SECTION 00001

TITLE PAGE

Contra Costa Community College

Diablo Valley College

D-1045E Library Boiler/Chiller Retrofit Plus Pumping VFDs

and

D-1033 Library Building HVAC
SECTION 06007
SIGNATURE SHEET
FOR
DIABLO VALLEY COLLEGE PROP 39
LIBRARY BOILER CHILLER & AHU
REPLACEMENT
CONTRA COSTA COMMUNITY COLLEGE DISTRICT

ALFA-TECH
Mechanical & Plumbing Engineer
Tim Chadwick M29729

DIVISION OF THE STATE ARCHITECT

S. MARK FISHER
Electrical Engineer
Mark Fisher E16525

HOHBACH-LEWIN
Structural Engineer
Dan Lewin S3272

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT

O'115191
AC 123456789
DATE 10/19/15
SECTION 00010

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DIVISION 02   SITEWORK

LIMITED HAZARDOUS MATERIALS ABATEMENT SPECIFICATION
DIABLO VALLEY COLLEGE
LIBRARY HVAC UPGRADE

MECHANICAL SPECIFICATIONS
INDEX

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SECTION 00015
PROJECT DIRECTORY

ARCHITECT:
None

STRUCTURAL ENGINEER:
Hohbach-Lewin, Inc.
260 Sheridan Avenue, Suite 150
Palo Alto, CA 94306
(650) 617-5930

MECHANICAL/ELECTRICAL/PLUMBING ENGINEER:
Alfa Tech, Inc.
1321 Ridder Park Drive, #50
San Jose, CA 95131
(408) 487-1200

OWNER:
Contra Costa Community College District
500 Court Street
Martinez, CA 94553

FACILITIES PLANNING:
P.J. Roach, Facilities Project Manager
(925) 229-6845
Ray Pyle, Chief Facilities Planner
(925) 229-6842

DVC – BUILDINGS & GROUNDS:
Tony Melendrez, Facilities Manager
(925) 969-2055
John Nahlen, V.P. Business & Administrative Services
(925) 969-2018

END OF SECTION 00015
NOTICE IS HEREBY GIVEN that the Governing Board of the Contra Costa Community College District (District), Martinez, California, will receive sealed bid proposals for the furnishing of all labor, materials, equipment, transportation and services for the construction of the projects entitled D-1045 Library Building HVAC.

Construction Cost Estimate (Range): $1,200,000.00 to $1,500,000.00; License Required: A- General Engineering; B-General Building Contractor; C-20 Warm-Air Heating, Ventilating and Air-Conditioning Contractor

In general, the Work consists of replacing the existing heating hot water boiler, water cooled chiller, cooling tower, and air handling unit with newer, higher efficiency models; replacing the heating hot water circulation pumps, chilled water pump, and condenser water pump; modifying and replacing associated hot water, chilled water, and condenser water piping; removing unnecessary supply and return ductwork for the air handling unit; and installing associated systems controls. Install new main building switchboard. All work occurs in an occupied building therefore temporary equipment will be required.

Project Documents including but not limited to plans, specifications, addenda, bidders lists, bid results, etc. can be viewed online at the Contra Costa Builders Exchange at: http://onlineplanservice.com/PublicWorks/ProjectList.aspx?Agency=20

The viewing software is free and can be downloaded from the website. If you are interested in receiving project notifications automatically, please register by clicking on the “Register” button on the Project Details page. Plan page copy service is available and can be ordered online through the Contra Costa Builders Exchange. Please feel free to contact the Contra Costa Builders Exchange at: 2440 Stanwell Drive, Suite “B”, Concord, California 94520, Tel: (925) 685-8630.

Hard copies of plans and specifications shall be available for purchase at ARC located at 5753 Pacheco Blvd., Pacheco, California, Phone: (925) 682-6930. To purchase plans at ARC’s Public Planroom website use the link: https://order.e-arc.com/arcEOC/PWELL_Main.asp?mem=23. Go to the Public Planroom for access to the documents without a login required. Payment for hardcopies shall be the responsibility of the bidder, and shall be made directly to ARC. The District does not provide hardcopies of bid documents or reimburse cost of printing, delivery, or any expenses related to the bidding process.

For information directly from the District, you may also log in to the District Website: http://www.4cd.edu/webapps/bids. Project documents available include but are not limited to plans, specifications, addenda, bidders lists, bid results, etc., and can be viewed on this District webpage.

All questions related to this project must be in writing and are directed to:

Jovan Esprit, Contract Manager
Contra Costa Community College District
500 Court St., Martinez, CA 94553
Email: jesprit@4cd.edu;
Facsimile: 925-229-6959
Each bid shall be made on the bid form, which is included in the Bid Documents and when submitted, shall be accompanied by a Bid Bond or Certified Cashier’s Check in the amount of 10% of bid (made payable to the Contra Costa Community College District). The District reserves the right to forfeit Bid Bond submitted for failure of the successful bidder to secure Payment & Performance Bonds.

**Important Information:**
- **Pre-Bid Meeting and Job Walk, Date / Time:** Friday, February 19th at 10:00 AM (MANDATORY)
- **Pre-Bid Meeting and Job Walk, Location:** DVC Library, 321 Golf Club Road, Pleasant Hill, CA 94523
- **Last Date / Time for Bidder Questions:** February 25, 2016 prior to 5:00 PM
- **Last Day to Issue Addendum:** March 2, 2016
- **Bids Due No Later Than, Date / Time:** Wednesday, March 9, 2016 prior to 2:00 PM
- **Bids Must Be Received at:** Contra Costa Community College District (Lobby) 500 Court St, Martinez, CA 94553

**Attn:** Jovan Esprit – Contracts Manager (CCCCD)

Bids must be received by the District prior to the time and by the date noted above. Bids that are not received by the District prior to the time and by the date noted above will not be accepted or will be returned to the Bidder unopened.

The successful bidder will be required to furnish a labor and material bond in an amount equal to one hundred percent (100%) of the contract price and a faithful performance bond in an amount equal to one hundred percent (100%) of the contract price, said bonds to be secured from a surety company acceptable to the Contra Costa Community College District and authorized to execute such surety in the State of California.

This project is a public works project and is subject to prevailing wage rate laws. A copy of the prevailing rates of wages is on file with the Contracts & Purchasing Office of the Contra Costa Community College District. Said rates of wages shall be included in the contract for the work by this reference.

Attention is directed to Section 4100 through 4113 of the Public Contract Code concerning subcontractors.

Attention is directed to Agreement Form, Article 5, and GENERAL CONDITIONS, Article 8, paragraphs 8.4.1 and 8.4.2, regarding liquidated damages. Liquidated Damages shall be set for seven hundred fifty Dollars ($750.00) for each calendar day the work is delayed. The Governing Board of the Contra Costa Community College District reserves the right to reject any and all bids and/or waive any informality or irregularity in any bid received. No bidder may withdraw their Bid for a period of ninety (90) days after the date set for opening thereof.

END OF SECTION 00100
SECTION 00200
INSTRUCTIONS TO BIDDERS

1.1 ISSUING OF DOCUMENTS
A. Complete sets of Bidding Documents may be purchased at ARC Reprographic Services located at 5753 Pacheco Blvd., Pacheco, California, (925) 682-6930 or via the ARC Reprographic Services internet website, www.e-arc.com. Payment shall be made to ARC Reprographic Services for the cost of printing. To order documents via the internet, log on to https://order.e-arc.com/arcEOC/PWELL_Main.asp?mem=23. In the lower left side of the webpage under "PUBLIC PLANROOM", click the "GO→" button and select the documents you need to order.
B. Bidding Documents may be examined at the Contra Costa Community College District, 500 Court Street, Martinez, CA 94553. By Appointment: Georgette Stewart, Facilities Department, phone: (925)229-6847.
C. Project documents including but not limited to plans, specifications, addenda, bidders lists, bid results, etc. can be viewed at online plan service through the Contra Costa Builders Exchange at: http://onlineplanservice.com/PublicWorks/ProjectList.aspx?Agency=49

1.2 QUALIFICATIONS OF BIDDERS
A. Bidders may be required to furnish evidence satisfactory to the District and the Architect that he has sufficient means and has had sufficient experience in the class of work called for to enable him to complete the Contract in a satisfactory manner.
B. Bidders shall be Contractors properly licensed in accordance with the laws of the State of California.
C. The successful Bidder shall furnish satisfactory Certificates of Insurance coverage as specified in the Contract Documents.

1.3 RECEIPT AND OPENING OF BIDS
A. Contra Costa Community College District hereinafter referred to as the District, will receive Bids at the same time and place specified in the Notice inviting Bids.
B. Complete the Bid Form included in the Project Manual.
C. The envelopes containing the Bids shall be sealed, addressed to the District, and designated as "D-1045E Library Building HVAC – Contra Costa Community College District". The envelope shall contain the name and address of the Bidder.
D. Bids that are mailed shall have the previously described envelope placed inside an envelope addressed to: CONTRA COSTA COMMUNITY COLLEGE DISTRICT, 500 Court Street, Martinez, CA 94553 ATTENTION: JOVAN ESPRIT, Contracts Manager. Bids should be mailed in time to be received prior to the time set forth in the Advertisement for Bids.
E. Bids which are conditional (or which make alterations, omissions, or reservations to the terms of the Bidding Documents) may be rejected as non-responsive.
F. All monetary figures are required, both in writing and in numerals. In event of conflict between written quotations and numerical quotations, written quotations shall govern.

G. Type or print all bid data legibly in ink except signatures which shall be in script. Mistakes may be crossed out and corrections inserted, if each is initialed in ink by signer of Bid.

H. Bidder’s business address and signature shall be on the Bid. A Bid by a partnership shall furnish the full names of partners and be signed in the partnership name by one member of the partnership, or by authorized representative, followed by the signature and designation of the person signing. Bids by corporations, with corporate seal affixed, shall be signed with the legal name of the corporation followed by the name of the state of incorporation and by the signature and designation of the person authorized to bind it to the matter. The name of each person signing shall also be typed or printed below the respective signatures. When required by the District, satisfactory evidence of authority of the office signing in behalf of the corporation shall be furnished.

I. No Bids will be received after the date and time set forth in the Notice Inviting Bids.

1.4 BID SECURITY

A. Submit with the Bid a Bid Security in the amount of 10 percent (10%) of the Bid.

B. The District reserves the right to forfeit the Bid Bond submitted for failure of the successful bidder to secure Payment & Performance Bonds.

1.5 SURETY BONDS

A. The successful Bidder shall furnish a Labor and Material Payment Bond in the amount equal to one hundred percent (100%) of the Contract Price and a faithful Performance Bond in the amount equal to 100 percent (100%) of the Contract Price as security for the successful performance of the work and payment of persons performing labor and furnishing materials. The Bonds shall be executed by a surety company or companies acceptable to the District and authorized to execute such in the State in which the Project is located and shall be furnished within 10 days after Notice of Acceptance of said Bid. Surety shall be made in favor of the District and shall cover the guarantee periods as well as the construction period.

1.6 WITHDRAWAL OR REVISIONS OF BID

A. This Bid may be withdrawn or revised prior to the scheduled time for receipt. Bids not withdrawn prior to the scheduled time for receipt may not be withdrawn for a period of 90 days.

1.7 BID PROTESTS

A. Inquiries or questions based on alleged patent ambiguity of the plans, specifications or estimate must be communicated as a bidder inquiry prior to bid opening. Any such inquiries or questions, submitted after bid opening, will not be treated as a bid protest.

B. Bidder may file a protest with the District against the Bid of other Bidder or Bidders (“Bid Protest”) subject to the provisions of this Article. The procedures and time limits set forth in
this Article are mandatory and are a Bidder’s sole and exclusive remedy in protesting other Bidders’ bids. Failure to comply with these procedures shall constitute a waiver of any right to pursue a Bid Protest, or to contest the District’s award of the contract for the work that is the subject of the Bid, in any legal proceeding before any authority with jurisdiction.

C. Bid Protests and Responses shall be governed by the following time limitations:
   1. Bidder must deliver any Bid Protest to the District in writing before 2:00PM five (5) working days after the date of bid opening. The District will reject any Bid Protest not received by the District by this deadline. Bidder must concurrently deliver a copy of its Bid Protest to all Bidders against whose Bids the Bid Protest is directed. The Bidder must include with its Bid Protest written proof to the District’s satisfaction that Bidder has delivered a copy of its Bid Protest to the other Bidder whose bid is the subject of the Bid Protest.
   2. A Bidder whose Bid is the subject of a Bid Protest must deliver its written response, if any, (“Response”) to the District, before 2:00PM ten (10) working days after the date of bid opening. The District will reject any Response not received by the District by this deadline.

D. Delivery of Bid Protest or Response:
   1. Bidder may deliver a Bid Protest to the District by personal delivery or electronic transmission such as by facsimile. Bidder is solely responsible for ensuring that the District receives any Bid Protest or Response by the deadlines set forth herein.
   2. The District will not consider Bid Protests or Responses by telephone conversation or any other non-written communication.
   3. Bidder shall submit any Bid Protest or Response to:
      Dave Wetmore, Director of Purchasing
      Contra Costa Community College District
      500 Court St., Martinez, CA 94553
      Email: dwetmore@4cd.edu
      Facsimile: 925-229-6955

E. Content of Bid Protest:
   1. A Bid Protest must state the basis for the protest and provide supporting evidence.
   2. A Bid Protest must refer to the specific portion of the Bid that forms the basis of the protest.
   3. A Bid Protest must include the name, address, and telephone number of the person representing the protesting Bidder.
   4. A Bid Protest must be clearly identified as a Bid Protest.

