinforced foil/kraft vapor retarding facing. Provide 2 inch stapling and taping flange. Wrap insulation entirely around duct and secure with outward clinching staples on 6 inch centers. Provide mechanical fasteners at maximum 18 inch centers for all bottoms of duct which are greater than 24 inches. Lap all insulation joints 3" minimum. Insulate ducts installed tight against other work before hanging in place. Seal all seams, both longitudinal and transverse, and all staple and mechanical fastener penetrations of facing with scrim backed foil tape or recommended sealant, to provide a vapor tight installation.

4. On all supply and return ductwork exposed to weather and not internally lined, field apply minimum 2" thick mineral-fiber board thermal insulation, glass fibers bonded with thermosetting resin. Comply with ASTM C612, type IB without facing and with all service jacket with factory applied FRK-25 foil reinforced kraft paper. Aluminum jacket, 0.024 inch thickness sheets manufactured from aluminum alloy complying with ASTM B209, stucco embossed finish and having an integrally bonded moisture barrier over entire surface in contract with insulation.

5. Provide internal duct lining in accordance with specification section 23 80 00.

PART 3 - EXECUTION

3.1 MECHANICAL DEMOLITION

A. Refer to Division 1 Sections “Cutting and Patching” and “Selective Demolition” for general demolition requirements and procedures.

B. Disconnect, dismantle and remove mechanical systems, equipment, and components indicated to be removed. Coordinate with all other trades.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping to remain with same or compatible piping material. Refrigerant system must be evacuated per EPA requirements.
3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and cap remaining ducts with same or compatible ductwork material.
4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
5. Equipment to Be Removed: Drain down and cap remaining services and remove equipment.
6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. 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.

3.2 ELECTRICAL REQUIREMENTS

A. Provide adequate working space around electrical equipment in compliance with the California Electrical Code. Coordinate the Mechanical Work with the Electrical Work to comply.

B. Furnish necessary control diagrams and instructions for the controls. Before permitting operation of any equipment which is furnished, installed, or modified under this Section, review all associated electrical work, including overload protection devices, and assume complete responsibility for the correctness of the electrical connections and protective devices. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers' Association. All equipment and connections exposed to the weather shall be NEMA IIIR with factory-wired strip heaters in each starter enclosure and temperature control panel where required to inhibit condensation.

C. All line voltage and low voltage wiring and conduit associated with the Temperature Control System are included in this Section. Wiring and conduit shall comply with Division 26.

D. Electric Motors:
   1. All motors shall be rated for continuous operation at 115% of nameplate amperage but shall be selected to operate at less than nameplate amperage throughout the entire operating cycle. Motors found exceeding the nameplate amperage shall be promptly replaced at no cost to the Owner. Horsepower shown is minimum and shall be increased as necessary to comply with above requirements. Furnish motors with splash-proof or weatherproof housings, where required or recommended by the manufacturer. Match the nameplate voltage rating with the electrical service supplied. Check Electrical Drawings. Provide a transformer for each motor not wound specifically for system voltage.
E. Motor Starters:
1. Provide magnetic motor starters for all equipment provided under the Mechanical Work. Starters shall be non-combination type. Provide part-winding or reduced voltage start motors on all motors 50 – HP and larger, or where shown or as hereinafter specified. Minimum size starter shall be Size 1. All three-phase starters shall have the following:
   a. Cover-mounted hand-off-automatic switch. Starters installed exposed in occupied spaces shall have key operated HOA switch.
   b. Three ambient compensated thermal overload.
   c. Fused control transformer (for 120 or 24 volt service).
   d. Pilot lights, integral with the starters. Starters located outdoors shall be in NEMA IIIR enclosures.
2. Starters for single-phase motors shall have thermal overloads, Westinghouse Type MSTOLSLIP, Square D, or equal, toggle-operated with pilot light, NEMA I enclosure for starters located indoors, NEMA IIIR enclosure for starters located outdoors.
3. Provide OSHA label indicating the device starts automatically.

3.3 PIPING SYSTEM REQUIREMENTS
A. Drawing plans, schematic and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

3.4 PRIMING AND PAINTING
A. Perform all priming and painting on the equipment and materials as specified herein.

B. Priming:
   1. Exposed ferrous metals, including piping, which are not galvanized or factory-finished shall be primed. Black steel pipe exposed to the weather shall be painted one coat of Rust-Oleum #1069 primer for black steel piping or Rust-Oleum #5260, Kelly Moore, or equal, primer for galvanized piping.
   2. Metal surfaces of items to be jacketed or insulated except ductwork and piping shall be given two coats of primer unless furnished with equivalent factory finish. Items to be primed shall be properly cleaned by effective means free of rust, dirt, scale, grease and other deleterious matter and then primed with the best available grade of zinc rich primer. After erection or installation, all primed surfaces shall be properly cleaned of any foreign or deleterious matter that might impair proper bonding of subsequent paint coatings. Any abrasion or other damage to the shop or field prime coat shall be properly repaired and touched up with the same material used for the original priming.
   3. Where equipment is provided with nameplate data, the nameplate should be masked off prior to painting. When painting is completed, remove masking material.

C. See Painting Section for detailed requirements.
3.5 EXCAVATING

A. Perform all excavating required for work of this Section. Provide the services of a pipe/cable locating service prior to excavating activities to determine location of existing utilities.

B. Unless shown otherwise, provide a minimum of 2'-6" cover above top of pipe to finished grade for all service piping, unless otherwise noted. Trim trench bottom by hand or provide a 4 inch deep minimum bed of sand to provide a uniform grade and firm support throughout entire length of pipe. For all PVC pipe and for PE gas pipe, bed the pipe in 4 inch sand bed. Pipe bedding materials should be clean crushed rock, gravel or sand of which 100 percent will pass a 1 inch sieve. For pipes that are larger than 10 inches in diameter, at least 95 percent should pass a 3/4 inch sieve, and for pipes 10 inches in diameter or smaller, 100 percent should pass a 1/2 inch sieve. All other materials should have a minimum sand equivalent of 50. Only a small proportion of the native soils will meet these requirements without extensive processing; therefore, importation of pipe bedding materials should be anticipated. Pipe bedding materials shall be compacted in lifts not exceeding 6 inches in compacted thickness. Each lift shall be compacted to not less than 90 percent relative compaction at or above the optimum moisture content, in accordance with ASTM Specification D2940, except that bedding materials graded such that less than 100 percent will pass a No. 200 sieve shall be compacted in 6 inch lifts using a single pass of a flat-plate, vibratory compactor or vibratory drum. Pipe bedding materials should extend at least to the spring line.

C. Maintain all warning signs, barricades, flares, and red lanterns as required.

D. For all trenches 5 feet or more in depth, submit copy of permit detailed drawings showing shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trenches. Obtain a permit from the Division of Industrial Safety prior to beginning excavations. A copy of the permit shall be available at the site at all times.

3.6 BACKFILLING

A. Backfill shall comply with applicable provisions of DIVISION 31 of these Specifications.

B. Except under existing or proposed paved areas, walks, roads, or similar surfaces, backfill for other types of pipe shall be made using suitable excavated material or other approved material. Place backfill in 8 inch layers, measured before compaction, and compact with impact hammer to at least 90 percent relative compaction per ASTM D2940.

1. Backfill plastic pipe and insulated pipe with sand for a minimum distance of 12 inches above the top of the pipe. Compact using mechanical tamping equipment.

C. Entire backfill for excavations under existing or proposed pavements, walks, roads, or similar surfaces, under new slabs on grade, shall be made with clean sand compacted with mechanical tamping equipment vibrator to at least 90 percent relative compaction per ASTM D2940. Remove excess earth. Increase the minimum compaction within the uppermost two feet of backfill to 95 percent.
D. Replace or repair to its original condition all sod, concrete, asphalt paving, or other materials disturbed by the trenching operation. Repair within the guarantee period as required.

3.7 INSTALLATION OF VALVES

A. General:
1. Valves shall be full line size unless indicated otherwise on Drawings.
2. Install horizontal valves with valve stem above horizontal, except butterfly valves.
3. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
4. Locate valves for easy access and provide separate support where necessary.
5. Install valves in position to allow full stem movement.
6. Install exposed polished or enameled connections with special care showing no tool marks or exposed threads.
7. Butterfly valves conforming to the paragraph “Butterfly Valves” may be used in lieu of gate or globe valves for locations above grade.
8. Ball valves conforming to the paragraph “Ball Valves” may be used in lieu of gate valves for locations above grade for services 2-1/2 inches and smaller.
9. Valves 2-1/2 inches and smaller (except ball valves) in nonferrous water piping systems may be solder joint type with bronze body and trim.
10. Provide gate or globe valves on inlet and outlet of each pump.

B. Gate Valves:
1. Furnish valves in copper lines with adapters to suit valve / line requirements.
2. Underground gate valves:
   a. Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.
   b. Furnish and deliver to Owner one wrench of each size required for operating underground valves.

C. Calibrated Balancing Valves: Install calibrated balancing valves per manufacturers’ recommendations, including requirements for straight pipe lengths at valve inlet and outlet.

D. Air Vent Valves:
1. Install with shutoff valves or cocks and drain to floor sink or drain.
2. At each high point of piping provide manual air vent connection at top of pipe. Provide ball valve within 18 inches of ceiling in accessible location, and extend drain line to allow convenient access.

E. Valve Adjustment: Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.8 INSTALLATION OF PIPING AND DUCT SYSTEMS

A. General:
1. All piping shall be concealed unless shown or otherwise directed. Allow sufficient space for ceiling panel removal.
2. Installation of piping shall be made with appropriate fittings. Bending of piping will not be accepted.

3. Install piping to permit application of insulation and to allow valve servicing.

4. Where piping or conduit is left exposed within a room, the same shall be run true to plumb, horizontal, or intended planes. Where possible, uniform margins are to be maintained between parallel lines and/or adjacent wall, floor, or ceiling surfaces.

5. Horizontal runs of pipes and/or electrical conduit suspended from ceilings shall provide for a maximum headroom clearance. The clearance shall not be less than 6'-6" without written approval from the Architect.

6. Close ends of pipe immediately after installation. Leave closure in place until removal is necessary for completion of installation.

7. Each piping system shall be thoroughly flushed and proved clean before connection to equipment.

8. Pipe the discharge of each relief valve, air vent, backflow preventer, and similar device to floor sink or drain.

9. Install exposed polished or enameled connections with special care showing no tool marks or threads at fittings.

10. Install horizontal valves with valve stem above horizontal.

11. Use reducing fittings; bushings shall not be allowed. Use eccentric reducing fittings wherever necessary to provide free drainage of lines and passage of air.

12. Verify final equipment locations for roughing-in.

13. Service Markers: Mark the location of each plugged or capped pipe with a 4 inch round by 30 inch long concrete marker, set flush with finish grade. Provide 2-1/2 inch diameter engraved brass plate as part of monument marker.

14. Where piping is installed in walls within one inch of the face of stud, provide a 16 gauge sheet metal shield plate on the face of the stud. The shield plate shall extend a minimum of 1-1/2 inches beyond the outside diameter of the pipe.

B. Expansion Loops:

1. Install expansion loops where piping crosses building expansion or seismic joints, between buildings, between buildings and canopies, and as indicated on Drawings.

2. Install expansion loops of sizes matching sizes of connected piping.

3. Install grooved-joint expansion joints to grooved-end steel piping.

4. Materials of construction and end fitting type shall be consistent with pipe material and type of gas or liquid conveyed by the piping system in which expansion loop is installed.

C. Sleeves:

1. Install AMI Products, Adjus-to-Crete, Pipeline Seal and Insulator, or equal, pipe sleeves of sufficient size to allow for free motion of pipe, 24 gauge galvanized steel. The space between pipe and sleeves through floor slabs on ground, through outside walls above or below grade, through roof, and other locations as directed shall be caulked with oakum and mastic and made watertight. The space between pipe and sleeve and between sleeve and slab or wall shall be sealed watertight.

2. At Contractor's option, Link-Seal, Metraflex Metraseal, or equal, casing seals may be used in lieu of caulking. Wrap pipes through slabs on grade with 1 inch thick fiberglass insulation to completely isolate the pipe from the concrete.
D. Floor, Wall, and Ceiling Plates:
1. Fit all pipes with or without insulation passing through walls, floors, or ceilings, and all hanger rods penetrating finished ceilings with chrome-plated or stainless escutcheon plates.

E. Firestopping:
1. Pack the annular space between the pipe sleeves and the pipe and between duct openings and ducts through all floors and walls with UL listed fire stop, and sealed at the ends. All pipe penetrations shall be UL listed, Hilti, 3M Pro-Set, or equal.
   a. Install fire caulking behind mechanical services installed within fire rated walls, to maintain continuous rating of wall construction.
2. Provide SpecSeal Systems UL fire rated sleeve/coupling penetrators for each pipe penetration or fixture opening passing through floors, walls, partitions or floor/ceiling assemblies. All Penetrators shall comply with UL Fire Resistance Directory (Latest Edition), and in accordance with Chapter 7, CBC requirements.
3. Sleeve penetrators shall have a built in anchor ring for waterproofing and anchoring into concrete pours or use the special fit cored hole penetrator for cored holes.
4. Copper and steel piping shall have SpecSeal plugs on both sides of the penetrator to reduce noise and to provide waterproofing.
5. All above Systems to be installed in strict accordance with manufacturer's instructions.
6. Alternate firestopping systems are acceptable if approved equal. However, any deviation from the above specification requires the Contractor to be responsible for determining the suitability of the proposed products and their intended use, and the Contractor shall assume all risks and liabilities whatsoever in connection therewith.

F. Hangers and Supports:
1. General: Support all ductwork, equipment and piping so that it is firmly held in place by approved iron hangers and supports and special hangers as required. All components shall support weight of ductwork, equipment and pipe, fluid, and pipe insulation based on spacing between supports with minimum factor of safety of five based on ultimate strength of material used. Do not exceed manufacturer's load rating. Pipe attachments or hangers, of same size as pipe or tubing on which used, or nearest available. Rigidly fasten hose faucets, fixture stops, compressed air outlets, and similar items to the building construction. The Architect shall approve all hanger material before installation. Do not support piping or ductwork with plumbers' tape, wire rope, wood, or other makeshift devices. Where building structural members do not match piping and ductwork support spacing, provide all "bridging" support members as required firmly attached to building structural members in a fashion approved by the Structural Engineer.
   a. Materials, design, and type numbers per Manufacturers' Standardization Society (MSS), Standard Practice (SP)-58.
2. All hanger components shall be provided by one manufacturer: B-Line, Grinnell, Uni-Strut, Badger, or equal.
3. Hanger and Support Spacing:
   a. Vertical piping support spacing: B-line #B3373 clamps attached to the pipe above each floor to rest on the floor. Provide with lead or Teflon
liners on copper tubing. Provide additional support at base of cast iron risers and support at unsupported riser joints and horizontal offsets per 2007 Mason Industries Seismic Restraint Guidelines. Provide intermediate support for vertical piping, spaced at or within the following maximum limits.

<table>
<thead>
<tr>
<th>Pipe Diameter</th>
<th>Steel Fluid</th>
<th>Steel Vapor</th>
<th>Copper Fluid</th>
<th>Copper Vapor</th>
<th>CPVC &amp; PVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 - 1”</td>
<td>12</td>
<td>6</td>
<td>10</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>1-1/4 - 2”</td>
<td>12</td>
<td>Each Floor</td>
<td>10</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>2-1/2 - 3”</td>
<td>12</td>
<td>Each Floor</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Over 4”</td>
<td>12</td>
<td>Each Floor</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

Note 1: Provide mid-story guides.
Note 2: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard.

b. Vertical cast iron piping support spacing: Base and each floor not to exceed 15 feet.

c. Horizontal piping, hanger and support spacing: Locate hangers and supports at each change of direction, within one foot of elbow, and spaced at or within following maximum limits.

<table>
<thead>
<tr>
<th>Pipe Diameter</th>
<th>Steel Fluid</th>
<th>Steel Vapor</th>
<th>Copper Fluid</th>
<th>Copper Vapor</th>
<th>CPVC &amp; PVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 - 1”</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>1-1/4 - 2”</td>
<td>7</td>
<td>10</td>
<td>6</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>2-1/2 - 3”</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>Over 4”</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>4</td>
</tr>
</tbody>
</table>

d. Horizontal cast iron piping support spacing:
1) Support piping at every other joint for piping length of less than 4 feet.
2) For piping longer than 4 feet, provide support on each side of the coupling, within 18 inches of each joint.
3) Hanger shall not be installed on the coupling.
4) Provide support at each horizontal branch connection.
5) Provide sway brace at 40 foot maximum spacing for all suspended pipe with no-hub joints, except where a lesser spacing is indicated in the 2007 Mason Industries Seismic Restraint Guidelines. Provide a brace on each side of a change
4. Individually Suspended Piping:
   a. Individually suspended piping: B-Line B3690 J-Hanger or B3100 Clevis, complete with threaded rod, or equal. All hangers on supply and return piping handling heating hot water or steam shall have a swing connector at point of support.

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Rod Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&quot; and Smaller</td>
<td>3/8&quot;</td>
</tr>
<tr>
<td>2-1/2&quot; to 3-1/2&quot;</td>
<td>1/2&quot;</td>
</tr>
<tr>
<td>4&quot; to 5&quot;</td>
<td>5/8&quot;</td>
</tr>
<tr>
<td>6&quot;</td>
<td>3/4&quot;</td>
</tr>
</tbody>
</table>

   b. Trapeze Suspension: B-Line 1-5/8 inch width channel in accordance with manufacturer's published load ratings. No deflection to exceed 1/180 of a span.

   c. Trapeze Supporting Rods: Shall have a safety factor of five; securely anchor to building structure.

   d. Pipe Clamps and Straps: B-Line B2000, B2400; isolate copper pipe with two thicknesses of 2 inches wide 10-mil polyvinyl tape. Where used for seismic support systems, provide B-Line B2400 series pipe straps.

   e. Concrete Inserts: B-line B221 continuous insert or B2500 spot insert. Do not use actuated fasteners for support of overhead piping unless approved by Architect.

   f. Above Roof: H frame made from Uni-Strut hot-dipped galvanized 1-5/8 inch single or double channel with P-2072A or P-2073A foot secured to roof and surrounded with waterproof roofed in sleeper. Secure to sleeper with lag screws, and secure sleeper to blocking under roof.

   g. Steel Connectors: Beam clamps with retainers.

5. Support to Structure:
   a. Wood Structure: Provide and install wood blocking as required to suit structure. Provide lag screws or through bolts with length to suit requirements, and with size (diameter) to match the size of hanger rods required.

      1) Do not install Lag screws in tension without written review and acceptance by Structural Engineer.

      Side Beam Angle Clip B-Line B3062 MSS Type 34
      Side Beam Angle Clip B-Line B3060
      Ceiling Flange B-Line B3199

      2) Blocking for support of piping shall be not less than 2 inch thick for piping up to 2 inch size (water filled) or 3 inch size (vapor filled). Provide 3 inch blocking for piping up through 5 inch size, and 4 inch blocking for larger piping. Provide support for blocking in accordance with Structural Engineers requirements.
3) Where lag screws are used, length of screw shall be 1/2 inch less than the wood blocking. Pre-drill starter holes for each lag screw.

b. Steel Structure: Provide and install additional steel bracing as required to suit structure. Provide through bolts with length to suit requirements of the structural components. Burning or welding on any structural member may only be done if approved by the Architect.

6. Rubber Neoprene Pipe Isolators:
   a. Pipe isolators shall comprise an internal rubber or neoprene material that isolates pipe from hanger and structure. Install at all piping located in acoustical walls. Refer to Architectural Drawings for location of acoustical walls.
   b. Isolation material shall be either a rubber or neoprene material that prevents contact between the pipe and the structure. The rubber shall have between a 45 to 55 durometer rating and a minimum thickness of 1/2 inch.
   c. Acceptable Suppliers:
      1) Vertical runs: Acousto-Plumb or equal.
      2) Horizontal runs: B-Line, Vibraclamp; Acousto-Plumb or equal.

7. Provide continuous V channel support for all horizontal plastic piping.

8. Provide support for piping through roof, arranged to anchor piping solidly in place at the roof penetration.

9. Provide rigid insulation and a 12 inch long, 18 gauge galvanized sheet iron shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering.

10. Insulate copper tubing from ferrous materials and hangers with two thicknesses of 3 inch wide, 10 mil polyvinyl tape wrapped around pipe.

11. Provide a support or hanger close to each change of direction of pipe either horizontal or vertical and as near as possible to concentrated loads.

12. Suspend rods from concrete inserts with removable nuts where suspended from concrete decks. Power actuated inserts will not be allowed.

13. On chilled or combination hot and chilled water or refrigerant pipes, install the hangers on the outside of the pipe covering and not in contact with the pipe. Provide rigid insulation and a 12 inch long, 18 gauge galvanized sheet iron shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering.

3.9 PIPE JOINTS AND CONNECTIONS

A. General:
1. Cutting: Cut pipe and tubing square, remove rough edges or burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt and debris from inside and outside of pipe before assembly.
3. Boss or saddle type fittings or mechanically extracted tube joints will not be allowed.
B. Threaded Pipe: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply thread compound to external pipe threads: Rectorseal No. 5, Permatex No. 1, or equal.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

C. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

D. Copper Pipe and Tubing (Except pneumatic control piping): All joints shall be brazed according to ASME Section IX, Welding and Brazing Qualifications, except domestic water piping 1-1/4 inches and smaller when not buried in the ground or concrete and type DWV plumbing piping may be soldered.

E. Welded Pipe:
   1. Make up with oxyacetylene or electric arc process.
   2. All welding shall conform to the American Standard Code for Power Piping ASME B-31.1. When requested by the Architect, furnish certification from an approved testing agency or National Certified Pipe Welding Bureau that the welders performing the work are qualified.
   3. All line welds shall be of the single "V" butt type. Welds for flanges shall be of the fillet type.
   4. Where the branch is two pipe sizes smaller than the main or smaller, Bonney Weldeolets, Threadolets, Nibco, or equal, may be used in lieu of welding tees.

F. Flexible Connections:
   1. Furnish and install Thermo Tech., Inc. F/J/R, Metraflex, or equal, flexible couplings with limiter bolts on piping connections to all equipment mounted on anti-vibration bases, except fan coil units under 2000 cfm, on each connection to each base mounted pump and where shown. Couplings shall be suitable for pressure and type of service.
   2. Flexible connections in refrigerant lines; Flexonic, Anaconda or equal, metal hose, full size.
   3. Anchor piping securely on the system side of each flexible connection.

3.10 UNIONS AND FLANGES

A. Install Epco, Nibco, or equal, dielectric unions or flanges at points of connection between copper or brass piping or material and steel or cast iron pipe or material except in drain piping. Bushings or couplings shall not be used.

B. Install unions in piping NPS 2" and smaller 3 or flanges in piping NPS 2-1/2" and larger whether shown or not at each connection to all equipment and tanks, and at all connections to all automatic valves, such as temperature control valves.

C. Locate the unions for easy removal of the equipment, tank, or valve.
D. Do not install unions or flanges in refrigerant piping systems.

3.11 ACCESS DOOR

A. Furnish and install access doors wherever required whether shown or not for easy maintenance of mechanical systems; for example, at concealed valves, strainers, traps, cleanouts, dampers, motors, controls, operating equipment, etc. Access doors shall provide for complete removal and replacement of equipment.

3.12 CONCRETE WORK

A. Concrete work required for work of this Section shall be included under another section of the Specification, unless otherwise noted, including poured-in-place concrete work for installing precast manholes, catch basins, etc., and shall include reinforced concrete bases for pumps, tanks, compressors, fan units, boilers, unless the work is specifically indicated on the Drawings to be furnished under this Section.

B. Underground anchors, and pads for valve access boxes are included under this Section of the Specification. Concrete shall be 3000 psi test minimum. Refer to Division 3 for concrete types.

3.13 PIPE PROTECTION

A. Wrap bare galvanized and black steel pipe buried in the ground and to 6" above grade, including piping in conduit, with one of the following, or equal:
   1. Polyethylene Coating: Pressure sensitive polyethylene coating, "X-Tru-Coat" as manufactured by Pipe Line Service Corporation or "Green Line" wrap as manufactured by Roystron Products, or equal.
      a. Field Joints and Fittings: Protecto Wrap #1170 tape as manufactured by Pipe Line Service Corporation, or Primer #200 tape by Roystron Products, or equal. Installation shall be as per manufacturer's recommendation and instructions.
   2. Tape Wrap: Pressure-sensitive polyvinyl chloride tape, "Transtex #V-10 or V-20", "Scotchwrap 50", Slipknot 100, Pabco, or equal, with continuous identification. Tape shall be a minimum of 20 mils thick for fittings and irregular surfaces, two wraps, 50 percent overlap, 40 mils total thickness. Tape shall be laminated with a suitable adhesive; widths as recommended by the manufacturer for the pipe size. Wrap straight lengths of piping with an approved wrapping machine.

B. Field Joints: Valves and Fittings: double wrap polyvinyl chloride tape as above. Provide at least two thicknesses of tape over the joint and extend a minimum of 4 inches over adjacent pipe covering. Build up with primer to match adjacent covering thickness. Width of tape of fittings shall not exceed 3 inches. Tape shall adhere tightly to all surfaces of the fittings without air pockets.

C. Testing: Test completed wrap of piping, including all epoxy painted piping with Tinker and Rasor Co. test machine (San Gabriel, CA - 818-287-5259), Pipeline Inspection Company (Houston, TX - 713-681-5837), or equal.

D. Cleaning: Clean all piping thoroughly before wrapping.
1. Inspection: Damaged or defective wraps shall be repaired as directed. No wrapped pipe shall be covered until approved by Architect.

E. Covering: No rocks or sharp edges shall be backfilled against the wrap. When backfilling with other than sand, protect wrap with an outer wrapping of Kraft paper; leave in place during backfill.

3.14 PIPE IDENTIFICATION

A. Provide temporary identification of each pipe installed, at the time of installation. Temporary identification shall be removed and replaced with permanent identification as part of the work.

B. Apply the legend and flow arrow at all valve locations; at all points where the piping enters or leaves a wall, partition, cluster of piping or similar obstruction, at each change of direction, and at approximately 20'-0" intervals on pipe runs. Variations or changes in locations and spacing may be made with the approval of the Architect. There shall be at least one marking in each room. Markings shall be located for maximum visibility from expected personnel approach.
   1. Apply legend and flow arrow at approximately 10'-0" intervals in science classrooms and science prep rooms.

C. Wherever two or more pipes run parallel, the markings shall be supplied in the same relative location on each.

D. Each valve on non-potable water piping shall be labeled with a metal tag stamped "DANGER -- NON-POTABLE WATER" in 1/4 inch high letters.

E. Apply the markings after painting and cleaning of piping and insulation is completed.

3.15 SPECIAL SEISMIC REQUIREMENTS

A. Supports, anchorage and restraints for piping, ductwork and equipment shall be a pre-approved system such as ISAT, Badger, Mason, or equal. Pipes, ducts and equipment shall be seismically restrained in accordance with requirements of the current edition of the California Building Code. System shall meet additional requirements of the authority having jurisdiction. Provide supporting documentation required by the reviewing authority and Architect and Engineer. Provide layout drawings showing piping, ductwork and restraint locations.

B. In lieu of the above or for non-standard installations not covered in the above pre-approved systems, Contractor shall provide layout drawings showing piping, ductwork and restraint locations, and detail supports, attachments and restraints, and furnish supporting calculations and legible details sealed by a California registered structural engineer, in accordance with 2010 California Building Code. Contractor shall use Seismic Design Category indicated in Structural Contract Documents.

C. Bracing of Ducts: Specifically state how bracing attachment to structure is to be accomplished. In-line equipment must be braced independently of ducts and in conformance with applicable building codes. Identify in-line equipment in ducts, regardless of duct size and note how seismic bracing has been independently provided.
Provide shop drawings indicating the location of all transverse and longitudinal seismic braces.

D. Bracing of piping: Specifically state how bracing attachment to structure is accomplished. Provide shop drawings indicating all seismic restraints, including details of anchorage to the building. In-line equipment must be braced independently of piping 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 the pre-approval documentation. Pipe bracing shall be designed in accordance with California Building Code Section 1615A.1.22 and ASCE 7-05 Section 13.6. Coefficient $I_p = 1.5$ shall be used for gas piping bracing calculations.

E. Additional Requirements: In addition to the above, conform to State and local requirements.

3.16 EXPANSION ANCHORS IN HARDENED CONCRETE

A. Refer to Structural Drawings.

B. Qualification Tests: The specific anchor shall have a current ICC-ES report and evaluated in cracked concrete in accordance with Acceptance Criteria AC193. The design shear and withdrawal load shall not be more than 80% of the allowable load listed in the current ICC-ES report and manufacturer's recommendations for the specific anchor.

C. Installation: The anchors must be installed in accordance with the requirements given in ICC Research Committee Recommendations for the specific anchor.

D. Testing: Fifty percent of the anchors shall be load-tested on each job to twice the allowable capacity in tension, except that if the design load is less than 75 pounds; only one anchor in ten need be tested. If any anchor fails, all anchors must be tested. The load test shall be performed in the presence of the project inspector.

E. The load may be applied by any method that will effectively measure the tension in the anchor, such as direct pull with a hydraulic jack, a torque wrench calibrated using the specific anchor or calibrated spring-loading devices. Anchors in which the torque is used to expand the anchor without applying tension to the bolt may not be verified with a torque wrench.

3.17 TESTS AND ADJUSTMENTS

A. Test the installations in accordance with the following requirements and all applicable codes:

1. Inspector of Record should witness all tests of piping systems.
2. Notify the Architect at least seven days in advance of any test.
3. All piping shall be tested at completion of roughing-in, or at other times as directed by the Architect.
4. Furnish all necessary materials, test pumps, gases, instruments and labor required for testing.
5. Isolate from the system all equipment that may be damaged by test pressure.
6. Make connections to existing systems with flanged connection. During testing of the new work, provide a slip-in plate to restrict test pressure to new systems only. Remove plate and complete connection to existing system at completion of testing.
   a. Inspector of record shall witness final connection to system.

B. Test Schedule: No loss in pressure or visible leaks shall show after four hours at the pressures indicated.

<table>
<thead>
<tr>
<th>System Tested</th>
<th>Test Pressure PSI</th>
<th>Test With</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressed Air, Acetylene and Oxygen</td>
<td>200 lb.</td>
<td>Air &amp; Non-corrosive Leak Test Fluid</td>
</tr>
<tr>
<td>Gases and Vacuum</td>
<td>100</td>
<td>Air &amp; Non-corrosive Leak Test Fluid</td>
</tr>
<tr>
<td>All Hot, Chilled, Combination,</td>
<td>125</td>
<td>Water</td>
</tr>
<tr>
<td>Condenser Water Piping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up to 15 psi Steam Piping</td>
<td>150</td>
<td>Water</td>
</tr>
<tr>
<td>&amp; All Steam Condensate Piping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steam Piping Above 15 psi</td>
<td>300</td>
<td>Water</td>
</tr>
<tr>
<td>Fuel Oil</td>
<td>1-1/2 x WP &amp; 20&quot;</td>
<td></td>
</tr>
<tr>
<td>Distilled Deionized Water</td>
<td>50</td>
<td>Water</td>
</tr>
</tbody>
</table>

1. Test all steam piping with nominal pressure steam before insulating.
2. Flush distilled deionized water lines with distilled deionized water after test and approval.
3. Non-corrosive leak test fluid shall be suitable for use with the piping material specified, and with the type of gas conveyed by the piping system.

C. Perform operational tests under simulated or actual service conditions, including one test of complete plumbing installation with all fixtures and other appliances connected, and one test of complete installation of 48 hours each for heating and cooling with all equipment connected and operating.

D. Should any material or work fail in any of these tests, it shall be immediately removed and replaced for new material, and portion of the work replaced shall again be tested by Contractor at his own expense.

E. Lubricate each item of equipment, including motors, before operation.
F. Testing, Evacuating, Charging and Lubrication of Refrigeration Systems:
   1. Pressurize with dry nitrogen and/or refrigerant to 300 psig and test all joints with an electronic detector or halide torch. Release the pressure and attach a high vacuum pump. Evacuate to 4 mm (4000 microns) and hold for 30 minutes. Break to 5 psig with dry nitrogen and allow to remain in the system for ten minutes. Evacuate to 2 mm (2000 microns) and hold for 30 minutes. Use a mercury manometer or electronic vacuum gauge. Do not start timing until recommended vacuum range is reached.
   2. At the end of the evacuation, if the system has been proved leak-free, charge with refrigerant and fill the crankcase to the oil level specified by the manufacturer. All refrigerant oil shall be delivered to the location in sealed containers.
   3. Replenish for a period of one year without cost to the Owner all refrigerant and oil required to maintain the proper levels.