1.8 AWARD AND REJECTION OF BIDS

A. In awarding or rejecting Bids, the District reserves the following rights:
   1. Identification of successful Bidder will not be determined at time of opening Bids.
   2. To obtain opinion of counsel on legality and sufficiency of bids.
   3. To reject all Bids, to re-bid, or waive irregularities or informalities in a Bid, and to accept or reject alternates.
4. Request proof that the successful Bidder can provide performance and payment bonds as required.

1.9 EXAMINE DOCUMENTS AND VISIT SITE

A. Before submitting a Bid, the Bidder shall examine the Bidding Documents, visit the site of the work, attend the required site visit arranged by the District and obtain Certification of Attendance signed by the District, ascertain existing conditions and limitations, including those of labor, and include in the Bid a sum to cover the cost of all items described in the Contract Documents.

B. No consideration will be granted for alleged misunderstanding of the materials to be furnished or work to be done. The tender of a Bid carries with it the agreement to terms and conditions referred to in the Contract Documents.

1.10 DISCREPANCIES, AMBIGUITIES, OR CONFLICTS

A. If the Bidder is in doubt as to the true meaning of any part of the Contract Documents; finds discrepancies, errors or omissions therein; or finds variances in any of the Contract Documents with applicable rules, regulations, ordinances and/or laws, a written request for an interpretation or correction thereof must be submitted to the District’s Contract Manager. Bidders are solely responsible for submitting to District’s Contract Manager such request. Ambiguities or inconsistencies arising as a result of separation of sections or portions of the drawings or specifications by or for subcontractor bidding shall not relieve the Contractor for providing the complete Work without increase to or adjustment in the Contract Price or the Time for performance. Interpretations or corrections of the Contract Documents will be by written addendum issued by the Architect. No person is authorized to render an oral interpretation or correction of any portion of the Contract Documents to any Bidder, and no Bidder is authorized to rely on any such oral interpretation or correction. Failure to request interpretation or clarification of any portion of the Contract Documents pursuant to the foregoing is a waiver of any discrepancy, defect or conflict therein.

1.11 ADDENDA

A. Cost for work included in any Addenda issued during the time of bidding shall be included in the Bid, and will become a part of the Contract. List Addenda received as indicated on the Bid Form.

1.12 FORM OF AGREEMENT

A. The form of agreement to be used for the Contract is provided by the District and is included in the Project Manual.

1.13 AWARD OF CONTRACT

A. The District will be allowed a period of ninety (90) days after Bid Opening Date for evaluating the Bids.
B. Bidders of record will be notified of the results of the District's evaluation of bids and Award of Contract, if any.

C. The contractor shall begin work within ten (10) calendar days of receipt of Notice to Proceed.

END OF SECTION 00200
SECTION 00210
INFORMATION AVAILABLE TO BIDDERS

PART 1 - REPORT AND INFORMATION

1.1 Existence of reports, record drawings, and utility surveys: Contra Costa Community College District, its consultants, and prior contractors may have collected documents providing a general description of the site and conditions of the work. These documents may consist of geotechnical reports for and around the site, record drawings, utility drawings, and information regarding underground utilities. These reports, documents and other information are not part of the Contract Documents and do not show new work to be constructed, rather, they show existing conditions that Contractor may have to address as part of its construction planning.

1.2 Available Documentation: The following existing documentation is available for review through District office for this project:

A. Existing Diablo Valley College Library Building Drawings

B. Campus Utilities Maps


1.3 Contractor shall acknowledge and accept that the documents are not a part of the Contract Documents and are made available to bidders for reference only. The District and its representatives are not responsible for any and all discrepancies between the documents and the existing and actual as-built conditions, and do not guarantee the accuracy of the documents.

1.4 The District and Architect assume no responsibility for the completeness or accuracy of the documents or the records compiled there from and the interpretations made from the documents. There is no express or implied guarantee that the conditions indicated in the documents are representative of those existing throughout the building and/or site Conditions differing substantially from those indicated may be encountered.

END OF SECTION 00210
SECTION 00300
BID PROPOSAL FORM

PROJECT NUMBER / NAME: ________________________________________________

CAMPUS / LOCATION: ____________________________________________________

DISTRICT: CONTRA COSTA COMMUNITY COLLEGE DISTRICT
500 Court St, Martinez, CA 94553

Herein Referred to as "District"

1. INTRODUCTION

A. The Bidder proposes to perform the Work for the Contract Sum and within the proposed Contract Time, based upon an examination of the site and the Bid and Contract Documents.

B. The Bidder certifies this Bid is submitted in good faith.

C. The Bidder agrees that the Contract Sum and other proposed terms will be considered in evaluating Bids and may be negotiated and adjusted before awarding of Contract.

D. The signed copy of the Certification of the Visit to the Site shall be attached to the Bid Form Submittal.

E. A fully executed Statement of Bidder's Qualifications signed by an authorized officer of the Bidder submitting the Bid shall be attached to the Bid Form.

F. A fully executed Non-Collusion Affidavit signed by an authorized officer of the Bidder submitting Bid shall be attached to the Bid Form.

G. The District shall award the contract to the lowest responsive and responsible Bidder. The evaluation of the low bid shall be based on the summation of BASE BID ITEM #1 and ITEM #2.

H. The District reserves the right to award the other Additive/Deductive Alternates through change orders as budget allows.

2. CONTRACT SUM

A. BASE BID

ITEM #1: D-1045E Library Boiler/Chiller/AHU/Pumps/VFDs: For labor, materials, bonds, fixtures, equipment, tools, transportation, services, sales taxes and other costs necessary to complete the general construction in accordance with the Contract Documents, for a stipulated Contract Sum in the amount of:
ITEM #2:
D-1033 Library Building Cooling Tower and building switchboard: For labor, materials, bonds, fixtures, equipment, tools, transportation, services, sales taxes and other costs necessary to complete the general construction in accordance with the Contract Documents, for a stipulated Contract Sum in the amount of:

____________________________________________ Dollars ($______________________)

TOTAL BASE BID (ITEM 1 + ITEM 2)

____________________________________________ Dollars ($______________________)
(In the event of a conflict, this dollar amount shall take precedence for bid award)

B. ALTERNATES

ADDITIVE ALTERNATE #1:
All material, labor, equipment, and other related costs to install underground conduit shown within the "Add Alternate" area on sheet E2.1.

____________________________________________ Dollars ($______________________)

3. COMPLETION TIME

A. For establishing the Date of Final Completion the contract time for the Base Bids and Alternates shall be **125 calendar days** after date of the Notice To Proceed. This time may be subject to modification to facilitate the work as mutually agreed upon at a later date.

B. The Bidder certifies that the Bid is based on the Contract Time for completion as stated above and in the Contract Documents. Bidder further certifies that the Base Bid amount is sufficient to cover all labor, materials, central office and construction site overhead, profit, and all other costs related to the completion of the Project for the entire Project construction time for both the General Contractor and all Subcontractors, as stated above in paragraphs 2 and 3.

4. ADDENDA

A. The Bidder acknowledges receipt of the following Addenda, and certifies the Bid has provided for all modifications and considerations required therein.
None [ ]

Addendum No.: ________ dated ________________

Addendum No.: ________ dated ________________

Addendum No.: ________ dated ________________

Addendum No.: ________ dated ________________

Addendum No.: ________ dated ________________

B. List of Additional Addenda Attached: Yes [ ]  No. [ ].

5. DESIGNATION OF SUBCONTRACTORS

A. The Bidder has set forth a complete list indicating the type of work, name, and business address of each Subcontractor who will perform work in excess of one-half of one percent of the Contract Sum.

B. Any portion of the work in excess of the specified amount having no designated Subcontractor shall be performed by the Bidder.

C. Substitution of listed Subcontractors will not be permitted unless approved in advance by the District.

D. Prior to signing the Contract, the District reserves the right to reject any listed Subcontractor.

<table>
<thead>
<tr>
<th>Type of Work</th>
<th>Subcontractor’s Name</th>
<th>Business Address</th>
<th>License #</th>
</tr>
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</tbody>
</table>

E. Complete list of Subcontractors is attached:  Yes [ ]  No [ ]

F. Continuation list of Subcontractors is attached:  Yes [ ]  No [ ]

6. ACCEPTANCE AND AWARD
A. The District reserves the right to reject this Bid and to negotiate changes before or after execution of the Contract. This Bid shall remain open and shall not be withdrawn for a period of 90 days after Bid Opening date.

B. If written notice of acceptance of this Bid is mailed or delivered to the Bidder within 90 days after the date set for the receipt of this Bid, or other time before it is withdrawn, the Bidder will execute and deliver to the District a Contract prepared by District with the required Surety Bonds and Certificates of Insurance, within 10 days after personal delivery or deposit in the mail of the notification of acceptance.

C. Notice of acceptance or request for additional information may be addressed to the Bidder at the address provided.

7. BID SECURITY

A. The required 10 percent (10%) Bid Security for this Bid is attached in the form of:

   ( ) Bid Bond Issued By: ________________________________

   ( ) Certified or Cashier’s Check No. ________________________________

   Issued by: ________________________________

8. BIDDER’S BUSINESS INFORMATION

A. Individual [ ]: ________________________________

   Personal Name: ________________________________

   Business Name: ________________________________

   Address: ________________________________

   __________________________ Zip Code: ______

   Telephone: ________________________________

   Fax Number: ________________________________

B. Partnership [ ]: ________________________________

   Co-partners’ Names: ________________________________

   Business Name: ________________________________
Address: ________________________________________________

_________ Zip Code: ______________

Telephone: ________________________________________________

Fax Number: ________________________________________________

C. Corporation [ ]:

Firm Name: ________________________________________________

Address: ________________________________________________

_________ Zip Code ______________

Telephone: ________________________________________________

Fax Number: ________________________________________________

State of Incorporation: __________________________________________

President: __________________________________________

Secretary: __________________________________________

Treasurer: __________________________________________

Manager: __________________________________________

D. Power of Attorney: Name: ____________________________

Title: __________________________________________

E. Contractor License No. ___________ State of ___________

F. Bidder is submitting this proposal on behalf of a Joint Venture. Names, license numbers, and relevant information are given on a separate attachment:
   Yes [ ] No [ ].

G. Upon request, furnish appropriate documentation to substantiate and/or support the data given.
9. The undersigned hereby certifies under penalty of perjury under the laws of the State of California that all the information submitted by the Bidder in connection with this Bid and all the representations herein made are true and correct.

Executed this day of __________________________

________________________________________
Contractor's License No. Expiration Date

________________________________________
Firm Name

________________________________________
Signature

________________________________________
By (Print or Type Name)

________________________________________
Title

End of Section 00300
NONCOLLUSION AFFIDAVIT
(TO BE EXECUTED BY BIDDER ANDSubmitted WITH BID)

State of California
County of Contra Costa

______________________________________________________________, 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.

I certify (or declare) under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: __________________________ Signature: ________________________________

State of California
County of Contra Costa

On __________________________, before me, __________________________, Notary Public personally appeared ______________________________________, 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.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing is true and correct.

WITNESS my hand and official seal.

Date: __________________________ Signature: ________________________________

[SEAL]

END OF SECTION 00350

Contra Costa Community College District
Diablo Valley College
D-1045E Library Building HVAC
Diablo Valley College Statement of Bidder’s Qualifications

SECTION 00400

STATEMENT OF BIDDER’S QUALIFICATIONS

Contra Costa Community College District (District), in accordance with Public Contract Code Section 20651.5, requires each prospective bidder for a contract, as described under Section 20651, to complete and submit to the district a standardized questionnaire and financial statement in a form specified by the district, including a complete statement of the prospective bidder’s financial ability and experience in performing public works. The questionnaire and financial statement shall be verified under oath by the bidder in the manner in which civil pleadings in civil actions are verified. The questionnaire responses of prospective bidders and their financial statements shall not be deemed public records and shall not be open to public inspection. All information requested must be provided and be current as of the date of the Bid.

I, ____________________________, being first duly sworn, depose and say:

(Name)

I am the __________________________ of __________________________________

(Title)      (Company / Entity)

Firm Name: __________________________ Check One: □ Corporation □ Partnership

(as it appears on license) □ Sole Proprietor □ Joint Venture

Contact Person: __________________________

Address: __________________________________________

Phone: __________________________ Fax: __________________________

Email: __________________________ Tax ID No.: __________________________

If firm is a sole proprietor or partnership:

Owner(s) of Company __________________________

Contractor’s License Number(s): (California State License Board Classification)

________________________________

________________________________

________________________________

Contra Costa Community College District
Diablo Valley College
D-1045E Library Building HVAC
For Bidders That Are Corporations:

1a. Date incorporated: ________________________________

1b. Under the laws of what state: __________________________

1c. Provide all the following information for each person who is either (a) an officer of the corporation (president, vice president, secretary, treasurer), or (b) the owner of at least ten per cent of the corporation's stock.

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Years with Co.</th>
<th>% Ownership</th>
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</table>

1d. Identify every construction firm that any person listed above has been associated with (as owner, general partner, limited partner or officer) at any time during the last five years.

NOTE: For this question, “owner” and “partner” refer to ownership of ten per cent or more of the business, or 10 per cent or more of its stock, if the business is a corporation.

<table>
<thead>
<tr>
<th>Person’s Name</th>
<th>Construction Firm</th>
<th>Dates of Person’s Participation with Firm</th>
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</table>
For Bidders That Are Partnerships:

1a. Date of formation: ________________________________

1b. Under the laws of what state: _____________________________

1c. Provide all the following information for each partner who owns 10 per cent or more of the firm.

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Years with Partnership</th>
<th>% Ownership</th>
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</table>

1d. Identify every construction company that any partner has been associated with (as owner, general partner, limited partner or officer) at any time during the last five years.

NOTE: For this question, “owner” and “partner” refer to ownership of ten per cent or more of the business, or ten per cent or more of its stock, if the business is a corporation.

<table>
<thead>
<tr>
<th>Person’s Name</th>
<th>Construction Company</th>
<th>Dates of Person’s Participation with Company</th>
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</table>
For Bidders That Are Sole Proprietorships:

1a. Date of commencement of business. ____________________________

1b. Tax ID number of company owner ____________________________

1c. Identify every construction firm that the business owner has been associated with (as owner, general partner, limited partner or officer) at any time during the last five years.

NOTE: For this question, "owner" and "partner" refer to ownership of ten per cent or more of the business, or ten per cent or more of its stock, if the business is a corporation.

<table>
<thead>
<tr>
<th>Person's Name</th>
<th>Construction Company</th>
<th>Dates of Person's Participation with Company</th>
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For Bidders That Intend to Make a Bid as Part of a Joint Venture:

1a. Date of commencement of joint venture. ____________________________

1b. Provide all of the following information for each firm that is a member of the joint venture that expects to bid on one or more projects:

<table>
<thead>
<tr>
<th>Name of Firm</th>
<th>% Ownership of Joint Venture</th>
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</table>
For All Bidders

2. Has there been any change in ownership of the firm at any time during the last five years?
   NOTE: A corporation whose shares are publicly traded is not required to answer this question.
   □ Yes □ No
   If “yes,” explain on a separate signed page (referring to this question).

3. Is the firm a subsidiary, parent, holding company or affiliate of another construction firm?
   NOTE: Include information about other firms if one firm owns 50 per cent or more of another, or if an owner, partner, or officer of your firm holds a similar position in another firm.
   □ Yes □ No
   If “yes,” explain on a separate signed page (referring to this question).

4. Are any corporate officers, partners or owners connected to any other construction firms?
   NOTE: Include information about other firms if an owner, partner, or officer of your firm holds a similar position in another firm.
   □ Yes □ No
   If “yes,” explain on a separate signed page (referring to this question).

5. List all California construction license numbers, classifications and expiration dates of the
   California contractor licenses held by your firm:
   ___________________________________________________________________
   ___________________________________________________________________
   If more space is needed add a separate signed page (referring to this question).

6. If any of your firm’s license(s) are held in the name of a corporation or partnership, list below
   the names of the qualifying individual(s) listed on the CSLB records who meet(s) the experience
   and examination requirements for each license.
   ___________________________________________________________________
   ___________________________________________________________________
   If more space is needed add a separate signed page (referring to this question).

7. Has your firm changed names or license number in the past five (5) years?
   □ Yes □ No
   If “yes,” explain on a separate signed page, including the reason for the change, and all former
   names under which the firm has conducted business.

8. Has any owner, partner or (for corporations) officer of your firm operated another construction
   firm under any other name in the last five (5) years?
   □ Yes □ No
   If “yes,” explain on a separate signed page (referring to this question), including the reason for
   the change.
9. Have you attached your latest copy of a REVIEWED OR AUDITED financial statement with accompanying notes and supplemental information?
□ Yes □ No
NOTE: A financial statement that is not either reviewed or audited is not acceptable. A letter verifying availability of a line of credit may also be attached; however, it will be considered as supplemental information only, and is not a substitute for the required financial statement.

10. Is the attached Financial Statement for the identical organization of the Bidder?
□ Yes □ No
If "no", explain the relationship and financial responsibility of the organization whose financial statement of provided (i.e., parent/subsidiary, etc.)
____________________________________
If more space is needed add a separate signed page (referring to this question).

11. Contractor possesses a VALID AND CURRENT California Contractor’s license for the project or projects for which it intends to submit a bid.
□ Yes □ No

12. List the categories of work your firm typically performs with its own forces, and check the adjacent boxes of those categories of work that will be self-performed on this project
□_________________________________ □_________________________________
□_________________________________ □_________________________________
□_________________________________ □_________________________________

13. On a separate signed page (referring to this question), list all construction projects your organization has in progress and for each project listed, state; (i) a general description of the work performed or to be performed by your organization; (ii) the owner’s name, name of the owner’s representative, the owner’s address and telephone number; (iii) the project architect, address and telephone number; (iv) percent presently completed and (v) the scheduled completion date.

14. On a separate signed page (referring to this question), list all construction projects completed by your organization in the past three years, and for each project, state: (i) a general description of the work performed by your organization on the project; (ii) the owner’s name, name of the owner’s representative, the owner’s address and telephone number; (iii) the initial and final contract amount; (iv) the initial and final dates of completion; and (v) whether the project was completed within contract time and contract budget.
15. Has a claim or other demand ever been made against your organization’s California Contractors License Bond?
   □ Yes □ No
   If yes, on a separate signed page (referring to this question), state the following: (i) the name, address and telephone number of each person or entity making claim or demand; (ii) the date of each claim or demand; (iii) the circumstances giving rise to each such claim or demand; and (iv) the disposition of each such claim or demand.

16. Has a complaint ever been filed against your organization’s California Contractors License with the California Contractors State License Board (CSLB)?
   □ Yes □ No
   If yes, on a separate signed page (referring to this question), state the following for each complaint: (i) the name, address and telephone number of each person or entity making the complaint; (ii) the date of each complaint; (iii) the circumstances giving rise to each such complaint; and (iv) the disposition of each such complaint, including without limitation, any disciplinary or other action imposed or taken by the California Contractors State License Board as a result of any such complaint.

17. Have any lawsuits or other proceedings ever been brought against your organization or any of its principals or officers in connection with any construction contract or construction project?
   □ Yes □ No
   If “yes,” on a separate signed page (referring to this question) describe the circumstances, the amount or relief sought and the disposition of each such lawsuit or other proceeding.

18. Has your organization ever filed a lawsuit or initiated other proceedings inconnection with any construction contract or construction project?
   □ Yes □ No
   If “yes,” on a separate signed page (referring to this question) describe the circumstances, the amount or relief sought and the disposition of each such lawsuit or other proceeding.

19. Are there any judgments, orders or arbitration awards pending, outstanding or by which your organization or any of its officers or principals are bound by?
   □ Yes □ No
   If “yes,” on a separate signed page (referring to this question) describe each such judgment, order or arbitration award and the present status of the satisfaction or discharge thereof.

20. Has any California State License Board (CSLB) license held by your firm, or its Responsible Managing Employee (RME) or Responsible Managing Officer (RMO) been suspended or revoked within the last five (5) years?
    □ Yes □ No

21. Has your organization ever failed to complete a construction contract?
    □ Yes □ No
    If “yes,” on a separate signed page (referring to this question) state the following: (i) describe each such contract; (ii) the owner’s name, address and telephone number; (iii) a description of the project; and (iv) the circumstances of the failure to complete.
22. Has your organization ever been declared in default of a construction contract?
   [ ] Yes  [ ] No
   If "yes," on a separate signed page (referring to this question) state the following: (i) describe each such contract; (ii) the owner's name, address and telephone number; (iii) a description of the project; and (iv) the circumstances of the declaration of default.

23. Has a claim or other demand ever been asserted against any Bid Bond, Performance Bond or Labor and Material Payment Bond posted by your organization in connection with any construction contract or your submittal of a bid or proposal on a construction contract?
   [ ] Yes  [ ] No
   If "yes," on a separate signed page (referring to this question) state the following: (i) state the name, address and telephone number of each such claimant; (ii) the date of the claim; and (iii) the disposition thereof.

24. At the time of submitting this qualification form, is your firm ineligible to bid on or be awarded a public works contract, or perform as a subcontractor on a public works contract, pursuant to either Labor Code section 1777.1 or Labor Code section 1777.7?
   [ ] Yes  [ ] No

25. At any time during the last five (5) years, has your firm, or any of its owners, officers, or partners been convicted of a crime involving the awarding of a contract of a government or Public construction project, or the bidding or performance of a government or Public contract?
   [ ] Yes  [ ] No

26. Has your firm or any of its owners, officers, or partners ever been convicted of a crime involving any federal, state, or local law related to bidding, awarding, or performance of any construction contract?
   [ ] Yes  [ ] No

27. Has your firm or any of its owners, officers or partners ever been found liable in a civil suit or found guilty in a criminal action for making any false claim or material misrepresentation to any public agency or entity in any way related to any construction contract?
   [ ] Yes  [ ] No

28. Is your firm CURRENTLY the debtor in a bankruptcy case?
   [ ] Yes  [ ] No

29. In the last twelve (12) months has your firm, or any firm with which any of your company's owners, officers or partners was associated, been debarred, disqualified, removed or otherwise prevented from bidding on, or completing, any government agency or public works project for any reason?
   [ ] Yes  [ ] No
   **NOTE:** "Associated with" refers to another construction firm in which an owner, partner or officer of your firm held a similar position.
   If YES, on a separate signed page (referring to this question) state the following: (i) describe each such project; (ii) the owner's name, address and telephone number; (iii) the circumstances and specific reason given for being prevented from bidding on or completing the project.
30. Has your organization ever refused to sign a contract awarded to it?
   ☐ Yes ☐ No
   If YES, on a separate signed page (referring to this question) state the following: (i) describe each such contract; (ii) the owner's name, address and telephone number; (iii) a description of the project; and (iv) the circumstances of the refusal to sign the contract.

31. In the last twelve (12) months has your firm been denied an award of a public works contract based on a finding by a public agency that your company was NOT a responsible bidder?
   ☐ Yes ☐ No
   If YES, on a separate signed page (referring to this question) state the following: (i) describe each such contract; (ii) the owner's name, address and telephone number; (iii) a description of the project; and (iv) the circumstances of the determination.

32. Contractor has CURRENT workers' compensation insurance policy as required by the Labor Code or is legally self-insured pursuant to Labor Code section 3700 et. seq.
   ☐ Yes ☐ No
   ☐ Contractor is exempt from this requirement, because it has no employees

33. Within the last two (2) years has there ever been a period when your firm had employees but was without Workers' Compensation insurance or state-approved self-insurance?
   ☐ Yes ☐ No

34. Attach to this statement true and correct copies of the following:
   34.1 Your organization's California Contractor's License (the copy must clearly and legibly show: (i) the licensee name; (ii) the expiration date; and (iii) the classification(s) of licensure).
   34.2 The Contractor's License Bond posted by your organization in connection with your organization's California Contractor's License pursuant to California Business & Professions Code 7071.5 and 7071.6 (the copy must clearly and legibly show: (i) the Bond number or other information sufficient for identification; (ii) the name, address and telephone number of the Surety on the Bond; (iii) the signature of the individual executing the Bond on behalf of the Surety and if such individual's authority is conferred by a power of attorney or by such individual's authority is conferred by a power of attorney or by such individual's designation as an attorney in fact on behalf of the Surety, include a clear and legible copy of such power of attorney or attorney in fact designation; (iv) the principal on such Bond; and (v) the expiration date of such Bond).
   34.3 If your organization's California Contractor's License is issued by virtue of the qualification of a responsible managing employee or responsible managing officer of your organization, the Qualifier's Bond, if required pursuant to California business & Professions Code 7071.9 (the copy must clearly and legibly show: (i) the bond number or other information sufficient for identification; (ii) the name, address and telephone number of the Surety on the Bond; (iii) the signature of the individual executing the Bond on behalf of the Surety and if such individual's authority is conferred by a power of attorney or by such individual's authority is conferred by a power of attorney or by such individual's designation as an attorney in fact on behalf of the Surety, include a clear and legible copy of such power of attorney or attorney in fact designation; (iv) the principal on such Bond; and (v) the expiration date of such Bond).
legible copy of such power of attorney or attorney in fact designation; (iv) the principal on such Bond; and (v) the expiration date of such Bond.

35. **Certification**

The responses to each and all of the foregoing are complete and accurate; there are no omissions of material fact or information such that would render any of the foregoing false or misleading; there are no misstatements of fact in any of the foregoing.

I, the undersigned, certify and declare that I have read all the foregoing answers to this Section and know their contents. The matters stated in the above answers are true of my own knowledge and belief, except as to those matters stated on information and belief, and as to those matters I believe them to be true. I declare under penalty of perjury under the laws of the State of California, that the foregoing is correct.

Dated: ______________

_________________________________________________
(Printed Name)

_________________________________________________
(Signature)

NOTARY PUBLIC

=====================================================================================  
ACKNOWLEDGEMENT (By Corporation, Partnership or Individual)

STATE OF CALIFORNIA  )
) ss.
COUNTY OF CONTRA COSTA  )

On ________________, before me, _____________________________, Notary Public, personally appeared ______________________________, 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.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing is true and correct.

Witness my hand and official seal.

________________________________  
Notary Public

[SEAL]

=====================================================================================  
END OF SECTION 00400
CERTIFICATION OF SITE VISIT

The Governing Board of the
Contra Costa Community College District
500 Court Street
Martinez, California  94553

Gentlemen/Ladies:

I visited the ___________________________ job site,
on  _________________ at  ______________ A.M.  P.M (Circle one)

to inspect the proposed work, which would be turned over to me in its present condition, with a representative of the Contra Costa Community College District in order to acquaint myself with the proposed work so that I might fully understand the facilities, difficulties, and restrictions attending the execution of the work under the contract, and acknowledge I had the opportunity to check the Record Drawing as-built drawings and/or previous Contract Documents, site conditions and Bid Documents with the authorized representative of the District.

Owner Representative:

Project Manager – CCCCD Facilities  Date

or

Manager – Buildings & Grounds  Date

Bidder:

Name of Firm or Company

Authorized Signatory

Address

Phone Number  Fax Number

NOTE: Any bidder who fails to return this CERTIFICATION, fully executed, including signature of company representative AND a Contra Costa Community College District representative, with the proposal form, may have their bid rejected as non-responsive.