3.18 TRACER WIRES
   A. Provide tracer wire for non-metallic water pipe in ground outside of buildings. Use AWG #12 tracer wire with blue colored low density high molecular weight polyethylene insulation, and lay continuously on pipe so that it is not broken or stressed by backfilling operations. Secure wire to the piping with tape at 18 inch intervals. Solder all joints.
   B. Terminals: Precast concrete box and cast iron locking traffic cover, Brooks 3TL, or equal; cover marked with name of service; 6 inches of loose gravel below box. Plastic terminal board with brass bolts; identify line direction with plastic tags. Test for continuity between terminals, after backfilling, in presence of Inspector.
   C. Alternate: Use electronically detectable plastic tape with metallic core, Terra Tape D, manufactured by Reef Industries, Inc., Seton, Inc., Marking Services, Inc., or equal; tape 2 inches wide, continuously imprinted "CAUTION WATER (GAS, etc.) LINE BELOW". Install, with printed side up, directly over pipe, 18 inches below finish grade. Backfill material shall be as previously specified for the particular condition where pipe is installed, but avoid use of crushed rock or of earth with particles larger than 1/2 inch within the top 12 inches of backfill. Take precautions to insure that tape is not damaged or misplaced during backfill operations. Terminal boxes not required.

3.19 OPERATION OF SYSTEMS
   A. Do not operate any mechanical equipment for any purpose, temporary or permanent, until all of the following has been completed:
      1. Complete all requirements listed under “Check, Test and Start Requirements.”
      2. Ductwork and piping has been properly cleaned. Piping systems should be flushed and treated prior to operation.
      3. Filters, strainers etc. are in place.
      4. Bearings have been lubricated, and alignment of rotating equipment has been checked.
      5. Equipment has been run under observation, and is operating in a satisfactory manner.
B. Provide test and balance agency with one set of Contract Drawings, Specifications, Addenda, Change orders issued, applicable shop drawings and submittals and temperature control drawings.

C. Operate every fire damper, smoke damper, combination smoke and fire damper under normal operating conditions. Activate smoke detectors as required to operate the damper, stage fan, etc. Provide written confirmation that all systems operate in a satisfactory manner.

3.20 TEMPORARY HEAT

A. The General Contractor will provide for all temporary heat at such times as may be required or directed by the Architect and pay all fuel and energy costs incurred.

B. Temporary heating facilities proposed for use by the Contractor will be subject to review of the Architect. Prior to use of any equipment for temporary heat, install temporary filters on all return air inlets, to preclude dust and construction debris from entering the duct system. In addition, install filters in air handling units, and replace at the completion of temporary operation.

C. Filters used for temporary operation of systems shall be as specified for permanent filters specified herein.

D. Comply with Check, Test and Start Requirements for start-up of equipment prior to operation for temporary heat.

E. Heating Contractor shall complete the permanent heating system as soon as possible, thereby making it available for temporary heat. When available, the system may be used as required at the direction of the Architect after systems are properly prepared for use as specified elsewhere. Heating Contractor shall then be responsible for operating the system during periods required and the General Contractor shall pay the fuel and energy costs incurred. Operation of the heating system prior to the filing of "notice of completion" shall not change the Guarantee provisions in any way.

3.21 CHECK, TEST AND START REQUIREMENTS

A. An authorized representative of the equipment manufacturer shall perform check, test and start of each piece of mechanical equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the check test and start of the equipment.

1. As part of the submittal process, provide a copy of each manufacturer's printed startup form to be used.

2. Some items of specified equipment may require that check, test and start of equipment must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.

3. Provide all personnel, test instruments, and equipment to properly perform the check, test and start work.

4. When work has been completed, provide copies of reports for review, prior to final observation of work.
B. Provide copies of the completed check, test and start report of each item of equipment, bound with the Operation and Maintenance Manual.

C. Upon completion of the work, provide a schedule of planned maintenance for each piece of equipment. Indicate frequency of service, recommended spare parts (including filters and lubricants), and methods for adjustment and alignment of all equipment components. Provide a copy of the schedule with each Operation and Maintenance Manual. Provide a copy of certification from the Owner's representative indicating that they have been properly instructed in maintenance requirements for the equipment installed.

3.22 COMMISSIONING AND PRELIMINARY OPERATIONAL TESTS

A. Prior to observation to determine final acceptance, put all mechanical systems into service and check that work required for that purpose has been done, including but not limited to the following condensed check list. Provide indexed report to tabulating the results of all work.

1. All equipment has been started, checked, lubricated and adjusted in accordance with the manufacturer's recommendations, including modulating power exhausts if present.
2. Correct rotation of motors and ratings of overload heaters are verified.
3. Specified filters are installed and spare filters have been turned over to Owner.
4. All manufacturers' certificates of start-up specified have been delivered to the Owner.
5. All equipment has been cleaned, and damaged painted finishes touched up.
6. Damaged fins on heat exchangers have been combed out.
7. Missing or damaged parts have been replaced.
8. Flushing and chemical treatment of piping systems has been completed and water treatment equipment, where specified, is in operation.
9. Equipment labels, pipe marker labels, ceiling markers and valve tags are installed.
10. Valve tag schedules, corrected control diagrams, sequence of operation lists and start-stop instructions have been posted.
11. Preliminary test and balance work is complete, and reports have been forwarded for review.
12. Automatic control set points are as designated and performance of controls checks out to agree with the sequence of operation.
13. Operation and Maintenance Manuals have been delivered and instructions to the operating personnel have been made.

B. Prior to the observation to determine final acceptance, operate all mechanical systems as required to demonstrate that the installation and performance of these systems conform to the requirements of these specifications.

1. Operate and test all mechanical equipment and systems for a period of at least five consecutive 8 hour days to demonstrate the satisfactory overall operation of the project as a complete unit.
2. Include operation of heating and air conditioning equipment and systems for a period of not less than two 8 hour days at not less than 90 percent of full specified heating and cooling capacities in tests.
3. Commence tests after preliminary balancing and adjustments to equipment have been checked. Immediately before starting tests, install air filters and lubricate all
running equipment. Notify the Architect at least seven calendar days in advance of starting the above tests.

4. During the test period, make final adjustments and balancing of equipment, systems controls, and circuits so that all are placed in first class operating condition.

5. Where Utility District rebates are applicable, demonstrate that the systems meet the rebate program requirements.

C. In addition to the requirements of paragraphs A and B above, the contractor shall also be responsible to complete all the Acceptance Requirements of the 2008 California Building Energy Efficiency Standards, including but not limited to Air Distribution Systems, Outside Air systems, Packaged HVAC Systems, VFD Systems, Hydronic system Controls, Space Conditioning Controls, Demand Control Ventilation and Air Economizers. Contractor shall perform all required acceptance tests and shall complete the appropriate “Certificates of Acceptance” and submit such certificates to the projects enforcement agency for approval by the agency and agency issuance for final occupancy permit.

D. Before handing over the system to Owner replace all filters with complete new set of filters.

E. Review of Contractor's Tests:
   1. All tests made by the Contractor or manufacturers' representatives are subject to observation and review by the Owner. Provide timely notice prior to start of each test, in order to allow for observation of testing. Upon the completion of all tests, provide a letter to confirm that all testing has been successful.

F. Test Logs:
   1. Maintain test logs listing the tests on all mechanical systems showing dates, items tested, inspectors' names, remarks on success or failure of the tests.

G. Preliminary Operation:
   1. The Owner reserves the right to operate portions of the mechanical system on a preliminary basis without voiding the guarantee.

H. Operational Tests:
   1. Before operational tests are performed, demonstrate that all systems and components are complete and fully charged with operating fluid and lubricants.
   2. Systems shall be operable and capable of maintaining continuous uninterrupted operation during the operating and demonstration period. After all systems have been completely installed, connections made, and tests completed, operate the systems continuously for a period of five working days during the hours of a normal working day.
   3. This period of continuous systems operation may be coordinated with the removal of Volatile Organic Compounds (VOCs) from the building prior to occupancy should the Owner decide to implement such a program.
   4. Control systems shall be completely operable with settings properly calibrated and adjusted.
   5. Rotating equipment shall be in dynamic balance and alignment.
   6. If the system fails to operate continuously during the test period, the deficiencies shall be corrected and the entire test repeated.
I. Pre-Occupancy Building Purge:
   1. Prior to occupancy, ventilate the building on 100% outside air, 100% exhaust for a continuous period determined by a qualified industrial hygienist (engaged by the Contractor) to reduce V.O.C’s prior to occupancy.
   2. Submit report by the industrial hygienist verifying satisfactory completion of the pre-occupancy purge.

3.23 OWNER TRAINING

A. An authorized representative of the equipment manufacturer shall train Owner-designated personnel in maintenance and adjustment of equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the Owner training for the equipment installed.
   1. As part of the submittal process, provide a training agenda outlining major topics and time allowed for each topic.
   2. Some items of specified equipment require that training must be performed by the manufacturer, using manufacturer’s employees. See specific equipment Articles in these Specifications for this requirement.
   3. Contractor shall provide three copies of certification by Contractor that training has been completed, signed by Owner’s representative, for inclusion in Operation and Maintenance Manual. Certificates shall include:
      a. Listing of Owner-designated personnel completing training, by name and title.
      b. Name and title of training instructor.
      c. Date(s) of training.
      d. List of topics covered in training sessions.
   4. Refer to specific equipment Articles for minimum training period duration for each piece of equipment.

END OF SECTION 23 00 50
SECTION 23 05 16 - EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Alignment guides and anchors.

1.3 PERFORMANCE REQUIREMENTS

A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Delegated-Design Submittal: For each anchor and alignment guide indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
   2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
   3. Alignment Guide Details: Detail field assembly and attachment to building structure.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of expansion joint, from manufacturer.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For expansion joints to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following as applicable to project:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 ALIGNMENT GUIDES AND ANCHORS

A. Alignment Guides:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Adsco Manufacturing LLC.
      b. Advanced Thermal Systems, Inc.
      c. Flex-Hose Co., Inc.
      d. Flexicraft Industries.
      e. Flex-Weld, Inc.
      f. Hyspan Precision Products, Inc.
      g. Metraflex, Inc.
      h. Senior Flexonics Pathway.
      i. Unisource Manufacturing, Inc.
      j. U.S. Bellows, Inc.
      k. Or equal.
   2. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding spider for bolting to pipe.

B. Anchor Materials:
   1. Steel Shapes and Plates: ASTM A 36/A 36M.
   2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
   4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.
   5. Chemical Fasteners: Insert-type-stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.
      a. Bonding Material: ASTM C 881/C 881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.

PART 3 - EXECUTION

3.1 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.
B. Install one guide(s) on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.

C. Attach guides to pipe and secure guides to building structure.

D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

E. Anchor Attachments:

F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.
   1. Anchor Attachment to Steel Structural Members: Attach by welding.
   2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.

G. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

END OF SECTION 23 05 16
SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Metal pipe hangers and supports.
   2. Trapeze pipe hangers.
   3. Metal framing systems.
   4. Thermal-hanger shield inserts.
   5. Fastener systems.
   6. Pipe stands.
   7. Equipment supports.

B. Related Sections:
   1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
   2. Section 230516 "Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.
   3. Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment" for vibration isolation devices.
   4. Section 233113 "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
   1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
   2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
   3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:
1. Trapeze pipe hangers.
2. Metal framing systems.
3. Pipe stands.
4. Equipment supports.

1.6 INFORMATIONAL SUBMITTALS
A. Welding certificates.

1.7 QUALITY ASSURANCE
A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS
A. Carbon-Steel Pipe Hangers and Supports:
   1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
   2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
   3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
   4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.

2.2 TRAPEZE PIPE HANGERS
A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS
A. MFMA Manufacturer Metal Framing Systems:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.
      c. Flex-Strut Inc.
      d. GS Metals Corp.
      e. Thomas & Betts Corporation.
      f. Unistrut Corporation; Tyco International, Ltd.
g. Wesanco, Inc.
h. Or equal.

2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.


4. Channels: Continuous slotted steel channel with inturned lips.

5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.


2.4 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Carpenter & Paterson, Inc.
3. ERICO International Corporation.
5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.
10. Or equal.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig or ASTM C 552, Type II cellular glass with 100-psig.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or stainless-steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
2.6 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand:
   1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
   2. Base: Plastic or Stainless steel.
   3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
   4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand:
   1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
   2. Bases: One or more; plastic.
   3. Vertical Members: Two or more protective-coated-steel channels.
   4. Horizontal Member: Protective-coated-steel channel.
   5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
   2. Design Mix: 5000-psi, 28-day compressive strength.
3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
   1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
   2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:
   1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:
   1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
   2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.

G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.


I. 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.

J. Install lateral bracing with pipe hangers and supports to prevent swaying.

K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

N. Insulated Piping:
   1. Attach clamps and spacers to piping.
      a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
      b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
      c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
   2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
      a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
   3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
      a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
   4. Shield Dimensions for Pipe: Not less than the following:
      a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
      b. NPS 4: 12 inches long and 0.06 inch thick.
   5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

   A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

   B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

   C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

   A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

   B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING
A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING
A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE
A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.
F. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.
G. Use padded hangers for piping that is subject to scratching.
H. Use thermal-hanger shield inserts for insulated piping and tubing.
I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
   a. Light (MSS Type 31): 750 lb.
   b. Medium (MSS Type 32): 1500 lb.
   c. Heavy (MSS Type 33): 3000 lb.
13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
   a. Horizontal (MSS Type 54): Mounted horizontally.
   b. Vertical (MSS Type 55): Mounted vertically.
   c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

Q. Use Mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 23 05 29
SECTION 23 05 48 - VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Isolation pads.
   2. Isolation mounts.
   3. Restrained elastomeric isolation mounts.
   4. Housed spring mounts.
   5. Spring hangers.
   6. Pipe riser resilient supports.
   7. Resilient pipe guides.
   8. Restraining braces and cables.

1.3 DEFINITIONS


1.4 PERFORMANCE REQUIREMENTS

A. Wind-Restraint Loading:
   1. Basic Wind Speed: 90 MPH.
   2. Building Classification Category: III.
   3. Minimum 10 lb/sq. ft. multiplied by the maximum area of the HVAC component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.

B. Seismic-Restraint Loading:
   1. Site Class as Defined in the IBC: D.
   2. Assigned Seismic Use Group or Building Category as Defined in the IBC: III.
      a. Component Importance Factor: 1.25.
      c. Component Amplification Factor: 2.5.
   3. Design Spectral Response Acceleration at Short Periods (0.2 Second): 0.463.
1.5 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
   2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
      a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an evaluation service member of ICC-ES an agency acceptable to authorities having jurisdiction.
      b. Annotate to indicate application of each product submitted and compliance with requirements.

B. Delegated-Design Submittal: For vibration isolation and seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic and wind forces required to select vibration isolators, seismic and wind restraints, and for designing vibration isolation bases.
      a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
   2. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system has been examined for excessive stress and that none will exist.
   3. Seismic- and Wind-Restraint Details:
      a. Design Analysis: To support selection and arrangement of seismic and wind restraints. Include calculations of combined tensile and shear loads.
      b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
      c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
      d. Preapproval and Evaluation Documentation: By an evaluation service member of ICC-ES an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of seismic bracing for HVAC piping and equipment with other systems and equipment in the vicinity, including other supports and seismic restraints.
B. Qualification Data: For professional engineer and testing agency.

C. Welding certificates.

D. Field quality-control test reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air-mounting systems to include in operation and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ace Mountings Co., Inc.
2. Amber/Booth Company, Inc.
4. Isolation Technology, Inc.
7. Vibration Eliminator Co., Inc.
8. Vibration Isolation.
10. Or equal.
B. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.
   1. Resilient Material: Oil- and water-resistant neoprene.

C. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.
   1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
   2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
   6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
   7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

2.2 SEISMIC-RESTRAINT DEVICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Amber/Booth Company, Inc.
   2. California Dynamics Corporation.
   3. Cooper B-Line, Inc.; a division of Cooper Industries.
   4. Hilti, Inc.
   7. Mason Industries.
   8. TOLCO Incorporated; a brand of NIBCO INC.
   9. Unistrut; Tyco International, Ltd.
   10. Or equal.

B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an evaluation service member of ICC-ES.
   1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

C. Snubbers: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.
   1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
   2. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
   3. Maximum 1/4-inch air gap, and minimum 1/4-inch-thick resilient cushion.
D. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

E. Restraint Cables: ASTM A 603 galvanized ASTM A 492 stainless-steel cables with end connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

F. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections Reinforcing steel angle clamped to hanger rod.

G. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

I. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

J. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

2.3 FACTORY FINISHES

A. Finish: Manufacturer's standard prime-coat finish ready for field painting.

B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.
   1. Powder coating on springs and housings.
   2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
   3. Baked enamel or powder coat for metal components on isolators for interior use.
   4. Color-code or otherwise mark vibration isolation and seismic- and wind-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic- and wind-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.
B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an evaluation service member of ICC-ES.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Comply with requirements in Section 077200 "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

B. Equipment Restraints:
   1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
   2. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES providing required submittals for component.

C. Piping Restraints:
   1. Comply with requirements in MSS SP-127.
   2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
   3. Brace a change of direction longer than 12 feet.

D. Install cables so they do not bend across edges of adjacent equipment or building structure.

E. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES providing required submittals for component.

F. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

G. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
H. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

I. Drilled-in Anchors:
1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 232113 "Hydronic Piping" for piping flexible connections.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:
1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
7. Measure isolator deflection.
8. **Air-Mounting System Leak Test**: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

9. **Air-Mounting System Operational Test**: Test the compressed-air leveling system.

10. **Test and adjust air-mounting system controls and safeties**.

11. **If a device fails test, modify all installations of same type and retest until satisfactory results are achieved**.

D. **Remove and replace malfunctioning units and retest as specified above**.

E. **Prepare test and inspection reports**.

### 3.6 ADJUSTING

A. **Adjust isolators after piping system is at operating weight**.

B. **Adjust limit stops on restrained spring isolators to mount equipment at normal operating height**. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. **Adjust air-spring leveling mechanism**.

D. **Adjust active height of spring isolators**.

E. **Adjust restraints to permit free movement of equipment within normal mode of operation**.

### 3.7 HVAC VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE SCHEDULE

A. **Suspended Equipment**: FC-1 thru FC-39, SF-1 thru SF-3.
   1. **Equipment Location**: Refer to plans.
   2. **Isolator Type**: Spring Hangers.
   3. **Minimum Deflection**: 2.0"

B. **SHWP-1, SHWP-2, CHWP-1 thru CHWP-4**
   1. **Equipment Location**: Boiler Room.
   2. **Isolator Type**: Neoprene pad waffle.
   3. **Thickness**: 3/4".

END OF SECTION 23 05 48
SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Equipment labels.
   2. Warning signs and labels.
   3. Pipe labels.
   4. Duct labels.
   5. Valve tags.
   6. Warning tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.
PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:
   1. Material and Thickness: Brass, 0.032-inch; Stainless steel, 0.025-inch; Aluminum, 0.032-inch; or anodized aluminum, 0.032-inc; and having predrilled or stamped holes for attachment hardware.
   2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
   3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

B. Plastic Labels for Equipment:
   1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
   2. Letter Color: Red
   3. Background Color: White
   4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
   5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
   6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
   7. Fasteners: Stainless-steel rivets or self-tapping screws.

C. Label Content: Include equipment's Drawing designation or unique equipment number.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black

C. Background Color: Yellow

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
F. Minimum Letter Size: \(\frac{1}{4}\) inch for name of units if viewing distance is less than 24 inches, \(\frac{1}{2}\) inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
   1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
   2. Lettering Size: At least 1-1/2 inches high.

2.4 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, \(\frac{1}{8}\) inch thick, and having predrilled holes for attachment hardware.


C. Background Color: Blue.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: \(\frac{1}{4}\) inch for name of units if viewing distance is less than 24 inches, \(\frac{1}{2}\) inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.
H. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.
   1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
   2. Lettering Size: At least 1-1/2 inches high.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
   1. Tag Material: Brass, 0.032-inch; Stainless steel, 0.025-inch; Aluminum, 0.032-inch; or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
   2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
   1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
   1. Size: Approximately 4 by 7 inches
   2. Fasteners: Brass grommet and wire.
   3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Division 09 Section "Interior Painting High-Performance Coatings."
B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

C. Pipe Label Color Schedule:
1. Chilled-Water Piping:
   a. Background Color: White
   b. Letter Color: Blue
2. Heating Water Piping:
   a. Background Color: Yellow
   b. Letter Color: Blue
3. Refrigerant Piping:
   a. Background Color: White
   b. Letter Color: Black

3.4 DUCT LABEL INSTALLATION
A. Install plastic-laminated self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:
1. Blue: For cold-air supply ducts.
2. Yellow: For hot-air supply ducts.
B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.5 VALVE-TAG INSTALLATION
A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
1. Valve-Tag Size and Shape:
   a. Chilled Water: 1-1/2 inches round
   b. Refrigerant: 1-1/2 inches round
   c. Hot Water: 1-1/2 inches round
   d. Gas: 1-1/2 inches round
2. Valve-Tag Color:
   a. Chilled Water: Natural
   b. Refrigerant: Natural
   c. Hot Water: Natural
   d. Gas: Natural

3. Letter Color:
   a. Chilled Water: White
   b. Refrigerant: White
   c. Hot Water: White
   d. Gas: White

3.6 WARNING-TAG INSTALLATION

   A. Write required message on, and attach warning tags to, equipment and other items where required.
SECTION 23 07 19 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following HVAC piping systems:
   1. Condensate drain piping, indoors and outdoors.
   2. Chilled-water piping, indoors and outdoors.
   3. Heating hot-water piping, indoors and outdoors.

B. Related Sections:
   1. Division 23 Section "Duct Insulation."
   2. Division 23 Section "Underground Hydronic Piping"

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
   2. Detail insulation application at pipe expansion joints for each type of insulation.
   3. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
   4. Detail removable insulation at piping specialties.
   5. Detail application of field-applied jackets.
   6. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.
1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS


B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Calcium Silicate:
   1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Industrial Insulation Group (IIG); Thermo-12 Gold.
   2. Prefomed Pipe Sections: Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate with a non-asbestos fibrous reinforcement. Comply with ASTM C 533, Type I.
   3. Prefabricated Fitting Covers: Comply with ASTM C 450 and ASTM C 585 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.

G. Cellular Glass: Inorganic, noncombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
   1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Pittsburgh Corning Corporation; Foamglas.
   2. Block Insulation: ASTM C 552, Type I.
   3. Special-Shaped Insulation: ASTM C 552, Type III.
   4. Board Insulation: ASTM C 552, Type IV.
   5. Prefomed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
   7. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

H. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
   1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Aeroflex USA, Inc.; Aerocel.
      b. Armacell LLC; AP Armaflex.
      c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.
      d. Or equal

I. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I II with factory-applied vinyl jacket III with factory-applied FSK jacket III with factory-applied FSP jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
   a. CertainTeed Corp.; SoftTouch Duct Wrap.
   b. Johns Manville; Microlite.
   c. Knauf Insulation; Friendly Feel Duct Wrap.
   d. Manson Insulation Inc.; Alley Wrap.
   e. Owens Corning; SOFTR All-Service Duct Wrap.
   f. Or equal

J. Mineral-Fiber, Preformed Pipe Insulation:
   1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Fibrex Insulations Inc.; Coreplus 1200.
      b. Johns Manville; Micro-Lok.
      c. Knauf Insulation; 1000-Degree Pipe Insulation.
      d. Manson Insulation Inc.; Alley-K.
      e. Owens Corning; Fiberglas Pipe Insulation.
      f. Or equal

2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

3. Type II, 1200 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type II, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

K. Mineral-Fiber, Pipe Insulation Wicking System: Preformed pipe insulation complying with ASTM C 547, Type I, Grade A, with absorbent cloth factory-applied to the entire inside surface of preformed pipe insulation and extended through the longitudinal joint to outside surface of insulation under insulation jacket. Factory apply a white, polymer, vapor-retarder jacket with self-sealing adhesive tape seam and evaporation holes running continuously along the longitudinal seam, exposing the absorbent cloth.
   1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Knauf Insulation; Permawick Pipe Insulation.
      b. Owens Corning; VaporWick Pipe Insulation.
      c. Or equal

L. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ FSK jacket complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
   a. CertainTeed Corp.; CrimpWrap.
   b. Johns Manville; MicroFlex.
   c. Knauf Insulation; Pipe and Tank Insulation.
   d. Manson Insulation Inc.; AK Flex.
   e. Owens Corning; Fiberglas Pipe and Tank Insulation.
   f. Or equal

2.2 INSULATING CEMENTS

   1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Ramco Insulation, Inc.; Super-Stik.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.
   1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Ramco Insulation, Inc.; Thermokote V.

   1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Calcium Silicate Adhesive: Fibrous, sodium-silicate-based adhesive with a service temperature range of 50 to 800 deg F.
   1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      b. Eagle Bridges - Marathon Industries; 290.
      d. Mon-Eco Industries, Inc.; 22-30.
      e. Vimasco Corporation; 760.
      f. Or equal

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services’ "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.
   1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
   2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services’ "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.
   1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Aeroflex USA, Inc.; Aeroseal.
      b. Armacell LLC; Armaflex 520 Adhesive.
      d. K-Flex USA; R-373 Contact Adhesive.
      e. Or equal
   2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services’ "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
   1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      b. Eagle Bridges - Marathon Industries; 225.
      d. Mon-Eco Industries, Inc.; 22-25.
      e. Or equal
   2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services’ "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.

F. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
   b. Eagle Bridges - Marathon Industries; 225.
   d. Mon-Eco Industries, Inc.; 22-25.
e. Or equal
2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services’ “Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.”

G. PVC Jacket Adhesive: Compatible with PVC jacket.
1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Dow Corning Corporation; 739, Dow Silicone.
   d. Speedline Corporation; Polyco VP Adhesive.
e. Or equal
2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services’ “Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.”

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
   1. Products: Subject to compliance with requirements, provide the following provide
      one of the following available products that may be incorporated into the Work
      include, but are not limited to, the following:
      a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B.
         Fuller Company; 30-80/30-90.
      b. Vimasco Corporation; 749.
      c. Or equal
   2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-
      mil dry film thickness.
   3. Service Temperature Range: Minus 20 to plus 180 deg F.
   4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.
   1. Products: Subject to compliance with requirements, provide the following provide
      one of the following available products that may be incorporated into the Work
      include, but are not limited to, the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B.
         Fuller Company; CP-30.
      b. Eagle Bridges - Marathon Industries; 501.
      c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B.
         Fuller Company; 30-35.
      d. Mon-Eco Industries, Inc.; 55-10.
      e. Or equal
   2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
   3. Service Temperature Range: 0 to 180 deg F.

D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient
   services.
   1. Products: Subject to compliance with requirements, provide the following provide
      one of the following available products that may be incorporated into the Work
      include, but are not limited to, the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B.
         Fuller Company; Encacel.
      b. Eagle Bridges - Marathon Industries; 570.
      c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B.
         Fuller Company; 60-95/60-96.
      d. Or equal
   2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
   3. Service Temperature Range: Minus 50 to plus 220 deg F.
   4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
E. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
   1. Products: Subject to compliance with requirements, provide the following products that may be incorporated into the Work:
      b. Eagle Bridges - Marathon Industries; 550.
      e. Vimasco Corporation; WC-1/WC-5.
      f. Or equal
   2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
   3. Service Temperature Range: Minus 20 to plus 180 deg F.
   4. Solids Content: 60 percent by volume and 66 percent by weight.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
   1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   2. Products: Subject to compliance with requirements, provide the following products that may be incorporated into the Work:
      c. Vimasco Corporation; 713 and 714.
      d. Or equal
   3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
   4. Service Temperature Range: 0 to plus 180 deg F.

2.6 SEALANTS

A. Joint Sealants:
   1. Joint Sealants for Cellular-Glass, Phenolic, and Polyisocyanurate Products: Subject to compliance with requirements, provide the following products that may be incorporated into the Work:
      b. Eagle Bridges - Marathon Industries; 405.
d. Mon-Eco Industries, Inc.; 44-05.
e. Pittsburgh Corning Corporation; Pittseal 444.
f. Or equal

2. Joint Sealants for Polystyrene Products: Subject to compliance with requirements, provide the following:

   b. Eagle Bridges - Marathon Industries; 405.
   d. Mon-Eco Industries, Inc.; 44-05.
   e. Or equal

3. Materials shall be compatible with insulation materials, jackets, and substrates.
4. Permanently flexible, elastomeric sealant.
5. Service Temperature Range: Minus 100 to plus 300 deg F.
6. Color: White or gray.
7. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
8. Sealants shall comply with the testing and product requirements of the California Department of Health Services’ "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide the following:

   b. Eagle Bridges - Marathon Industries; 405.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
   d. Mon-Eco Industries, Inc.; 44-05.
   e. Or equal

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services’ "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

HVAC PIPING INSULATION
23 07 19 - 10
C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
   1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
   2. Materials shall be compatible with insulation materials, jackets, and substrates.
   3. Fire- and water-resistant, flexible, elastomeric sealant.
   4. Service Temperature Range: Minus 40 to plus 250 deg F.
   6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
   1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
   2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
   3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
   4. PVDC Jacket for Indoor Applications: 4-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perm when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.
      a. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
         1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.
         2) Or approved equal
   5. PVDC Jacket for Outdoor Applications: 6-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perm when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.
      a. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
         1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.
   a. Products: Subject to compliance with requirements, provide the following:
      provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

7. **Vinyl Jacket**: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.8 **FIELD-APPLIED FABRIC-REINFORCING MESH**

A. **Woven Glass-Fiber Fabric**: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in. for covering pipe and pipe fittings.
   1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

B. **Woven Polyester Fabric**: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe.
   1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      b. Vimasco Corporation; Elastafab 894.
      c. Or equal

2.9 **FIELD-APPLIED CLOTHS**

A. **Woven Glass-Fiber Fabric**: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd..
   1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

2.10 **FIELD-APPLIED JACKETS**

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
B. **FSK Jacket**: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
C. **PVC Jacket**: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
1. **Products:** Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Johns Manville; Zeston.
   c. Proto Corporation; LoSmoke.
   d. Speedline Corporation; SmokeSafe.
   e. Or equal

2. **Adhesive:** As recommended by jacket material manufacturer.

3. **Color:** White Color-code jackets based on system. Color as selected by Architect.

4. **Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.**
   a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

**D. Metal Jacket:**

1. **Products:** Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
   b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
   c. RPR Products, Inc.; Insul-Mate.
   d. Or equal

2. **Aluminum Jacket:** Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
   a. Sheet and roll stock ready for shop or field sizing Factory cut and rolled to size.
   b. Finish and thickness are indicated in field-applied jacket schedules.
   d. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper 2.5-mil- thick polysurlyn.
   e. Factory-Fabricated Fitting Covers:
      1) Same material, finish, and thickness as jacket.
      2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
      3) Tee covers.
      4) Flange and union covers.
      5) End caps.
      6) Beveled collars.
      7) Valve covers.
      8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

3. **Stainless-Steel Jacket:** ASTM A 167 or ASTM A 240/A 240M.
   a. Sheet and roll stock ready for shop or field sizing Factory cut and rolled to size.
b. Material, finish, and thickness are indicated in field-applied jacket schedules.


d. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper 2.5-mil- thick polysurlyn.

e. Factory-Fabricated Fitting Covers:
   1) Same material, finish, and thickness as jacket.
   2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
   3) Tee covers.
   4) Flange and union covers.
   5) End caps.
   6) Beveled collars.
   7) Valve covers.
   8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

E. Underground Direct-Buried Jacket: 125-mil- thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.
   1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Pittsburgh Corning Corporation; Pittwrap.
      b. Polyguard Products, Inc.; Insulrap No Torch 125.
      c. Or equal

F. Self-Adhesive Outdoor Jacket: 60-mil- thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a crosslaminated polyethylene film covered with white stucco-embossed aluminum-foil facing.
   1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Polyguard Products, Inc.; Alumaguard 60.
      b. Or approved equal

G. PVDC Jacket for Indoor Applications: 4-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.
   1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Dow Chemical Company (The); Saran 540 Vapor Retarder Film.

H. PVDC Jacket for Outdoor Applications: 6-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perms when tested according to ASTM E 96/E 96M and
with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.

1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Dow Chemical Company (The); Saran 560 Vapor Retarder Film.


1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

2.11 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
   a. ABI, Ideal Tape Division; 428 AWF ASJ.
   b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
   c. Compac Corporation; 104 and 105.
   d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
   e. Or equal

2. Width: 3 inches.
3. Thickness: 11.5 mils.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
   a. ABI, Ideal Tape Division; 491 AWF FSK.
   b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
   c. Compac Corporation; 110 and 111.
   d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.
   e. Or equal

2. Width: 3 inches.
3. Thickness: 6.5 mils.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
   1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. ABI, Ideal Tape Division; 370 White PVC tape.
      b. Compac Corporation; 130.
      c. Venture Tape; 1506 CW NS.
      d. Or equal
   2. Width: 2 inches.
   3. Thickness: 6 mils.
   5. Elongation: 500 percent.
   6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
   1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. ABI, Ideal Tape Division; 488 AWF.
      b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
      c. Compac Corporation; 120.
      d. Venture Tape; 3520 CW.
      e. Or equal
   2. Width: 2 inches.
   3. Thickness: 3.7 mils.
   5. Elongation: 5 percent.
   6. Tensile Strength: 34 lbf/inch in width.

E. PVDC Tape for Indoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.
   1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Dow Chemical Company (The); Saran 540 Vapor Retarder Tape.
   2. Width: 3 inches.
   3. Film Thickness: 4 mils.
   4. Adhesive Thickness: 1.5 mils.
   5. Elongation at Break: 145 percent.
   6. Tensile Strength: 55 lbf/inch in width.

F. PVDC Tape for Outdoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.
   1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Dow Chemical Company (The); Saran 560 Vapor Retarder Tape.
   2. Width: 3 inches.
   3. Film Thickness: 6 mils.
   4. Adhesive Thickness: 1.5 mils.
5. Elongation at Break: 145 percent.
6. Tensile Strength: 55 lbf/inch in width.

2.12 SECUREMENTS

A. Bands:
   1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. ITW Insulation Systems; Gerrard Strapping and Seals.
      b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.
      c. Or equal
   2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch 3/4 inch wide with wing seal or closed seal.
   3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch 3/4 inch wide with wing seal or closed seal.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

C. Wire: 0.080-inch nickel-copper alloy 0.062-inch soft-annealed, stainless steel 0.062-inch soft-annealed, galvanized steel.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
   1. Verify that systems to be insulated have been tested and are free of defects.
   2. Verify that surfaces to be insulated are clean and dry.
   3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
   1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
   2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to
structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:
1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches 4 inches o.c.
   a. For below-ambient services, apply vapor-barrier mastic over staples.
4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
5. Handholes.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor
insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
1. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.

5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.

7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

9. Label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.

2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.

3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.

4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly.
with insulating cement applied in two coats. After first coat is dry, apply and
trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed
surfaces with a metal jacket.

3.6 INSTALLATION OF CALCIUM SILICATE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
1. Secure single-layer insulation with stainless-steel bands at 12-inch intervals and
tighten bands without deforming insulation materials.
2. Install two-layer insulation with joints tightly butted and staggered at least 3
inches. Secure inner layer with wire spaced at 12-inch intervals. Secure outer
layer with stainless-steel bands at 12-inch intervals.
3. Apply a skim coat of mineral-fiber, hydraulic-setting cement to insulation surface.
When cement is dry, apply flood coat of lagging adhesive and press on one layer
of glass cloth or tape. Overlap edges at least 1 inch. Apply finish coat of lagging
adhesive over glass cloth or tape. Thin finish coat to achieve smooth, uniform
finish.

B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus
twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer
circumference of adjacent straight pipe segments with cut sections of block
insulation of same material and thickness as pipe insulation.
4. Finish flange insulation same as pipe insulation.

C. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material as straight segments of pipe
insulation when available. Secure according to manufacturer's written
instructions.
2. When preformed insulation sections of insulation are not available, install mitered
sections of calcium silicate insulation. Secure insulation materials with wire or
bands.
3. Finish fittings insulation same as pipe insulation.

D. Insulation Installation on Valves and Pipe Specialties:
1. Install mitered segments of calcium silicate insulation to valve body. Arrange
insulation to permit access to packing and to allow valve operation without
disturbing insulation.
2. Install insulation to flanges as specified for flange insulation application.
3. Finish valve and specialty insulation same as pipe insulation.

3.7 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of insulation to pipe with wire or bands and tighten bands
without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and
protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.8 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:
1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:
1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.9 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.
3.10 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.
   1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
   2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
   3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:
   1. Draw jacket material smooth and tight.
   2. Install lap or joint strips with same material as jacket.
   3. Secure jacket to insulation with manufacturer's recommended adhesive.
   4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
   5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.
   1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

E. Where PVDC jackets are indicated, install as follows:
   1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
   2. Wrap factory-presized jackets around individual pipe insulation sections with one end overlapping the previously installed sheet. Install presized jacket with an approximate overlap at butt joint of 2 inches over the previous section. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.
   3. Continuous jacket can be spiral-wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.
   4. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33-1/2 inches or less. The 33-1/2-inch-circumference limit allows for 2-inch- overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
   5. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.
3.11 FINISHES

A. Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.
   1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:
   1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.13 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
   1. Drainage piping located in crawl spaces.
   2. Underground piping.
   3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.14 INDOOR PIPING INSULATION SCHEDULE

A. Chilled Water above 40 Deg F:
   1. NPS 4 and Smaller: Insulation shall be one of the following:
      a. Cellular Glass: 2 inches thick.
b. Mineral-Fiber, Preformed Pipe, Type I or Pipe Insulation Wicking System: 1-1/2 inches thick.

B. Heating-Hot-Water Supply and Return, 200 Deg F and Below:
   1. NPS 12 and Smaller: Insulation shall be one of the following:
      a. Cellular Glass: 2 inches thick.
      b. Mineral-Fiber, Preformed Pipe, Type I: 2 inches thick.

3.15 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Chilled Water:
   1. All Pipe Sizes: Insulation shall be one of the following:
      a. Cellular Glass: 3 inches thick.
      b. Flexible Elastomeric: 3 inches thick.
      c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 3 inches thick.

B. Heating-Hot-Water Supply and Return, 200 Deg F and Below:
   1. All Pipe Sizes: Insulation shall be one of the following:
      a. Cellular Glass: 3 inches thick.
      b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

3.16 OUTDOOR, UNDERGROUND PIPING INSULATION SCHEDULE

A. Chilled Water, All Sizes: Cellular glass, 2 inches thick.

B. Heating-Hot-Water Supply and Return, All Sizes, 200 Deg F and Below: Cellular glass, 3 inches thick.

3.17 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor’s option.

C. Piping, Concealed:
   1. None.

D. Piping, Exposed:
   1. PVC, Color-Coded by System: 30 mils thick.
   2. Aluminum, Corrugated Stucco Embossed: 0.032 inch thick.
   3. Painted Aluminum, Stucco Embossed 0.024 inch thick.
   4. Stainless Steel, Type 304 or Type 316, Smooth 2B Finish 0.020 inch thick.

3.18 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor’s option.
C. Piping, Concealed:
1. Aluminum, Stucco Embossed: 0.032 inch thick.
2. Painted Aluminum, Stucco Embossed: 0.032 inch thick.

D. Piping, Exposed:
1. Painted Aluminum, Stucco Embossed with Z-Shaped Locking Seam: 0.040 inch thick.
2. Stainless Steel, Type 304 or 316, Stucco Embossed with Z-Shaped Locking Seam: 0.024 inch thick.

END OF SECTION 23 07 19
SECTION 23 21 13 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:
   1. Hot-water heating piping.
   2. Chilled-water piping.
   4. Makeup-water piping.
   5. Blowdown-drain piping.
   6. Air-vent piping.
   7. Safety-valve-inlet and -outlet piping.

B. Related Sections include the following:
   1. Section 232123 "Hydronic Pumps" for pumps, motors, and accessories for hydronic piping.

1.3 DEFINITIONS

A. PTFE: Polytetrafluoroethylene.

1.4 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:
   1. Hot-Water Heating Piping: <150 psig> at 200 deg F.
   2. Chilled-Water Piping: <150 psig> at 200 deg F.
   3. Makeup-Water Piping: 80 psig at 150 deg F.
   4. Condensate-Drain Piping: 150 deg F.
   5. Blowdown-Drain Piping: 200 deg F.
   6. Air-Vent Piping: 200 deg F.
   7. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of the following:
   1. Pressure-seal fittings.
   2. Valves. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
   3. Air control devices.
5. Hydronic specialties.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.
B. Welding certificates.
C. Field quality-control test reports.
D. Water Analysis: Submit a copy of the water analysis to illustrate water quality available at Project site.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Water-Treatment Chemicals: Furnish enough chemicals for initial system startup and for preventive maintenance for one year from date of Substantial Completion.
B. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

1.9 QUALITY ASSURANCE

A. Installer Qualifications:

B. Steel Support Welding: Qualify processes and operators according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
   1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
   2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.
B. Wrought-Copper Fittings: ASME B16.22.
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Anvil International, Inc.
      b. S. P. Fittings; a division of Star Pipe Products.
      c. Victaulic Company.
      d. Or equal.
   2. Grooved-End Copper Fittings: ASTM B 75, copper tube or ASTM B 584, bronze casting.
   3. Grooved-End-Tube Couplings: Rigid pattern, unless otherwise indicated; gasketed fitting. Ductile-iron housing with keys matching pipe and fitting grooves, prelubricated EPDM gasket rated for minimum 230 deg F for use with housing, and steel bolts and nuts.

C. Wrought-Copper Unions: ASME B16.22.

2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article.

B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in Part 3 "Piping Applications" Article.


E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in Part 3 "Piping Applications" Article.

F. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.

G. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
   2. End Connections: Butt welding.
   3. Facings: Raised face.

H. Grooved Mechanical-Joint Fittings and Couplings:
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Anvil International, Inc.
      b. Central Sprinkler Company; a division of Tyco Fire & Building Products.
      c. National Fittings, Inc.
      d. S. P. Fittings; a division of Star Pipe Products.
2. Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47/A 47M, Grade 32510 malleable iron; ASTM A 53/A 53M, Type F, E, or S, Grade B fabricated steel; or ASTM A 106, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.

3. Couplings: Ductile- or malleable-iron housing and synthetic rubber gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.

I. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

2.3 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
   1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
      a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
      b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

E. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      c. Jomar International Ltd.
      d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
      e. Wilkins; a Zurn company.
SJC Environmental Health T.I.
Stockton, California

HYDRONIC PIPING

f. Or equal.

2. Description:
   b. Pressure Rating: 125 psig minimum at 180 deg F 150 psig 250 psig.
   c. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:
   1. Manufacturers: Subject to compliance with requirements, available
      manufacturers offering products that may be incorporated into the Work include,
      but are not limited to, the following:
      b. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
      c. Wilkins; a Zurn company.
      d. Or equal.
   2. Description:
      b. Factory-fabricated, bolted, companion-flange assembly.
      c. Pressure Rating: 150 psig.
      d. End Connections: Solder-joint copper alloy and threaded ferrous;
         threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:
   1. Manufacturers: Subject to compliance with requirements, available
      manufacturers offering products that may be incorporated into the Work include,
      but are not limited to, the following:
      a. Advance Products & Systems, Inc.
      b. Calpico, Inc.
      c. Central Plastics Company.
      d. Pipeline Seal and Insulator, Inc.
      e. Or equal.
   2. Description:
      a. Nonconducting materials for field assembly of companion flanges.
      b. Pressure Rating: 150 psig.
      c. Gasket: Neoprene or phenolic.
      d. Bolt Sleeves: Phenolic or polyethylene.
      e. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:
   1. Manufacturers: Subject to compliance with requirements, available
      manufacturers offering products that may be incorporated into the Work include,
      but are not limited to, the following:
      a. Elster Perfection.
      b. Grinnell Mechanical Products.
      c. Matco-Norca, Inc.
      d. Precision Plumbing Products, Inc.
      e. Victaulic Company.
      f. Or equal.
   2. Description:
      a. Standard: IAPMO PS 66
      b. Electroplated steel nipple; complying with ASTM F 1545.
      c. Pressure Rating: 300 psig at 225 deg F.
d. End Connections: Male threaded or grooved.
e. Lining: Inert and noncorrosive, propylene.

2.5 VALVES

A. Gate, Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Section 230523 "General-Duty Valves for HVAC Piping."

B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Section 230923 "Direct Digital Control System for HVAC."

C. Bronze, Calibrated-Orifice, Balancing Valves:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Armstrong Pumps, Inc.
   b. Bell & Gossett Domestic Pump; a division of ITT Industries.
   c. Flow Design Inc.
   d. Gerard Engineering Co.
   e. Griswold Controls.
   f. Taco.
   g. Or equal.
2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Plug: Resin.
5. Seat: PTFE.
6. End Connections: Threaded or socket.
8. Handle Style: Lever, with memory stop to retain set position.
10. Maximum Operating Temperature: 250 deg F.

D. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Armstrong Pumps, Inc.
   b. Bell & Gossett Domestic Pump; a division of ITT Industries.
   c. Flow Design Inc.
   d. Gerard Engineering Co.
   e. Griswold Controls.
   f. Taco.
   g. Tour & Andersson; available through Victaulic Company.
   h. Or equal.
2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
5. Disc: Glass and carbon-filled PTFE.
6. Seat: PTFE.
7. End Connections: Flanged or grooved.
9. Handle Style: Lever, with memory stop to retain set position.
11. Maximum Operating Temperature: 250 deg F.

E. Diaphragm-Operated, Pressure-Reducing Valves:
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Amtrol, Inc.
      b. Armstrong Pumps, Inc.
      c. Bell & Gossett Domestic Pump; a division of ITT Industries.
      d. Conbraco Industries, Inc.
      e. Spence Engineering Company, Inc.
      f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
      g. Or equal.
   2. Body: Bronze or brass.
   3. Disc: Glass and carbon-filled PTFE.
   5. Stem Seals: EPDM O-rings.
   6. Diaphragm: EPT.
   7. Low inlet-pressure check valve.
   8. Inlet Strainer: Removable without system shutdown.
   10. Valve Size, Capacity, and Operating Pressure: Selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

F. Diaphragm-Operated Safety Valves:
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Amtrol, Inc.
      b. Armstrong Pumps, Inc.
      c. Bell & Gossett Domestic Pump; a division of ITT Industries.
      d. Conbraco Industries, Inc.
      e. Spence Engineering Company, Inc.
      f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
      g. Or equal.
   2. Body: Bronze or brass.
   3. Disc: Glass and carbon-filled PTFE.
   5. Stem Seals: EPDM O-rings.
   6. Diaphragm: EPT.
   8. Inlet Strainer: Removable without system shutdown.
   10. Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.
G. Automatic Flow-Control Valves:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Flow Design Inc.
   b. Griswold Controls.
   c. Or equal.
2. Body: Brass or ferrous metal.
3. Piston and Spring Assembly: Stainless steel, tamper proof, self cleaning, and removable.
4. Combination Assemblies: Include bronze or brass-alloy ball valve.
5. Identification Tag: Marked with zone identification, valve number, and flow rate.
6. Size: Same as pipe in which installed.
7. Performance: Maintain constant flow, plus or minus 5 percent over system pressure fluctuations.
9. Maximum Operating Temperature: 250 deg F.

2.6 AIR CONTROL DEVICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Amtrol, Inc.
2. Armstrong Pumps, Inc.
3. Bell & Gossett Domestic Pump; a division of ITT Industries.
4. Taco.
5. Or equal.

B. Manual Air Vents:
1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: NPS 1/2.
7. Maximum Operating Temperature: 225 deg F.

C. Automatic Air Vents:
1. Body: Bronze or cast iron.
2. Internal Parts: Nonferrous.
4. Inlet Connection: NPS 1/2.
7. Maximum Operating Temperature: 240 deg F.

D. Expansion Tanks:
1. Tank: Welded steel, rated for 125-psig working pressure and 375 deg F maximum operating temperature, with taps in bottom of tank for tank fitting and taps in end of tank for gage glass. Tanks shall be factory tested with taps.
fabricated and labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

2. Air-Control Tank Fitting: Cast-iron body, copper-plated tube, brass vent tube plug, and stainless-steel ball check, 100-gal. unit only; sized for compression-tank diameter. Provide tank fittings for 125-psig working pressure and 250 deg F maximum operating temperature.

3. Tank Drain Fitting: Brass body, nonferrous internal parts; 125-psig working pressure and 240 deg F maximum operating temperature; constructed to admit air to compression tank, drain water, and close off system.


E. Bladder-Type Expansion Tanks:

1. Tank: Welded steel, rated for 125-psig working pressure and 375 deg F maximum operating temperature. Factory test with taps fabricated and supports installed and labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

2. Bladder: Securely sealed into tank to separate air charge from system water to maintain required expansion capacity.


F. Tangential-Type Air Separators:

1. Tank: Welded steel; ASME constructed and labeled for 125-psig minimum working pressure and 375 deg F maximum operating temperature.

2. Air Collector Tube: Perforated stainless steel, constructed to direct released air into expansion tank.

3. Tangential Inlet and Outlet Connections: Threaded for NPS 2 and smaller; flanged connections for NPS 2-1/2 and larger.


5. Size: Match system flow capacity.

2.7 CHEMICAL TREATMENT

A. Bypass Chemical Feeder: Welded steel construction; 125-psig working pressure; 5-gal. capacity; with fill funnel and inlet, outlet, and drain valves.

1. Chemicals: Specially formulated, based on analysis of makeup water, to prevent accumulation of scale and corrosion in piping and connected equipment.

B. Ethylene and Propylene Glycol: Industrial grade with corrosion inhibitors and environmental-stabilizer additives for mixing with water in systems indicated to contain antifreeze or glycol solutions.

2.8 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.

2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.

3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
B. Basket Strainers:
   1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
   2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
   3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.

C. T-Pattern Strainers:
   1. Body: Ductile or malleable iron with removable access coupling and end cap for strainer maintenance.
   2. End Connections: Grooved ends.
   3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 57 percent free area.
   4. CWP Rating: 750 psig.

D. Stainless-Steel Bellow, Flexible Connectors:
   2. End Connections: Threaded or flanged to match equipment connected.
   4. CWP Rating: 150 psig.
   5. Maximum Operating Temperature: 250 deg F.

E. Spherical, Rubber, Flexible Connectors:
   2. End Connections: Steel flanges drilled to align with Classes 150 and 300 steel flanges.
   4. CWP Rating: 150 psig.
   5. Maximum Operating Temperature: 250 deg F.

F. Expansion fittings are specified in Section 230516 "Expansion Fittings and Loops for HVAC Piping."

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Hot-water heating piping, aboveground, NPS 2 and smaller, shall be any of the following:
   1. Type L, drawn-temper copper tubing, wrought-copper fittings, and brazed pressure-seal joints.
   2. Schedule 40 steel pipe; Class 250, cast-iron fittings; cast-iron flanges and flange fittings; and threaded joints.
B. Hot-water heating piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:
   1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered brazed joints.
   2. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
   3. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints. Grooved piping shall be utilized only within Boiler Room, at Contractors option.
   4. Type L, drawn-temper copper tubing, wrought-copper fittings, and brazed joints.
   5. Schedule 40 steel pipe; Class 250, cast-iron fittings; cast-iron flanges and flange fittings; and threaded joints.

C. Chilled-water piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:
   1. Type L, drawn-temper copper tubing, wrought-copper fittings, and brazed joints.
   2. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
   3. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints. Grooved piping shall be utilized only within Boiler Room, at Contractors option.

D. Makeup-water piping installed aboveground shall be either of the following:
   1. Type L, drawn-temper copper tubing, wrought-copper fittings, and brazed joints.

E. Blowdown-Drain Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.

F. Air-Vent Piping:
   1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.
   2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.

G. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.

3.2 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment.

B. Install calibrated-orifice, balancing valves at each branch connection to return main.

C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.

D. Install check valves at each pump discharge and elsewhere as required to control flow direction.
E. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; and pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.

F. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

3.3 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

C. 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.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

P. Install valves according to Section 230523 "General-Duty Valves for HVAC Piping."

Q. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

R. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

S. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install NPS 3/4 nipple and ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.

T. Install expansion loops, expansion joints, anchors, and pipe alignment guides as specified in Section 230516 "Expansion Fittings and Loops for HVAC Piping."

U. Identify piping as specified in Section 230553 "Identification for HVAC Piping and Equipment."

V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor devices are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment." Comply with the following requirements for maximum spacing of supports.

B. Seismic restraints are specified in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment."

C. Install the following pipe attachments:
   1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
   2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
1. NPS 3/4: Maximum span, 7 feet; minimum rod size, 3/8 inch.
2. NPS 1: Maximum span, 7 feet; minimum rod size, 3/8 inch.
3. NPS 1-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
4. NPS 2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
5. NPS 2-1/2: Maximum span, 11 feet; minimum rod size, 1/2 inch.
6. NPS 3: Maximum span, 12 feet; minimum rod size, 1/2 inch.
7. NPS 4: Maximum span, 14 feet; minimum rod size, 5/8 inch.

E. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 3/8 inch.
2. NPS 1: Maximum span, 6 feet; minimum rod size, 3/8 inch.
3. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
4. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
5. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 1/2 inch.
6. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.

F. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

3.5 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.


E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
F. **Welded Joints:** Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

G. **Flanged Joints:** Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

H. **Grooved Joints:** Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer’s written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.

### 3.6 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

B. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Manual vents at heat-transfer coils and elsewhere as required for air venting.

C. Install piping from boiler air outlet, air separator, or air purger to expansion tank with a 2 percent upward slope toward tank.

D. Install tangential air separator in pump suction. Install blowdown piping with gate or full-port ball valve; extend full size to nearest floor drain.

E. Install bypass chemical feeders in each hydronic system where indicated, in upright position with top of funnel not more than 48 inches above the floor. Install feeder in minimum NPS 3/4 bypass line, from main with full-size, full-port, ball valve in the main between bypass connections. Install NPS 3/4 pipe from chemical feeder drain, to nearest equipment drain and include a full-size, full-port, ball valve.

F. Install expansion tanks on the floor. Vent and purge air from hydronic system, and ensure tank is properly charged with air to suit system Project requirements.

### 3.7 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

D. Install ports for pressure gages and thermometers at coil inlet and outlet connections according to Section 230519 "Meters and Gages for HVAC Piping."
3.8 CHEMICAL TREATMENT

A. Perform an analysis of makeup water to determine type and quantities of chemical treatment needed to keep system free of scale, corrosion, and fouling.

B. Fill system with fresh water and add liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products from piping. Circulate solution for a minimum of 24 hours, drain, clean strainer screens, and refill with fresh water.

C. Add initial chemical treatment and maintain water quality in ranges required for the first year of operation.

D. Fill systems indicated to have propylene glycol solutions to concentrations indicated on drawings.

3.9 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:
1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:
1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least four hours, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.
C. Perform the following before operating the system:
1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION 23 21 13
SECTION 23 21 23 - HYDRONIC PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   2. Close-coupled, end-suction centrifugal pumps.

1.3 DEFINITIONS

A. Buna-N: Nitrile rubber.
B. EPT: Ethylene propylene terpolymer.

1.4 SUBMITTALS

A. Product Data: Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated. Indicate pump's operating point on curves.

B. Shop Drawings: Show pump layout and connections. Include setting drawings with templates for installing foundation and anchor bolts and other anchorages.

C. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain hydronic pumps through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of hydronic pumps and are based on the specific system indicated.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. UL Compliance: Comply with UL 778 for motor-operated water pumps.
1.6 DELIVERY, STORAGE, AND HANDLING
   A. Manufacturer’s Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.
   B. Store pumps in dry location.
   C. Retain protective covers for flanges and protective coatings during storage.
   D. Protect bearings and couplings against damage from sand, grit, and other foreign matter.
   E. Comply with pump manufacturer’s written rigging instructions.

1.7 COORDINATION
   A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified on structural Drawings.

1.8 EXTRA MATERIALS
   A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
      1. Mechanical Seals: One mechanical seal(s) for each pump.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
      1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 CLOSE-COUPLLED, IN-LINE CENTRIFUGAL PUMPS
   A. Manufacturers:
      1. Armstrong Pumps Inc.
      2. Bell & Gossett; Div. of ITT Industries.
      3. PACO Pumps.
      4. Peerless Pump; a Member of the Sterling Fluid Systems Group.
      5. Taco, Inc.
      6. Or equal.
   B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with
pump and motor shafts mounted horizontally or vertically. Rate pump for 250-psig minimum working pressure and a continuous water temperature of 250 deg F.

C. Pump Construction:
1. Casing: Radially split, cast iron, with replaceable bronze wear rings, threaded gage tappings at inlet and outlet, and threaded companion-flange connections.
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. Trim impeller to match specified performance.
4. Mechanical Seal: Carbon rotating ring against a ceramic seat held by a stainless-steel spring, and Buna-N bellows and gasket. Include water slinger on shaft between motor and seal.
5. Packing Seal: Stuffing box, with a minimum of four rings of graphite-impregnated braided yarn with bronze lantern ring between center two graphite rings, and bronze packing gland.

D. Motor: Single speed, with permanently lubricated ball bearings, unless otherwise indicated; and rigidly mounted to pump casing. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

2.3 CLOSE-COUPLED, END-SUCTION CENTRIFUGAL PUMPS

A. Manufacturers:
1. Armstrong Pumps Inc.
2. Bell & Gossett; Div. of ITT Industries.
3. PACO Pumps.
4. Taco, Inc.
5. Or equal.

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, end-suction pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally. Rate pump for 175-psig minimum working pressure and a continuous water temperature of 250 deg F.

C. Pump Construction:
1. Casing: Radially split, cast iron, with replaceable bronze wear rings, drain plug at bottom and air vent at top of volute, threaded gage tappings at inlet and outlet, and flanged connections.
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. Trim impeller to match specified performance.
4. Mechanical Seal: Carbon rotating ring against a ceramic seat held by a stainless-steel spring, and Buna-N bellows and gasket. Include water slinger on shaft between motor and seal.
5. Pump Bearings: Permanently lubricated ball bearings.
6. Motor: Single speed, with permanently lubricated ball bearings, unless otherwise indicated; rigidly mounted to pump casing with integral pump support. Comply
with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

2.4 PUMP SPECIALTY FITTINGS

A. Suction Diffuser: Angle pattern, 300-psig pressure rating, cast ductile-iron body and end cap, pump-inlet fitting; with bronze startup and bronze or stainless-steel permanent strainers; bronze or stainless-steel straightening vanes; drain plug; and factory-fabricated support.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine equipment foundations and anchor-bolt locations for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.

C. Examine foundations and inertia bases for suitable conditions where pumps are to be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONCRETE BASES

A. Cast-in-place concrete materials and placement requirements are specified on structural Drawings.

3.3 PUMP INSTALLATION

A. Comply with HI 1.4.

B. Install pumps with access for periodic maintenance including removal of motors, impellers, couplings, and accessories.

C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

D. Install continuous-thread hanger rods and spring hangers with vertical-limit stop of sufficient size to support pump weight. Vibration isolation devices are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment." Fabricate brackets or supports as required. Hanger and support materials are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

E. Set base-mounted pumps on concrete foundation. Disconnect coupling before setting. Do not reconnect couplings until alignment procedure is complete.
1. Support pump baseplate on rectangular metal blocks and shims, or on metal wedges with small taper, at points near foundation bolts to provide a gap of 3/4 to 1-1/2 inches between pump base and foundation for grouting.

2. Adjust metal supports or wedges until pump and driver shafts are level. Check coupling faces and suction and discharge flanges of pump to verify that they are level and plumb.

3.4 ALIGNMENT

A. Align pump and motor shafts and piping connections after setting on foundation, grout has been set and foundation bolts have been tightened, and piping connections have been made.

B. Comply with pump and coupling manufacturers' written instructions.

C. Adjust pump and motor shafts for angular and offset alignment by methods specified in HI 1.1-1.5, "Centrifugal Pumps for Nomenclature, Definitions, Application and Operation."

D. After alignment is correct, tighten foundation bolts evenly but not too firmly. Completely fill baseplate with nonshrink, nonmetallic grout while metal blocks and shims or wedges are in place. After grout has cured, fully tighten foundation bolts.

3.5 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Connect piping to pumps. Install valves that are same size as piping connected to pumps.

D. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

E. Install check valve and throttling valve on discharge side of pumps.

F. Install Y-type strainer or suction diffuser, as indicated on Drawing details, and shutoff valve on suction side of pumps.

G. Install flexible connectors on suction and discharge sides of base-mounted pumps between pump casing and valves.

H. Install pressure gages on pump suction and discharge, at integral pressure-gage tapping, or install single gage with multiple input selector valve.

I. Install check valve and gate or ball valve on each condensate pump unit discharge.

J. Install electrical connections for power, controls, and devices.
K. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

L. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.6 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.
   1. Complete installation and startup checks according to manufacturer's written instructions.
   2. Check piping connections for tightness.
   3. Clean strainers on suction piping.
   4. Perform the following startup checks for each pump before starting:
      a. Verify bearing lubrication.
      b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
      c. Verify that pump is rotating in the correct direction.
   5. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
   7. Open discharge valve slowly.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fan-coil units. Refer to Section 01650 "Starting of Systems" for additional requirements. Provide minimum 4 hours training for Owners' operational and maintenance personnel.

END OF SECTION 23 21 23
SECTION 23 51 00 - BREECHINGS, CHIMNEYS, AND STACKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY
A. This Section includes the following:
   1. Listed double-vents for Category IV appliances.

1.3 ACTION SUBMITTALS
A. Product Data: For the following:
   1. Special gas vents.

B. Shop Drawings: For vents, breechings, chimneys, and stacks. Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, methods of field assembly, components, hangers and seismic restraints, and location and size of each field connection.
   2. For installed products indicated to comply with design loads, include calculations required for selecting seismic restraints and structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS
A. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE
A. Source Limitations: Obtain listed system components through one source from a single manufacturer.

PART 2 - PRODUCTS

2.1 LISTED SPECIAL GAS VENTS (CONDENSING BOILER)
A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Heat-Fab, Inc.
   2. Metal-Fab, Inc.
   3. Selkirk Inc.; Selkirk Metalbestos and Air Mate.
   4. Z-Flex; Flexmaster Canada Limited.
   5. Or equal.
B. Description: Double-wall metal vents tested according to UL 1738 and rated for 480 deg F continuously, with positive or negative flue pressure complying with NFPA 211.

C. Construction: Inner shell and outer jacket separated by at least a 1/2-inch airspace.

D. Inner Shell: ASTM A 959, Type 29-4C stainless steel.

E. Outer Jacket: Stainless steel.

F. Accessories: Tees, elbows, increasers, draft-hood connectors, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.
   1. Termination: Round chimney top designed to exclude minimum 98 percent of rainfall.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATION

A. Listed Special Gas Vent: Condensing gas appliances.

3.3 INSTALLATION OF LISTED VENTS AND CHIMNEYS

A. Locate to comply with minimum clearances from combustibles and minimum termination heights according to product listing or NFPA 211, whichever is most stringent.

B. Seal between sections of positive-pressure vents according to manufacturer's written installation instructions, using sealants recommended by manufacturer.

C. Support vents at intervals recommended by manufacturer to support weight of vents and all accessories, without exceeding appliance loading.

D. Slope breechings down in direction of appliance, with condensate drain connection at lowest point piped to nearest drain.

E. Lap joints in direction of flow.

3.4 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.
B. Provide temporary closures at ends of breechings, chimneys, and stacks that are not completed or connected to equipment.

END OF SECTION 23 51 00
SECTION 23 52 33 - WATER-TUBE BOILERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. The heating boiler shall be design certified by CSA International and shall meet the requirements of ANSI Z21.13 and CSA 4.9. The boiler shall bear the ASME “H” stamp and shall be national board listed where required. The external jacket shall be of stainless and enameled steel panels assembled with crimptite non-strip self-tap screws. The heating boiler shall be vented as a Category I condensing appliance.

1.3 ACTION SUBMITTALS

A. Product Data: Include performance data, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: For boilers, boiler trim, and accessories. Include plans, elevations, sections, details, and attachments to other work. Include wiring diagrams.

1. Design calculations and vibration isolation base details, signed and sealed by a qualified professional engineer.

   a. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.

   b. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails and equipment mounting frames.

2. Wiring Diagrams: Power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Source quality-control test reports.

B. Field quality-control test reports.

C. Warranty: Special warranty specified in this Section.

D. Other Informational Submittals:


2. Startup service reports.
1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For boilers, components, and accessories to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. The boilers will be completely assembled, wired, and fire-tested prior to shipment from the factory. The boilers will be furnished with ASME Manufacturer's Data Reports, inspection sheet, wiring diagram, rating plate and Installation and Operating Manual.