END OF SECTION 00450
PAYMENT BOND
(CALIFORNIA PUBLIC WORK)

KNOW ALL MEN BY THESE PRESENTS:

THAT WHEREAS, the Contra Costa Community College District (sometimes referred to hereinafter as “Obligee”) has awarded to __________________________________ (hereinafter designated as the “Principal” or “Contractor”), an agreement for the work described as follows: __________________________________________________________ (hereinafter referred to as the “Public Work”); and

WHEREAS, said Contractor is required to furnish a bond in connection with said Contract, and pursuant to California Civil Code Section 9550;

NOW, THEREFORE, We, _______________________________________, the undersigned Contractor, as Principal; and ________________________________, a corporation organized and existing under the laws of the State of ________________, and duly authorized to transact business under the laws of the State of California, as Surety, are held and firmly bound unto the Contra Costa Community College District and to any and all persons, companies, or corporations entitled by law to file stop notices under California Civil Code Section 9100, or any person, company, or corporation entitled to make a claim on this bond, in the sum of __________________________________ Dollars ($_____________), said sum being not less than one hundred percent (100%) of the total amount payable by said Obligee under the terms of said Contract, for which payment will and truly to be made, we bind ourselves, our heirs, executors and administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that if said Principal, its heirs, executors, administrators, successors, or assigns, or subcontractor, shall fail to pay any person or persons named in Civil Code Section 9100; or fail to pay for any materials, provisions, or other supplies, used in, upon, for, or about the performance of the work contracted to be done, or for any work or labor thereon of any kind, or for amounts due under the Unemployment Insurance Code, with respect to work or labor thereon of any kind; or shall fail to deduct, withhold, and pay over the Employment Development Department, any amounts required to be deducted, withheld, and paid over by Unemployment Insurance Code Section 13020 with respect to work and labor thereon of any kind, then said Surety will pay for the same, in an amount not exceeding the amount herein above set forth, and in the event suit is brought upon this bond, also will pay such reasonable attorneys’ fees as shall be fixed by the court, awarded and taxed as provided in California Civil Code Sections 9550 et seq.

This bond shall inure to the benefit of any person named in Civil Code Section 9100 giving such person or his/her assigns a right of action in any suit brought upon this bond.

It is further stipulated and agreed that the Surety of this bond shall not be exonerated or released from the obligation of the bond by any change, extension of time for performance, addition, alteration or modification in, to, or of any contract, plans, or specifications, or agreement pertaining or relating to any scheme or work of improvement herein above described; or pertaining or relating to the furnishing of labor, materials, or equipment therefor; nor by any change or modification of any terms of payment or extension of time for payment pertaining or
relating to any scheme or work of improvement herein above described; nor by any rescission or attempted rescission of the contract, agreement or bond; nor by any conditions precedent or subsequent in the bond attempting to limit the right of recovery of claimants otherwise entitled to recover under any such contract or agreement or under the bond; nor by any fraud practiced by any person other than the claimant seeking to recover on the bond; and that this bond be construed most strongly against the Surety and in favor of all persons for whose benefit such bond is given; and under no circumstances shall the Surety be released from liability to those for whose benefit such bond has been given, by reason of any breach of contract between the Obligee and the Contractor or on the part of any obligee named in such bond; that the sole condition of recovery shall be that the claimant is a person described in California Civil Code Sections 9100, and who has not been paid the full amount of his or her claim; and that the Surety does hereby waive notice of any such change, extension of time, addition, alteration or modification herein mentioned.

IN WITNESS WHEREOF, we have hereunto set our hands and seals this___________ day of ____________, 20____.

PRINCIPAL/CONTRACTOR:

____________________________________

By: _________________________________

SURETY:

____________________________________

By: _________________________________

Attorney-in-Fact
IMPORTANT: THIS IS A REQUIRED FORM.

Surety companies executing bonds must possess a certificate of authority from the California Insurance Commissioner authorizing them to write surety insurance defined in California Insurance Code Section 105, and if the work or project is financed, in whole or in part, with federal, grant or loan funds, Surety’s name must also appear on the Treasury Department’s most current list (Circular 570 as amended).

Any claims under this bond may be addressed to:

(Name and Address of Surety)   (Name and Address of agent or representative for service for service of process in California)

 ______________________________   ______________________________
 ______________________________   ______________________________

Telephone: ____________________________ Telephone: ____________________________

STATE OF CALIFORNIA  )
 ) ss.
COUNTY OF   )

On ___________________________ before me, ______________________________, a Notary Public in and for said State, personally appeared ______________________________, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument as the Attorney-in-Fact of the _____________________ (Surety) and acknowledged to me that he/she/they subscribed the name of the _____________________ (Surety) thereto and his own name as Attorney-in-Fact on the executed instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

____________________________ (SEAL)
Notary Public in and for said State

Commission expires: ____________________________

NOTE: A copy of the power-of-attorney to local representatives of the bonding company must be attached hereto.
CONTRACT PERFORMANCE BOND
(CALIFORNIA PUBLIC WORK)

KNOW ALL MEN BY THESE PRESENTS:

THAT WHEREAS, Contra Costa Community College District (sometimes referred to hereinafter as “Obligee”) has awarded to ______________________________ (hereinafter designated as the “Principal” or “Contractor”), an agreement for the work described as follows: ______________________________ (hereinafter referred to as the “Public Work”); and

WHEREAS, the work to be performed by the Contractor is more particularly set forth in that certain contract for said Public Work dated ______________, (hereinafter referred to as the “Contract”), which Contract is incorporated herein by this reference; and

WHEREAS, the Contractor is required by said Contract to perform the terms thereof and to provide a bond both for the performance and guaranty thereof.

NOW, THEREFORE, we, ________________________________, the undersigned Contractor, as Principal, and ________________________________, a corporation organized and existing under the laws of the State of ______________, and duly authorized to transact business under the laws of the State of California, as Surety, are held and firmly bound unto the Contra Costa Community College District in the sum of ________________________________ Dollars ($_______________), said sum being not less than one hundred percent (100%) of the total amount payable by said Obligee under the terms of said Contract, for which amount well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH THAT, if the bounded Contractor, his or her 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 agreements in said Contract and any alteration thereof made as therein provided, on his or her part, to be kept and performed at the time and in the manner therein specified, and in all respects according to their intent and meaning; and shall faithfully fulfill guarantees of all materials and workmanship; and indemnify, defend and save harmless the Obligee, its officers and agents, as stipulated in said Contract, then this obligation shall become null and void; otherwise it shall be and remain in full force and effect.

The Surety, for value received, hereby stipulates and agrees that it shall not be exonerated or released from the obligation of this bond (either by total exoneration or pro tanto) by any change, extension of time, alteration in or addition to the terms of the contract or to the work to be performed there under or the specifications accompanying the same, nor by any change or modification to any terms of payment or extension of time for any payment pertaining or relating to any scheme of work of improvement under the contract. Surety also stipulates and agrees that it shall not be exonerated or released from the obligation of this bond (either by total exoneration or pro tanto) by any overpayment or underpayment by the Obligee that is based upon estimates
approved by the Architect. The Surety stipulates and agrees that none of the aforementioned changes, modifications, alterations, additions, extension of time or actions shall in any way affect its obligation on this bond, and it does hereby waive notice of any such changes, modifications, alterations, additions or extension of time to the terms of the contract, or to the work, or the specifications as well notice of any other actions that result in the foregoing.

Whenever Principal shall be, and is declared by the Obligee to be, in default under the Contract, the Surety shall promptly either remedy the default, or shall promptly complete the Contract through its agents or independent contractors, subject to acceptance and approval of such agents or independent contractors by Obligee as hereinafter set forth, in accordance with its terms and conditions and to pay and perform all obligations of Principal under the Contract, including, without limitation, all obligations with respect to warranties, guarantees and the payment of liquidated damages; or, at Obligee’s sole discretion and election, Surety shall obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by Obligee of the lowest responsible bidder, arrange for a contract between such bidder and the Obligee and make available as Work progresses (even though there should be a default or succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the “balance of the Contract price” (as hereinafter defined), and to pay and perform all obligations of Principal under the Contract, including, without limitation, all obligations with respect to warranties, guarantees and the payment of liquidated damages. The term “balance of the Contract price,” as used in this paragraph, shall mean the total amount payable to Principal by the Obligee under the Contract and any modifications thereto, less the amount previously paid by the Obligee to the Principal, less any withholdings by the Obligee allowed under the Contract.

Surety expressly agrees that the Obligee may reject any agent or contractor which may be proposed by Surety in fulfillment of its obligations in the event of default by the Principal. Unless otherwise agreed by Obligee, in its sole discretion, Surety shall not utilize Principal in completing the Contract nor shall Surety accept a bid from Principal for completion of the work in the event of default by the Principal.

No final settlement between the Obligee and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

The Contractor and Surety shall remain responsible and liable for all patent and latent defects that arise out of or are related to the Contractor’s failure and/or inability to properly complete the Public Work as required by the Contract and the Contract Documents. The obligation of the Surety hereunder shall continue so long as any obligation of the Contractor remains.

Contractor and Surety agree that if the Obligee is required to engage the services of an attorney in connection with enforcement of the bond, Contractor and Surety shall pay Obligee’s reasonable attorneys’ fees incurred, with or without suit, in addition to the above sum.

In the event suit is brought upon this bond by the Obligee and judgment is recovered, the Surety shall pay all costs incurred by the Obligee in such suit, including reasonable attorneys’ fees to be fixed by the Court.
IN WITNESS WHEREOF, we have hereunto set our hands and seals this ____ day of ____________, 2010.

PRINCIPAL/CONTRACTOR:


By: ________________________________

SURETY:


By: ________________________________

Attorney-in-Fact

The rate of premium on this bond is ______________________________ per thousand.

The total amount of premium charged: $__________________________ (This must be filled in by a corporate surety).

IMPORTANT: THIS IS A REQUIRED FORM.

Surety companies executing bonds must possess a certificate of authority from the California Insurance Commissioner authorizing them to write surety insurance defined in California Insurance Code Section 105, and if the work or project is financed, in whole or in part, with federal, grant or loan funds, Surety’s name must also appear on the Treasury Department’s most current list (Circular 570 as amended).

Any claims under this bond may be addressed to:

(Name and Address of Surety) (Name and Address of agent or representative for service for service of process in California)

                                                                                          
                                                                                          
Telephone:_________________________ Telephone: ______________________________
STATE OF CALIFORNIA
COUNTY OF

On __________________________ before me, ______________________________________
(insert name and title of the officer)

On ____________________________, before me, _________________________, a Notary
Public in and for said State, personally appeared _______________________________, who
proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are
subscribed to the within instrument as the Attorney-in-Fact of the _____________________
(Surety) and acknowledged to me that he/she/they subscribed the name of the
_____________________ (Surety) thereto and his own name as Attorney-in-Fact on the
executed instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the
foregoing paragraph is true and correct.

WITNESS my hand and official seal.

______________________________ (SEAL)
Notary Public in and for said State
Commission expires:_____________________

NOTE: A copy of the power-of-attorney to local representatives of the bonding company
must be attached hereto.
SECTION 00600
CONSTRUCTION AGREEMENT

CONTRACT NO. ______________________
(Construction Agreement)

========================================================================================

This Agreement shall not be enforceable until ratified and approved by the Contra Costa Community College District's Governing Board. The estimated board meeting date is March 23, 2016.

(§1.1) Parties: (Public Agency) CONTRA COSTA COMMUNITY COLLEGE DISTRICT
500 Court St, Martinez, CA 94553

Contractor
Address:

(§1.2) Effective Date: _______________________

(§1.3) The Work: D-1045E DVC Library HVAC Equipment Replacement

(§1.4) Completion Time: 125 Calendar Days from the Notice to Proceed to Substantial Completion, and 45 Calendar Days from Substantial Completion to Final Completion (Remaining Work).

(§1.5.1) Liquidated Damages, Substantial Completion: $750 per Calendar Day beyond the Contract Substantial Completion Date.

(§1.5.2) Liquidated Damages, Remaining Work/Final Completion: $750/ per calendar day Remaining Work is delayed beyond the Contract Final Completion Date.

(§1.6) Public Agency’s Agent: CONTRA COSTA COMMUNITY COLLEGE DISTRICT (“District”)

(§1.7) Contract Sum: _______________ MILLION _______ THOUSAND, ______ HUNDRED DOLLARS and NO CENTS ($00,000,000.00)

2. SCOPE OF WORK:

The Scope of Work consists of general construction to replace the existing boiler, chiller, cooling tower, one air handler, associated pumps and piping, associated controls, and associated hazardous material abatement. See Contract Documents for the complete contract scope of work.

3. WORK CONTRACT, CHANGES

(a) By their signatures below, effective on the above date, these parties promise and agree as set forth in this Agreement, incorporating by these references labor and materials contained in Section 2, Scope of Work.
(b) Contractor shall, at Contractor's own cost and expense, and in a workmanlike manner, fully and
faithfully perform and complete the work; and will furnish all materials, labor, services, equipment,
and transportation necessary, convenient and proper in order fairly to perform the requirements
of this contract, all strictly in accordance with the Public Agency’s- drawings and specifications.

(c) The work can be changed only with Public Agency’s prior written order specifying such change and
its cost agreed to by the parties; and the Public Agency shall never have to pay more than specified
in Section 1.7 without such an order.

4. **TIME: NOTICE TO PROCEED AND ACCEPTANCE**

(a) Contractor shall start this work as directed in the specifications or the Notice to Proceed and shall
complete it as specified in Section 1, Completion Time.