B. The boilers to meet the requirements of ANSI Z21.13 and CSA 4.9.

C. The boiler shall be <10ppm on NOx emissions and shall meet the NOx emissions requirements of the local Air Quality Control District.

D. The boiler shall be design certified by CSA International. The boiler shall bear the ASME "H" stamp and shall be national board listed where required.

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.8 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace shell, tubes, furnace, cabinets, gas burners, and pressure vessels of fire-tube boilers that fail in materials or workmanship within specified warranty period.

1. One (1) Year Parts and Labor Warranty. Manufacturer's Representative shall provide a One (1) year warranty for defective parts including labor to replace defective parts.

2. If within ten years after initial installation of the appliance, a heat exchanger shall prove upon examination by Camus to be defective in material, thermal shock, leakage or workmanship, Camus will exchange or repair such part or portion on the following pro rated limited warranty

<table>
<thead>
<tr>
<th>Years into Warranty</th>
<th>% of List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>60</td>
</tr>
<tr>
<td>7</td>
<td>65</td>
</tr>
<tr>
<td>8</td>
<td>70</td>
</tr>
<tr>
<td>9</td>
<td>75</td>
</tr>
<tr>
<td>10</td>
<td>80</td>
</tr>
</tbody>
</table>
1.9 **REFERENCE CODES AND STANDARDS**

A. All equipment, materials and workmanship shall conform to the current edition of the following codes and standards.

1. Hydraulic Institute
2. ANSI – American National Standards Institute
3. ASME – American Society of Mechanical Engineers – Boiler and Pressure Vessel Code; Section IV.
5. OSHA – Occupational Safety and Health Administration.
7. Title 24 – California Building Energy Efficiency Standards.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Camus
2. Cleaver-Brooks
3. Fulton

B. Manufacturer must obtain authorization in writing from the Engineer for any proposed deviation from this specification.

#### 2.2 PACKAGED WATERTUBE BOILERS

A. Description: Factory-fabricated, assembled, and tested watertube boiler with heat exchanger, combustion-air intake connections, water supply and return connections, and controls.

B. Boiler Characteristics and Capacities:

2. ASME Rating: 160 psig
3. Entering-Water Temperature: 160 deg F
4. Leaving-Water Temperature: 180 deg F
5. Minimum Efficiency: 85% on gas

#### 2.3 PACKAGED WATERTUBE BOILER COMPONENTS

A. The heat exchanger shall be suitable for a M.A.W.P. of 160 psig (1100 kPa) and shall be of a two pass design employing integrally finned 7/8" copper tubes. All castings shall be bronze. There shall be ready access to the heat exchanger to permit internal and external inspection and cleaning of the tube.

B. The combustion chamber shall be fully enclosed by high temperature fiberboard refractory, which is of modular interlocking construction for ease of replacement.
C. The burner shall be constructed of high heat resistant ceramic tile supported in a steel casing. The burner shall provide equal distribution of heat through the entire heat exchanger.

D. ASME Code relief valves with side outlet set for 160PSIG.

2.4 BOILER CONNECTIONS

A. Groove-lock water connections. A series of "V" shaped baffles are installed between the individual tubes to control the movement of the flue products over the finned tubes to maximize efficiencies.

2.5 BURNER CONTROL

A. SmartFlame 780014 combination limit/operator.

B. The On/off switch, and full diagnostic light package shall be provided. The complete control package shall be mounted on the front panel with hinged door for easy access to all control modules. A flow switch shall be provided loose. The control shall have 6 preset modes to allow operation of the heater as hydronic heating with outdoor reset, DHW or remote enable. Honeywell Sola S7999B1026 or equivalent operating control

C. Controller shall provide the following functions
   1. Control accurate to 1ºF (0.5ºC)
   2. Control readouts:
      a. Boiler target temperature
      b. Hot water inlet/outlet temperatures
      c. Accumulated runtime
   3. Boiler modulation to shut down on high temperature flue gas detection
   4. The controller shall employ a direct spark ignition with three (3) trials for ignition followed by a lock-out condition

2.6 ELECTRICAL REQUIREMENTS

A. Minimum voltage Required, 120V/1Ph/60Hz.

2.7 EFFICIENCY

A. The boilers will have a guaranteed efficiency of up to 85%.

2.8 EMISSIONS

A. Burner boiler design shall produce NOx emission levels of less than 10PPM at full firing rate.

2.9 HOT-WATER BOILER TRIM

A. Flow Switch - McDonnell Miller FS43
B. Relief Valve - This appliance is supplied with a relief valve sized in accordance with ASME Boiler and Pressure Vessel Code, Section IV to be set at 160 PSIG

C. Low Water Cut Off W/Manual Reset - Hydro-level Probe Type W/ Test Light

2.10 BURNER DESIGN

A. The burner shall be constructed of high heat resistant ceramic tile supported in a steel casing.

B. Burner shall incorporate a variable speed combustion air fan capable of modulating the burner at a 5:1 ratio from high fire to low fire.

C. Burner design shall have provision for induction of outside combustion air for sealed combustion.

2.11 BURNER OPERATING CONTROLS

A. Description: To maintain safe operating conditions, burner safety controls limit the operation of burner.
   1. High Temperature Limit: Manual reset stops burner if operating conditions rise above maximum boiler design temperature.
   2. Low-Water Cutoff Switch: Electronic probe shall prevent burner operation on low water. Cutoff switch shall be manual-reset type.
   3. Flow Switch: Electronic switch shall prevent burner operation if flow through unit is insufficient.
   4. Burner to be fully modulating. On/off or high/low burners are NOT acceptable.
   5. Pump Time Delay Relay: Pump shall run after burner is shutdown to prevent overheating of heat exchanger
   6. Low and High Gas Pressure Switches: Stops burner operation if gas pressure is out of normal operating range

2.12 BOILER OPERATING CONTROLS

A. Refer to section 2.5 Computerized Burner Control

B. Boiler operating controls shall include the following devices and features:
   1. MODBUS Building Management System Interface
   2. Outdoor temperature sensor.

2.13 BOILER STACK

A. Shall be Simpson Duravent Type B-Vent. Meeting the following specifications.
   1. UL 1738 tested and listed venting system for categories I or in Canada type BH Gas Vent.
   2. For use with non-condensing appliances burning natural gas or propane.
   3. Capable of being installed in either interior or exterior installations.
   4. Installation must be made in accordance with code requirements and our installation instructions.
2.14 STARTUP SERVICE

A. Engage a factory-authorized service representative to test, inspect, and adjust boiler components and equipment installation and to perform startup service.

B. Perform installation and startup checks according to manufacturer’s written instructions.

C. Leak Test: Hydrostatic test at 30psig. Repair leaks and retest until no leaks exist.

D. Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.

E. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

F. Adjust initial temperature set points.

G. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

H. Prepare written report that documents testing procedures and results.

I. Supplier shall have a local service presence and have 24 / 7 service capabilities.

2.15 ELECTRICAL POWER

A. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in electrical Sections.

B. Single-Point Field Power Connection: Factory-installed and -wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to boiler.
   1. House in NEMA 250, Type 1 enclosure.
   2. Wiring shall be numbered and color-coded to match wiring diagram.
   3. Install factory wiring outside of an enclosure in a metal raceway.
   4. Field power interface shall be to fused disconnect switch.
   5. Provide branch power circuit to each motor and to controls with disconnect switch.
   6. Provide each motor with overcurrent protection.

2.16 SOURCE QUALITY CONTROL

A. Test and inspect factory-assembled boilers, before shipping, according to ASME Boiler and Pressure Vessel Code.

B. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas and to achieve combustion efficiency; perform hydrostatic test.

C. Allow Owner access to source quality-control testing of boilers. Notify Architect 14 days in advance of testing.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Before boiler installation, examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations, and piping and electrical connections to verify actual locations, sizes, and other conditions affecting boiler performance, maintenance, and operations.
   1. Final boiler locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.

B. Examine mechanical spaces for suitable conditions where boilers will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 BOILER INSTALLATION

A. Install boilers level on concrete base. Concrete materials and installation requirements are specified with concrete.

B. Vibration Isolation: Elastomeric isolator pads with a minimum static deflection of 0.25 inch.

C. Install gas-fired boilers according to NFPA 54.

D. Assemble boiler tubes in sequence and seal each tube joint.

E. Assemble and install boiler trim.

F. Install electrical devices furnished with boiler but not specified to be factory mounted.

G. Install control wiring to field-mounted electrical devices.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to boiler to allow service and maintenance.

C. Connect gas piping to boiler gas-train inlet with union. Piping shall be at least full size of gas train connection. Provide a reducer if required.

D. Connect hot-water piping to supply- and return-boiler tappings with shutoff valve and union or flange at each connection.

E. Install piping from safety relief valves to nearest floor drain.

F. Install piping from safety valves to drip-pan elbow and to nearest floor drain.
G. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve if required.

H. Boiler Flue Venting:
1. Connect full size to boiler connections.

I. Connect breeching to full size of boiler outlet. Comply with requirements in Section “Boiler Stacks” for venting materials.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.
1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:
1. Perform installation and startup checks according to manufacturer's written instructions.
2. Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.
3. Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
   a. Burner Test: Adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas and to achieve combustion efficiency.
   b. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level, and water temperature.
   c. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

C. Remove and replace malfunctioning units and retest as specified above.

D. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

E. Performance Tests:
1. Engage a factory-authorized service representative to inspect component assemblies and equipment installations, including connections, and to conduct performance testing.
2. Boilers shall comply with performance requirements indicated, as determined by field performance tests. Adjust, modify, or replace equipment in order to comply.
3. Perform field performance tests to determine the capacity and efficiency of the boilers.
   a. For dual-fuel boilers, perform tests for each fuel.
   b. Test for full capacity.
   c. Test for boiler efficiency at low fire 20, 40, 60, 80, 100, 80, 60, 40 and 20 percent of full capacity. Determine efficiency at each test point.
4. Repeat tests until results comply with requirements indicated.
5. Provide analysis equipment required to determine performance.
6. Provide temporary equipment and system modifications necessary to dissipate
   the heat produced during tests if building systems are not adequate.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance
   personnel to adjust, operate, and maintain watertube boilers.

END OF SECTION 23 52 33
SECTION 23 73 13 - CUSTOM VARIABLE AIR VOLUME AIR HANDLERS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Air Handling Units.

1.2 REFERENCES

B. ANSI/AHRI Standard 430 - Central Station Air Handling Units.
F. ANSI/NEMA MG 1 - Motors and Generators.
G. ANSI/UL 900 - Standard for Safety Air Filter Units.

1.3 QUALITY ASSURANCE

A. Air Coils: Certify capacities, pressure drops and selection procedures in accordance with current AHRI Standard 410.
B. Air handling units with fan sections utilizing single fans shall be rated and certified in accordance with AHRI Standard.

1.4 SUBMITTALS

A. No equipment shall be fabricated or delivered until the receipt of approved shop drawings from the Owner or Owner's approved representative.
B. AHU manufacturer shall provide the following information with each shop drawing/product data submission:
1. Each component of the unit shall be identified and mechanical specifications shall be provided for unit and accessories describing construction, components, and options.
2. All performance data, including capacities and airside and waterside pressure drops, for components.
3. Fan curves shall be provided for fans with the design operating points indicated. Data shall be corrected to actual operating conditions, temperatures, and altitudes.
4. A schedule detailing necessary trap height shall be provided for each air handling unit. Schedule shall detail unit tag, unit size, appropriate trap schematic with recommended trap dimensions, and unit supplied base rail height. Contractor shall be responsible for additional trap height required for trapping and insulation beyond the unit supplied base rail height by adequate housekeeping pad.
5. Sound data shall be provided using AHRI 260 test methods. Unit discharge, inlet, and radiated sound power levels in dB shall be provided for 63, 125, 250, 500, 1000, 2000, 4000 and 8000Hz.

C. The AHU manufacturer shall list any exceptions to the specification.

1.5 REGULATOR REQUIREMENTS

A. Agency Listings/Certifications
1. Unit shall be manufactured to conform to UL 1995 and shall be listed by either UL/CUL or ETL. Units shall be provided with listing agency label affixed to the unit. In the event the unit is not UL/CUL or ETL approved, the contractor shall, at his/her expense, provide for a field inspection by a UL/CUL or ETL representative to verify conformance. If necessary, contractor shall perform modifications to the unit to comply with UL/CUL or ETL as directed by the representative, at no additional expense to the owner.
2. Certify air handling units in accordance with AHRI Standard 430. Units shall be provided with certification label affixed to the unit. If air handling units are not certified in accordance with AHRI Standard 430, contractor shall be responsible for expenses associated with testing of units after installation to verify performance of fan(s). Any costs incurred to adjust fans to meet scheduled capacities shall be the sole responsibility of the contractor.
3. Certify air handling coils in accordance with AHRI Standard 410. Units shall be provided with certification label affixed to the unit. If air handling coils are not certified in accordance with AHRI Standard 410, contractor shall be responsible for expenses associated with testing of coils after installation to verify performance of coil(s). Any costs incurred to adjust coils to meet scheduled capacities shall be the sole responsibility of the contractor.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.
B. Units shall ship fully assembled up to practical shipping and rigging limitations. Units not shipped fully assembled shall have tags and airflow arrows on each section to indicate location and orientation in direction of airflow. Shipping splits shall be clearly defined on submittal drawings. Cost associated with non-conformance to shop drawings shall be the responsibility of the manufacturer. Each section shall have lifting lugs for field rigging, lifting and final placement of AHU section(s). AHU’s less than 100-inches wide shall allow for forklift transport and maneuverability on the jobsite.

C. Deliver units to jobsite with fan motor(s), sheave(s), and belt(s) completely assembled and mounted in units.

D. Installing contractor shall be responsible for storing AHU in a clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.7 START-UP AND OPERATING REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters in place, bearings lubricated (if applicable), condensate properly trapped, piping connections verified and leak-tested, belts aligned and tensioned, all shipping braces removed, bearing set screws torqued, and fan has been test run under observation.

1.8 WARRANTY

A. AHU manufacturer shall provide, at no additional cost, a parts and labor warranty that covers a period of one year from unit start-up or 18 months from shipment, whichever occurs first. This warrants that all products are free from defects in material and workmanship and shall meet the capacities and ratings set forth in the equipment manufacturer’s catalog and bulletins.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Trane.

2.2 GENERAL

A. Manufacturer to provide an integral base frame for either ceiling suspension of units or to support and raise all sections of the unit for proper trapping. Contractor will be responsible for providing a housekeeping pad when unit base frame is not of sufficient height to properly trap unit. Unit base frames not constructed of galvanized steel shall be chemically cleaned and coated with both a rust-inhibiting primer and finished coat of rust-inhibiting enamel. Unit base height to be included in trap.

2.3 UNIT CASING

A. Unit manufacturer shall ship unit in segments as specified by the contractor for ease of installation in tight spaces. The entire air handler shall be constructed of galvanized steel.
Casing finished to meet ASTM B117 250-hour salt-spray test. The removal of access panels or access doors shall not affect the structural integrity of the unit. All removable panels shall be gasketed. All doors shall have gasketing around full perimeter to prevent air leakage. Contractor shall be responsible to provide connection flanges and all other framework that is needed to properly support the unit.

B. Casing performance - Casing air leakage shall not exceed leak class 6 (CL = 6) per ASHRAE 111 at specified casing pressure, where maximum casing leakage (cfm/100 ft² of casing surface area) = CL X P⁰.⁶⁵.

C. Air leakage shall be determined at 1.00 times maximum casing static pressure up to 8 inches w.g. Specified air leakage shall be accomplished without the use of caulk. Total estimated air leakage shall be reported for each unit in CFM, as a percentage of supply air, and as an ASHRAE 111 Leakage Class.

D. Under 55F supply air temperature and design conditions on the exterior of the unit of 81F dry bulb and 73F wet bulb, condensation shall not form on the casing exterior. The AHU manufacturer shall provide tested casing thermal performance for the scheduled supply air temperature plotted on a psychrometric chart. The design condition on the exterior of the unit shall also be plotted on the chart. If tested casing thermal data is not available, AHU manufacturer shall provide, in writing to the Engineer and Owner, a guarantee against condensation forming on the unit exterior at the stated design conditions above. The guarantee shall note that the AHU manufacturer will cover all expenses associated with modifying units in the field should external condensate form on them. In lieu of AHU manufacturer providing a written guarantee, the installing contractor must provide additional external insulation on AHU to prevent condensation.

E. Unit casing (wall/floor/roof panels and doors) shall be able to withstand up to 1.5 times design static pressure, or 8-inch w.g., whichever is less, and shall not exceed 0.0042 per inch of panel span (L/240).

F. Unit casing panels shall be 2-inch double-wall construction, with solid galvanized exterior and solid galvanized interior, to facilitate cleaning of unit interior.

G. Unit casing panels (roof, walls, floor) and doors shall be provided with a minimum thermal resistance (R-value) of 13 Hr*Ft²°F/BTU.

H. Unit casing panels (roof, walls, floor) and external structural frame members shall be completely insulated filling the entire panel cavity in all directions so that no voids exist. Panel insulation shall comply with NFPA 90A.

I. Casing panel inner liners must not extend to the exterior of the unit or contact the exterior frame. A mid-span, no-through-metal, internal thermal break shall be provided for all unit casing panels.

J. Access panels and/or access doors shall be provided in all sections to allow easy access to drain pan, coil(s), motor, drive components and bearings for cleaning, inspection, and maintenance.
2.4  ACCESS DOORS

A. Access doors shall be 2-inch double-wall construction. Interior and exterior shall be of the same construction as the interior and exterior wall panels.

B. All doors downstream of the cooling coil shall be provided with a thermal break construction of door panel and door frame.

C. Gasketing shall be provided around the full perimeter of the doors to prevent air leakage.

D. Door hardware shall be surface-mounted to prevent through-cabinet penetrations that could likely weaken the casing leakage and thermal performance.

E. Hinges shall be interchangeable with the door handle hardware to allow for alternating door swing in the field to minimize access interference due to unforeseen job site obstructions.

F. All doors shall be a 60-inch high when sufficient unit height is available, or the maximum height allowed by the unit height.

G. Multiple door handles shall be provided for each latching point of the door necessary to maintain the specified air leakage integrity of the unit.

2.5  PRIMARY DRAIN PANS

A. All cooling coil sections shall be provided with an insulated, double-wall, galvanized drain pan.

B. The drain pan shall be designed in accordance with ASHRAE 62.1 being of sufficient size to collect all condensation produced from the coil and sloped in two planes, pitched toward drain connections, promoting positive drainage to eliminate stagnant water conditions when unit is installed level and trapped per manufacturer's requirements. See section 2.07, paragraph F through H for specifications on intermediate drain pans between cooling coils.

C. The outlet shall be located at the lowest point of the pan and shall be sufficient diameter to preclude drain pan overflow under any normally expected operating condition.

D. Drain connections shall be of the same material as the primary drain pan and shall extend a minimum 2-1/2-inch beyond the base to ensure adequate room for field piping of condensate traps.

E. The installing contractor is responsible to ensure the unit is installed level, trapped in accordance with the manufacturer's requirements, and visually inspected to ensure proper drainage of condensate.

F. Coil support members inside the drain pan shall be of the same material as the drain pan and coil casing.
G. If drain pans are required for heating coils, access sections, or mixing sections they will be indicated in the plans.

2.6 FANS

A. Fan sections shall have a minimum of one hinged and latched access door located on the drive side of the unit to allow inspection and maintenance of the fan, motor, and drive components. Construct door(s) per Section 2.04.

B. Provide fans of type and class as specified on the schedule. Fan shafts shall be solid steel, coated with a rust-inhibiting coating, and properly designed so that fan shaft does not pass through first critical speed as unit comes up to rated RPM. All fans shall be statically and dynamically tested by the manufacturer for vibration and alignment as an assembly at the operating RPM to meet design specifications. Fans controlled by variable frequency drives shall be statically and dynamically tested for vibration and alignment at speeds between 25% and 100% of design RPM. If fans are not factory-tested for vibration and alignment, the contractor shall be responsible for cost and labor associated with field balancing and certified vibration performance. Fan wheels shall be keyed to fan shafts to prevent slipping.

C. Belt-driven fans shall be provided with grease lubricated, self-aligning, anti-friction bearings selected for L-50 200,000-hour average life per ANSI/AFBMA Standard 9. Lubrication lines for both bearings shall be extended to the drive side of the AHU and rigidly attached to support bracket with zerk fittings. Lubrication lines shall be a clear, high-pressure, polymer to aid in visual inspection. If extended lubrication lines are not provided, manufacturer shall provide permanently lubricated bearing with engineering calculations for proof of bearing life.

D. All fans shall be mounted on isolation bases. Internally-mounted motor shall be on the same isolation base. Fan and motor shall be internally isolated with spring isolators. Unit sizes up to a nominal 4,000 CFM shall have 1-inch spring isolation. Units with nominal CFM's higher than 4,000 shall have 2-inch springs. A flexible connection (e.g. canvas duct) shall be installed between fan and unit casing to ensure complete isolation. Flexible connection shall comply with NFPA 90A and UL 181 requirements. If fans and motors are not internally isolated, then the entire unit shall be externally isolated from the building, including supply and return duct work, piping, and electrical connections. External isolation shall be furnished by the installing contractor in order to avoid transmission of noise and vibration through the ductwork and building structure.

E. MOTORS AND DRIVES

1. All motors and drives shall be factory-installed and run tested. All motors shall be installed on a slide base to permit adjustment of belt tension. Slide base shall be designed to accept all motor sizes offered by the air-handler manufacturer for that fan size to allow a motor change in the future, should airflow requirements change. Fan sections without factory-installed motors shall have motors field installed by the contractor. The contractor shall be responsible for all costs associated with installation of motor and drive, alignment of sheaves and belts, run testing of the motor, and balancing of the assembly.
2. Motors shall meet or exceed all NEMA Standards Publication MG 1 - 2006 requirements and comply with NEMA Premium efficiency levels when applicable. Motors shall comply with applicable requirements of NEC and shall be UL Listed.

3. Fan Motors shall be heavy duty, open drip-proof operable at 460 volts, 60Hz, 3-phase. If applicable, motor efficiency shall meet or exceed NEMA Premium efficiencies.

4. Belt driven fans shall use 4-pole, 1800 rpm, motors, NEMA B design, with Class B insulation, capable to operate continuously at 104 deg F (40 deg C) without tripping overloads.

5. V-Belt Drive shall be fixed pitch rated at 1.5 times the motor nameplate.

6. Manufacturer shall provide for each fan a nameplate with the following information to assist air balance contractor in start up and service personnel in maintenance:
   a. Fan and motor sheave part number.
   b. Fan and motor bushing part number.
   c. Number of belts and belt part numbers.
   d. Fan design RPM and motor HP.
   e. Belt tension and deflection.
   f. Center distance between shafts.

2.7 VARIABLE FREQUENCY DRIVES (VFD’S)

A. Variable frequency drives shall be provided, mounted and wired by the AHU manufacturer as indicated on the schedule and drawings. All standard and optional features shall be included within the VFD enclosure, unless otherwise specified. The VFDs shall be UL listed. The listing shall allow mounting in plenum or other air handling compartments.

B. The VFD and options shall be tested to ANSI/UL Standard 508. The complete VFD, including all specified options, shall be assembled by the manufacturer, which shall be UL 508 certified for the building and assembly of option panels. Assembly of separate panels with options by a third-party is not acceptable. The appropriate UL stickers shall be applied to both the VFD and option panel, in the case where these are not contained in one panel.

C. Each VFD shall be provided with a bypass.

D. Protective Features
   1. Protection shall be provided against input transients, loss of AC line phase, output short circuit, output ground fault, overvoltage, undervoltage, VFD overtemperature and motor overtemperature. The VFD shall display all faults as words. Codes are not acceptable.

E. Interface Features
   1. Hand/Start, Off/Stop and Auto/Start selector switches shall be provided to start and stop the VFD and determine the speed reference. On units with bypass, a VFD/Off/Bypass selector switch shall be provided.
F. Adjustments
1. The VFD shall have an adjustable carrier frequency in steps of not less than 0.1 kHz to allow tuning the VFD to the motor.

G. Service Conditions
1. VFDs shall provide full output in an ambient temperature from -10 to 50°C (14 to 104°F).
2. VFDs shall provide full output in a relative humidity from 0 to 95%, non-condensing.
3. VFDs shall provide full output with an AC line voltage variation from -10 to +10% of nominal voltage.
4. No side clearance shall be required for cooling of any units. All power and control wiring shall be done from the bottom.

H. VFD Warranty
1. The VFD shall be warranted by the manufacturer for a period of 42 months from date of shipment, or 36 months from start-up, which ever occurs first. The warranty shall include parts, labor, travel costs and living expenses incurred by the manufacturer to provide factory-authorized on-site service.

2.8 FACTORY-INSTALLED MOTOR WIRE TERMINATION AND VFD ENCLOSURES
A. VFDs shall be factory mounted on the drive side of the fan section. VFD may be mounted on the interior of the unit, accessible from the unit exterior through an access door, or on the casing exterior in a NEMA Type 1 enclosure for indoor units. If not mounted on the fan section due to NEC disconnect height limitations or serviceability constraints in the mechanical equipment room, VFD may be mounted in another location other than the fan.

B. Any welds shall be properly finished with no rough edges. Enclosures shall house circuit breaker disconnects, bypass circuitry, Drive-OFF-Bypass switches, manual speed controls, and control transformers. VFDs and starter/disconnects shall have an external disconnect located on the outside of the access door.

2.9 FACTORY WIRING OF VFD'S
A. VFD's shall be wired per NEC, UL, and NFPA 90A requirements. Units with factory-mounted controls shall also include power wiring from the VFD or starter/disconnect control transformer to the control system transformers. Units with VFDs and factory-mounted controls shall have a binary start-stop signal and an analog speed signal wired from the direct digital controller to the VFD.

B. All power wiring for voltages greater than 24V and traveling through multiple unit sections shall be contained in an enclosed, metal, power-wiring raceway or EMT. Sections less than 6-inch in length may be contained in FMC.

C. After mounting and wiring of VFDs, on the AHUs, trained factory personnel shall ensure proper operation of each VFD, through a thorough factory test. Testing shall include a Hypot test of unit wiring to ensure that no weaknesses exist in wiring or motor. Each VFD
shall be energized and the fan run to ensure the VFD will operate throughout the usable range of the drive and that the fan rotation is correct. Each VFD with bypass shall also be tested in the bypass position to ensure the bypass is operational.

2.10 COILS

A. Coils section header end panel shall be removable to allow for removal and replacement of coils without impacting the structural integrity of the unit.

B. Install coils such that headers and return bends are enclosed by unit casing to ensure that if condensate forms on the header or return bends, it is captured by the drain pan under the coil.

C. Coils shall be manufactured with plate fins to minimize water carryover and maximize airside thermal efficiency. Fin tube holes shall have drawn and belled collars to maintain consistent fin spacing to ensure performance and air pressure drop across the coil as scheduled. Tubes shall be mechanically expanded and bonded to fin collars for maximum thermal conductivity. Use of soldering or tinning during the fin-to-tube bonding process is not acceptable due to the inherent thermal stress and possible loss of bonding at that joint.

D. Construct coil casings of galvanized steel. End supports and tube sheets shall have belled tube holes to minimize wear of the tube wall during thermal expansion and contraction of the tube.

E. All coils shall be completely cleaned prior to installation into the air handling unit. Complete fin bundle in direction of airflow shall be degreased and steam cleaned to remove any lubricants used in the manufacturing of the fins, or dirt that may have accumulated, in order to minimize the chance for water carryover.

F. When two or more cooling coils are stacked in the unit, an intermediate drain pan shall be installed between each coil. The intermediate drain pan shall be designed being of sufficient size to collect all condensation produced from the coil and sloped to promote positive drainage to eliminate stagnant water conditions. The intermediate drain pan shall be constructed of the same material as the sections primary drain pan.

G. The intermediate drain pan shall begin at the leading face of the water-producing device and be of sufficient length extending downstream to prevent condensate from passing through the air stream of the lower coil.

H. Intermediate drain pan shall include downspouts to direct condensate to the primary drain pan. The intermediate drain pan outlet shall be located at the lowest point of the pan and shall be sufficient diameter to preclude drain pan overflow under any normally expected operating condition.

2.11 FILTERS

A. Provide factory-fabricated filter section of the same construction and finish as unit casings. Filter section shall have side access filter guides and access door(s) extending
the full height of the casing to facilitate filter removal. Construct doors in accordance with Section 2.04. Provide fixed filter blockoffs as required to prevent air bypass around filters. Blockoffs shall not need to be removed during filter replacement. Filters to be of size, and quantity needed to maximize filter face area of each particular unit size.

B. Filters shall be 4” cartridge type rated MERV 11.

C. Manufacturer shall provide initial set of filters and one extra set of filters.

2.12 DAMPERS

A. All dampers shall be internally mounted. Dampers shall be premium ultra low leak and located as indicated on the schedule and plans. Blade arrangement (parallel or opposed) shall be provided as indicated on the schedule and drawings. Dampers shall be Ruskin CD60 double-skin airfoil design or equivalent for minimal air leakage and pressure drop. Leakage rate shall not exceed 4 CFM/square foot at one inch water gauge complying with ASHRAE 90.1 maximum damper leakage and shall be AMCA licensed for Class 1A. All leakage testing and pressure ratings shall be based on AMCA Standard 500-D. Manufacturer shall submit brand and model of damper(s) being furnished, if not Ruskin CD60.

PART 3 - EXECUTION

3.1 SHIPPING

A. Paper copies of the IOM shall also be shipped with each AHU.

B. The AHU manufacturer shall identify all shipments with the order number. Enough information shall be provided with each shipment to enable the Owner to confirm the receipt of units when they are received. For parts too small to mark individually, the AHU manufacturer shall place them in containers.

3.2 ON-SITE STORAGE

A. If equipment is to be stored for a period of time prior to installation, the purchaser shall remove any stretch or shrink wrap from units upon receipt to prevent unit corrosion and shall either place the units in a controlled indoor environment or shall cover the units with canvas tarps and place them in a well-drained area. Covering units with plastic tarps shall not be acceptable.

3.3 FIELD EXAMINATION

A. The Mechanical Contractor shall verify that the mechanical room and/or roof are ready to receive work and the opening dimensions are as indicated on the shop drawings and contract documents.

B. The Mechanical Contractor shall verify that the proper power supply is available prior to starting of the fans.
3.4 INSTALLATION

A. The Mechanical Contractor shall be responsible to coordinate ALL of his installation requirements with the Owner to ensure that a complete installation for each unit is being provided. Coordination efforts shall include such items as unloading and hoisting requirements, field wiring requirements, field piping requirements, field ductwork requirements, requirements for assembly of field-bolted or welded joints, and all other installation and assembly requirements.

B. The AHU manufacturer shall provide all screws and gaskets for joining of sections in the field.

3.5 LEVELING

A. The Mechanical Contractor shall level all unit sections in accordance with the unit manufacturer’s instructions. The Mechanical Contractor shall provide and install all necessary permanent shim material to ensure individual sections and entire assembled units are level.

3.6 FINAL INSPECTION AND START UP SERVICE

A. After the Mechanical Contractor has provided all water and steam piping connections, ductwork connections, and field control wiring, and Electrical Contractor has provided all the field power wiring, the Mechanical Contractor shall inspect the installation. The Mechanical Contractor shall then perform startup of the equipment.

B. The Automatic Temperature Control (Building Direct Digital Control) Contractor shall be scheduled to be at the job site at the time of the equipment start up.

END OF SECTION 23 73 13
SECTION 23 80 00 – HEATING, VENTILATING AND AIR CONDITIONING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Split system heat pump units.
B. Split system air conditioning units.
C. Air cooled condensing units.
D. Refrigeration piping and fittings.
E. Fans.
F. Relief and intake vents.
G. Louvers.
H. Air inlets and outlets.
I. Filters.
J. Dampers.
K. Ductwork.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. Section 23 00 50 Basic HVAC Materials and Methods.

1.3 ADDITIONAL REQUIREMENTS

A. Furnish and install any incidental work not shown or specified which is necessary to provide a complete and workable system.
B. Coordinate all of work in this Section with all of the Trades covered in other Sections of the Specifications to provide a complete, operable and sanitary installation of the highest quality workmanship.

1.4 DESCRIPTION OF WORK

A. Work of this section includes, but is not necessarily limited to Heating, Ventilating and Air Conditioning work indicated on the drawings and described herein.
1.5 QUALITY ASSURANCE

A. Design Criteria:
1. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture. All gas-fired equipment shall be UL, ETL or CSA listed.
2. Supply all equipment and accessories in accordance with requirements of applicable national, state and local codes.
3. All items of a given type shall be products of the same manufacturer.
4. Scheduled equipment performance is minimum capacity required.
5. Scheduled electrical capacity shall be considered as maximum available.
6. Scheduled gas BTU input shall be considered as maximum available.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, dimensions, weights, furnished specialties and accessories; and installation and start-up instructions. Product data shall include applicable product listings and standards.
1. Upon approval of submittal, provide manufacturer's installation and operating instructions to the Project inspector for the following:
   a. Fire dampers, smoke dampers, and combination smoke-fire dampers.

B. Engineering Data: Submit fan curves and sound power level data for each fan unit. Data shall be at the scheduled capacity. Data shall include the name of the rating agency or independent laboratory.

C. Maintenance Data: Submit maintenance data and parts list for each piece of equipment, control, and accessory; including "trouble-shooting guide," in Operation and Maintenance Manual.

D. Record Drawings: At project close-out, submit Record Drawings of installed ductwork, duct accessories, and outlets and inlets in accordance with requirements of Division 1.

E. Product Data for California Green Building Standards Code Compliance: For adhesives and sealants, including primers, documentation of compliance including printed statement of VOC content and chemical components.

1.7 COORDINATED LAYOUT

A. Coordinated layouts are required to amplify, expand and coordinate the information contained in the Contract Documents.

B. Provide minimum 1/4 inch equals one foot scaled coordination drawings showing plan and pertinent section or elevation views of all piping, ductwork and electrical systems. Drawings shall be on vellum or sepia mylar, reproducible and the work represented shall be fully coordinated with the structure, other disciplines, and with all finishes. Drawings shall all be presented on a single size sheet. Contractor may use either size D (24 inch x 36 inch) or E (36 inch x 42 inch). Drawings graphics shall fully comply with A.I.A. Architectural Graphic Standards and ANSI Y14. Drawings may be hand drawn or computer generated using AutoCad or "Quick Pen". All drawings shall have title block,
key plan, north arrow and sufficient grid lines to provide cross-reference to the design drawings.

1. Provide a stamp or title block on each drawing with locations for signatures from all contractors involved, including but not limited to the General, HVAC, Plumbing, Fire Protection, and Electrical contractors. Include statement for signature that the contractor has reviewed the coordination drawings in detail and has coordinated the work of his trade.

2. Show on drawings the intended elevation of all ductwork in accordance with the following example.
   B.O.D. = 9'-0"
   OFFSET UP 6"
   B.O.D. = 9'-6"

3. Highlight, encircle or otherwise indicate deviations from the Contract Documents on the coordinated layouts. Architect will not be responsible for "finding" changes or deviations to the originalContract Documents.

   C. Since scale of contract drawings is small and all offsets and fittings are not shown, contractor shall make allowances in bid for additional coordination time, detailing, fittings, offsets, hangers and the like to achieve a fully coordinated installation. If changes in duct size are required, equivalent area shall be maintained and the aspect ratio shall not be in excess of 2 to 1 unless approved by the engineer. Drawings shall be submitted for review prior to fabrication and installation. Drawings may be submitted in packages representing at least one quarter of the building ductwork.

   D. Check routing on all ductwork before fabricating. Report any discrepancies to Architect. No extra cost will be allowed for failure to conform to above.

   E. It shall be responsibility of the General Contractor to insure that the Heating, Ventilating and Air Conditioning Contractor coordinates all of his work with all other trades, including mechanical and electrical trades, so that complete job is neat and in conformity with plans and specifications.

   F. Where computer aided drafting has been used for the Contract Documents, the Drawing files may be made available. Upon request by the contractor, the files will be made available at a price of $50 per drawing, with a minimum of $200.00 per request.

1.8 REFERENCES

   A. AABC - Associated Air Balance Council
   B. AFBMA - Anti Friction Bearing Manufacturer's Association
   C. CSA – Canadian Standards Association International
   D. AMCA - Air Moving and Control Association Inc.
      1. Standard 210 - Laboratory Methods of Testing Fans
   E. ANSI - American National Standards Institute
   F. ARI - Air-Conditioning and Refrigeration Institute
PART 2 - PRODUCTS

2.1 GAS FIRED EQUIPMENT

A. All gas-fired equipment shall be listed for use as a gas appliance.

B. All units shall comply with the emissions requirements of the Air Quality Management District (AQMD) in which they are to be installed.

2.2 SPLIT SYSTEM HEAT PUMPS

A. General: Furnish and install split system air-to-air heat pump system, with R410A refrigerant, and complete with automatic controls. Equipment shall be shipped factory assembled, wired, tested, and ready for field connections.

B. Quality Assurance:
   1. Unit shall be ETL listed and labeled.
   2. Unit shall be manufactured in a facility registered to ISO 9001:2000.
   3. Unit shall be rated in accordance with ARI standard 210.
C. Delivery, Storage and Handling: Follow manufacturer's recommendations.

D. Heating/Cooling System: The total certified heating/cooling capacity shall not be less than scheduled. The compressor power input shall not exceed that of the unit specified.

E. Indoor Section: Wall mounted, ceiling surface mounted, or ceiling recessed mounted, as indicated on Drawings.
   1. Cabinet:
      a. Wall mounted: Molded white high strength plastic.
         1) Provide wall mounted unit with factory mounting plate.
      b. Ceiling surface mounted: Molded white high strength plastic with provision for outside air duct connection.
      c. Ceiling recessed mounted: galvanized steel with provision for outside air duct connection.
   2. Fans: Double inlet, forward curved, statically and dynamically balanced.
   3. Fan Motor: Direct drive, permanently lubricated, with two or 4 speed operation for unit size scheduled on Drawings.
      a. Wall and ceiling surface mounted units: Horizontal vane shall close air outlet upon unit shut-down.
   5. Evaporator Coil: Aluminum fins mechanically bonded to copper tubes. Coils shall be pressure leak tested.
   6. Insulation: Interior surfaces exposed to the airstream shall be fully insulated.

F. Outdoor Section:
   1. Casing: Galvanized steel plate, powder coated with acrylic or polyester.
   2. Condenser Fan Grille: ABS plastic.
   3. Fan and fan motor: Direct drive, totally enclosed, propeller type, permanently lubricated, horizontal discharge.
   4. Compressor: Variable speed rotary type, with crankcase heater and accumulator. Compressor shall be capable of operating at 0 degrees F. Compressor mounted on vibration isolator pads.
   5. Coil: Aluminum fins mechanically bonded to copper tubes. Coils shall be pressure leak tested. Provide coil with integral metal guard.

G. Controls: Hard wired, microprocessor based, wall mounted controller with LCD display shall provide the following functions, as a minimum:
   1. 7-day programmable timer.
   2. Test and check functions.
   3. Diagnostic functions.
   4. Vane position control.
   5. Fan speed adjustment.
   6. Temperature adjustment.
   7. Automatic restart.
      a. Provide lockable enclosure for wall mounted controller.

H. Safeties: Shall include the following, as a minimum:
   1. Five minute compressor anti-recycle timer.
   2. High pressure protection.
I. Filters: Provide manufacturers washable filters for indoor unit. Provide sufficient filters for four complete changes for each unit.

J. Service Access: All components, wiring, and inspection areas shall be completely accessible through removable panels.

K. Refrigerant Piping:
   1. Provide factory pre-charged and sealed line set piping, length to suit the location of equipment. Tubing sizes shall be in accordance with manufacturers written instructions.
   2. Provide refrigeration piping in accordance with Article, Refrigerant Piping, in this Section.

L. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   - Mitsubishi Electric Corporation.
   - Carrier Corporation.
   - Sanyo Electric Co., Ltd.

M. Owner Training: Manufacturer shall provide one on-site 2-hour training session for Owners’ maintenance personnel.

2.3 SPLIT SYSTEM AC UNIT

A. General: Furnish and install split system air conditioner, with R410A refrigerant, and complete with automatic controls. Equipment shall be shipped factory assembled, wired, tested, and ready for field connections.

B. Quality Assurance:
   1. Unit shall be ETL listed and labeled.
   2. Unit shall be manufactured in a facility registered to ISO 9001:2000.
   3. Unit shall be rated in accordance with ARI standard 210.

C. Delivery, Storage and Handling: Follow manufacturer’s recommendations.

D. Cooling System: The total certified cooling capacity shall not be less than scheduled. The compressor power input shall not exceed that of the unit specified.

E. Indoor Section: Wall mounted, ceiling surface mounted, or ceiling recessed mounted, as indicated on Drawings.
   1. Cabinet:
      a. Wall mounted: Molded white high strength plastic.
         1) Provide wall mounted unit with factory mounting plate.
      b. Ceiling surface mounted: Molded white high strength plastic with provision for outside air duct connection.
      c. Ceiling recessed mounted: galvanized steel with provision for outside air duct connection.
   2. Fans: Double inlet, forward curved, statically and dynamically balanced.
   3. Fan Motor: Direct drive, permanently lubricated, with two or 4 speed operation for unit size scheduled on Drawings.
a. Wall and ceiling surface mounted units: Horizontal vane shall close air outlet upon unit shut-down.

5. Evaporator Coil: Aluminum fins mechanically bonded to copper tubes. Coils shall be pressure leak tested.

6. Insulation: Interior surfaces exposed to the airstream shall be fully insulated.

F. Outdoor Section:
1. Casing: Galvanized steel plate, powder coated with acrylic or polyester.
2. Condenser Fan Grille: ABS plastic.
3. Fan and fan motor: Direct drive, totally enclosed, propeller type, permanently lubricated, horizontal discharge.
4. Compressor: Variable speed rotary type, with crankcase heater and accumulator. Compressor shall be capable of operating at 0 degrees F. Compressor mounted on vibration isolator pads.
5. Coil: Aluminum fins mechanically bonded to copper tubes. Coils shall be pressure leak tested. Provide coil with integral metal guard.

G. Controls: Hard wired, microprocessor based, wall mounted controller with LCD display shall provide the following functions, as a minimum:
1. 7-day programmable timer.
2. Test and check functions.
3. Diagnostic functions.
4. Vane position control.
5. Fan speed adjustment.
6. Temperature adjustment.
7. Automatic restart.
8. Mode selection, including cool/dry/fan.
   a. Provide lockable enclosure for wall mounted controller.

H. Safeties: Shall include the following, as a minimum:
1. Five minute compressor anti-recycle timer.
2. High pressure protection.

I. Filters: Provide 1 inch thick fiberglass throwaway filters with cardboard holding frames for indoor unit. Provide sufficient filters for four complete changes for each unit.

J. Service Access: All components, wiring, and inspection areas shall be completely accessible through removable panels.

K. Refrigerant Piping:
1. Provide factory pre-charged and sealed line set piping, length to suit the location of equipment. Tubing sizes shall be in accordance with manufacturers written instructions.
2. Provide refrigeration piping in accordance with Article, Refrigerant Piping, in this Section.

L. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal: Mitsubishi Electric Corporation. Carrier Corporation.
Sanyo Electric Co., Ltd.

M. Owner Training: Manufacturer shall provide one on-site 2-hour training session for Owners’ maintenance personnel.

2.4 AIR COOLED CONDENSING UNIT

A. Provide outdoor-mounted, factory assembled, single piece, air-cooled, split-system air conditioner unit suitable for ground or rooftop installation, rated in accordance with ARI Standard 210, and UL listed and labeled. Provide refrigerant charge R-410A, all internal wiring, piping, controls, compressor, and special features required prior to field start-up. Design unit to conform to the following:
   2. NEC latest edition.
   3. Unit cabinet to be capable of withstanding Federal Test Method Standard No. 141 (Method 6061) 500-hr salt spray test.
   4. Unit shall be constructed in accordance with UL standards.

B. Unit shall be certified for capacity and efficiency, and listed in the latest ARI directory.

C. Unit shall be manufactured in a facility registered to ISO 9001:2000.

D. Unit shall be Energy Star Qualified.

E. Provide unit with 5 year limited parts warranty.

F. Cabinet:
   1. Unit cabinet constructed of galvanized steel, bonderized, and coated with powder coat paint.

G. Fans:
   1. Direct-drive propeller type condenser fan, discharging air vertically.
   2. Totally enclosed condenser fan motors, 1-phase type with Class B insulation and permanently lubricated bearings, and corrosion resistant shafts.
   3. Condenser fan openings equipped with PVC-coated steel wire safety guards.
   4. Statically and dynamically balanced fan blades.

H. Compressor:
   1. Hermetically sealed compressor mounted on rubber vibration isolators.
   2. Compressor with sound insulator.
   3. Provide unit with 10 year limited compressor warranty.

I. Refrigeration Components:
   1. Refrigerant circuit to include liquid and vapor line shut-off valves with sweat connections.
   2. System charge of R-410A refrigerant and compressor oil.
   3. Unit to be equipped with factory-supplied high-pressure switch, low pressure switch, and filter drier.
   4. Provide unit with manufacturer’s refrigerant line set.
   5. Provide refrigeration piping in accordance with Article, Refrigerant Piping, in this Section.
J. Condenser Coil:
   1. Air-cooled condenser coil constructed of aluminum fins mechanically bonded to
      copper tubes.
   2. Coils shall be leak and pressure tested.

K. Electrical Requirements:
   1. Unit shall have single point power connection.
   2. Provide unit with 24V control circuit.

L. Provide the following additional components and features:
   1. Provide evaporator freeze thermostat, winter start control, compressor start
      assist capacitor and relay, low ambient controller, and ball bearing fan motor.
   2. Provide expanded metal coil guard for all sides of the air cooled condensing unit.
      Coil guard shall be as manufactured by MicroMetl, Can-Fab, or equal.

M. Operating Characteristics:
   1. Unit shall be capable of starting and running a 115 degrees F ambient outdoor
      temperature per maximum load criteria of ARI Standard 210.
   2. Compressor with standard controls shall be capable of operation down to 55
      degrees F ambient outdoor temperature.

N. Manufacturers: Subject to compliance with requirements, available manufacturers
   offering products that may be incorporated into the Work include the following, or equal:
   Carrier Corporation
   Trane Inc.

O. Owner Training: Manufacturer shall provide one on-site 1-hour training sessions for
   Owners’ maintenance personnel.

2.5 PIPE AND FITTINGS

A. Refrigeration Piping: Refrigeration gas and liquid piping shall be type ACR hard drawn
   copper tubing with wrought copper fittings. All joints shall be brazed with Sil-fos under
   nitrogen purge. Relief valve discharge piping shall be full size of relief discharge.
   Furnish and install Superior, Sporlan, Alco, Henry, or equal, stop valves, solenoid valves,
   adjustable thermal expansion valves, sight glass, flexible connection, charging valve, and
   drier with valve bypass in the liquid lines and Superior DFN shell and cartridge suction
   line filter sized 2-1/2 times tonnage.

2.6 FANS

A. All fans shall be Air Moving and Control Association Inc. (AMCA) labeled.

B. Provide self-aligning, enclosed ball bearings, accessible for lubrication unless specified
   otherwise.

C. Provide variable speed switch for all direct drive fans.
D. In-Line Centrifugal Fans:
1. Centrifugal fan with airfoil blades, aluminum or steel housing, externally mounted belt-drive motor, external lube tubes, integral support brackets.
2. Provide sloped roof or flat roof type roof cap, or wall cap to suit the location indicated on the Drawings.

E. Fan Drives:
1. Drive Design: The design horsepower rating of each drive shall be at least 1.5 times, single belt drives 2 times, the nameplate rating of the motor with proper allowances for sheave diameters, speed ratio, arcs of contact and belt length.
2. Provide variable speed drives, Dayco, Browning, Woods, or equal. Allow for replacement of fan and motor drives and belts as required to suit the balance requirements of the project.
3. Provide a minimum of two belts for all drives with motors 5 horsepower motors and larger.
4. Belts shall be within 1 degree 30 minutes of true alignment in all cases.
5. Select variable speed drives to allow an increase or decrease of minimum of ten percent of design fan speed.
6. Motors of 25 HP and less shall have adjustable pitch sheaves; sheaves on motors above 25 HP may be non-adjustable. Change, at no extra cost to Owner, the non-adjustable sheaves to obtain desired air quantities.

F. Sheaves: Sheaves shall be cast or fabricated, bored to size or bushed with fully split tapered bushings to fit properly on the shafts. All sheaves shall be secured with keys and set screws.

G. Belts: All belts shall be furnished in matched sets.

H. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
- Greenheck Fan Corporation
- Lauren Cook Company
- PennBarry
- American Coolair Corporation

I. Owner Training: Manufacturer shall provide one on-site 1-hour training session for Owners’ maintenance personnel.

2.7 RELIEF AND INTAKE VENTS

A. Galvanized steel housing with 1/2 inch mesh screen, counterbalanced backdraft damper and matching prefabricated curb. Omit backdraft damper on intake vents. Provide pitched roof curb for relief vents, and install with backdraft damper level.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
- Greenheck Fan Corporation
- Lauren Cook Company
- PennBarry
- American Coolair Corporation
2.8 LOUVERS
   A. Louvers shall be minimum 16 gauge steel with Bonderite and Epon gray primer and 1/2 inch square mesh, 16 gauge galvanized steel screen on the inside. Louvers shall be Airolite #609, Arrow United Industries, or equal, with 4 inch louver depth.

2.9 AIR INLETS AND OUTLETS
   A. Except as otherwise indicated, provide manufacturer's standard outlets and inlets where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.

   B. Ceiling, wall or floor Compatibility: Provide outlets with border styles that are compatible with adjacent ceiling, wall or floor systems, and that are specifically manufactured to fit into ceiling, wall or floor module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems that will contain each type of air outlet and inlet.

   C. Refer to Schedule on Mechanical Drawings for details of inlets and outlets to be used.

2.10 AIR FILTERS
   A. Provide MERV 8 disposable pleated media type. Refer to specific equipment Articles for filter depth and for exceptions to this specification. Filters shall conform to the following:
      1. Standards:
      2. Construction:
         a. Media: Synthetic or cotton-synthetic blend with radial pleats.
         b. Media Frame: High wet-strength beverage board.
         c. Media Support: Welded wire or expanded metal grid bonded to air leaving side of the media.
      3. Performance: 2" deep filter shall have a maximum initial air resistance of 0.31 inches w.g.

   B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
      Camfil Farr, Inc., model 30/30.
      Flanders Corporation, model 40 LPD.

   C. Temporary (Construction Period) Filters:
      1. Install new temporary filters in all units that have filter systems installed. Temporary filters shall match the permanent filters that are specified for the units. Replace filters as needed, in accordance with manufacturer's directions, in order to provide protection for the unit prior to occupancy by the Owner.
      2. If air handling units are operated during construction of the project, install temporary filters directly over each return air inlet. Filters shall match the permanent filters that are specified for the units. Select size of filter to completely cover the frame of the return air inlet, and tape filters firmly in place to eliminate any construction debris from entering the duct system or unit. Remove the temporary filters upon completion of the work, and repair all damaged paintwork.
D. Spare Filters:
   1. Furnish two new, complete sets of filter cartridges for each filter bank on completion and acceptance of the work. Install one set of filters in units (prior to final air balance) and leave the remaining filters in location designated by the Owner.

2.11 FILTER GAUGE

   A. Furnish and install for each bank of air filters including air conditioning units, heating and ventilating units and fan units, except individual room units, a magnehelic air filter gauge.
      1. Provide 0 to 1 inch range for pre-filter systems, with a permanent red line to indicate change out pressure.
      2. Provide 0 to 2 inch range for final filter systems, with a permanent red line to indicate change out pressure.

2.12 DAMPERS

   A. Backdraft Dampers: Ruskin CBD2, counterbalanced, Nailer Industries, or equal.

   B. Manual Air and Balance Dampers: Provide dampers of single blade type or multi-blade type constructed in accordance with SMACNA, "HVAC Duct Construction Standards," except as noted herein.
      1. Rectangular Ductwork:
         a. Single damper blades may be used in ducts up to 10 inches in height. Dampers shall be 16 gauge minimum. Provide self-locking regulators, equal to Ventlok 641. Provide end bearings equal to Ventlok 607 at each damper. Provide continuous solid 3/8 inch square shafts.
         b. Multiple blade dampers shall be equal to Ruskin CD35 Standard Control Damper. Maximum width for multiple damper blades for use in rectangular duct shall not exceed 6 inches.
         c. Where duct velocity may be expected to exceed 1500 fpm, provide Ruskin CD-50, or equal, low leakage dampers with airfoil blades.
      2. Round Ductwork:
         a. Single damper blades may be used in ducts up to 12 inches in diameter. Provide multiple blade opposed blade dampers, with connected linkage, for ductwork larger than 12 inches in diameter.
         b. Damper blades for round ductwork shall be 20 gauge steel for ducts up to 12 inches diameter and 16 gauge steel for dampers larger than 12 inches damper. Provide self-locking regulators, equal to Ventlok 641, Durodyne, or equal for operation of dampers. Provide end bearings equal to Ventlok 607 and provide continuous solid 3/8 inch square shafts.
      3. Where ductwork is externally insulated, provide self-locking regulators equal to Ventlok 644, Durodyne, or equal for rectangular ductwork, and Ventlok 637, Durodyne, or equal for round ducts.

2.13 DUCTWORK

   A. Construct and install all sheet metal ductwork in accordance with the 2010 California Mechanical Code for 2 inches static pressure for supply air, and 2 inches minimum for return and exhaust air unless otherwise noted on Drawings.
B. Construct and install all sheet metal ductwork in accordance with the 2010 California Mechanical Code for 4 inches static pressure upstream of VAV boxes and 2 inches minimum downstream of VAV boxes for supply air, and 2 inches minimum for return and exhaust air unless otherwise noted on Drawings.


2. Provide variations in duct size, and additional duct fittings as required to clear obstructions and maintain clearances as approved by the Architect at no extra cost to the Owner.

3. Gauges, joints and bracing shall be in accordance with the 2010 California Mechanical Code.

4. Provide beading or cross breaking for all ductwork inside building. Provide cross breaking for ductwork exposed to weather.

5. At the contractor's option, ductwork may be fabricated using the Ductmate, Nexus, Quickduct, Transverse Duct Connection (TDC), Pyramid-Loc duct connection systems, or equal. Fabricate in strict conformance with manufacturer’s written installation instructions and in accordance with California Mechanical Code.
   a. Seal flanged ends with pressure sensitive high density, closed cell neoprene or polyethylene tape gasket, Thermo 440, or equal.
   b. Provide metal clips for duct connections, except at breakaway connections for fire dampers and fire smoke dampers. Provide corner clips at each corner of duct, through bolted, at all locations except at breakaway connections for fire dampers and fire smoke dampers. Where used on locations exposed to weather, provide continuous metal clip at top and sides of duct, with 1 inch overhang for top side.

C. Design and installation standards:

1. SMACNA Compliance: Comply with applicable portions of Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) for all work in this section.


D. Fabricate all ductwork with sheet metal. Fiberglass ductwork will not be accepted for use on this project.

E. Duct sizes indicated are external sizes.
F. Galvanized Sheet Steel: Lock-forming quality, ASTM A924 and ASTM A653, Coating Designation G 90. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view.
   1. Provide mill certification for galvanized material at request of the IOR.

G. Duct Sealing:
   1. Sealant shall have a VOC content of 250 g/L or less.
   2. Sealant shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
   3. Sealant shall comply with the testing and product requirements of the California Department of Health Services’ “Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.”
   4. Seal airtight all joints and seams, including standing seams and manufactured joints and seams, of all supply, return and exhaust ducts except those exposed in the conditioned space. Provide one part, non-sag, synthetic latex sealant, formulated with a minimum of 68 percent solids. Sealant shall comply with ASTM E84, Surface Burning Characteristics.
      a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
         Design Polymerics, model DP1010
         Polymer Adhesive Sealant Systems Inc, model Airseal #11
         McGill Airseal, LLC
   5. Seal airtight and watertight all joints and seams of all ductwork exposed to the weather with 6 ounce canvas bonded with MEI Eco-Tack adhesive; cover the canvas with a heavy coat of Foster's 56-10, United McGill, or equal, no dilution.
      a. Pressure-sensitive tapes or single part sealant not acceptable.
      b. Where seams are exposed to weather, paint seams with aluminum paint. Provide cross broken ductwork, and insure that the ductwork will shed water. Beading of duct work will not be considered.

H. Provide sheet metal angle frame at all duct penetrations to wall, floor, roof, or ceiling.

I. Duct Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, straps, trim, and angles for support of ductwork.

J. Rectangular Duct Fabrication:
   1. Shop fabricate ductwork of gauges and reinforcement complying with the more stringent of the following standards, except as noted herein.
      a. SMACNA HVAC Duct Construction Standards
      b. California Mechanical Code
   2. Fabricate ducts with minimum duct gauges and reinforcement as follows, except as otherwise noted:

<table>
<thead>
<tr>
<th>Duct Dimension</th>
<th>Minimum Gauge</th>
<th>Joint Reinforcement Per CMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Through 12&quot;</td>
<td>26</td>
<td>Not Required</td>
</tr>
<tr>
<td>13&quot; through 18&quot;</td>
<td>24</td>
<td>Not Required</td>
</tr>
<tr>
<td>19&quot; through 30&quot;</td>
<td>24</td>
<td>C/4</td>
</tr>
<tr>
<td>31&quot; through 42&quot;</td>
<td>22</td>
<td>E/4</td>
</tr>
<tr>
<td>43&quot; through 54&quot;</td>
<td>22</td>
<td>F/2</td>
</tr>
</tbody>
</table>
3. Fabricate duct fittings to match adjoining ducts and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to 1.5 times associated duct width. Fabricate to include single thickness turning vane in elbows where space does not permit the above radius or where square elbows are shown. Limit angular tapers to 30 degrees for contracting tapers and 20 degrees for expanding tapers. Turning vanes shall be E-Z Rail II, Durodyne, or equal.

4. Fabricate round supply connections at rectangular, plenum type fittings using spin-in type fittings, complete with extractor and volume control damper. Refer to Paragraph “DAMPERS” for damper requirements.

5. Provide drive slip or equivalent flat seams for ducts exposed in the conditioned space or where necessary due to space limitations. On ducts with flat seams, provide standard reinforcing on inside of duct. Duct connection to outlet on exposed duct shall be full size of outer perimeter of outlet flange.

6. Ducts exposed in the conditioned space shall be free of dents and blemishes and be mounted tight against adjacent surface with flat hangers. Remove all fabrication labels from ductwork.

7. Provide 20 gauge minimum for ductwork exposed within occupied spaces.

K. Rectangular Internally insulated Duct:

1. Provide internal duct lining where indicated on the Drawings, with a minimum of 10'-0" length in each direction from the fan, fan casing, or unit casing. Line all transfer ducts.
   a. Where ductwork is within the building insulation envelope, lining shall be 1" thick, 1-1/2 pound density, with R-value of 4.2 minimum.
   b. Ducts exposed in the conditioned space shall be free of dents and blemishes and be mounted tight against adjacent surface with flat hangers. Remove all fabrication labels from ductwork.
   c. Where installed exposed in the conditioned space, duct shall be minimum 20 gauge with 1 inch insulation layer (minimum R-value – R-4.2).
   d. Cement duct liner in place with nonflammable, non-hardening duct adhesive. Seal all raw edges of insulation inside ductwork with adhesive, including longitudinal liner edges.
   e. Provide metal nosing at all locations where liner is preceded by unlined metal.
   f. Provide sheet metal weld pins and washers or clinch pins and washers on all ductwork on 12 inch intervals with the first row within 3 inches of the leading edge of each piece of insulation and within 4 inches of corners. No use of adhesive mounted pins will be considered.
      1) Install clinched pin fasteners with properly adjusted automatic fastening equipment. Manual installation will not be considered.
      2) Install weld pins with properly adjusted automatic fastening equipment. Installation shall not damage the galvanized coating on the outside of the duct.
g. All ductwork, adhesives, lining, sealant, flex duct and the like shall have a flame spread of 25 or less and developed smoke rating of 50 or less when tested in accordance with one of the following test methods: NFPA 255, ASTM E84, or UL 723.

h. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owens-Corning Fiberglas Corp.</td>
<td>Aeroflex Plus</td>
</tr>
<tr>
<td>Johns Manville</td>
<td>Linacoustic</td>
</tr>
<tr>
<td>CertainTeed Corporation</td>
<td>ToughGard</td>
</tr>
<tr>
<td>Fosters Adhesive</td>
<td>85-462</td>
</tr>
<tr>
<td>Swifts Adhesive</td>
<td>7336</td>
</tr>
</tbody>
</table>

L. Round and Oval Ductwork Fabrication:
1. Round and oval duct and fittings shall be spiral lockseam or longitudinal seam as indicated in table below. Provide couplings to join each length of duct.
   a. At contractors’ option, round or oval ductwork may be utilized in place of rectangular ductwork shown on Drawings, provided available space allows installation of round or oval ductwork without compromising space required for installation of products and systems of other trades.
      1) Round or oval ductwork utilized in place of rectangular ductwork shown on Drawings shall be sized to have a static pressure loss equivalent to rectangular duct shown on Drawings.
      2) Unlined round or oval duct shall not be utilized in place of rectangular internally lined ductwork shown on Drawings.

2. Fabricate duct fittings to match adjoining ducts and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to 1.5 times associated duct width. Provide two-piece, die-stamped, 45-degree to 90-degree elbows for sizes up to 12 inches; five-piece, 90-degree elbows for sizes 12 inches and above; conical tees; and conical laterals. All reducers shall be placed after a tap has been made on the duct main. Reducers shall be long-taper style.

3. Round Ductwork: Construct of galvanized sheet steel complying with ANSI/ASTM A 653 by the following methods and in minimum gauges listed.

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Minimum Gauge</th>
<th>Method of Manufacture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 14&quot;</td>
<td>26</td>
<td>Spiral Lockseam</td>
</tr>
<tr>
<td>15&quot; to 23&quot;</td>
<td>24</td>
<td>Spiral Lockseam</td>
</tr>
<tr>
<td>24&quot; to 36&quot;</td>
<td>22</td>
<td>Spiral Lockseam</td>
</tr>
<tr>
<td>37&quot; to 50&quot;</td>
<td>20</td>
<td>Spiral Lockseam</td>
</tr>
<tr>
<td>51&quot; to 60&quot;</td>
<td>18</td>
<td>Spiral Lockseam</td>
</tr>
<tr>
<td>Over 60&quot;</td>
<td>14</td>
<td>Longitudinal Seam</td>
</tr>
</tbody>
</table>

4. Provide locked seams for spiral duct; fusion welded butt seam for longitudinal seam duct.

5. Fittings and Couplings: Construct of minimum gauges listed. Provide continuous welds along seams at exposed ducts. Provide spot weld bonded seams at concealed ducts.

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Minimum Gauge</th>
</tr>
</thead>
</table>
HEATING, VENTILATING AND AIR CONDITIONING

6. Ducts exposed in the conditioned space shall be free of dents and blemishes and be mounted tight against adjacent surface with flat hangers. Remove all fabrication labels from ductwork.

7. Provide 20 gauge minimum for ductwork exposed within occupied spaces.

M. Duct Access Doors:

1. Duct Access: Provide hinged access door in rectangular ducts for access to fire dampers, control equipment, etc. Access door size shall be duct diameter wide by duct diameter high for all ducts under 24 inches. Ducts over 24 inches in diameter shall have 24-inch by 18-inch access doors. Minimum size access doors shall be 6 inches by 6 inches.

2. Provide hinged style access doors for round ductwork, NCA Manufacturing, Inc., Model AD-RD-87, Pottorff Series 60, or equal. Access doors shall be 16 gauge galvanized steel with continuous piano hinge. Locks shall be plated steel strike and catch. Provide 1" x 3/8" Polyethylene "Perma Stik" gasket all around door.

N. Flexible Ducts:

1. Provide exterior reinforced laminated vapor barrier, fiberglass insulation, (minimum R-value = R-8.0 for ductwork installed outside the building insulation envelope; minimum R-value = R-6.0 for ductwork installed within the building insulation envelope), encapsulated spring steel wire Helix and impervious, smooth, non-perforated interior vinyl liner. Individual lengths of flexible ducts shall contain factory fabricated steel connection collars.