(b) Remaining Work after Substantial Completion. If the Architect or District determines that the work
required by the Contract is Substantially Complete during any inspection conducted pursuant to
this Agreement or Specification Section 01770, Contract Closeout Procedures, the Contractor shall
be notified of that determination and the District shall determine if there is Remaining Work. A
list of Remaining Work shall be issued only by the District or the Architect and only after the District
has certified Substantial Completion. The District or Architect shall give the Contractor the
necessary instructions for correction or completion of the Remaining Work, and the Contractor
shall immediately comply with and execute such instructions within the Contract Time. Upon
completion of the Remaining Work, another inspection shall be made that shall constitute the
Final Inspection, provided the Remaining Work has been completed to the satisfaction of the
District. If the remaining work has been completed to the satisfaction of the District, the District
shall make the final acceptance and notify the Contractor in writing of this acceptance as of the
date of Final Inspection.

(c) Final Acceptance – Upon due notice from the Contractor of completion of the entire project, the
District shall make an inspection. If all construction provided for and contemplated by the contract
is found to be completed to the District’s satisfaction then that inspection shall constitute the Final
Inspection and the District shall notify the Contractor in writing of final acceptance effective as of the
date of the Final Inspection.

(d) Default for failure to Complete Remaining Work In the event the Contract Time expires before the
Remaining Work is completed to the satisfaction of the District, the District may provide notice to
the Contractor that the Remaining Work shall be completed by Contractor to the satisfaction of
the District within ten consecutive calendar days from the date of such notice. The failure of the
Contractor to satisfactorily complete the Remaining Work within the ten days shall entitle to
District to declare Contractor in default and thereafter terminate the Contract. The ten-day notice
provided under this paragraph shall not be construed as adding any time to the Contract Time and
is a time period solely for the purposes of providing notice of default.

(e) Application for Final Payment. After the Contractor has completed all Remaining Work to the
satisfaction of the District and delivered all maintenance and operating instructions, schedules,
guarantees, warranties, bonds, certificates of inspection, marked-up record documents and other
documents as required by the Contract, and after the District or Architect has indicated that the
work is acceptable, Contractor may make application for final payment following the Payments
Procedures for progress payments. The final application for payment shall be accompanied by all
documentation called for in the Contract Documents, together with complete and legally effective
releases or waivers (satisfactory to the District) of all liens arising out of or filed in connection with
the work on the project.

(f) Final Payment and Acceptance. If the Architect determines that the work has been completed and
the Contractor’s other obligations under the Contract have been fulfilled, the Architect shall,
within ten working days after receipt of the final application for payment, indicate in writing the
Architect’s recommendation of payment and present the application to District for payment.
Thereupon the Architect shall prepare a Certificate of Final Completion. Otherwise, Architect shall
return the application to Contractor indicating in writing the reasons for refusing to recommend
final payment. Contractor shall make the corrections identified in the Architect’s refusal to
recommend final payment. Thirty days after presentation to District of the application and
accompanying documentation, with the Architect’s recommendation and notice of acceptability
of the work, the amount recommended by Architect shall be come due and payable by District to
Contractor.

5. LIQUIDATED DAMAGES

5.1 LIQUIDATED DAMAGES - SUBSTANTIAL COMPLETION

If the Contractor fails to complete this contract and this Work within the time fixed therefore, allowance
being made for contingencies as provided herein, Contractor becomes liable to the Public Agency for all
its loss and damage there from; and because, from the nature of the case, it is and will be impracticable
and extremely difficult to ascertain and fix the Public Agency's actual damage from any delay in
performance hereof, it is agreed that Contractor will pay as liquidated damages to the Public Agency the
reasonable sum specified in Section 1, the result of the parties' reasonable endeavor to estimate fair
average compensation therefore, for each calendar day's delay in finishing said Work; and if the same
be not paid, Public Agency may, in addition to its other remedies, deduct the same from any money due
or to become due Contractor under this Contract. If the Public Agency for any cause authorizes or
contributes to a delay, suspension of work or extension of time, its duration shall be added to the time
allowed for completion, but it shall not be deemed a waiver nor be used to defeat any right of the Agency
to damages for non-completion or delay hereunder. Pursuant to Government Code Section 4215, the
Contractor shall not be assessed liquidated damages for delay in completion of the work, when such
delay was caused by the failure of the Public Agency or the owner of a utility to provide for removal or
relocation of existing utility facilities.

5.2 LIQUIDATED DAMAGES-THE REMAINING WORK

The Remaining Work, as such work is determined by the Public Agency or Public Agency's
Representative, shall be completed within the Contract Time or any proper extension thereof granted
by Public Agency. If the Contractor shall neglect, fail or refuse to complete the Remaining Work within
the Contract Time or any proper extension thereof granted by the Public Agency, then the Contractor
does hereby agree, as part consideration for the awarding of this Contract, to pay to the Public Agency
the amount specified in the Contract, not as a penalty but as liquidated damages for the Remaining Work
for each such breach of Contract set forth herein for each and every consecutive calendar day that the
Contractor shall be in default after expiration of the Contract Time.
6. **INTEGRATED DOCUMENTS**

The drawings and specifications and special provisions of the Public Agency’s Notice Inviting Bids, and Contractor’s accepted bid for this work are hereby incorporated into this Contract; and they are intended to cooperate, so that anything exhibited in the drawings and not mentioned in the specifications or special provisions, or vice versa, is to be executed as if exhibited, mentioned and set forth in both, to the true intent and meaning thereof when taken all together; and differences of opinion concerning these shall be finally determined by the Public Agency.

7. **PAYMENT**

(a) For strict and literal fulfillment of these promises and conditions, and full compensation for all this work, the Public Agency shall pay the Contractor the sum specified in Section 1, except that in unit price contracts the payment shall be for finished quantities at unit bid prices.

(b) On or about the first day of each calendar month, the Contractor shall submit to the Public Agency a verified application for payment, supported by a statement showing all materials actually installed during the preceding month, the labor expended thereon, and the cost thereof; whereupon, after checking, the Public Agency shall issue to Contractor a certificate for the amount determined to be due, minus five (5%) percent thereof pursuant to the Public Agency’s General Terms and Conditions, but not until defective work and materials have been removed, replaced and made good.

8. **PAYMENTS WITHHELD**

(a) The Public Agency or its agent may withhold any payment, or because of later discovered evidence nullify all or any certificate for payment, to such extent and period of time only as may be necessary to protect the Public Agency from loss because of:

1. Defective work not remedied, or work not completed, or
2. Claims filed or reasonable evidence indicating probable filing, or
3. Failure to properly pay subcontractors or for material or labor, or
4. Reasonable doubt that the work can be completed for the balance then unpaid, or
5. Damage to another contractor, or
6. Damage to the Public Agency, other than damage due to delays.

(b) The Public Agency shall use reasonable diligence to discover and report to the Contractor, as the work progresses, the materials and labor which are not satisfactory to it, so as to avoid unnecessary trouble or cost to the Contractor in making good any defective work or parts.

(c) Thirty-five (35) calendar days after Public Agency files its notice of completion of the entire work, it shall issue a certificate to the Contractor and pay the balance of the contract sum after deducting all amounts withheld under this contract, provided the Contractor shows that all claims for labor and materials have been paid, no claims have been presented to the Public Agency based on acts or omissions of the Contractor, and no liens or withhold notices have been filed against the work or site, and provided there are not reasonable indications of defective or missing work or of late-recorded notices of liens or claims against Contractor.
9. **INSURANCE**

**Contractor’s Liability Insurance:** Before the commencement of the Work, the Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in California as admitted carriers with a financial rating of at least A status as rated in the most recent edition of Best’s Insurance Reports or as amended by the Supplementary General Conditions, if any, such insurance as will protect the Public Agency from claims set forth below, which may arise out of or result from the Contractor’s operations under the Contract and for which the Contractor may be legally liable, whether such operations are by the Contractor, by a Subcontractor, by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable.

(a) Claims for damages because of bodily injury, sickness, disease, or death of any person District would require indemnification and coverage for employee claim;

(b) Claims for damages insured by usual personal injury liability coverage, which are sustained by a person as a result of an offense directly or indirectly related to employment of such person by the Contractor or by another person;

(c) Claims for damages because of injury or destruction of tangible property, including loss of use resulting therefrom, arising from operations under the Contract Documents;

(d) Claims for damages because of bodily injury, death of a person, or property damage arising out of the ownership, maintenance, or use of a motor vehicle, all mobile equipment, and vehicles moving under their own power and engaged in the Work;

(e) Claims involving contractual liability applicable to the Contractor’s obligations under the Contract Documents, including liability assumed by and the indemnity and defense obligations of the Contractor and the Subcontractors; and

(f) Claims involving Completed Operations, Independent Contractors’ coverage, and Broad Form property damage, without any exclusions for collapse, explosion, demolition, underground coverage, and excavating. (XCU)

(g) Claims involving sudden or accidental discharge of contaminants or pollutants.

**Subcontractor Insurance Requirements:** The Contractor shall require its Subcontractors to take out and maintain similar public liability insurance and property damage insurance as required under the above paragraph, titled “Contractor’s Liability Insurance, in amounts commensurate with the value of the subcontract. A “claims made” or modified “occurrence” policy shall not satisfy the requirements of the above paragraph, titled “Contractor’s Liability Insurance, without prior written approval of the District.

**Additional Insured Endorsement Requirement:** The Contractor shall name, on any policy of insurance, the District, Architect, Inspector, the State of California, their officers, employees, agents and independent contractors as Additional Insured. Subcontractors shall name the Contractor, the District, Architect, Inspector, the State of California, their officers, employees, agents and independent contractors as Additional Insured.

The Additional Insured Endorsement included on all such insurance policies shall state that coverage is afforded the additional insured with respect to claims arising out of operations performed by or on behalf of the insured. If the Additional Insured have other insurance which is applicable to the loss, such other insurance shall be on an excess or contingent basis. The insurance provided by the Contractor must be
designated in the policy as primary to any insurance obtained by the Public Agency. The amount of the insurer’s liability shall not be reduced by the existence of such other insurance.

**Workers’ Compensation Insurance:** During the term of this Contract, the Contractor shall provide workers’ compensation insurance for all of the Contractor’s employees engaged in Work under this Contract on or at the Site of the Project and, in case any of the Contractor’s Work is subcontracted, the Contractor shall require the Subcontractor to provide workers’ compensation insurance for all the Subcontractor’s employees engaged in Work under the subcontract. Any class of employee or employees not covered by a Subcontractor’s insurance shall be covered by the Contractor’s insurance. In case any class of employees engaged in Work under this Contract on or at the Site of the Project is not protected under the Workers’ Compensation laws, the Contractor shall provide or cause a Subcontractor to provide adequate insurance coverage for the protection of those employees not otherwise protected. The Contractor shall file with the District certificates of insurance as required under Section 00700, Article 11.6, and in compliance with Labor Code § 3700.

**Specific Insurance Requirement:** Contractor shall take out and maintain and shall require all subcontractors, if any, whether primary or secondary, to take out and maintain:

(a) **Workers’ Compensation Insurance:** $1,000,000.00; Contractor is aware of and complies with Labor Code Section 3700 and the Worker’s Compensation Law.

(b) **Comprehensive General Liability Insurance** with a combined single limit per occurrence of not less than $1,000,000.00 and $2,000,000.00 project specific aggregate, or Commercial General Liability Insurance (including automobile insurance) which provides limits of not less than:

1. **Per occurrence (combined single limit)** $1,000,000.00
2. **Project Specific Aggregate (for this project only)** $2,000,000.00
3. **Products and Completed Operations** $1,000,000.00

(c) **Insurance Covering Special Hazards**

The following Special hazards shall be covered by riders or riders to above mentioned public liability insurance or property damage insurance policy or policies of insurance, in amounts as follows:

1. **Automotive and truck where operated in amounts** $1,000,000.00
2. **Material Hoist where used in amounts** $1,000,000.00
3. **Explosion, Collapse and Underground (XCU coverage)** $1,000,000.00

(d) In addition, provide Excess Liability Insurance coverage in the amount of Two Million Dollars ($2,000,000.00).

**Builder’s Risk/ “All Risk” Insurance/Course-of-Construction Insurance Requirements:** The Contractor, during the progress of the Work and until final acceptance of the Work by District upon completion of the entire Contract, shall maintain Builder’s Risk, Course of Construction or similar first party property coverage issued on a replacement cost value basis consistent with the total replacement cost of all insurable Work and the Project included within the Contract Documents. Coverage is to insure against all risks of accidental direct physical loss, and must include, by the basic grant of coverage or by endorsement, the perils of vandalism, malicious mischief (both without any limitation regarding vacancy or occupancy), fire, sprinkler leakage, civil authority, sonic boom, earthquake, flood, collapse, wind,
lightning, smoke and riot. The coverage must include debris removal, demolition, increased costs due to enforcement of building ordinance and law in the repair and replacement of damage and undamaged portions of the property, and reasonable costs for the Architect’s and engineering services and expenses required as a result of any insured loss upon the Work and Project which is the subject of the Contract Documents, including completed Work and Work in progress, to the full insurable value thereof. Such insurance shall include the District and the Architect as additional named insureds, and any other person with an insurable interest as designated by the District.

The Contractor shall submit to the District for its approval all items deemed to be uninsurable. The risk of the damage to the Work due to the perils covered by the “Builder’s Risk/All Risk” Insurance, as well as any other hazard which might result in damage to the Work, is that of the Contractor and the surety, and no claims for such loss or damage shall be recognized by the District nor will such loss or damage excuse the complete and satisfactory performance of the Contract by the Contractor.

10. BONDS

**Bond Requirements:** Prior to commencing any portion of the Work, the Contractor shall furnish separate payment and performance bonds for its portion of the Work which shall cover 100% faithful performance of and payment of all obligations arising under the Contract Documents and/or guaranteeing the payment in full of all claims for labor performed and materials supplied for the Work. All bonds shall be provided by a corporate surety authorized and admitted to transact business in California as sureties.

To the extent, if any, that the Contract Sum is increased in accordance with the Contract Documents, the Contractor shall, upon request of the Public Agency, cause the amount of the bonds to be increased accordingly and shall promptly deliver satisfactory evidence of such increase to the Public Agency. To the extent available, the bonds shall further provide that no change or alteration of the Contract Documents (including, without limitation, an increase in the Contract Sum, as referred to above), extensions of time, or modifications of the time, terms, or conditions of payment to the Contractor will release the surety. If the Contractor fails to furnish the required bonds, the Public Agency may terminate the Contract for cause.

On signing this contract, Contractor shall deliver to Public Agency for approval good and sufficient bonds with sureties, in amount(s), specified in the specifications or special provisions, guaranteeing faithful performance of this contract and payment for all labor and materials hereunder.

Surety Qualifications: Only bonds executed by admitted Surety insurers as defined in Code of Civil Procedure § 995.120 shall be accepted. Surety must be a California-admitted surety and listed by the U.S. Treasury with a bonding capacity in excess of the Project cost.

Alternate Surety Qualifications: If a California-admitted surety insurer issuing bonds does not meet these requirements, the insurer will be considered qualified if it is in conformance with § 995.660 of the California Code of Civil Procedure and proof of such is provided to the District.

11. FAILURE TO PERFORM

If the Contractor at any time refuses or neglects, without fault of the Public Agency or its agent(s), to supply sufficient materials or workers to complete this agreement and work as provided herein, for a
period of ten days or more after written notice thereof by the Public Agency, the Public Agency may furnish same and deduct the reasonable expenses thereof from the contract price.

12. **LAWS APPLY: General**

Both parties recognize the applicability of various federal, state and local laws and regulations, especially Chapter 1 of Part 7 of the California Labor Code (beginning with Section 1720, and including Sections 1735, 1777.5, 1777.6, forbidding discrimination) and intend that this agreement complies therewith. The parties specifically stipulate that the relevant penalties and forfeitures provided in the Labor Code, especially in Sections 1775, 1776, and 1813, concerning prevailing wages and hours, shall apply to this agreement as though fully stipulated herein.

13. **SUBCONTRACTORS**

Public Contract Code Sections 4100-4113 are incorporated herein.

14. **WAGE RATES**

(a) Pursuant to Labor Code Section 1773, the Director of the Department of Industrial Relations has ascertained the general prevailing rates of wages per diem, and for holiday and overtime work, in the locality in which this work is to be performed, for each craft, specified in the call for bids for this work and are on file with the Public Agency, and are hereby incorporated herein.

(b) This schedule of wages is based on a working day of eight (8) hours unless otherwise specified; and the daily rate is the hourly rate multiplied by the number of hours constituting the working day. When less than that number of hours are worked, the daily wage rate is proportionately reduced, but the hourly rate remains as stated.

(c) The Contractor, and all subcontractors, must pay at least these rates to all persons on this work, including all travel, subsistence, and fringe benefit payments provided for by applicable collective bargaining agreements. All skilled labor not listed above must be paid at least the wage scale established by collective bargaining agreement for such labor in the locality where such work is being performed. If it becomes necessary for the Contractor or any subcontractor to employ any person in a craft, classification or type of work (except executive, supervisory, administrative, clerical or other non-manual workers as such) for which no minimum wage rate is specified, the contractor shall immediately notify the Public Agency which shall promptly determine the prevailing wage rate therefore and furnish the Contractor with the minimum rate based thereon, which shall apply from the time of the initial employment of the person affected and during the continuance of such employment.

15. **HOURS OF LABOR**

Eight hours of labor in one calendar day constitutes a legal day's work, and no worker employed at any time on this work by the Contractor or by any subcontractor shall be required or permitted to work longer thereon except as provided in Labor Code Sections 1810-1815.
16. **APPRENTICES**

Properly indentured apprentices may be employed on this work in accordance with Labor Code Sections 1777.5 and 1777.6, forbidding discrimination.

17. **PREFERENCE FOR MATERIALS**

The Public Agency desires to promote the industries and economy of Contra Costa County, and the Contractor therefore promises to use the products, workers, laborers and mechanics of this County in every case where the price, fitness and quality are at least equal.

18. **ASSIGNMENT**

This agreement binds the heirs, successors, assigns, and representatives of the Contractor; but Contractor cannot assign it in whole or in part, nor any monies due or to become due under it, without the prior written consent of the Public Agency and the Contractor's surety or sureties, unless they have waived notice of assignment.

19. **NO WAIVER BY PUBLIC AGENCY**

Inspection of the work and/or materials, or approval of work and/or materials inspected, or statement by any officer, agent or employee of the Public Agency indicating the work or any part thereof complies with the requirements of this contract, or acceptance of the whole or any part of said work and/or materials, or payments therefore, or any combination of these acts, shall not relieve the Contractor of Contractor's obligation to fulfill this contract as prescribed; nor shall the Public Agency be thereby stopped from bringing any action for damages or enforcement arising from the failure to comply with any of the terms and conditions hereof.

20. **HOLD HARMLESS AND INDEMNITY**

(a) Contractor promises to and shall hold harmless and indemnify from the liabilities as defined in this section.

(b) The indemnities benefited and protected by this promise are the Public Agency and its elective and appointive boards, commissions, officers, agents and employees.

(c) The liabilities protected against are any liability or claim for damage of any kind allegedly suffered, incurred or threatened because of actions defined below, including personal injury, death, property damage, inverse condemnation, or any combination of these, regardless of whether or not such liability, claim or damage was unforeseeable at any time before the Public Agency approved the improvement plan or accepted the improvements as completed, and including the defense of any suit(s) or action(s) at law or equity concerning these.

(d) The actions causing liability are any act or omission (negligent or non-negligent) in connection with the matters covered by this contract and attributable to the contractor, subcontractor(s), or any officer(s), agent(s), or employee(s) of one or more of them.

(e) Non-conditions: The promise and agreement in this section is not conditioned or dependent on whether or not any Indemnities has prepared, supplied, or approved any plan(s), drawing(s),
specifications(s) or special provision(s) in connection with this work, has insurance or other indemnification covering any of these matters, or that the alleged damage resulted partly from any negligent or willful misconduct of any Indemnities.

21. EXCAVATION

Contractor shall comply with the provisions of Labor Code Section 6705, if applicable, by submitting to Public Agency a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during trench excavation.

22. GOVERNMENT CODE SECTION 10532

Contractor shall be subject to the examination and audit of the Auditor General for a period of three years after final payment under the contract.

23. WARRANTY

(a) In addition to any other warranties or guaranties in the Contract Documents, the Contractor warrants, except as provided in paragraph (i) 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 1 year from the date of final acceptance of the Work or Phase of Work, unless otherwise provided or extended in the Contract Documents. If the District takes possession of any part of the work before final acceptance, this warranty shall continue for a period of 1 year from the date the District takes possession.

(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 District-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 1 year or as otherwise provided or extended from the date of repair or replacement.

(e) The District shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage.

(f) If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, the District shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor’s expense.

(g) With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall—

(1) Obtain all warranties that would be given in normal commercial practice;
(2) Require all warranties to be executed, in writing, for the benefit of the District, if directed by the District; and
(3) Enforce all warranties for the benefit of the District, if directed by the District.

(h) In the event the Contractor’s warranty under paragraph (b) of this clause has expired, the District may bring suit at its expense to enforce a subcontractor’s, manufacturer’s, or supplier’s warranty.

(i) Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the District nor for the repair of any damage that results from any defect in District-furnished material or design.

(j) This warranty shall not limit the District’s rights under the Inspection and Acceptance clause of this contract with respect to latent defects, gross mistakes, or fraud.

24. CONSEQUENTIAL DAMAGES

The Contractor and Public Agency waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes:

(a) Damages incurred by the Public Agency for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

(b) Damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination. Nothing contained in this subparagraph shall be deemed to preclude an award of liquidated direct damages, when applicable, in accordance with the requirements of the Contract Documents.

25. HAZARDOUS MATERIALS

(a) If reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos, lead or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Public Agency in writing.

(b) The Public Agency shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to verify that it has been rendered harmless. The Public Agency shall furnish in writing to the Contractor the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written notification from the Public Agency and Contractor. The Contract Time shall be extended appropriately.
26. SAFETY

(a) **Safety Programs.** In addition to and as required by other Sections of the Contract Documents, the Contractor shall be solely responsible for initiating, maintaining and supervising all safety programs required by applicable law, ordinance, regulation or governmental orders in connection with the performance of the Contract, or otherwise required by the type or nature of the Work. The Contractor’s safety program shall include all actions and programs necessary for compliance with California or federally statutorily mandated workplace safety programs, including without limitation, compliance with the California Drug Free Workplace Act of 1990 (California Government Code §§8350 et seq.). Without limiting or relieving the Contractor of its obligations hereunder, the Contractor shall require that its Subcontractors similarly initiate and maintain all appropriate or required safety programs. Prior to commencement of Work, the Contractor shall meet with the Campus Buildings and Grounds Manager, Project Manager, and Construction Manager to review Contractor’s safety precautions and implementation of safety programs during the Work.

(b) **Safety Precautions.** In addition to and as required by other Sections of the Contract Documents, the Contractor shall be solely responsible for initiating and maintaining reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to: (i) employees on the Work and other persons who may be affected thereby; (ii) the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and (iii) other property or items at the site of the Work, or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction. The Contractor shall take adequate precautions and measures to protect existing roads, sidewalks, curbs, pavement, utilities, adjoining property and improvements thereon (including without limitation, protection from settlement or loss of lateral support) and to avoid damage thereto. Without adjustment of the Contract Price or the Contract Time, the Contractor shall repair, replace or restore any damage or destruction of the foregoing items as a result of performance or installation of the Work.

(c) **Safety Signs, Barricades.** In addition to and as required by other Sections of the Contract Documents, the Contractor shall erect and maintain, as required by existing conditions and conditions resulting from performance of the Contract, reasonable safeguards for safety and protection of property and persons, including, without limitation, posting danger signs and other warnings against hazards, promulgating safety regulations and notifying Districts and users of adjacent sites and utilities.

(d) **Safety Notices.** In addition to and as required by other Sections of the Contract Documents, the Contractor shall give or post all notices required by applicable law and comply with applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.
27. **SIGNATURES AND ACKNOWLEDGEMENT**

**Public Agency**, By:  
David Wetmore, Director of Purchasing and Contracts

**Note to Contractor**: (1) Execute acknowledgement form below, and (2) if a corporation, affix Corporate Seal.

**Contractor** hereby also acknowledging awareness of and compliance with Labor Code S1861 concerning Worker's Compensation Law.

**Contractor**:  
By: __________________________________________ (CORPORATE SEAL)  
(Designate Official Capacity – COMPANY NAME)

Print NAME and TITLE

________________________  _____________________  
License Number   Federal ID Number

**NOTARY PUBLIC**

========================================================================================================

State of California  
)ss. ACKNOWLEDGEMENT (By Corporation, Partnership or Individual)  
County of Contra Costa  
)

The person(s) signing above for Contractor, known to me in individual and business capacity as stated, personally appeared before me today and acknowledged that he/she/they executed it and that the corporation or partnership named above executed it.

Dated: ________________________________

(NOTARIAL SEAL)

**END OF SECTION 00600**
# 00700

## GENERAL CONDITIONS

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ARTICLE 1
GENERAL CONDITIONS

1.1 BASIC DEFINITIONS

1.1.1 Action of the Governing Board is a vote of a majority of the District's governing board.

1.1.2 Approval for a Contract, Agreement, or Change Order means written authorization through action of the governing board unless specific delegation of approval authority is delegated to a District representative.

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

1.1.4 Architect means the architect, engineer, or other design professional engaged by the District to design and perform general observation of the work of construction and interpret the drawings and specifications for the Project.

1.1.5 As shown, as indicated, as detailed refer to drawings accompanying this specification.

1.1.6 Bid/Bidders. The term Bid and Proposal have the same meaning, and the same is true for Bidders and Proposers.

1.1.7 Contract or Agreement. When the terms are used in these General Conditions shall be references to the Contract Documents as defined herein.

1.1.8 Contract Time. Contract Time means the number of consecutive calendar days specified in the contract immediately after the date to commence work issued by Owner in the Notice to Proceed and includes both the time allowed for completion of the work required to achieve Substantial Completion and the time allowed to complete the Remaining Work.

1.1.9 Contractor. Whenever the term "Contractor" is used in the Contract or elsewhere in the Contract Documents, it refers to a person or entity that has an agreement directly with the District to perform any of the work for the Project. The term Contractor is referred to throughout the Contract Documents as if singular in number and masculine in gender and means a Contractor or his authorized representative. The term Contractor does not include any contractors under separate and direct contract with the District. A Subcontractor is a person or entity that has a direct or indirect contract with the Contractor to perform any of the Work at the site.

1.1.10 Contractor's Construction Schedule. The document prepared by the Contractor, which details the events of construction and establishes completion dates for the various stages of the Work and the entire project.

1.1.11 The Contract Documents. The Contract Documents consist of the Agreement between District and Contractor (hereinafter the Agreement or Contract), Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, addenda issued prior to bid, instructions
to bidders, notice to bidders, and the requirements contained in the Bid Documents, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is a written amendment to the Contract signed by parties, a Change Order, a Construction Change Directive, or a written order for a minor change in the Work issued by the Architect. The Contract Documents collectively form the Contract. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a written Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind between the Architect and Contractor, between the District and any Subcontractor or Sub-subcontractor, or between any persons or entities other than the District and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect’s duties.

1.1.12 Contractor, District, and Architect are those mentioned as such in the Agreement. They are treated throughout the Contract Documents as if they are of singular number and neuter gender. Any reference to “Owner” shall mean “District.”