2. Factory made air ducts shall be approved for the use intended and shall conform to the requirements of UL 181. Each portion of a factory-made air duct system shall be identified by the manufacturer with a label or other suitable identification indicating compliance with UL 181 and its class designation. These ducts shall be UL listed Class 1, 25/50 smoke and flame spread and shall be installed in accordance with the terms of their listing and the requirements of UMC Standard 6-5. Factory-made air ducts shall have the following minimum R-values: R-8.0 for ductwork installed outside the building insulation envelope, R-6.0 for ductwork installed within the building insulation envelope.

   a. Flexible ductwork shall be maximum of 8 feet long, and shall be extended to the fullest possible length, in order to minimize pressure drop in the duct.

   b. Ducts shall be U.L. approved and tested and meet Class requirements of NFPA 90A, and comply with UMC Standards 6-2 & 6-5. Make bends to maintain R/W-1.5.

3. Flexible ducts shall be selected for minimum of 6 inch positive static pressure and minimum of 1 inch negative static pressure.

4. Make connections to rigid duct and units with Panduit style draw band at inner liner material, and a second draw band over the outer vapor barrier material.

5. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

   Cal Flex Model 2PMJ (Minimum R-6)
ThermaFlex  Model M KC (Minimum R-6)

O. Underfloor Ducts:
   1. Construct ductwork buried under the floor or slab using Spunstrand, or equal, fiberglass-reinforced plastic duct and fittings. All fittings shall be factory fabricated. Field joints shall be made in accordance with the following:
      a. Join all duct sections with a 24 gauge minimum galvanized sheet metal sleeve installed inside of duct and secured with sheet metal screws.
      b. Clean and sand all areas to be joined and provide wet lay-up polyester resin and fiberglass mat over joint, in strict accordance with manufacturers instructions.
      c. Provide 20 gauge galvanized sheet metal sleeve for register boots. Field cut register boots and sheet metal connections with 1 inch flange, secured to the duct with sheet metal screws and tape the flange securely, covering all screw heads.
      d. Provide 6 mil wrap of plastic over all sheet metal work and duct.
      e. Sheet metal boots shall be encased in minimum 2” concrete.
      f. Installation shall conform to duct manufacturers’ requirements.
   2. Install duct in trench with provision for drainage, and with four inch depth of pea gravel or dry sand, arranged to completely encase the duct. Top of duct must be at least 2-1/2 inches below the top of the concrete slab.
   3. Duct Access Panels:
      a. Provide duct access panel assembly of the same material and gauge used for the duct. Duct access panels shall conform to the following:
         1) Fasteners: Black steel or stainless steel to match material used for the duct. Panel fasteners shall not penetrate duct wall.
         2) Gasket: Comply with NFPA 96, grease-tight, high temperature ceramic fiber, rated for minimum 1500 °F.

P. Shower exhaust ducts: Provide ducts and supports from stainless steel for a length of 20 feet from exhaust grille or register.

Q. Provide Ventlon, or equal, flexible connections on inlet and outlet of AC Unit, air handler and exhaust fans. Provide galvanized weather hood over flexible connections exposed to the weather.

2.14 TEMPERATURE CONTROL SYSTEM

A. Refer to Section 25 50 00.

B. Provide Novar control system, to match Owner standards and site conditions. No exceptions allowed.

C. All conduit and wiring associated with the temperature control system, regardless of voltage, is included as part of this Section. Contractor shall obtain power for temperature control devices from the nearest available adequate source. Furnish all interlocks, power supplies, relays, and the like required to render the control system complete and functional for the intended use.
D. Control contractor shall add to the existing host software all program functions required to implement the sequence of operation on the Drawings.

E. Provide outside air dampers and return air dampers to allow setting of minimum outside air. Provide dampers to close outside air duct when unit is cycled off. Counterbalanced dampers shall be used at each location.

PART 3 - EXECUTION

3.1 INSTALLATION OF SPLIT SYSTEM AC AND HEAT PUMP UNITS

A. Install units level and plumb.

B. Install evaporator-fan components as detailed on Drawings.

C. Install ground or roof-mounted condensing units as detailed on Drawings.

D. Install seismic restraints as required by applicable codes.

E. Install and connect refrigerant piping as detailed in unit manufacturers’ literature. Install piping to allow access to unit.

3.2 REFRIGERANT PIPING INSTALLATION

A. General:
1. Install refrigerant piping according to ASHRAE 15.
2. Install piping straight and free of kinks, restrictions or traps.
3. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
4. Slope horizontal suction piping 1 inch/10 feet towards compressor.
5. Install fittings for changes in direction and branch connections.
6. Piping under raised floors shall be kept 6 inches minimum above ground; excavate as necessary.

B. Factory Pre-charged and sealed line set piping:
1. Keep the entire system clean and dry during installation.
2. All tubing shall be evacuated and sealed at the factory. The seal must not be broken until ready for assembly.
3. If there is any evidence of dust, moisture, or corrosion, the tubing must be cleaned out by drawing a swab soaked with methyl alcohol through the tubing as many times as necessary to thoroughly clean the tubing.
4. Where line set piping is used, enclose in iron or steel piping and fittings or in EMT conduit.

C. Field Assembled Refrigerant Piping:
1. Select system components with pressure rating equal to or greater than system operating pressure.
2. Where subject to mechanical injury, enclose refrigerant piping in EMT conduit.
3. When brazing, 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.

3.3 INSTALLATION OF FANS

A. Provide access doors for fans or motors mounted in ductwork.
B. Mount all fans as detailed on Drawings and in compliance with CBC standards.
C. Fan motors mounted in air-stream to be totally enclosed.
D. Completely line supply, return or exhaust fan cabinets with 1 inch thick, 3/4 pound density acoustic insulation securely cemented in place.

3.4 RELIEF VENTS

A. Install relief vents to provide a level mounting for backdraft damper.

3.5 AIR INLETS AND OUTLETS

A. Provide all air inlets and outlets with gaskets and install so that there will be no streaking of the walls or ceilings due to leakage. Duct connection to outlet on exposed duct shall be full size of outer perimeter of outlet flange.
B. Unless otherwise indicated on Drawings, provide rectangular plenum on top of each diffuser and ceiling return for connection to ductwork. Line plenum with internal insulation as indicated for lined ductwork. Size plenum to allow full opening into air terminal.
C. Ceiling-mounted air terminals or services installed in T-Bar type ceiling systems shall be positively attached to the ceiling suspension main runners or to cross runners with the same carrying capacity as the main runners.
   1. Terminals or services weighing not more than 56 pounds shall have two No. 12 gauge hangers connected from the terminal or service to the structure above. These wires may be slack.
   2. Support terminals or services weighing more than 56 pounds directly from the structure above by approved hangers. Provide 4 taut 12 gauge wires each, attached to the fixture and to the structure above. The 4 taut 12 gauge wires, including their attachment to the structure above must be capable of supporting 4 times the weight of the unit.
   3. Secure air inlets and outlets to main runners of ceiling suspension system with two #8 sheet metal screws at opposing corners.
D. Furnish all air inlets and outlets with a baked prime coat unless otherwise noted. Provide off-white baked enamel finish on ceiling-mounted air inlets and outlets. Paint exposed mounting screws to match the material being secured.
E. Air inlets and outlets shall match all qualities of these specified including appearance, throw, noise level, adjustability, etc.
3.6 FILTERS

A. Mount filters in airtight frames furnished by the filter manufacturer, and install in accordance with manufacturer's recommendations.

B. Air filters shall be accessible for cleaning or replacement.

C. Identify each filter access door with 1/2 inch high minimum stenciled letters.

D. Provide temporary filters for all fans that are operated during construction; after all construction dirt has been removed from the building install new filters at no additional cost to the Owner. In addition to temporary filters at filter location, provide temporary filters on all duct openings which will operate under a negative pressure.
   1. Filters used for temporary operation shall be the same as permanent filters for the application. Filters used for duct openings may be 1 inch thick pleated media disposable type.

3.7 DAMPERS

A. All dampers automatically controlled by damper motors are specified under "Temperature Control System" except those specified with items of equipment.

B. Provide opposed blade manual air dampers at each branch duct connection and at locations indicated on the drawings and where necessary to control air flow for balancing system. Provide an opposed blade balancing damper in each zone supply duct. Provide an access panel or Ventlok flush type damper regulator on ceiling or wall for each concealed damper.

C. Install fusible link fire dampers full size of duct at points where shown or required.

D. Provide 18 inch x 12 inch minimum hinged access doors in ductwork and furring for easy access to each fire damper; insulated access doors in insulated ducts. Label access doors with 1/2 inch high red letters.
   1. Provide Ventlok Series 100, Durodyne, or equal access doors with hardware for convenient access to all automatic dampers and other components of the system, insulated type in insulated ducts. Provide Ventlok #202 for light duty up to 2 inch thick doors, #260 heavy-duty up to 2 inch thick doors and #310 heavy-duty for greater than 2 inch thick doors. Provide #260 hinges on all hinged and personnel access doors; include gasketing.

3.8 INSTALLATION OF DUCTWORK

A. Assemble and install ductwork in accordance with recognized industry practices which will achieve air tight and noiseless (no objectionable noise) systems capable of performing each indicated service. Install each run with minimum of joints. Align ductwork accurately at connections within 1/8 inch misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers, and anchors of type which will hold ducts true to shape and to prevent buckling. Where possible, install ductwork to clear construction by 1/4 inch minimum, except at air inlets and outlets. Where ductwork will not clear construction, secure duct firmly to eliminate noise in the system.
B. **Duct Joints:** Install duct sealers, pop rivets or sheet metal screws at each fitting and joint. Duct sealer shall be fire retardant. Sheet metal screw for joints shall be minimum #10 size galvanized.

C. **Applicable Leakage Classes:**

<table>
<thead>
<tr>
<th>Pressure Class</th>
<th>Leakage Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Round Duct</td>
<td>Rectangular Duct</td>
</tr>
<tr>
<td>2&quot;W.G. or less</td>
<td>12</td>
</tr>
<tr>
<td>4&quot;W.G. or greater</td>
<td>3</td>
</tr>
</tbody>
</table>

D. **Upper connection of support to wood structure** shall be with wood screws or lag screws in shear fastened in the upper one half of the wood structural member. Fasteners shall conform to the following schedule:

- For ducts with P/2=30" #10 x 1-1/2" wood screw
- For ducts with P/2=72" 1/4"x 1-1/2" lag screw
- For ducts with P/2 over 73" 3/8"x 1-1/2" lag screw

E. **Upper connection in tension to wood** shall not be used unless absolutely necessary. Where deemed necessary the contractor shall submit calculations to show the size fastener and penetration required to support loads in tension from wood in accordance with the following schedule:

- For ducts with P/2=30" 260 pounds per hanger
- For ducts with P/2=72" 320 pounds per hanger
- For ducts with P/2=96" 460 pounds per hanger
- For ducts with P/2 larger than 120" NOT ALLOWED

F. **Install concrete inserts** for support of ductwork in coordination with formwork as required to avoid delays in work.

G. **Upper connection to manufactured truss construction must comply with truss manufacturers published requirements and Structural Engineers requirements.**
H. Where ducts pass through interior partitions and exterior walls, conceal space between construction opening and duct or duct plus insulation with sheet metal flanges of same gauge as duct. Overlap opening on four sides by at least 1-1/2 inches.

I. Support ductwork in manner complying with SMACNA "HVAC Duct Construction Standards," hangers and supports sections. Where special hanging of ductwork is detailed or shown on Drawings, Drawings shall be followed. Angles shall be attached to overhead construction in a manner so as to allow a minimum of 2 inches of movement in all directions with no bending or sagging of the angle.
   1. Except where modified in individual paragraphs of this Section, provide hanger support with minimum 18 gauge straps, 1 inch wide. Fold duct strap over at bottom of duct.
   2. Install duct supports to rectangular ducts with sheet metal screws. Provide one screw at top of duct and one screw into strap at bottom of duct.

J. Installation of Flexible Ductwork:
   1. Provide flexible ducts with supports at 30 inch centers with 2 inch wide, 26 gauge steel hanger collar attached to the structure with an approved duct hanger. Installation shall minimize sharp radius turns or offsets.
      a. Supports shall be in accordance with UMC Standard 6-5.
   2. Make connection to duct with spin-in fittings, with air scoop and balance damper.

3.9 DUCTWORK SEALING AND LEAK TESTING

A. New Construction: All duct systems (supply return, outside air intake, and exhaust), except those exposed in the conditioned space, shall be sealed and leak tested to a leakage rate not to exceed 6 % of the fan flow of the system. The leakage rate shall be confirmed through field verification and diagnostic testing in accordance with the procedures set forth in the 2008 California Building Energy Efficiency Standards Non-Residential ACM Manual. Contractor shall also complete the Acceptance Requirements in the standards for duct sealing/leak testing. Refer to section 23 00 50 for further information on Acceptance Requirements.

B. Retrofit Construction, including alterations to existing duct system or space conditioning equipment: All duct systems (supply, return, outside air intake and exhaust), except those exposed in the conditioned space, shall be sealed and leak tested in strict conformance with the requirements of section 149 of the 2008 California Building Energy Efficiency Standards. See drawings for extent of this work and leakage rate requirements. The leakage rate shall be confirmed through field verification and diagnostic testing in accordance with the procedures set forth in the 2008 California Building Energy Efficiency Standards Non-Residential ACM Manual. Contractor shall also complete the Acceptance Requirements in the standards for duct sealing/leak testing. Refer to Section 23 00 50 for further information on Acceptance Requirements.

3.10 TEMPERATURE CONTROL SYSTEM

A. General: Coordinate with the requirements of Section 25 50 00.

B. Provide thermostats where indicated on drawings. All wiring shall be in conduit. Provide all relays, transformers and the like to render the control system complete and fully operable. All control conduit to be rigid steel type.
3.11 TESTING AND BALANCING

A. Obtain the service of an independent test and balance agency that specializes in, and whose business is limited to, testing and balancing of air conditioning systems. Balance agency shall be a member of Associated Air Balance Council (AABC). Coordinate testing and balancing agency work with work of other trades.

B. Testing and balancing agency, as a part of its contract, shall act as authorized inspection agency and shall report any discrepancies or items not installed in accordance with Contract Drawings and/or Specifications pertaining to air and water distribution, and exhaust systems.
   1. Balance report shall be signed by the Contractor, attesting that all reported deficiencies have been corrected. Balance reports containing uncorrected deficiencies will be rejected.

C. Provide for adjustments and/or additions or modifications to fan and motor sheaves, belts, damper linkages and the like to achieve proper air balance at no additional cost.

D. Perform testing and balancing in complete accordance with AABC National Standards. Perform testing on the following:
   1. Air distribution system
   2. Chilled water system
   3. Heating water system
   4. Domestic water system

E. Instruments used for testing and balancing of systems shall have been calibrated within a period of six (6) months and shall be checked for accuracy prior to start of work.

F. Submit three (3) copies of complete test report prior to final acceptance of project.

G. Tabulate magnetic starters size, type, and manufacturer with heater strip size, type and rating along with motor nameplate data.

H. Measure the ampere reading of each motor input after final adjustments have been made.

I. Air Distribution System Balancing:
   1. Balance air quantities of supply, return, outside air, and exhaust to achieve those given on Drawings with accuracy within minus 5 percent and plus 10 percent. Measure the total air quantity at each fan. Measure the total air quantity at each supply fan with maximum outside air and with minimum outside air. Measure the ampere reading of each motor input after final adjustments have been made. Upon satisfactory completion of balance and operational test, submit three sets of reports to the Architect on balance final readings, summary of fan CFM delivery rates, static pressure ratings, motor ampere input, and general summary of test results. Specified ratings and motor nameplate ratings shall be listed with measured readings.
      a. Check and report operation of relief air dampers. Insure that dampers remain full open during economizer cycle, and full closed at all other times. Measure and report total relief from power economizer operation during each phase of economizer cycle.
b. Test each system for building operating pressure, under all operating conditions, including all phases of the economy cycle. Maximum building pressure shall not exceed 0.03 inches of pressure.

2. Balance air quantities of supply to achieve those given on drawings. Keep records on all air quantities measured, including tests prior to final balance. Use branch duct volume control dampers for balancing. Use of terminal dampers is not acceptable.

3. Air balance shall be achieved using variable fan speeds.

4. Adjust single or double deflection registers and variable pattern diffusers to evenly distribute air within the conditioned space. The terminal air velocity at 5 feet above the floor shall not exceed 50 FPM in normal air conditioned spaces.

5. Test economizer cycle for each air system.
   a. Adjust control systems to provide correct operation.
   b. Adjust relief air dampers as required to provide 100 percent relief in economizer mode, and confirm satisfactory operation of all backdraft dampers.
   c. Provide, as part of air balance report, final settings of each economizer control, and total air flow through relief air hood.

J. Hydronic System Balancing:
1. Calibration and testing of hydronic system in conformance with AABC recommendations.
2. Complete air balance prior to hydronic system balancing.
3. Water Balance Procedures: Set combination chilled/hot water, and condenser water and hot water pumps to design GPM quantities.
4. Check and adjust water temperature and GPM flow characteristics at all cooling and heating coils.
5. Upon completion of flow ratings and coil adjustments, mark all settings and record all data.
6. Recorded Data Shall Include:
   a. Inlet and leaving temperatures at all coils and heating and cooling equipment.
   b. Pressure drop at each coil including coil bypass.
   c. Pump operating suction and discharge pressure and final total dynamic pump head.
   d. Rated and actual running amperage of pump motors.
7. Venturies and calibrated orifices with portable or permanent flow meters shall be used to balance the waterflows. When above equipment is not installed, obtain waterflow balance by measurement of temperature differential across the various coils or elements.

K. Plumbing Systems Balancing:
1. Measure pressure drop across assembly for each backflow preventer provided as part of this contract.
2. Measure pump operating suction and discharge pressure and final total dynamic pump head.
3. Check and adjust flow rate for each hot water recirculation balance valve.

3.12 EQUIPMENT START-UP
A. Initial start-up of the systems and pumps shall be under the direct supervision of the Contractor.

B. Equipment start-up shall not be performed until the piping systems have been flushed and treated and the initial water flow balance has been completed.

C. It shall be the responsibility of the Contractor to assemble and supervise a start-up team consisting of Controls Contractor, Start-Up Technician and Test and Balance Contractor; all to work in concert to assure that the systems are started, balanced and operate in accordance with the design.

D. After start-up is complete, instruct the Owner's personnel in the operation and maintenance of the systems. Obtain from the Owner's representative a signed memo certifying that instruction has been received.

3.13 ANTI-VIBRATION BASES AND HANGERS

A. Isolate all ventilating and air conditioning equipment connections including conduit, piping, drains, etc., so that equipment will operate under continuous demand without objectionable vibration.

B. Support all air conditioning units, all fans, and all pumps of 5 HP and over on anti-vibration bases or hangers. Other equipment shall be supported on anti-vibration bases, pads, or hangers, as shown on the drawings or specified with the equipment. Individual fans shall have integral fan and motor bases, spring-type unless noted. High velocity fans - unguided stable springs with 2" deflection.

C. Selection of the bases or supporting units shall be in accordance with the vibration eliminator manufacturer's recommendations. Minimum static deflection shall be 1-1/2 inches or as marked on the drawings.

D. The equipment manufacturer shall furnish the weight of equipment at each point of support.

3.14 CLEANING AND PROTECTION

A. Clean ductwork internally, unit by unit as it is installed, of dust and debris. Clean external surfaces of foreign substances that might cause corrosive deterioration of metal or where ductwork is to be painted.

B. Strip protective paper from stainless ductwork surfaces, and repair finish wherever it has been damaged.

C. Temporary Closure: At ends of ducts that are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering that will prevent entrance of dust and debris until connections are to be completed.

D. At completion of work, check internal lining for small cuts, tears, or abrasions. Repair all damage with fire retardant adhesive.
3.15 ACCEPTANCE REQUIREMENTS

A. In addition to the testing and balancing requirements specified in the previous section, the contractor shall also be responsible to complete all the Acceptance Requirements of the 2008 California Building Energy Efficiency Standards. Refer to Section 23 00 50 for further information on Acceptance Requirements.

3.16 EQUIPMENT MOUNTING

A. Mount and anchor equipment in strict compliance with drawings details. Alternate anchorage methods will not be considered for roof mounted equipment.

END OF SECTION 23 80 00
SECTION 25 50 00 - CONTROLS AND INSTRUMENTATION

PART 1 - GENERAL

1.1 RESPONSIBILITY / QUALITY ASSURANCE

A. The temperature control system shall be Novar Logic One DDC System to match existing San Joaquin County extensive Novar control system. No exceptions. The temperature control contractor must be an authorized manufacturer representative for a minimum of 10 years. The Temperature control contractor must have a fully staffed service office and must have successfully installed at least fifty (50) Novar projects and have experience programming the existing Novar systems. The temperature control contractor must have a minimum of 10 years experience in the design and installation of Novar Control Systems. All engineering, installation, and service has been preformed by L&H Airco of Rocklin, CA. 1-916-677-1000. The design and installation employees of the temperature control contractor will be factory trained technicians and in the direct employ of the temperature control contractor. The Novar Dealer must have an office within one hour of the project site.

B. At the Owner's Representative's discretion, before award of contract, the controls vendor may be required to demonstrate a fully operational system mockup utilizing the exact hardware components as bid. During the demonstration of the system mock-up, the controls must be able to demonstrate signal input/output and communication protocol compatibility with the existing Novar Host Computer.

C. Control diagrams show in general the equipment required for the control sequence specified. Variations in the selection of temperature control and EMS equipment that will produce the required control sequences and meet the quality assurance criteria shall be submitted for review.

D. The final responsibility for providing all the necessary control components and for the proper operation of the HVAC control systems as described, except where directly excluded or listed as work not included, shall be by the Controls Contractor. Nothing in this specification is intended to override this responsibility.

E. The Controls Contractor shall have the responsibility as the expert in the proper application of Novar control components and DDC systems. The final design, installation, and operation of the control system are the responsibility of this Contractor. The Contractor shall make additions and/or modifications to the design as required at no additional cost.

F. The Contractor is responsible for including the proper settings of each control loop (setpoint, throttling range, integral, and derivative) as necessary to achieve system stability and control accuracy. The database shall have the provisions for changing any or all of these settings by the operator at any time, as required.

G. Control submittals must be stamped by a Professional Mechanical Engineer licensed in the State of California in the direct employment of the temperature control contractor.
H. The temperature control contractor shall employ California Certified Electricians on this project only who are regular employees and fully trained on the installation of Novar control systems.

I. The temperature control contractor must have a valid C-10 and C-20 California State contractors license to bid this project. Licenses must be kept current for the duration of the project.

J. Sub-contracting of any portion of the control system installation is prohibited. Design, programming, engineering and conduit and wire installation shall be performed by regular employees of the controls contractor.

1.2 DESCRIPTION OF WORK

A. Remove the existing Novar Logic One control systems from the existing multi-zone air handlers and replace the system on the new multi-zone units after they have been installed. Remove the existing standard White and Rogers thermostats of two existing packaged AC units and install a Novar control system on the units as shown on the control diagrams.

B. Add the new controllers to the existing Novar system after installation and update programming system files and graphic's and install system files on County's existing Novar server.

C. Check and test all re-installed controls and new controls and place the control system back into the operational mode it was in before the replacement of the multi-zone air handlers.

1.3 MANUFACTURERS

A. Acceptable manufacturers: Novar Logic One to match existing.

B. Engineer reserves the right to reject, at his option any and all bids that do not meet the specified requirements stated.

C. It shall be the Mechanical Contractor's responsibility to verify that the proposed Control System and Control System Contractor have been approved prior to the removal and re-installation of the Novar control system.

D. Mechanical Contractors and their related service company will not be considered as a qualified Temperature Control Contractor.

E. All work described in this section shall be engineered, installed, wired, circuit tested calibrated and programmed by regularly employed control system engineers, electricians and technicians of the authorized Novar factory representative or branch office of the listed acceptable bidder. System Engineering, Programming and Installation shall not be subcontracted. The supplier of the direct digital control system shall be responsible for inspection and Quality Assurance (QA) for all materials and workmanship furnished by
Contractor must have a valid C-10 and C-20 license to bid this project.

F. Maximum reliability shall be achieved through extensive use of high-quality, pre-tested components. The manufacturer prior to shipment shall individually test each and every controller, sensor, and all other DDC components.

G. Provide all tools, testing and calibration equipment necessary to ensure reliability and accuracy of the direct digital control.

H. Bids by wholesalers, parts distributors, mechanical contractors or franchised dealers or any firm whose principal business is not that of installing automatic temperature control systems shall not be acceptable.

I. Manufacturer and temperature controls contractor shall have been in business for a minimum of ten years. Temperature controls contractor shall have on staff two Mechanical Engineer that is a licensed Professional Engineer by the State of California and two Certified Energy Managers.

J. The temperature controls contractor shall have a service department that has been established for a minimum of five years and is staffed with factory trained and authorized service technicians capable of servicing all aspects of the control systems depicted on these plans. Service department shall have service technicians that can be dispatched 24 hours per day, seven days per week.

K. The Temperature Control Contractor shall maintain a factory certified training facility within 60 miles of the center of Stockton where factory trained instructors teach regularly scheduled classes on the operation, programming, graphics development and system trouble shooting of the Novar control system.

1.4 WORK INCLUDED

A. Automatic temperature control systems shall include all relays, temperature sensors, and control devices required to control the mechanical equipment as shown on the drawings. Control devices shall be installed as required to perform the necessary functions and operate in the proper sequence. Provide duct smoke detectors if not provided by Division 16, control valves, power to VAV boxes and all other control components whether shown or not for a complete and functional control system as specified.

B. Temperature control equipment, including control panels, shall be furnished and installed by the Novar authorized temperature control contractor. No portion of the controls system installation or programming will be allowed to be sub-contracted out.

C. All installation work, including conduit and wiring of the control system and internal wiring of the temperature control panels, shall be done under this Section.

D. Provide all wiring, conduit, relays, time switches, etc., required for controls and interlock wiring. Control wiring and conduit shall be installed in conformance to the requirements of local codes. Before ordering controls or authorizing the control installation, submit for the Engineer's approval, detailed control diagrams showing all controls, wiring, piping,
etc. Detailed wiring diagrams for the various equipment interlocks shall be submitted to coordinate the overall system operation of the entire system.

E. Submittal drawings shall consist of actual fan system or mechanical system layouts on not less than 11 x 17 inch paper, complete in all details.

F. Training and Documentation:
   1. Four days of factory training at the Manufacturer's corporate training facility or an authorized training facility maintained by the temperature control contractor locally shall be provided for four County technicians including all travel, lodging, car rental, meals and course cost.
   2. Upon system completion, the Contractor shall submit a letter stating that system adjustment and validation have been completed and that the Owner's operating personnel have been instructed in its use.
   3. Submittals shall include a training course syllabus.

G. Warranty:
   1. Controls contractor shall provide a 1-year warranty for both parts and labor on control system components and computers from the date of completion regardless of the age of the controls that were removed and replaced.

H. Include all necessary cables to connect DDC and computer devices.

I. Provide complete start-up and field calibration of the control system. The set points shown are suggested starting points only. This Contractor must set the controls at the proper values to assure that all systems are stable, hold the required conditions, and function as intended.

J. Provide complete engineering/detailed control drawings showing all devices, terminal numbers, schedules, legends, labels, etc., as required to properly display the system to be installed and to allow early trouble-shooting in the future. The diagrams shall also indicate set points, throttling range, ratios and all other switch settings and adjustments.

K. Provide a detailed written sequence of operation that specifically describes the system operation in terms easily understandable by the Owner's Representative and describes how the Contractor's specific equipment will accomplish making the system operate as intended. This shall be more detailed than the engineer's sequence and specifically describe the operation of each device.

L. During start-up, the Contractor shall "tune the loops" as required to obtain stable operation, hold the required conditions, and maintain as tight control as possible. The Contractor shall submit, as part of his operation and maintenance manuals, a listing of the final set-up values.

1.5 DRAWINGS AND SUBMITTAL

A. Control drawings are diagrammatic and shall be used in conjunction with the points list and construction documents to design a complete and functional DDC control system.
B. Submittals shall illustrate point to point wiring terminations. As-built drawings shall show actual interface terminations to fan relays, devices, etc. Complete sequences of operations for each type of equipment shall be included in the submittal package.

C. Submittal Drawings must be stamped by a Stats of California Licensed Professional Engineer in the direct employment of the Temperature control contractor.

PART 2 - PRODUCTS

2.1 GENERAL

A. Global and Local Controllers: Existing

2.2 NOVAR EXECUTIVE PROCESSORS “LINGO’S” or Savvy’s (Existing)

2.3 NOVAR UNIVERSAL IOM MODULES (IOM-2) (Existing)

2.4 NOVAR UCM’S (UNIVERSAL CONTROL MODULES)

A. Novar package unit controllers with inputs for space temperature, set point adjustments, after hour override and supply air temperature sensor and fan run status current switch.

2.5 NOVAR ELECTRONIC SPACE SENSORS

A. The space sensors will be the Futura Temperature Sensor series having set point adjustment, LED status indicator and after hour over-ride button. Space temperature set point and duration of after hour operation will be programmable from the host computer.

2.6 NOVAR DUCT TEMPERATURE SENSOR

A. The duct sensor will be a precision electronic sensor manufactured by Novar for use with Novar Logic One hardware. The sensor will come factory calibrated and contain 6 feet of wire with a sensing element at the tip.

2.7 WIRING

A. All sensor and control wiring to control Modules shall be shielded No. 18 gauge. It shall be UL listed as Article 760 Fire Protection Signaling and UL classified as a low smoke, flame retardant cable. All Control wiring will be installed in conduit consistent with Div. 16 specifications. All other control wiring shall be minimum No. 18 gauge copper with 600 volt insulation installed in conduit pursuant to Div. 16 specifications.

B. All wiring shall meet local standards and adhere to conduit specification in Division 26 00 00.

C. All control wiring (low or line voltage) shall be installed in EMT conduit where exposed unless directed otherwise by specifying engineer. Rigid Conduit on roofs or below 8 feet where exposed to damaging activities. All control wiring will be installed in EMT conduit in the mechanical rooms with seal tight flex for short connections.
2.8 LABELS

A. Each panel or device (panel-mounted or field-installed) shall be labeled to correspond with the label of that device on the drawings. (Excludes Room Sensors)

B. Labels shall be permanently attached and shall be plastic engraved with letters at least 1/4 inches high. ("Dyno" Plastic labels will not be allowed.).

PART 3 - INSTALLATION

3.1 INSTALLATION OF EQUIPMENT

A. All installation work, including piping of control systems and internal wiring of control panel boards, shall be performed by technicians in the direct full time employ of the authorized manufacturer's representative of the temperature control system.

B. Provide the service of a control system specialist to completely sequence each control system through it's complete range, both heating and cooling, and work in conjunction with the testing and balancing specialist to insure that all controllers and controlled devices are calibrated and functioning properly. Record and submit to Owner's Representative all final control setpoint readings and control ranges with date of final setting

3.2 SERVICE

A. Provide one (1) year of system service, commencing with the guarantee period in accordance with standard warranty.

B. The Contractor shall perform all troubleshooting, hardware and software examination and system performance via system telephone dial-in capability as required.

C. The Contractor shall have tested diagnostic equipment, established control system troubleshooting procedures and a technical staff consisting of specialists in hardware, software, HVAC equipment and automatic control systems. Maximum response time to a service request shall be four hours. Following a service request, the Owner shall receive a written description of the diagnostics and services performed by the Contractor.

D. Contractor must maintain a complete service department staffed with factory trained service personnel. Service department must have at least 5 years of Novar Experience.

END OF SECTION 25 50 00
SECTION 26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. All basic instructions of the project including scope and project electrical requirements.

1.2 RELATED SECTIONS

A. All of the Division 26 Sections relate.

1.3 QUALIFICATIONS

A. Electrical Contractor shall be established with a minimum of 5 years in the area with a working knowledge of the California Electrical Code.

B. All electrical equipment shall be of a manufacturer as specified or approved equal.

1.4 REFERENCES

A. California Electrical Code 2010 Edition

B. California Building Code 2010 Edition

C. California Mechanical Code 2010 Edition


PART 2 - SCOPE AND PROJECT ELECTRICAL REQUIREMENTS

2.1 PROVISIONS

A. The General Conditions, Supplemental Conditions and Division 1, 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.

2.2 SCOPE

A. Provide all labor, materials, tools, plant equipment, transportation and perform all operations necessary for and completion of all electrical work whether specifically mentioned or not; all as indicated, specified herein, and/or implied thereby to carry out the apparent intent thereof. Some of the items of work specified herein are as follows.

1. Study work and related drawings and specifications of all other crafts whose work abuts, adjoins, or in any manner is affected by work of this Section. Consult with other trades and with them expedite and coordinate material and labor to avoid omissions and delays.

2. Complete system of 480 and 208/120 volt, three phase, four wire, wiring distributions including all branch circuits and outlets for the lighting and convenience outlets, as shown on the drawings.
3. Any electrical item that needs to be relocated temporarily in order to carry out the contract works shall be included in the bid.

4. All lighting fixtures furnished and installed complete with lamps.

5. Time clock control for exterior lighting. Motion Sensor controls for the interior lighting.

6. Rework and add to existing intercom/speaker/clock system. Provide new addition to existing system.

7. Rework and add to the existing fire alarm system for the new building.

8. Provide data and telephone system conduits and boxes, as shown on the plans and specified herein. All outlets, cover plates, cables and terminations for data system by owners vendor.

9. Framing and other associated work required for the installation of the electrical system.

10. Submission of shop drawings and submittals.

11. Excavation, backfill, framing and other associated work required for the installation of the electrical systems.

12. “As-Built” drawings.

13. Acceptance testing for all the different systems installed. Provide itemized list of tests carried out and recorded test results.

14. Prepare day-by-day record of "as built" changes as specified hereinafter.

15. Furnish, install and connect all line voltage conduit and wiring to mechanical equipment and other Owner furnished electrical equipment unless otherwise noted. Conduit and wiring for low voltage control wiring of the HVAC systems is under another section unless otherwise noted.

16. Furnish and install disconnect switches, as required for the mechanical equipment and controls as shown on electrical and mechanical drawings. Install all motor starters furnished loose by Mechanical Contractor.

2.3 WORK NOT INCLUDED:

The following work as outlined is not included in the Electrical Contract; however, this Contractor shall cooperate with the other contractors involved and shall be responsible to give complete directions on sizes of openings, locations, etc., and to insure that the completed electrical installation shall be of good workmanship and in accordance with drawings and specifications.

A. Telephone and Data processing system head end equipment and rack.

B. Equipment or work indicated "NIC" or "By others."
2.4 QUALITY ASSURANCE:

A. QUALIFICATIONS OF INSTALLERS: For the actual fabrication, installation and testing of the electrical work, use only personnel who are thoroughly trained and experienced in the skills required and who are completely familiar with the manufacturer's recommend methods of installation, the equipment to be utilized, and the requirements of this work.

B. PERMITS AND ORDINANCES: Comply with all codes, ordinances, and authorities having jurisdiction, including all local ordinances, the State of California Title 24, the California Electrical Code, and the California Building Code. Electrical Contractor shall procure and pay for all permits, licenses, etc. required to carry on and complete the work. Additionally:
   1. Comply with pertinent requirements of Underwriters' Laboratories, incorporated for all items installed for which UL standards have been established.

2.5 REVIEW SUBMITTALS:

A. For ease of maintenance and parts replacement, to the maximum extent possible use equipment of a single manufacturer. The Architect reserves the right to reject any Materials List which contains equipment from various manufacturers if suitable materials can be secured from fewer manufacturers and to require that the source of materials be unified to the maximum extent possible.

B. When specific names are used in connection with materials, they are used as standards only, but this implies no right upon the part of the Contractor to use other materials or methods unless approved as equal in quality and utility by the Architect in writing and in accordance with provisions for substitutions previously stipulated in these specifications.

C. Shop drawings and all supporting data shall be submitted as instruments of the Contractor. Contractor shall place his stamp on the cover sheet of submittal documents, thereby stating that the equipment meets all requirements of the conditions. At least one set of submittals shall have check marks at each item indicating that the Contractor has verified compliance with the above requirements.

D. Should the original submittal of a proposed substitution be rejected, the specified item shall be furnished.

E. Within twenty one (21) days after award of contract, submit (7) bound copies of brochures containing complete information and catalog cuts on all equipment including, that which is to be furnished as specified. Include wiring diagrams where so required. The brochures shall be bound separately according to classifications of equipment such as power, lighting, emergency generator, signal systems and miscellaneous systems. Proposed substitutions shall be accompanied by catalog cuts, ratings, sizes, performance curves, shop drawings and other data complete to prove full equality to the specified item. At least one copy of the submittals for each system shall be made up of original printed manufacturer's cut sheets. Additional copies by may be made up of Xerox copies. FAX submittals are not acceptable and will be returned unreviewed.
F. Approval of a substitution does not authorize any deviation from the utility, size or function of the specified item unless specifically pointed out and approval requested in the letter of submittals. Responsibility for conflicts due to space limitations are not relieved by approval of a substitution. If revision of wiring, piping or arrangement of other equipment is necessary, after approval, furnish the Architect with (7) copies for file and future reference.

G. Panelboard submittals shall be arranged to show bussing circuit numbers with respective branch circuit devices similar to schedules on drawings. Switchboard and motor control center submittals shall show elevations indicating layout of devices, metering, etc. Device ratings, circuit numbers and nameplates shall be in table form. Terminal cabinet submittals shall include elevations with terminal strip mounting arrangement.

H. Unless otherwise shown or specified, material shall be new, full weight, standard, the best quality of its kind and satisfactory to the Architect. Materials shall be stored and protected as necessary and/or required by the Architect, and the Contractor shall be entirely responsible for damage or loss from any cause. Unless otherwise shown or specified, major equipment shall be the product of a manufacturer who has for a period of not less than five (5) years, been in successful manufacture of the equipment and who has nationally distributed catalog covering ratings and specifications of said equipment.

I. Electrical materials and equipment shall bear the label of, or be listed by, the Underwriters’ Laboratories unless of a type for which label or listing service is not provided.

J. Materials and components shall conform to industrial standards including:

N.E.M.A. - National Electrical Manufacturers’ Association  
A.S.A. - American Standards Association  
A.S.T.M. - American Society of Testing Materials  
I.P.C.E.A. - Insulated Power Cable Engineers’ Association  
C.B.M. - Certified Ballast Manufacturers

K. Samples of fixtures, materials and equipment shall be submitted for approval of Architect if requested.

L. As a minimum, submittals shall be provided for the following items/systems:

1. Light fixtures.
2. Interior Lighting Controls.
3. Exterior Lighting Controls.
4. Panelboards.

2.6 PRODUCT HANDLING:

A. Delivery and Storage: Deliver material in time to insure uninterrupted progress of the work. Materials shall be stored in a manner to preclude damage and permit ready access for inspection and identification of each shipment. Materials shall be kept free from dirt, grease and other foreign matter, and shall be protected from corrosion.
Materials showing evidence of damage will be rejected and shall be immediately removed from the work.

B. Protection: Use all means necessary to protect the electrical work and fixtures before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage to either the work or materials hereunder or the work and/or materials of other trades, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional expense to the Owner.

2.7 JOB CONDITIONS:

A. Examination of Site: Contractor shall be held to have visited the site and satisfied himself as to the conditions under which the work is to be performed. Contractor shall check all existing conditions which may affect the work under this Section. No allowances will subsequently be made on behalf of the Contractor for any extra expense to which Contractor may be put due to any failure or neglect relative to the discovery of conditions affecting the work under this Section.

B. Specification and Contract Drawings: Accuracy of data given herein and on the drawings are as exact as could be secured, but their extreme accuracy is not guaranteed. The drawings and specifications are for the assistance and guidance of the Contractor and exact locations, distances, levels, etc., will be governed by the building and the Contractor shall accept same with this understanding.

1. Drawings and specifications may be superseded by later detail specifications and detail drawings prepared by the Architect, and the Contract shall conform to them and to such reasonable changes in the Contract Drawings as may be called for by those revised drawings without extra cost to the Owner. Where work called for exceeds code requirements, drawings and specifications shall take precedence.

2. Layouts of equipment, accessories and wiring systems are diagrammatic (not pictorial), but shall be followed as closely as possible. Architectural, structural and other mechanical drawings shall be examined, noting all conditions that may affect this work. Report conflicting conditions to the Architect for adjustment before proceeding with work.

3. Should Contractor proceed with work without so reporting matter, he does so on his own responsibility, and shall alter work if directed by the Architect, at his own expense. Right is reserved to make minor changes in locations of equipment and wiring systems shown, providing change is ordered before conduit runs and/or work directly connected to same is installed and no extra materials are required.

C. Relocation by Owner: The Owner reserves the right to make minor changes in locations of equipment, lighting, outlets, switches, telephone outlets, and any other component of the electrical work under this Section, providing such change is ordered before conduit runs and/or work directly connected to same is installed and no extra materials are required, all at no extra cost to the Owner.
D. Working Space: Adequate working space shall be provided around electrical equipment in strict compliance with the Electrical Safety Orders. In general provide six and one half feet (6' - 6") of headroom and thirty-six inches (36") minimum clear working space in front of panelboards and controls for 120 volts and forty-two inches (42") 480 volts. Particular attention shall be paid to CEC Article 110-26 and 408.

E. Equipment Identification: Nameplates shall be installed on electrical equipment. Equipment to be so labeled shall include the following:

1. Individual enclosures such as disconnect switches, time switches, push buttons, contactors, relays, motor starters, etc.
2. Group mounted equipment such as panelboards and switchboard.
3. Individual circuit breakers on switchboards.
4. Wall switches for lighting or other use where the control function is not self-evident.
5. Each panel shall be labeled to provide the following information minimum:
   (a) Panel name.
   (b) Size of feeder feeding the panel.
   (c) Rated voltage, amps and phases.

Each distribution panel shall be labeled to provide the following information minimum:

(a) Rated voltage, amps and phases.
(b) Main switch rating.
(c) Feeder circuit breaker rating with name of panel or equipment fed and size of feeder to this equipment.

Nameplates shall adequately describe the item and its' function or use of the particular equipment involved.

Nameplates shall be laminated phenolic plastic, black front and black with white core. Engraving shall be through the outer layer. Embossed plastic pressure sensitive labels are not acceptable. In lieu of plastic plates, device plates shall be engraved directly with lettering filled with black enamel.

F. Electrical Work for Motors and Appliances Furnished by Others:

1. Work is shown on drawings according to best information available at time drawings was prepared; but this Contractor shall obtain accurate information on equipment power requirements and connection points from Contractors furnishing the actual equipment and shall install electrical work to suit at no extra cost to Owner. Should Contractor proceed with work without first verifying accuracy of the plans, he does so on his own risk and shall alter work if required at his own expense.

2. Mechanical, Plumbing, and Fire Sprinkler Contractors shall furnish written or printed specifications, dimension sheets and wiring diagrams for the electrical work applying to the actual equipment being installed. Electrical Contractor
shall be responsible for obtaining these and shall assist other Contractors in testing of their systems, but his responsibility is restricted to having correctly installed and connected electrical work in accordance with diagrams and specifications furnished him by the other Contractors.

G. OPERATIONS AND MAINTENANCE MANUALS: Provide the Owner a complete O & M manual encompassing the following systems: Data and Telephone system cabling, Fire Alarm System. Each section shall be clearly identified and shall include procurement sources and parts and product descriptions and replacement numbers. Provide “As built” drawings for each system as part of the O & M manual. Provide O & M manuals for switchgear, panels, light fixtures and lighting controls. Each binder shall be a 3 ring binder and have project name, contractor’s name, address, telephone and system description. Provide one binder for signal systems and one binder for power/lighting systems. Do not combine these binders with any other disciplines on this project.

PART 3 - EXECUTION

3.1 PREPARATION

A. REVIEW OF DEVELOPED CONDITIONS: Prior to the installation of any electrical system, under this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where the work hereunder can properly commence.

Verify that all electrical work can be performed in accordance with all pertinent codes and regulations, the original design, and the referenced standards.

B. DISCREPANCIES: In the event of discrepancies, immediately notify the Architect. Do not proceed with the installation of work hereunder in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 EXECUTION

A. NAMEPLATES: Install engraved nameplates for each electrical device, disconnect control station, etc. Designation shall be as directed by the Engineer. Nameplates shall be securely fastened to the equipment with #4 Phillips round head cadmium plated self-tapping screws.

B. WEATHERPROOF CONSTRUCTION:

1. All wiring or equipment installed exterior to buildings or in wet or damp locations shall be weatherproof construction to suit the service conditions.

2. Outlet boxes shall be gasketed; electrical metallic tubing shall have compression type fittings; lighting fixtures shall be designed for exterior installation.

3. All exterior mounted equipment shall be corrosion resistant and constructed in accordance with NEMA standards for the service conditions encountered.

C. STRUCTURAL REQUIREMENTS: Installation under this Section shall comply with the Uniform Building Code and Title 24.
D. MANUFACTURER’S DIRECTIONS: Follow manufacturer’s directions where these directions cover points not included in the drawings or in the specifications.

E. WORKMANSHIP: Workmanship shall be of the best quality and shall be performed by craftsmen to insure long and trouble-free service. The requirements of the Codes and Safety Orders are minimum standards.

F. CUTTING AND PATCHING: This Contractor shall be responsible for all cutting and patching required for the installation of the electrical work under this Section. The actual cutting and patching work shall be executed by the appropriate trade involved under the supervision of the General Contractor, but the cost of such cutting and patching shall be borne by this Contractor.

1. Neither holes or notches shall be made in any structural member without the written approval of the Structural Engineer for each specific location.

2. This Contractor shall arrange for, and bear all costs for, all necessary sleeves or openings in masonry, concrete, or other structural elements where such are permitted by the Structural Engineer.

G. EXCAVATION AND BACKFILL: Perform excavation and backfill required for electrical installation. Restore surfaces, roadways, walks, curbs, walls, existing underground installations of original condition in an acceptable manner.

1. Excavation: Dig trenches straight and true to line and grade, with bottom smoothed of any rock points. Support conduit for entire length on undisturbed, original earth. Minimum conduit depth of pipe crown shall be twenty four inches (24") below finished or natural grade.

2. Backfill: All backfill material, placement and compaction shall conform to applicable requirements of Site Work, Section 1.

H. CLEANING: Keep the premises in a neat, safe and orderly condition at all times during the execution of the electrical work. Areas adjacent to the electrical work, both interior and exterior shall be free from accumulations of debris and/or shipping containers and packing. All refuse shall be removed to the area of the job site set aside for its storage.

I. FLASHING AND SEALING: Flash and counter flash roof and wall penetrations in manner described under other applicable sections of this specification and as approved by the Architect. Conduits, ducts, etc. passing through finished walls shall be fitted with steel escutcheon plates, chrome or paint finish as directed. Conduits which penetrate floor slabs and concrete or masonry walls shall be grouted and sealed watertight at penetration in addition to escutcheon plate trim.

J. Cooperation and Coordination: Cooperate and coordinate with other crafts in putting the installation in place at a time when the space required by this installation is accessible. Works done with disregard to other crafts shall be moved at the Contractor’s expense.

K. TESTING: The entire electrical installation shall be free from short circuits and improper grounds. Test all feeder cables and branch circuit wiring and connections for...
continuity and grounds before any fixtures or equipment are connected and where such tests indicate faulty insulation or other defects, they shall be located, repaired and retested at the Contractor's expense. Electrical load shall be balanced at the panelboards. Rotation of all motors shall be checked and corrected, if necessary, after final connections are made. Demonstrate to the Owner and the Engineer that the entire installation is complete, in proper operating condition and that the Contract has been properly and fully executed.

All signal systems listed and described in Part 2 shall be tested in the presence of the Owner's representative or the enforcing authority as applicable and provide a completion certificate and a successful test report to the Architect. Three copies shall be provided. Provide a minimum of five days notice prior to tests. Repeat tests until a 100% successful test is achieved.

System test shall be performed only by an individual who has attended a manufacturer's training school for installation and testing the system as described herein. Testing of the system shall be performed with the test instruments as required by the manufacturer; testing by means other than the manufacturer's procedures will not be acceptable unless agreed to by the Owner, specifying Engineer and the Manufacturer.

L. ACCEPTANCE BY GOVERNING AUTHORITIES: Upon the completion of the electrical work, and as a condition of its acceptance, this Contractor shall obtain final inspections and acceptance from local building inspection agencies, utility companies, and/or other governing authorities. Deliver to the Owner and the Architect verification of such acceptance.

3.3 COMPLETION:

A. Upon completion of work covered by this Contract, furnish Architect with Mylar transparencies, as required by the General Conditions, upon which shall be shown all changes of feeders, panels, circuits, light fixtures, etc., within building and installed under this contract, which are not in accord with these drawings for the work. Diazo sepia transparencies will not be acceptable.

B. In addition, furnish one tracing showing all outside utility lines, transformer pad, pullboxes, etc., installed under this Contract. Locate and dimension all work with reference to permanent landmarks.

C. All symbols and designations used in preparing "Record" drawings shall match those used in contract drawings. All record drawings shall be produced by CAD using same size of plan and symbols as the project plans. Each Sheet shall have "As-Built Plan" and date printed on it with complete address of the Contractor providing the As-Built plans.

D. Properly identify all stubs for future connections, as to locations and use, by setting of concrete marker at finished grade in the manner suitable to the Architect.

E. Guarantee: Acceptance of the Contract for this work includes this guarantee: The Contractor guarantees that he has performed the work in accordance with the Contract Documents. Contractor agrees to replace or repair, as new, any defective work, materials, or part which may appear within one years of final acceptance, if in the opinion of the Architect or the Owner the defect is due to workmanship or material.
Warranties, guarantees, certificates, etc. that are furnished and available for equipment and materials furnished and installed under this Section shall be properly filled out as of the date of the acceptance of the completed work by the Owner and shall be delivered to the Architect.

END OF SECTION 26 05 00
SECTION 26 05 19 – LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SECTION INCLUDES
   A. Conductors
   B. Lubricants
   C. Splices
   D. Pull Wires
   E. Cable Identification
   F. Signal Conductors

1.2 RELATED SECTIONS
   A. Section 26 05 33: Raceways and Fittings
   B. Section 26 27 26: Wiring Devices
   C. Section 26 50 00: Lighting

1.3 REFERENCES
   A. California Electrical Code 2010 Edition

PART 2 - PRODUCTS

2.1 CABLES
   A. Cables shall be 600V, insulated copper cables, CEC standard Types THW, THWN, THHN, or AVA, as manufactured by Essex, Houston Wire & Cable, American Insulated Wire Corp. or Rome Cable Company, subject to the following:
      1. Branch circuit cables shall be copper cables, Type THWN, unless otherwise noted.
      2. Cables for feeders and branch circuits installed on the roof, when permitted, shall be copper cables, Type THWN/THHN, unless otherwise noted.
      3. Minimum size of all cables shall be #12 AWG unless otherwise indicated on the drawings.
      4. Cables shall be delivered to the site in unbroken packages, plainly marked with the manufacturer’s name, date of manufacture (not more than six months old), voltage size and classification number.
5. All wiring in continuous rows of fluorescent fixtures shall be Type MTW/AWM.

6. MC Cable and AC Cables are not approved on this project.

2.2 LUBRICANT

A. Lubricant for cable installation shall be powdered soapstone, Y-er EAS, Minerallac “Pull In” compound or other U.L. approved lubricant. Flax soap is not approved and not permitted on the job.

2.3 SPLICES

A. Splices of #10 and smaller, including fixture tape, shall be made with “Scotchlok” connectors, T&B “Piggys” or equal.

B. Splices of #8 through #4 shall be split bolt service connectors “Kerneys”, T&B “Lock Tites” or equal, insulated with Scotch #88 or Okeweld four-purpose tape.

C. Splices #2 and larger shall be OZ “ST” Series insulated with “Scotchfill” and Scotch #88 or Okeweld.

D. Splices in underground pull boxes shall be Scotchcast cast resin splices.

E. Wire splicing devices shall be sized according to manufacturer’s recommendations.

2.4 CABLE IDENTIFICATION

A. Non-ferrous identifying tags or pressure sensitive labels shall be securely fastened to all cables, feeders and power circuits in pull boxes and manholes. Tags or labels shall be stamped or printed to correspond with markings on drawings or marked so that feeder or cable may be readily identified.

2.5 PULL WIRES

A. Install a #12 THWN pull cable in all empty conduits 1” size or under and a 3/16” polypropylene rope in all conduits 1-1/4” and larger in trade size.

2.6 SIGNAL CABLES

A. Signal cables shall be as listed on drawings and herein after specified.

B. Connections in terminal cabinets shall be on Siemon #S-66 terminal blocks with #89B bracket.

PART 3 - EXECUTION

3.1 INSTALLATION OF CONDUCTORS

A. See Section 26 05 33, “Execution”.

END OF SECTION 26 05 19
PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Grounding System

1.2 RELATED SECTIONS
A. Section 26 05 33: Raceways and Fittings
B. Section 26 05 19: Low Voltage Cables

1.3 REFERENCES
A. California Electrical Code 2010 Edition

PART 2 - PRODUCTS

2.1 MATERIALS
A. See Section 26 05 19 for Cables.

PART 3 - EXECUTION

3.1 GROUNDING AND BONDING
A. Grounding and bonding shall be installed as required by the applicable codes, rules, regulations, and safety orders. Attention is directed to Article 250 of the California Electrical Code.

B. The secondary side of on-site transformers shall be grounded in the same way as the service.

C. The service neutral and enclosure shall be grounded.

D. All raceway systems, supports, cabinets, switchboard, motor control equipment, motor frames, lighting fixtures and utilization apparatus shall be permanently and effectively grounded.

E. Where the raceway is used as equipment bond, good contact shall be made between conduit or tubing and panels, cabinets, outlet boxes and equipment, lighting fixtures, etc. to maintain continuity of equipment bond. Where it is not possible to obtain good contact, additional bonding shall be provided. Supplemental bonding shall be provided between raceway and enclosures at concentric knockouts and at reducing washers.

F. All non-metallic raceways exclusive of telephone and signal shall contain a code size copper conductor, green insulated, properly bonded to equipment at either end and to metallic portions of the same raceway.

G. All grounding type receptacles shall be bonded to outlet box, using code size copper conductor, green insulated, attached to receptacle grounding terminal and to lug or screw terminal in box.

H. Provide insulated green ground wire, run with the branch circuit conductors in the same raceway, for all circuits feeding isolated ground receptacles.
I. Provide bonding conductor around flexible metallic conduit (Greenfield). Bonding conductor shall be inside flex.

J. Raceway size shall be increased if necessary to accommodate bonding conductors and shall be based on raceway fill tables.

K. Where cabinets are furnished with grounding bus, all required bonding conductors should connect thereto, each with separate lug.

L. Ground all receptacles in patient care and non-patient care areas with an insulated green ground conductor. Installed with branch circuit conductors supplying these receptacles.

END OF SECTION 26 05 26
SECTION 26 05 33 – RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1- GENERAL

1.1 SECTION INCLUDES

A. Raceways
B. Conduit Fittings

1.2 RELATED SECTIONS

A. Section 26 05 19: Low Voltage Cables
B. Section 26 27 26: Wiring Devices

1.3 REFERENCES

A. California Electrical Code 2010 Edition

PART 2- PRODUCTS

2.1 CONDUITS AND FITTINGS:

A. All wiring shall be in raceways. Raceways shall be run underfloor, in walls, above ceilings or exposed as indicated on drawings. Acceptable raceway systems and their limitations of use are as follows:

1. Rigid Steel Conduit may be used in all areas.
   a. Standard weight, zinc coated on outside by hot dipping or sheradized process, with either zinc coating or other approved corrosion resistant coating on the inside.
   b. Fittings shall be threaded and finished similar to conduit. Threadless fittings shall not be used.

2. Electrical Metallic Tubing (EMT):
   a. Rolled steel, zinc coated outside with either zinc-coating or other approved corrosion resistant coating on the inside.
   b. Couplings shall be steel, rain compression type Appleton TWC-CS Series or equal.
   c. May be used:
      (1) Concealed in drywall partitions.
      (2) Exposed in telephone equipment rooms.
      (3) Concealed above furred ceilings.
      (4) Exposed in chiller and boiler rooms.
e. May not be used:

(1) Any location subject to physical damage.
(2) Any other areas not listed under (d) above unless specifically otherwise noted on the plans.

3. Flexible Metal Conduit may be used only for indoor final connections to mechanical equipment (not to exceed 36") and final connections to recessed fluorescent lighting fixtures (not to exceed 72").

a. Minimum trade size - one-half inch (1/2").
b. Connectors - T & B "Tite Bite" insulated.
c. Suitable for connection of recessed fixtures, control and mechanical equipment. Not permitted where exposed to weather or other wet or corrosive conditions.
d. Length shall be a practical minimum, but to allow for movement of equipment connected without restricting flexibility of conduit.

4. Liquid Tight Flexible Metal Conduit - Sealtight: May be used only for outdoor final connections to mechanical equipment.

a. Minimum trade size - one-half inch (1/2").
b. Connectors - Appleton STB Series through two inch trade size and ST Series with insulated bushings over two inch trade size. Appleton, Crouse-Hinds or equal may be used.
c. Length shall be practical minimum, but to allow for movement of equipment connected without restricting flexibility of Sealtight.

5. Poly-Vinyl-Chloride Schedule 40 may not be used.

2.2 BOXES: Boxes shall be of the shape and size best suited for the particular application and shall be supported directly to structural members, framing or blocking by means of screws, anchors, bolts or embedded in masonry.

A. Switch and receptacle box shall be one piece drawn steel boxes. Minimum size shall be four inches (4") square. Boxes shall be fitted with flush device covers, plaster rings, or tile switch rings in masonry. In areas where exposed wiring is permissible, boxes shall be fitted with surface type covers.

B. Lighting outlets shall be four inch (4") octagon, minimum fitted with three-eighths inch (3/8") malleable fixture studs.

C. Floor Boxes: Shall be single service or multi-service as noted on plans. Boxes shall be fully adjustable before and after concrete pour. Boxes shall be furnished with all required accessories for a complete and working installation, including device mounting brackets, both power and communications, trim ring/coverplate or floor port activation kit. Provide power and communications system devices and terminations.

Single service box shall be Wiremold Type Omnibox, cast iron, #880CS1-1 with one gang, brass trim #817B, brass duplex coverplate #828R for power and brass duplex coverplate #828GFITC for communications devices.
Multiple Service box shall be Wiremold type RFB4-CI-1 with coverplate #S38BBTCBK, black finish.

D. Weatherproof boxes shall be Appleton FD Series and fitted with gasketed cast covers.

E. Telephone and television outlet boxes shall be 4-11/16" x 2-1/2" deep minimum, fitted with plaster rings.

F. Boxes for special equipment shall be suitable for the particular equipment.

G. Boxes shall be located and placed according to architectural and structural requirements.

2.3 PULL OR JUNCTION BOXES

A. Install where indicated, or as required by Code, pull boxes and junction boxes of sufficient size and capacity to facilitate all wiring. Boxes shall be fabricated of code gauge steel and sized to properly accommodate all conductors entering same.

2.4 SUPPORTS:

A. Furnish all necessary foundations, supports, backing, etc., for all electrical enclosures, conduits and equipment. Attach all boxes, cabinets, etc. to wood with wood or lag screws, to metal with machine screws or bolts and to concrete with expansion anchors and machine screws or bolts.

B. Electrical lighting fixtures weighing 50 lbs. or more shall not be installed using wood screws for supports to the ceiling. Each such fixture shall have pre-stretched galvanized wires or rods anchored to the roof or structural member of the building.

C. All hangers and supports shall be designed and constructed for the intended purpose.

D. Materials shall be as manufactured by Unistrut, Powerstrut, or approved equal.

E. The use of makeshift materials such as wire or plumber’s tape will not be permitted.

F. Exposed horizontal runs of feeder raceways shall be mounted on trapeze type hangers, secured to the concrete slab with approved type drilled-in-place inserts.

G. Vertical runs of feeder raceways

2.5 TERMINAL CABINETS:

A. Terminal cabinets shall be of panelboard type construction and finish.

B. Trim shall be fitted with hinged door and flush latch.

C. Doors shall provide maximum size openings to box interior.

D. Boxes shall be provided with half inch (2") backboard having a two coat insulating varnish finish.
E. Top of cabinet shall be 6'-6" above finished floor.

F. Flush terminal cabinet installed adjacent to flush panelboards shall be of the same physical size and trim as the panelboard.

G. Terminal cabinets

PART 3 - EXECUTION

3.1 INSTALLATION OF RACEWAYS AND FITTINGS

A. Conceal raceways within ceilings, walls, and floors except where exposed raceways are specifically permitted.

B. Where conduit is allowed to be exposed, install the conduit parallel with or at right angles to structural members, walls, and lines of the building.

C. Install where indicated, or as required by Code, pullboxes and junction boxes of sufficient size to facilitate wiring. Boxes shall be sized to properly accommodate all conductors entering same.

D. Do not install conduit or tubing which has been crushed or deformed.

E. Run conductors of same circuit in same conduit. Run conductors of different voltage systems in separate conduits.

F. Install no conductors until work which might cause damage to such conductor or the conduit has been completed.

G. Keep all conduits at least six inches away from the covering on hot water or steam pipes.

H. Cap raceway ends during construction. Clean or replace conduits in which water or foreign matter have accumulated, to satisfaction of the Architect.

I. Conduits shall be supported with straps, with galvanized malleable split ring and rod for individual runs or with Kindorf or Unistrut channel supports for multiple runs. Distance between supports shall not exceed 10 feet. Conduits shall be supported independently of one another.

J. Conduits run on roof shall be fastened to a 4" x 4" x length as required redwood block set in mastic on roof structure using galvanized double hole straps and screws. Multiple conduit runs shall be gathered neatly in straight lines and fastened individually to the redwood block. Conduit runs on roof are not permitted on this project without specific prior approval of both the Architect and the Engineer.

K. Conduits connected to boxes and cabinets shall be fitted with two locknuts and insulated bushing, OA "A" Series.

L. Conduits not connected with locknuts and bushings shall be fitted with grounding bushing, OZ "BL" Series, U. L. approved and bonded.

M. Conduit stubs underground shall be capped with coupling, nipple, coupling and plug.

N. Conduits connected to boxes, cabinets, etc., exposed to weather or in areas subject to
excessive moisture shall be fitted with watertight sealing hubs of steel or malleable iron with sealing ring and insulated throat, T & B 370 Series, Efcor 40-50B Series or equal.

O. Install insulate bushings on each end of steel conduit 1-1/4" and larger.

P. Conduit straps for individual runs shall be secured by toggle bolts on hollow masonry, expansion shields and machine bolts on solid concrete or masonry, machine screws or bolts on metal surfaces and wood screws on wood construction. The use of nails to anchor straps on wood construction is prohibited. Straps shall be two hole malleable iron or snap-type steel with ribbed back, galvanized or cadmium plated. The use of perforated strap iron or nail type straps is prohibited.

Q. Placement of all boxes shall be governed by applicable architectural and structural requirements.

R. Conduit fittings: Except where otherwise noted, conduit fittings shall be Appleton. Unilets shall be malleable iron and fitted with covers and gaskets.

S. Telephone and signal conduit bends where required shall have a radius of ten times the conduit trade size.

T. Conduit, subject to limitations noted elsewhere in the specifications, may be installed in concrete slab provided prior approval of the Architect is obtained. In such a case, locate conduit in center of slab, unless otherwise instructed. Such conduit shall have an outside diameter less than one-third the thickness of the slab.

U. Conduits shall be capped during construction.

V. Provide pull wires in empty conduits. Size shall be #12 TW in conduits 1" and smaller and 3/16 polypropolene rope in conduits 1-1/4" and larger.

W. Minimum size underground conduit shall be 3/4".

3.2 INSTALLATION OF SUPPORT SYSTEMS:

A. All conduits and fixtures shall be supported in a firm and secure manner as required by code. Materials shall be secured to the structure by means of suitable clamps and hangers specifically designed for the purpose and using machine screws or bolts on metal or wood screws on wood construction.

B. Rigid steel conduit shall be supported at intervals not greater than 10 ft, electrical metallic tubing at intervals not greater than 5 ft.

C. A support shall be provided not more than 3 ft. from any change in direction. Additional supports to those specified above shall be installed where required to suit job conditions and to provide a secure installation. All hangers and supports shall be the products of one manufacturer, as specified in Part 2 of this Section.

3.3 OUTLET, JUNCTION, AND PULL BOXES:

A. All boxes shall be of sufficient size to contain, without crowding, all wires, connections, and devices which may be required in any particular location. Extra deep boxes shall be provided wherever necessary to meet these requirements.

B. Use outlet boxes as pull boxes wherever possible.
C. Provide raised covers as required to suit the type and thickness of wall finish in each location.

D. When other than outlet boxes are employed, pull boxes and covers shall be galvanized steel, code gauge, sized to accommodate wiring and connections. Locate such junction boxes only in equipment rooms, wire closets, and above accessible ceilings.