1.1.13 Construction Manager. Whenever the term "Construction Manager" or "CM" is used in the contract or elsewhere in the Contract Documents, it refers to the District assigned Construction Manager, or the District Project Manager if no CM is assigned.

1.1.14 Days means calendar days, unless otherwise noted as working days.

1.1.15 Directed. Terms such as “directed,” “requested,” “authorized,” “selected,” “approved,” “required,” and “permitted” mean directed by the Architect or the District, requested by the Architect or District, and similar phrases.

1.1.16 District. Whenever the term "District" is used in the Contract Documents, it refers to the Contra Costa Community College District or those persons designated by the District to act in/on its behalf.

1.1.17 The Drawings are graphic and pictorial portions of the Contract Documents prepared for the Project and approved changes thereto, wherever located and whenever issued, showing the design, location, and scope of the Work, generally including plans, elevations, sections, details, schedules, and diagrams as drawn or approved by the Architect.

1.1.18 Emergency shall be defined as a sudden, unexpected occurrence, involving a clear and imminent danger, demanding immediate action to prevent or mitigate loss of, or damage to, life, health, property, or essential public services. Emergency includes such occurrences as fire, flood, earthquake, or other soil or geologic movements, as well as such occurrences as riot, accident, or sabotage.

1.1.19 Exposed. Whenever this term is used it shall be understood to mean any item or surface, exterior, or interior, which can be seen by a person outside the building, or seen by a person inside any usable space within the building during normal activity. Mechanical and electrical rooms, utility and service tunnels, air handling rooms, and penthouses or platforms shall be considered to have exposed surfaces, as shall the mechanical and electrical construction within them. The interior of closets and alcoves shall be considered exposed surfaces, and shall be finished to match the finish of the adjoining room or space, unless another finish is shown. The interiors of cabinets shall be considered
exposed, but a finish different from that of the exterior may be permitted or specified. Spaces which are not normally occupied or used by occupants or building staff, such as shafts, hoistways, ceiling plenums, attics and crawl spaces shall be considered "concealed" spaces, unless finishes are shown or specified for their surfaces.

1.1.20 Final Completion. The date when all Work for the total project has been completed in accordance with the terms of the Contract Documents and has been inspected following completion of Work identified in the Punchlist Inspection and accepted by the Architect and the District.

1.1.21 Furnish. Whenever this term is used it shall be understood to mean “purchase and deliver to the project site” ready for unloading, unpacking, assembly, installation, and similar operations.

1.1.22 Governing Dictionary. The definitions of words used in these Specifications, which are not defined, The General Conditions, or in referenced standards, are as given in "The American Heritage Dictionary of the English Language”.

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

1.1.24 Inspector of Record is the individual retained by the District in accordance with titles 21 and 24 of the California Code of Regulations and who will be assigned to the Project. May also be referred to as the Project Inspector.

1.1.25 Install. Whenever this term is used it shall be understood to mean “receive, unload, inventory, store and be responsible for at the project site, transport from point of receipt to final destination, protect, unpack, erect, install in place, anchor, connect, apply, and place in operation or finish, cleaning, complete for intended use.”

1.1.26 Installer. An installer is the Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations. Using a term such as “carpentry” does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as “carpenter.” It also does not imply that requirements specified apply exclusively to trades people of the corresponding generic name.

1.1.27 Locality in which the work is performed means the county in which the Project is located.

1.1.28 Option. Whenever this term is used it shall be understood to mean a choice from among the specified products or procedures which shall be made by the Contractor. The choice is not “whether” the work is to be performed, but “which” product or “which” procedure is to be used. The product or procedure chosen by the Contractor shall be provided at no increase in the cost to the District with no lessening of the Contractor’s responsibility for its performance. All or any options selected or proposed are still subject to all requirements for submittals and for approval of same.
1.1.29  **Or Equal** and Or Approved Equal. The terms “or equal” and “or approved equal” shall mean “or equal as approved in writing by the Architect”.

1.1.30  **The Project** is the complete construction of the Work performed in accordance with the Contract Documents.

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

1.1.32  **The Project Site.** Project site is the space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.1.33  **Provide** shall include “provide complete in place,” that is “furnish and install.” Complete and ready for the intended use.

1.1.34  **Punch List Inspection.** The inspection performed by the Construction Manager, Architect and the District upon written notification by the Contractor that the Work is substantially complete.

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

1.1.36  **Remaining Work.** Remaining Work means the work required by the Contract, but not required for Substantial Completion, that the District or Architect determines has not been satisfactorily completed at the time of Substantial Completion, deferred commissioning requirements, deferred and seasonal testing, and all maintenance and operating instructions, schedules, reports, guaranties, warranties, bonds, certificates of inspection, marked-up record documents, prevailing wage compliance reports and all other documents as required by the Contract Documents. Remaining Work may also be referred to as Punch List work.

1.1.37  **Safety Orders** are those issued by any cognizant city, county, state or federal agency.

1.1.38  **Site** refers to the grounds of the Project as defined in the Contract Documents and such adjacent lands as may be directly affected by the performance of the Work.

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

1.1.40  **Specification Language.** These Specifications are written in the imperative mood, as defined in the Construction Specifications Institute’s Manual of Practice. Imperative language is directed to the Contractor. The indicative mood is employed on occasion when such sentence structure is necessary to convey the intended meaning in a more accurate or understandable form. The text is streamlined, with the colon (:) employed as a symbol for the words “shall be”, “shall have”, “shall
conform with”, “shall comply with”, or “shall meet the requirements of”. The colon is also used to separate a paragraph title or heading from the text that follows.

1.1.41 **Standards, Rules, and Regulations** referred to are recognized printed standards and shall be considered as one and a part of these specifications within limits specified. Federal, state and local regulations are incorporated into the Contract Documents by reference.

1.1.42 **Subcontractor**, as used herein, includes those having direct or indirect contracts with Contractor and ones who furnished labor, material or services for a special design according to drawings and specifications of this Work, but does not include ones who merely furnish material not so worked.

1.1.43 **Substantial Completion.** The date on which the Work or designated portion thereof, as certified by the District Project Manager and Architect, is sufficiently complete, in accordance with the Contract Documents, so the District, may occupy or utilize the Work or designated portion thereof for the use for which it is intended.

1.1.44 **Surety** is the person, firm, or corporation that executes as surety the Contractor's Performance Bond and Payment Bond.

1.1.45 **Work of the Contractor or Subcontractor** shall include all labor, materials and equipment necessary for the Contractor to fulfill all of its obligations pursuant to the Contract Documents. It shall include the initial obligation of any Contractor or Subcontractor who performs any portion of the Work, to visit the Site of the proposed Work (a continuing obligation after the commencement of the Work), to fully acquaint and familiarize itself with the conditions as they exist and the character of the operations to be carried out under the Contract Documents, and make such investigation as it may see fit so that it shall fully understand the facilities, physical conditions, and restrictions attending the Work under the Contract Documents. Each such Contractor or Subcontractor shall also thoroughly examine and become familiar with the Drawings, Specifications, and associated bid documents before preparing and submitting any bid.

1.1.46 **Workers** includes laborers, workers, and mechanics.

### 1.2 EXECUTION, CORRELATION AND INTENT

1.2.1 Correlation and Intent

1.2.1.1 **Documents Complementary and Inclusive.** The Contract Documents are complementary; what is required by one shall be as binding as if required by all. The Contract Documents will be construed in accordance with the laws of the State of California and applicable building codes and statutes of the City and/or County where the Project is located. The intent of the Contract Documents is to describe and provide for a functionally complete and operational Project (or part thereof) to be constructed in accordance with the Contract Documents. All Work, materials, and equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as necessary to properly execute and complete the Work to conform to the requirements of the Contract Documents and provide for a functionally complete and operational Project shall be provided by Contractor with no change in the Contract Sum or Contract Time. A typical or representative detail on the Drawings shall constitute the
standard for workmanship and material throughout corresponding parts of the Work. Where necessary, and where reasonably inferable from the Drawings, Contractor shall adapt such representative detail for application to such corresponding parts of the Work with no change in the Contract Sum or Contract Time. The details of such adaptation shall be submitted to the City for approval. Repetitive features shown in outline on the Drawings shall be in exact accordance with corresponding features completely shown. All Contract Documents form the Contractor’s contract with the District. Any item of Work mentioned in the Specifications and not shown on the Drawings, or shown on the Drawings and not mentioned in the Specifications, shall be provided by Contractor as if shown or mentioned in both. Ambiguities or inconsistencies arising as a result of separation of sections or portions of the drawings or specifications by or for subcontractor bidding shall not relieve the Contractor for providing the complete Work at the Contract Price and within the Contract Time.

1.2.1.2 Coverage of the Drawings and Specifications. The Drawings and Specifications generally describe the Work to be performed by Contractor. Generally, the Specifications describe Work which cannot be readily indicated on the Drawings and indicate types, qualities, and methods of installation of the various materials and equipment required for the Work. It is not intended to mention every item of Work in the Specifications, which can be adequately shown on the Drawings, or to show on the Drawings all items of Work described or required by the Specifications even if they are of such nature that they could have been shown. All materials or labor for Work, which is shown on either the Drawings or the Specifications (or is reasonably inferable therefrom as being necessary to complete the Work), shall be provided by the Contractor to provide a complete project. It is intended that the Work be of sound, quality construction, and the Contractor shall be responsible for the inclusion of adequate amounts to cover installation of all items indicated, described, or implied in the portion of the Work to be performed by them.

1.2.1.3 Conflicts. In the event there is a discrepancy between the various Contract Documents, the more stringent, higher quality, and greater quantity of Work shall apply.

1.2.1.4 Conformance With Laws. Each and every provision of law required by law to be inserted in this Contract shall be deemed to be inserted herein, and the Contract shall be read and enforced as though it were included herein, even if through mistake or otherwise any such provision is not inserted, or is not correctly inserted. Before commencing any portion of the Work, Contractor shall check and review the Drawings and Specifications for such portion for conformance and compliance with all laws, ordinances, codes, rules and regulations of all governmental authorities and public and municipal utilities affecting the construction and operation of the physical plant of the Project, all quasi-governmental and other regulations affecting the construction and operation of the physical plant of the Project, and other special requirements, if any, designated in the Contract Documents. Such checking shall include Title 21 and Title 24 of the California Code of Regulations, California Building Code, local utility, local water connection, local grading and all other applicable agencies. In the event Contractor observes any violation of any law, ordinance, code, rule or regulation, or inconsistency with the Contract Documents, Contractor shall, within five (5) days, notify Architect and
District in writing of same and shall ensure that any such violation or inconsistency shall be corrected in the manner provided hereunder prior to the construction of that portion of the Project. The Contractor shall bear all expenses of correcting Work done contrary to said laws, ordinances, rules, and regulations if the Contractor performed same (1) without first consulting the Architect for further instructions regarding said Work or (2) disregarded the Architect’s instructions regarding said work.

1.2.1.5 Ambiguity and Inconsistency. Before commencing any portion of the Work, Contractor shall carefully examine all Drawings and Specifications and other information given to Contractor as to materials and methods of construction and other Project requirements. Contractor shall, within five (5) days, notify Architect and District in writing of any perceived or alleged error, inconsistency, conflict, ambiguity, or lack of detail or explanation in the Drawings and Specifications in the manner provided herein. If the Contractor or its Subcontractors, material or equipment suppliers, or any of their officers, agents, and employees performs, permits, or causes the performance of any Work under the Contract Documents, which it knows or should have known to be in error, inconsistent, or ambiguous, or not sufficiently detailed or explained, Contractor shall bear any and all costs arising therefrom including, without limitation, the cost of correction thereof without increase or adjustment to the Contract Price or the time for performance. If Contractor performs, permits, or causes the performance of any Work under the Contract Documents prepared by or on behalf of Contractor which is in error, inconsistent or ambiguous, or not sufficiently detailed or explained, Contractor shall bear any and all resulting costs, including, without limitation, the cost of correction, without increase to or adjustment in the Contract Price or the Time for performance. Ambiguities or inconsistencies arising as a result of separation of sections or portions of the drawings or specifications by or for subcontractor bidding shall not relieve the Contractor for providing the complete Work without increase to or adjustment in the Contract Price or the Time for performance.

1.2.2 Addenda and Deferred Approvals

1.2.2.1 Addenda are the changes in specifications, drawings, and contract documents, which have been authorized in writing by the District or Architect prior to receipt of bids, and which alter, explain, or clarify the contract documents. Addenda shall govern over all other Contract Documents. Subsequent addenda issued shall govern over prior addenda unless otherwise specified in the addenda.

1.2.2.2 Deferred Approvals. Contract Documents which require deferred approval items are meant to be for illustration purposes only. Contractor is responsible for all deferred approval requirements set forth in the Contract Documents. Contractor is responsible to comply with all laws, building codes, and regulations necessary to obtain all necessary approvals, including those required from the Division of the State Architect (“DSA”) and the State Fire Marshall. Contractor shall not be granted an extension of time for failure to obtain necessary approvals due to failure to comply with laws, building codes, and other regulations (including Title 24 of the California Code of Regulations). Contractor shall schedule all deferred approval items in its progress schedule pursuant to Article 3. If Contractor fails to include deferred-approval items in
its schedule which results in a critical path delay, then Contractor shall be subject to the assessment of liquidated damages.

1.2.2.3 Deferred Approval Requirements. Deferred approvals shall be submitted and processed pursuant to the requirements of Division 1 of the Specifications. All deferred approvals shall be prepared by Contractor or Contractor’s agent early enough so as to not delay the Project. Contractor is aware that Title 21 California Code of Regulations Section 17(g) and Title 24 California Code of Regulations Section 4-317 have specific requirements for deferred approval as to governing agencies and as to the Architect and Engineer for the Project. As a result, any delay associated with the time for approval by applicable agencies or by the Architect or Architect’s consultants shall be Contractor’s.