E. All junction boxes shall be fully accessible according to code.

END OF SECTION 26 05 33
SECTION 26 24 16 – PANELBOARDS

PART 1 - GENERAL

1.1 THIS SECTION INCLUDES

A. Panelboards

1.2 RELATED SECTIONS

A. Section 26 05 26: Grounding and Bonding System
B. Section 26 28 00: Low Voltage Circuit Protective Devices

1.3 REFERENCES

A. California Electrical Code 2010 Edition

PART 2- PRODUCTS

2.1 PANELBOARDS

A. Bussing Assembly and Temperature Rise: Panelboard bus structure and main lugs or main circuit breaker (as shown on drawing) shall have current ratings as shown on the panelboards schedule. Bus structure shall be insulated. Bus bar connections to the branch circuit breakers shall be the phase sequence type and shall accept bolt on circuit breakers. All current carrying parts of the bus structure shall be plated, copper only. Neutral bus and ground bus shall be plated, copper.

B. Circuit breakers: See Section 26 28 00.

C. Cabinets and Fronts: The panelboard bus assembly shall be enclosed in a steel cabinet as specified in UL Standard 50 for cabinets. Wiring gutter space shall be in accordance with UL Standard 67 for panelboards. The box shall be fabricated from galvanized steel or equivalent rust resistant steel. Each front shall include a door and have a flush, cylinder tumbler-type lock with catch and spring-loaded stainless steel door pull. All panelboards locks shall have be keyed alike. Fronts shall have adjustable indicating trim clamps, which shall be completely concealed when the doors are closed. Doors shall be mounted with completely concealed steel hinges. Fronts shall not be removable with door in the locked position. Column width fronts shall have exposed hinges and be screw cover type. A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door. Panelboards shall have door-in-door construction.

PART 3 - EXECUTION

3.1 INSTALLATION OF PANELBOARDS

A. The Contractor shall comply with the following requirements relative to the installation of the panelboards and cabinets under this Section.

B. Panelboards shall be provided with proper gutter space, approved barriers and adjustable supports.
C. Cabinets shall be surface or flush mounted, as specified and provided with single door and trim, complete with concealed hinges.

D. Cabinet fronts shall be fastened to the cabinets with adjustable trim clamps.

E. Multiple pole circuit breakers shall have internal common trip connection. Single pole breakers shall not be tied at handles to form multiple pole breakers. All circuit breakers shall be of the bolt-on type unless otherwise noted.

F. Circuit breakers to be installed within panels to be installed on the roof shall be of the ambient compensated type.

G. Circuit breakers for switching fluorescent lighting and H.I.D. lighting shall be so labeled and rated respectively.

H. Handle "Lock-On” devices shall be furnished for ten percent (10%) of the circuit breakers.

I. Surface mounted cabinets shall be finished to match trim.

J. Semi-recessed panels shall be fitted with a wood or metal escutcheon providing neat return to wall finish, flush with edge of trim.

K. Cabinets and switchboard shall be fitted with copper grounding bus, similar to neutral bus, not insulated from enclosure. Bus shall be complete with lugs.

L. Wall mounted cabinets shall be mounted with top of cabinet 6'-6" above finished floor.

M. Cabinets, doors and trim shall be finished is ASA 61 or standard factory gray enamel.

N. Conduits shall enter cabinet through neat hole and perpendicular to entrance face.

O. Panelboard directories shall be typewritten and conform to room description (not plan numbers).

P. Conductors shall be neatly laced with T & B Ty-raps.

Q. Nameplates shall be as hereinbefore specified.

R. Recessed cabinets shall be provided with a minimum of (3) 3/4" empty conduits stubbed into accessible space. Drawings may require additional conduits.

S. Busses shall extend full length of useable space of distribution sections.

END OF SECTION 26 24 16
SECTION 26 27 26 – WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES
   A. Wiring Devices

1.2 RELATED SECTIONS
   A. Section 26 05 19: Low Voltage Cables

1.3 REFERENCES
   A. California Electrical Code 2010 Edition

PART 2 - PRODUCTS

2.1 WIRING DEVICES: Units shall be equal to the devices set forth herein, in standard colors (brown, white, grey, beige, red, or ivory) as selected by the Architect:
   A. WIRING DEVICES  LEVITON#  HUBBELL#
      Single pole switch  1221  1221
      Double pole switch  1222  1222
      Three way switch  1223  1223
      Duplex conv out 15A  5262  5262
      Duplex conv out 20A  5361  5361
      Isol ground outlet  5262IG  IG5262

2.2 DEVICE PLATES
   A. All device plates for flush mounted devices shall be Hubbell nylon or approved equal unless otherwise noted. All device plates for devices controlling emergency power circuits or are fed by emergency power shall have red coverplates.
   B. Install multiple gang plates where devices are grouped.
   C. Furnish in color per Architect. See exception in Item A above.
   D. Device covers for surface mounted boxes shall be raised steel plates.
   E. Outdoor receptacle plates shall be Sierra line stainless steel.

PART 3 - EXECUTION

3.1 GENERAL
   A. See Section 26 05 00 for Basic Execution methods.

3.2 INSTALLATION OF WIRING DEVICES
   A. Devices shall be installed 18" above finished floor unless otherwise noted.
   B. Devices on walls above countertops shall be installed 4" above countertop surface or backsplash.
C. Verify exact location of all outlets with architectural plans, cabinetry, equipment connections, etc, prior to rough-in.

D. Grounding type receptacles shall be installed with the grounding pin up above the hot and neutral pins.

E. Outlets installed outdoors shall be provided with weatherproof snap type coverplate.

F. Outlets installed outdoors in bathrooms, rooftops and in breakroom shall be GFI type, except outlets in breakroom which are dedicated to specific appliances.

END OF SECTION 26 27 26
SECTION 26 50 00 – EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SECTION INCLUDES
   A. Lighting outdoors.

1.2 RELATED SECTIONS
   A. Section 26 27 26: Wiring Devices

1.3 REFERENCES
   A. California Electrical Code 2010 Edition
   B. I. E. S. Lighting Standards, 10th Edition
   C. ASTM
   D. California Title 24
   E. Cal Green

PART 2 - PRODUCTS

2.1 LIGHTING FIXTURES
   A. Units shall be as designated in the Lighting fixture schedule on the drawings. All fixtures shall bear the Underwriters’ Laboratories label. All fluorescent fixtures shall be equipped with CBM-ETL certified ballasts provided with internally mounted automatic reset thermal protector and silver plated sockets.
   B. Fixtures mounted against combustible material shall be approved for such installation.
   C. All equipment or materials for any one system shall be furnished by the same manufacturer. Items such as lamps, conduits fittings, and wiring devices shall be the same throughout the job.
   D. Fixtures shall be complete with lamps, all fitting, accessories, and supports necessary for a complete and operable installation.
   E. Pole mount fixtures shall have all the accessories required for mounting on the poles specified.

2.2 LIGHTING CONTROLS
   A. Photo cell as manufactured by Intermatic “K4100” Series.
   B. Time Clock shall be Paragon, 7 day programmable, 2 channel, with Lithium battery backup # EC72 or equal.
   C. Lighting contactors shall be as manufactured by Square D Co. Type “SMG”, electrically held, with number of poles per plans. Provide housing as noted on plans.
PART 3 - EXECUTION

3.1 GENERAL

A. See Section 26 05 00 for Basic Execution methods.

3.2 INSTALLATION OF LIGHTING FIXTURES

A. For building mount fixtures, verify with Architect mounting heights of all light fixtures.

B. Install lighting fixtures in accordance with code requirements.

C. Provides all supports for lighting fixtures in accordance with code requirements for installation in earthquake Zone 4.

D. Lamp all new fixtures with lamps of the designed rating and pattern as noted on the plans. Lamps utilized in excess of 12 hours shall be replaced with new lamps immediately before project acceptance by the owner.

E. Set all controls as noted on plans and directed by owner in field.

3.3 CLEANING:

A. On completion of the work, all fixtures and lenses shall be left clean. Any minor damage or scratches shall be touched up to the satisfaction of the Architect.

END OF SECTION 26 50 00
SECTION 26 51 00 – INTERIOR LIGHTING

PART 1- GENERAL

1.1 SECTION INCLUDES
   A. Lighting indoor.

1.2 RELATED SECTIONS
   A. Section 26 27 26: Wiring Devices

1.3 REFERENCES
   A. California Electrical Code 2010 Edition
   B. I. E. S. Lighting Standards, 10th Edition
   C. California Title 24

PART 2 - PRODUCTS

2.1 LIGHTING FIXTURES
   A. Units shall be as designated in the Lighting fixture schedule on the drawings. All fixtures shall bear the Underwriters’ Laboratories label. All fluorescent fixtures shall be equipped with CBM-ETL certified ballasts provided with internally mounted automatic reset thermal protector and silver plated sockets. Additionally:
   B. Fixtures mounted against combustible material shall be approved for such installation.
   C. Recessed fixtures installed in fire rated ceilings shall have housing approved by the State Fire Marshal. Recessed fixtures shall be supported to satisfy earthquake requirements.
   D. All equipment or materials for any one system shall be furnished by the same manufacturer. Items such as lamps, conduits fittings, and writing devices shall be the same throughout the job.
   E. Fixtures shall be complete with all fitting, accessories, and supports necessary for a complete and operable installation.

2.2 BALLASTS:
   A. Fluorescent fixtures ballasts shall be UL-listed energy conserving solid-state type, as noted on the Drawings or approved equal.
   B. Replace ballasts, which in the opinion of the Architect are excessively noisy, with acceptably quiet units without cost to the Owner.
   C. Ballasts shall be equipped with automatic reset thermal protectors.
   D. Ballasts shall be designed for rapid-start lamps, electronic, reduced harmonic, high power factor or as required and as shown on the Drawings.
   E. Acceptable manufacturers: Advance, Universal, General Electric, Sylvania.
INTERIOR LIGHTING

2.3 LAMPS:

A. Fluorescent lamps shall be energy-conserving type, Sylvania, General Electric, or Philips or approved equal, as noted on Drawings.

B. Incandescent lamps shall be inside-frosted except where otherwise noted, rated at 130 V.

C. All fluorescent lamps shall be 4100K with a CRI of 85 unless otherwise noted.

D. Lamps shall be new and operating at the same time of acceptance. Lamps with less than 170 hours operation on the site shall be considered new.

2.4 FLUORESCENT FIXTURE LENSES:

A. Manufacturers: Carolite, KSH, or Plaskolite.

B. Domestic origin, 100% virgin acrylic, high molecular weight

C. Pattern as specified under fixture description

D. Crowned to prevent sag

E. 1/8' normal thickness

2.5 OCCUPANCY MOTION SENSOR LIGHTING CONTROL SYSTEM:

A. General requirements:

1. Provide a complete and fully operational occupancy motion sensor lighting control system in classrooms, and other rooms as specified herein and shown on the drawings.

2. The complete system shall be comprised of ultrasonic and infrared sensors, power packs, slave packs, automatic motion sensor wall switches, wall light switches and relays as required.

3. All equipment and items of control shall be installed and wired in accordance with manufacturer’s requirements. Particular attention shall be given to placement of sensors in the rooms to provide maximum coverage and minimize false “ON’s” and “OFF’s”. To this respect, coordinate sensor placement with HVAC duct registers to keep sensors a minimum of six feet from the sensors. Provide additional sensors to those shown in rooms on prints where deemed necessary to obtain maximum coverage.

4. Final connections, testing, adjusting, and calibration shall be made under the direct supervision of factory-trained technician of the system supplier and in the presence of the owner and Engineer. Such testing and adjustment to be carried out after furniture has been placed in the room.

5. Provide a minimum of five days of notice for such test. Testing and adjustments shall be carried out until an acceptable setting and operation is achieved. Any device which fails to work satisfactory shall be replaced the same day as the test. Contractor shall make sure he has available spares on hand to enable this to happen.
6. The system shall be as manufactured by the Legrande, Leviton, Hubbell or approved equal.

B. Scope of function:

1. Automatically switch off lighting when controlled space becomes unoccupied. Switch on lights when the space is re-occupied. All sensors shall be provide with user adjustable time delay (15 sec to 15 minutes) for “switch-off” function and adjustable sensitivity. Sensors shall be UL listed and approved by the California Energy Commission.

2. Provide additional wall light switches to switch off the lights when the space is occupied and it is required to switch off the lights in the controlled spaces.

C. Equipment: The following equipment as manufactured by Leviton is specified to determine quality and standard of product to be installed on this project. All substitute products shall have equal performance capability and quality.

Classroom/large room sensor:

Ceiling mount, dual technology combination infrared/ultra sonic sensor as Leviton #OSC20-MOW.

Wall mount, dual technology combination infrared/ultra sonic sensor as Leviton #OSW12-MOW.

Small office/room sensor wall switch:

Passive infrared as Leviton # ODS-15 Color per Architect.

Power Rack: Leviton #OSP20

Slave Rack: Leviton #OSA20

D. Shop Drawings: Provide shop submittals in accordance with Section 16100, Paragraph 11.

E. Low Voltage Wiring: Low voltage wiring is not required to be in conduit in accessible spaces. Provide conduit for inaccessible space.

F. Spares: Provide one each spare of each type of device to the owner.

PART 3 - EXECUTION

3.1 GENERAL

A. See Section 26 05 00 for Basic Execution methods.

3.2 INSTALLATION OF LIGHTING FIXTURES

A. Fixtures shall be free from any undesirable hum, vibration and/or other noises. Fixtures that are installed and are found unsatisfactory in the opinion of the Architect shall be removed and replaced at the Contractor's expense.
B. Fixtures shall be installed in true lines and all continuous row fixtures shall be installed as recommended by the fixture manufacturer.

C. Install lighting fixtures in accordance with code requirements.

D. Refer to reflected ceiling plan on Architectural Drawings for the exact location of ceiling grid and lighting fixtures. Do not scale electrical drawings.

E. All suspended fixtures shall be braced seismically to prevent swinging of fixture where such fixture will hit any obstruction if permitted to swing up 45 degrees from the vertical in any direction. Bracing shall be of a type and nature as approved by the AHJ.

F. Provides all hanger and supports for lighting fixtures in accordance with code requirements for installation in earthquake Zone 4.

G. Fixtures shall be equal in design, quality, utility, material and workmanship to those specified and shall have been tested and approved by all necessary authorities and agencies before being submitted for approval.

H. Lamp all new fixtures with lamps of the designed rating and pattern as noted on the plans. Lamps utilized in excess of 170 hours shall be replaced with new lamps immediately before project acceptance by the owner.

3.3 CLEANING:

A. On completion of the work, all fixtures and lenses shall be left clean. Any minor damage or scratches shall be touched up to the satisfaction of the Architect.

END OF SECTION 26 51 00
SECTION 27 00 00 – COMMUNICATIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES
   A. Telephone and Data system raceways and boxes only.

1.2 RELATED SECTIONS
   A. Section 26 05 00: Common Work Results for Electrical.
   B. Related work not included: Cables and equipment for telephone and data systems.

1.3 REFERENCES/STANDARDS/CODES

PART 2 - PRODUCTS

2.1 TELEPHONE/DATA SYSTEM:
   A. Scope: Provide all labor and materials for a partial raceway system and cabinets/backboards for the Telephone/Data System.
   B. System Equipment, racks, devices and cables shall be provided by Owner approved vendor.
   C. Owner’s vendor to provide and terminate all cables on devices and control panel.
   D. Coordinate with Owner’s vendor to determine exact raceways and boxes required and provide the same.

PART 3 – EXECUTION

3.1 INSTALLATION OF TELEPHONE/DATA SYSTEM:
   A. Review the total point to point wiring layout to assure that the correct type and size of conduit is installed.
   B. Final connections, testing, adjusting and calibration shall be by Owner’s vendor.

END OF SECTION 27 00 00
SECTION 31 22 00 – EXCAVATING, FILLING, COMPACTING & GRADING

PART 1 - GENERAL

1.1 SUMMARY:
Excavate, backfill, compact, and grade the site to the elevations shown on the Drawings, and as specified herein.

1.2 GENERAL REQUIREMENTS:
This Section shall be performed in accordance with the General Conditions, Supplementary Conditions and all Sections in Division 1 of these Specifications. These documents must be read with the other Contract Documents and Sections as a whole to complete the intent of the contract.

1.3 SUBMITTALS:
Make submittals to the Owner's Representative in accordance with the provision of Section 013323 of these specifications.

PART 2 - PRODUCTS

2.1 FILL MATERIAL:
All fill material shall be subject to approval of the Owner's Representative. All fill material shall be soil or soil-rock mixture which is free from organic matter and other deleterious substance. It shall be of granular nature with sufficient binder to form a firm and stable, unyielding subgrade. It shall contain no rocks or lumps over three inches in greatest dimension. Engineered fill shall have a minimum R value of 40, a maximum Plasticity index of 8, passing the #4 sieve 100%, passing the #200 sieve 3% maximum. Fill shall have a coefficient of expansion of not more than 3% from air dry to saturation under a surcharge of 60 pounds per square foot at 90% compaction. Provide fill material per requirements of the Soils Report.

2.2 ON-SITE FILL MATERIAL:
All on-site fill material shall meet the requirements of Article 2.1 above. Adobe and clay soils will not be acceptable.

2.3 IMPORTED FILL MATERIAL:
All imported fill material shall meet the requirements of Article 2.1 above. Adobe and clay soils will not be acceptable. For approval of imported fill material, notify the Owner's Representative at least four (4) working days in advance of intention to import material, designate the proposed borrow area, and permit the Owner's Representative to sample as necessary from the borrow area for the purpose of making acceptance tests to prove the quality of the material.

2.4 GRANULAR CUSHION:
Granular cushion under interior concrete slabs on grade shall be clean mineral aggregate with particle size grading within the following limits:

- Passing the one inch mesh: 100%
- Passing the number four sieve: not more than 5%
- Passing the number 200 sieve: not more than 1%
2.5 STRUCTURAL BACKFILL:
Provide cohesionless sand material free from organic material.

2.6 TOPSOIL
Where and if shown on the Drawings or otherwise required, provide topsoil consisting of friable, fertile soil of loamy character, containing an amount of organic matter normal to the region, capable of sustaining healthy plant life, and reasonably free from subsoil, roots, heavy or stiff clay, stones larger than 2" in greatest dimension, noxious weeds, sticks, brush, litter, or other deleterious matter. Obtain topsoil from sources within the project limits, or provide imported topsoil obtained from sources outside the project limits, or from both sources.

2.7 OTHER MATERIALS:
All other materials, not specifically described but required for proper completion of the work of this Section, shall be as selected by the Contractor subject to the approval of the Owner’s Representative.

PART 3 - EXECUTION

3.1 FINISH ELEVATIONS AND LINES:
Secure the services of a licensed land surveyor or other experienced personnel for setting and establishing finish elevations and lines. Carefully preserve all data and all monuments set and, if displaced or lost, immediately replace to the approval of the Owner's Representative and at no additional cost to the Owner.

3.2 UTILITIES:
A. Unless shown to be removed, protect active utility lines shown on the Drawings or otherwise made known to the Contractor prior to excavation. If damaged, repair or replace at no additional cost to the Owner.

B. If active utility lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly notify the Owner's Representative and take necessary steps to assure that service is not interrupted.

C. If service is interrupted as a result of work under this Section, immediately notify the Owner’s Representative and restore service by repairing the damaged utility.

D. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Owner's Representative and secure his instructions.

E. Do not proceed with permanent relocation of utilities until written instructions are received from the Owner's Representative.

3.3 PROTECTION OF PERSONS AND PROPERTY:
A. Barricade open holes and depressions occurring as part of the work, and post warning lights on property adjacent to or within public access. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage.
caused by settlement, lateral movement, washout, and other hazards created by operations under this section.

C. Protect trees and shrubs designated to remain.

3.4 DEWATERING:
Remove all water, including rain water, encountered during trench and sub-structure work to an approved location by pumps, drains, and other approved methods. Keep excavations and site construction area free from water.

3.5 EXCAVATING:
A. Perform excavating of every type of material encountered within the limits of the Work to the lines, grades and elevations indicated on the Drawings and specified herein. Where excavation grades are not shown on the Drawings, excavate as required to accommodate the installation.

B. Surplus materials:
Dispose of excavated material away from the site.

C. On-Site Fill:
Where excavated materials meet the standard of 2.01, Fill Materials, and are to be used for fill in this work, transport to and place in fill or storage areas within limits of the work.

D. Unsatisfactory excavated materials:
In the excavation where unsatisfactory materials are encountered at grades required for the work, excavate to a distance below grade as directed by the Owner's Representative, and replace with satisfactory materials.

E. Excavation of rock:
1. Subject to the approval of the Owner's Representative, rock encountered in the excavation may be broken into pieces not larger than three inches in maximum dimension and be incorporated in the fill material.
2. Remove from the site all rock larger than 3" in maximum dimension. Rocks and stones larger than 1/2" in maximum dimension will not be permitted within the top 12" of finished grade in those areas outside of building and paved areas.
3. Do not use explosives without the written permission from the Owner's Representative.

F. Excavate and backfill in a manner and sequence that will provide proper drainage at all times.

G. Unauthorized excavation:
1. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific instruction from the Owner's Representative.
2. Under footings, foundations or retaining walls, fill unauthorized excavations by extending the indicated bottom elevation of the footing or base to the excavation bottom, without altering the required top elevation. When acceptable to the Owner's Representative, lean concrete fill may be used to bring the bottom elevation to proper elevation.
3. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations, unless otherwise directed by the Owner's Representative.

H. Stability of excavations:
1. Slope sides of excavations to 1:1 or flatter, unless otherwise directed by the Owner's Representative. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.
2. Shore and brace where sloping is not possible because of space restrictions or stability of the materials being excavated.

I. Shoring and bracing:
Provide materials for shoring and bracing as may be necessary for safety of personnel, protection of work, and compliance with requirements of governmental agencies having jurisdiction. Maintain shoring and bracing in excavations regardless of the time period excavations will be open. Carry shoring and bracing down as excavation progresses.

J. Excavating for structures:
1. Conform to elevations and dimensions shown within a tolerance of 0.10 ft., and extending a sufficient distance from footings and foundations to permit placing and removing concrete formwork, installation of services, other construction required, and for inspection.
2. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand tools to final grade just before concrete is placed. Trim bottoms to required lines and grades to leave solid base to receive concrete.
3. Excavate for footings and foundations only after general site excavating, filling, and grading are complete.

K. Excavating for pavements:
Cut surface under pavements to comply with cross sections, elevations, and grades.

L. Cold weather protection:
Protect excavation bottoms against freezing when atmospheric temperature is less than 35°F.

3.6 FILLING AND BACKFILLING
Place acceptable soil material in layers to required subgrade elevations. Use satisfactory on-site or imported materials.

A. Backfill excavations as promptly as progress of the Work permits, but not until completion of the following:
1. Acceptance of construction below finish grade.
2. Inspecting, testing, approving and recording locations of underground utilities.
3. Removing concrete formwork.
4. Removing shoring and bracing, and backfilling of voids with satisfactory materials.
5. Removing trash and debris.
6. Placement of horizontal bracing on horizontally supported walls.
B. Ground surface preparation:
   1. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious matter from ground surface prior to placement of fills.
   2. Plow, strip, or break up sloped surfaces steeper than one vertical to four horizontal so that fill material will bond with existing surface.
   3. When existing ground surface has a density less than that specified under "compacting" for the particular area, break up the ground surface, pulverize, moisture-condition to the optimum moisture content, and compact to required depth and percentage of maximum density.
   4. At exposed soils in areas to be paved, scarify to a minimum depth of 8", and recompact at a moisture content that will permit proper compaction as specified for fill.

C. Placing fill:
   1. Place backfill and fill materials in layers not more than 8" in loose depth.
   2. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content.
   3. Do not place backfill or fill material on surfaces that are muddy, frozen or contain frost or ice.
   4. Place backfill or fill material evenly adjacent to structures, to required elevations.
   5. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around the structure to approximately the same elevation in each lift.

3.7 GRADING:

A. Uniformly grade the areas within the limits of grading under this Section, including adjacent transition areas. Smooth the finished surfaces within specified tolerance.

B. Where a change of slope is indicated on the Drawings, construct a rolled transition section having a minimum radius of approximately 8’0”, unless adjacent construction will not permit such a transition, or if such a transition defeats positive control of drainage.

C. Grade areas adjacent to buildings to achieve drainage away from the structures, and to prevent ponding. Finish the surfaces to be free from irregular surface changes and shape the surface of areas scheduled to be under walks and pavement to line, grade, and cross-section, with finished surface not more than 0.10 ft. above or below the required subgrade elevation.

3.8 COMPACTATION

A. Control soil compaction during construction to provide the minimum percentage of density specified for each area as determined according to ASTM D1557.

B. Provide not less than the following maximum density of soil material compacted at optimum moisture content for the actual density of each layer of soil material in place and as approved by the soil engineer.
   1. Structures: Compact the top 6” of subgrade and each layer of fill material or backfill material to a minimum of 90% of maximum dry density.
2. Lawn and unpaved areas: Compact each layer of fill material or backfill material to a minimum of 90% maximum dry density. Compact the upper 12" of filled areas, or natural soils exposed by excavating, to a minimum of 85% of maximum dry density.

3. Walks: Compact the top 6" of subgrade and each layer of fill material or backfill material to a minimum of 90% of maximum dry density.

4. Pavements: Compact the top 6" of subgrade and each layer of fill material or backfill material to a minimum of 95% of maximum dry density.

C. Moisture control:
1. Where subgrade or layer of soil material must be moisture conditioned before compacting, uniformly apply water to surface of subgrade or layer of soil material to prevent free water appearing on surface during or subsequent to compacting operations.
2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compacting to the specified density.
3. Soil material that has been removed because it is too wet to permit compacting may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value as determined by moisture-density relation tests approved by the Owner's Representative.

D. Field Quality Control:
Secure the Owner's Representative's approval of subgrades and fill layers before subsequent construction is permitted thereon. If, in the Owner's Representative's opinion, based on reports of the testing laboratory, subgrade or fills which have been placed are below specified density, provide additional compacting to meet compaction standards.

3.9 MAINTENANCE:
A. Protect newly graded areas from traffic and erosion, and keep free from trash and weeds. Repair and reestablish grades in settled, eroded and rutted areas to the specified tolerances.

B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.

3.10 PLACING GRANULAR CUSHION:
Carefully place the granular cushion where shown on the Drawings, attaining the indicated thicknesses uniformly, and providing all required transition planes.

3.11 CLEAN UP:
Upon completion of the work of this Section, remove all debris resulting from operations. Remove surplus equipment and tools. Leave the site in a neat and orderly condition acceptable to the Owner's Representative.

END OF SECTION 31 22 00
SECTION 32 10 00 – SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY: Remove site features and clear the site as shown on the Drawings and specified herein.

1.2 GENERAL REQUIREMENTS: This Section shall be performed in accordance with the General Conditions, Supplementary Conditions and all Sections in Division 1 of these Specifications. These documents must be read with the other Contract Documents and Sections as a whole to complete the intent of the contract.

1.3 SUBMITTALS: Make submittals to the Owner’s Representative in accordance with the provisions of Section 013323 of these specifications.

1.4 SECTION REQUIREMENTS

A. Traffic: Minimize interference with adjoining parking lot, walks, and other adjacent occupied or used facilities during site demolition and clearing operations. Provide safety devices such as cones, barricades, tape, etc. as required to safely divert vehicular and pedestrian traffic around the project area.

B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

C. Notify utility locator service for area where Project is located before site demolition and clearing.

D. Do not begin demolition and site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance.

B. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, in accordance with the erosion control plan and San Joaquin County Standards.

C. UTILITIES:

1. Unless shown to be removed, protect active utility lines shown on the Drawings or otherwise made known to the Contractor prior to excavation. If damaged, repair or replace at no additional cost to the Owner.

2. If active utility lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly notify the Owner's
Representative and take necessary steps to assure that service is not interrupted.

3. If service is interrupted as a result of work under this Section, immediately notify the Owner's Representative and restore service by repairing the damaged utility.

4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Owner's Representative and secure his instructions.

5. Do not proceed with permanent relocation of utilities until written instructions are received from the Owner's Representative.

D. Protection of persons and property:

1. Barricade open depressions and holes occurring as part of this Work, and post warning lights on property adjacent to or within public access. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by operations under this section.

E. Protect trees and shrubs, where indicated to remain, by providing a fence around the tree or shrub of sufficient distance away and of sufficient height so trees and shrubs will not be damaged in any way as part of this Work.

3.2 SITE CLEARING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots. Clean out roots 1” in diameter and larger to a depth of at least 12” below the existing ground surface or subgrade of new graded surface, whichever is lower. Treat roots remaining in the soil with a weed killer approved by the Owner's Representative.

B. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

C. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Neatly saw-cut length of existing pavement and sidewalk to remain before removing existing pavement.

D. In areas not to be further excavated, fill depressions resulting from site clearing. Place and compact satisfactory soil materials in 6-inch- (150-mm-) thick layers to density of surrounding original ground.

E. Dispose of waste materials, including trash, debris, and excess topsoil, off Owner's property. Burning waste materials on-site is not permitted.

3.3 UTILITIES

Coordinate with utility companies and agencies as required. Where utility cutting, capping or plugging is required, perform such work in accordance with requirements of the utility company or governmental agency having jurisdiction.
SECTION 32 12 16 – ASPHALT PAVING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Asphaltic concrete paving, wearing, binder and base course.
   2. Surface sealer.
   3. Aggregate subbase course.

1.2 REFERENCES

A. Asphalt Institute:
   1. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot- Mix Types.

B. ASTM International:

1.3 PERFORMANCE REQUIREMENTS

A. Paving: Designed for patch paving.

1.4 SUBMITTALS

A. **Product** Data: Submit product information and mix design.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with San Joaquin County Standards.

B. Mixing Plant: Conform to San Joaquin County Standards.

C. Obtain materials from same source throughout.
1.6 ENVIRONMENTAL REQUIREMENTS
   A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
   B. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 – PRODUCTS

2.1 MATERIALS
   A. Asphalt Cement: In accordance with San Joaquin County Standards.
   B. Aggregate for Base Course Mix: In accordance with San Joaquin County Standards.
   C. Aggregate for Wearing Course Mix: In accordance with San Joaquin County Standards.
   D. Tack Coat: In accordance with San Joaquin County Standards.

2.2 ASPHALT PAVING MIX
   A. Use dry material to avoid foaming. Mix uniformly.
   B. Base Course: In accordance with San Joaquin County Standards.
   C. Wearing Course: In accordance with San Joaquin County Standards.

2.3 SOURCE QUALITY CONTROL AND TESTS
   A. Section 01 45 00 - Quality Control: Testing, inspection and analysis requirements.
   B. Submit proposed mix design of each class of mix for review prior to beginning of Work.

PART 3 – EXECUTION

3.1 EXAMINATION
   A. Verify existing conditions before starting work.
   B. Verify compacted subgrade subbase is dry and ready to support paving and imposed loads.
   C. Verify gradients and elevations of base are correct.
   D. Verify gutter drainage grilles and frames, manhole frames, and are installed in correct position and elevation.

3.2 SUBBASE
   A. Prepare subbase in accordance with San Joaquin County Standards.

3.3 PREPARATION – PRIMER
   A. Apply primer in accordance with San Joaquin County Standards.
3.4 PREPARATION - TACK COAT
   A. Apply tack coat in accordance with San Joaquin County Standards.

3.5 PLACING ASPHALT PAVEMENT - SINGLE COURSE
   A. Install Work in accordance with San Joaquin County Standards.
   B. Place asphalt within twenty-four (24) hours of applying primer or tack coat.
   C. Place asphalt wearing course as indicated on the Plans.
   D. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
   E. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.6 PLACING ASPHALT PAVEMENT - DOUBLE COURSE
   A. Place wearing course within twenty-four (24) hours of placing and compacting binder course. When binder course is placed more than twenty-four (24) hours before placing wearing course, clean surface and apply tack coat before placing wearing course.
   B. Compact each course by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
   C. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.7 TOLERANCES
   A. Section 01 43 00 - Quality Assurance: Tolerances.
   B. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
   C. Scheduled Compacted Thickness: Within 1/4 inch.
   D. Variation from Indicated Elevation: Within 1/2 inch.

3.8 FIELD QUALITY CONTROL
   A. Section 01 45 00 - Quality Control: Field inspecting, testing, adjusting, and balancing.

3.9 PROTECTION OF FINISHED WORK
   A. Section 01 77 00 - Closeout Procedures: Protecting finished work.
   B. Immediately after placement, protect pavement from mechanical injury for forty-eight (48) hours or until surface temperature is less than 140 degrees F.

END OF SECTION 32 12 16