1.2.3 Specification Interpretation

1.2.3.1 Titles. The Specifications are separated into titled sections for convenience only and not to dictate or determine the trade or craft involved.

1.2.3.2 As Shown, Etc. Where “as shown,” “as indicated,” “as detailed,” or words of similar import are used, reference is made to the Drawings accompanying the Specifications unless otherwise stated. Where “as directed,” “as required,” “as permitted,” “as authorized,” “as accepted,” “as selected,” or words of similar import are used, the direction, requirement, permission, authorization, approval, acceptance, or selection by Architect is intended unless otherwise stated.

1.2.3.3 General Conditions. The General Conditions and supplementary general conditions are a part of each and every section of the Specifications.

1.2.3.4 Abbreviations. In the interest of brevity, the Specifications are written in an abbreviated form and may not include complete sentences. Omission of words or phrases such as “Contractor shall,” “shall be,” etc., are intentional. Nevertheless, the requirements of the Specifications are mandatory. Omitted words or phrases shall be supplied by inference in the same manner as they are when a “note” occurs on the Drawings. In the interest of brevity, the Contract Documents frequently omit modifying words such as “all” and “any” and articles such as “the” and “an,” but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

1.2.3.5 Plural. Words in the singular shall include the plural whenever applicable or the context so indicates.

1.2.3.6 Metric. The Specifications may indicate metric units of measurement as a supplement to U.S. customary units. When indicated thus: 1" (25 mm), the U. S. customary unit is specific, and the metric unit is nonspecific. When not shown with parentheses, the unit is specific. The metric units correspond to the “International System of Units” (SI) and generally follow ASTM E 380, “Standard for Metric Practice.”

1.2.3.7 Standard Specifications. Any reference to standard specifications of any society, institute, association, or governmental authority is a reference to the organization’s standard specifications, which are in effect at the date of the Contractor’s proposal unless directed otherwise. If applicable specifications are revised prior to
completion of any part of the Work, the Contractor may, if acceptable to Architect, perform such Work in accordance with the revised specifications. The standard specifications, except as modified in the Specifications for the Project, shall have full force and effect as though printed in the Specifications. Architect will furnish, upon request, information as to how copies of the standard specifications referred to may be obtained.

1.2.4 Rules of Document Interpretation

1.2.4.1 In the event of conflict within the drawings, the following rules shall apply:

(a) General Notes, when identified as such, shall be incorporated into other portions of Drawings.

(b) Schedules, when identified as such, are complementary with other notes and other portions of Drawings including those identified as General Notes.

(c) Larger scale drawings shall take precedence over smaller scale drawings.

(d) At no time shall the Contractor base construction on scaled drawings.

1.2.4.2 Specifications shall govern as to materials, workmanship, and installation procedures.

1.2.4.3 If Contractor observes that drawings and specifications are in conflict, Contractor shall, within five (5) days, notify the Architect in writing for the purposes of obtaining an interpretation of the Contact Documents.

1.2.4.4 In the case of conflict or inconsistencies, the order of precedence shall be as follows:

(a) General Conditions take precedence over Drawings and Specifications.

(b) Special Conditions take precedence over General Conditions.

(c) The Agreement shall take precedent over the Special Conditions.

(d) In the case of disagreement or conflict between or within standards, specifications, and drawings, the more stringent, higher quality, and greater quantity of Work shall apply.

1.3 OWNERSHIP AND USE OF ARCHITECT’S DRAWINGS, SPECIFICATIONS AND OTHER DOCUMENTS

The Drawings, Specifications, and other contract documents for the Project are the property of the District and/or Architect pursuant to Education Code § 17316. The Contractor may retain one contract record set. Neither the Contractor nor any Subcontractor, or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications, and other documents prepared by the Architect. All copies except the Contractor’s record set, shall be returned or properly accounted for upon completion of the Work. The Drawings, Specifications, and other documents prepared by the Architect, and copies thereof furnished to the Contractor are not to be used by the Contractor or any Subcontractor, Sub-subcontractor, or material or equipment supplier on other projects or for additions to this Project outside the scope of the Work. The District and/or Architect hereby grants the Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers a limited license
to use applicable portions of the Drawings, Specifications, and other documents prepared for the Project in the execution of their Work under the Contract Documents. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the District’s property interest or other reserved right.

ARTICLE 2

DISTRICT

2.1 INFORMATION AND SERVICES REQUIRED OF THE DISTRICT

2.1.1 Site Survey.

If applicable, the District will furnish, at its expense, a legal description of the Site and a land survey showing the boundaries of the Site. Contractor shall be responsible for all surveys regarding location of construction, grading and site work.

2.1.2 Soils.

When required by the scope of the Project, the District will furnish, at its expense, the services of geotechnical engineers or consultants when reasonably required and deemed necessary by the Architect or as required by local or state codes. Such services, with written reports and appropriate written professional recommendations, may include test boring, test pits, soil bearing values, percolation tests, air and water pollution tests, and ground corrosion and resistivity tests, including necessary operations for determining subsoil, air, and water conditions.

2.1.3 Contractor Reliance.

If appropriate to the Work, a soils investigation report has been obtained from test holes at the Site, and such report is available for the Contractor’s use in preparing its bid and Work under this Contract. The soils report is provided for review. Any information obtained from such report or any other information given on drawings as to subsurface soil condition or to elevations of existing grades or elevations of underlying rock is approximate only. If, during the course of Work under this Contract, Contractor encounters subsurface conditions which differ materially from those indicated in the soils investigation report, then Contractor shall notify the District within five (5) calendar days of discovery of the condition, and changes to the contract price may be made in accordance with Article 7 entitled “Changes in the Work.” Contractor agrees that no claim against District will be made by Contractor for damages and hereby waives any rights to damages in the event the Contractor fails to notify District within the five-day period mentioned above.

WARNING: DISTRICT DOES NOT WARRANT THE SOILS AT THE PROJECT SITE. SOILS INVESTIGATION REPORT IS PROVIDED FOR CONTRACTORS INFORMATION ONLY. CONTRACTOR HAS CONDUCTED AN INDEPENDENT INVESTIGATION OF THE PROJECT SITE AND THE SOILS CONDITIONS OF THE SITE. DISTRICT DOES NOT WARRANT THE SOILS CONDITIONS OF THE SITE AND CONTRACTOR IS FULLY RESPONSIBLE TO ASCERTAIN SITE CONDITIONS FOR THE PURPOSES OF DETERMINING CONSTRUCTION MEANS AND METHODS PRIOR TO
COMMENCING CONSTRUCTION. THE SOILS INVESTIGATION REPORT IS NOT A CONTRACT DOCUMENT.

2.1.4 Utilities.

2.1.4.1 Regional Notification Center. Contractor, except in an emergency, shall contact the appropriate regional notification center at least two working days prior to commencing any excavation if the excavation will be conducted in an area or in a private easement which is known, or reasonably should be known, to contain subsurface installations other than the underground facilities owned or operated by the District, and obtain an inquiry identification number from that notification center. No excavation shall be commenced and carried out by the Contractor unless such an inquiry identification number has been assigned to the Contractor or any subcontractor of the Contractor and the District has been given the identification number by the Contractor. Any damages arising from failure to make appropriate regional notification shall be at the sole risk of Contractor. Any delays caused by failure to make appropriate regional notification shall be at the sole risk of Contractor and shall not be considered for extension of time pursuant to Paragraph 8.4.

2.1.4.2 Utilities – Removal and Restoration

The District has endeavored to determine the existence of utilities at the Site of the Work from the records of the District of known utilities in the vicinity of the Work. The positions of these utilities as derived from such records are shown in the Contract Documents.

No excavations were made to verify the locations shown for underground utilities. The service connections to these utilities may not be shown on the drawings. It shall be the responsibility of the Contractor to determine the exact location of all service connections. The Contractor shall make its own investigations, including exploratory excavations, to determine the locations and type of service connections, prior to commencing work which could result in damage to such utilities. The Contractor shall immediately notify the District’s representative as to any utility discovered by Contractor in a different position than shown in the Contract Documents or which is not shown on the Contract Documents.

Contractor shall coordinate its Work with all utilities, including, but not limited to electricity, water, gas and telephone and meet with said utilities prior to the start of any work.

2.1.4.3 Other Utilities.

In case it should be necessary to remove, relocate, or temporarily maintain a utility because of interference with the Work, the work on the utility shall be performed and paid for as follows:

When it is necessary to remove, relocate or temporarily maintain a service connection, the cost of which is not required to be borne by the owner thereof, the Contractor shall bear all expenses incidental to the work on the service connection. The work on the service connection shall be done in a manner satisfactory to the owner thereof; it being understood that the owner of the service connection has the option of doing such work with his own forces or permitting the work to be done by the Contractor.
When it is necessary to remove, relocate, or temporarily maintain a utility which is in the position shown on the drawings, the cost of which is not required to be borne by the owner thereof, the Contractor shall bear all expenses incidental to the work on the utility. The work on the utility shall be done in a manner satisfactory to the owner thereof; it being understood that the owner of the utility has the option of doing such work with his own forces or permitting the work to be done by the Contractor.

When it is necessary to remove, relocate, or temporarily maintain a utility which is not shown on the drawings or is in a position different from that shown on the drawings and were it in the position shown on the drawings would not need to be removed, relocated, or temporarily maintained, and the cost of which is not required to be borne by the owner thereof, the District will make arrangements with the owner of the utility for such work to be done at no cost to the Contractor, or will require the Contractor to do such work in accordance with Article 7 or will make changes in the alignment and grade of the Work to obviate the necessity to remove, relocate, or temporarily maintain the utility. Changes in alignment and grade will be ordered in accordance with Article 7 herein.

No representations are made that the obligations to move or temporarily maintain any utility and to pay the cost thereof is or is not required to be borne by the owner of such utility, and it shall be the responsibility of the Contractor to investigate to find out whether said cost is required to be borne by the owner of the utility.

The right is reserved to governmental agencies and to owners of utilities to enter at any time upon any street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the Work and for the purpose of maintaining and making repairs to their property.

2.1.5 Existing Utility Lines; Removal, Relocation.

2.1.5.1 Main or Trunkline Facilities

If the Contractor while performing the contract discovers utility facilities not identified by the District in the Contract Documents, Contractor shall, within five (5) days, notify the District and utility in writing.

The District has the responsibility to identify, with reasonable accuracy, main or trunkline facilities on the drawings and specifications. In the event that main or trunkline utility facilities are not identified with reasonable accuracy in the drawings and specifications, District shall assume the responsibility for their timely removal, relocation, or protection.

The owner of the public utility shall have the sole discretion to perform repairs or relocation work or permit the Contractor to do such repairs or relocation work at a reasonable price.

The Contractor shall exercise reasonable care and shall be compensated by the District for the actual verified field costs of locating, and removing, relocating, protecting or temporarily maintaining such main or trunkline utility facilities not indicated with reasonable accuracy in the drawings and specifications, and for equipment in use on the project necessarily idled during such work. This work shall be performed in accordance with Article 7 of these General Conditions.

Alternatively, District may make changes in the alignment and grade of the work to obviate the need to remove, relocate, or temporarily maintain the utility, in accordance with Article 7 or District
may make arrangements with the owner of the utility for such work to be done at no cost to the Contractor.

The Contractor shall not be assessed a forfeiture for delay in completion of the Project when such delay is caused by the failure of the District or the owner of the utility to provide for the removal, relocation, protection or temporary maintenance of all such main or trunkline facilities not indicated with reasonable accuracy.

Nothing herein shall preclude the District from pursuing any appropriate remedy against the utility for delays which are the responsibility of the utility.

Nothing herein shall be construed to relieve the utility from any obligation as required either by law or by contract to pay the cost of removal or relocation of existing utility facilities.

2.1.5.2 Assessment. These subparagraphs shall not be construed to preclude assessment against the Contractor for any other delays in completion of the Work. Nothing in these subparagraphs shall be deemed to require the District to indicate the presence of existing service laterals or appurtenances whenever the presence of such utilities on the Site can be inferred from the presence of other visible facilities, such as buildings, or meter junction boxes on or adjacent to the Site.

2.1.5.3 Notification. If the Contractor, while performing Work under this Contract, discovers utility facilities not identified by the District in the Contract Documents, Contractor shall, within five (5) days, notify the District and the utility in writing. If Contractor fails to notify the District within five (5) days after discovery of any utility facilities not identified by District in the Contract Documents, Contractor waives all rights to be compensated for any extra Work or damages resulting from such discovered utilities.

2.1.6 Easements.

District shall secure and pay for easements for permanent structures or permanent changes in existing facilities, if any, unless otherwise specified in the Contract Documents.

2.2 DISTRICT’S RIGHT TO CARRY OUT THE WORK

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents, including, but not limited to:

1. Failure to supply adequate workers on the entire Project or any part thereof;
2. Failure to supply a sufficient quantity of materials;
3. Failure to perform any provision of this Contract;
4. Failure to comply with safety requirements, or due to Contractor is creation of an unsafe condition;
5. In the case of bona fide emergency;
6. Failure to order materials in a timely manner;
7. Failure to prepare deferred-approval items or shop drawings in a timely manner;
8. Failure to comply with Contractor’s schedule which would result in a delay to the critical path;

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents, and fails (within a five-day period after receipt of written notice or a shorter time period expressly stated in the written notice from the District in an emergency situation) to commence and continue correction of such default with diligence and promptness, the District may correct such deficiencies without prejudice to other remedies the District may have, including those set forth in Article 14 after providing five-day written notice to Contractor and Surety. If during this five (5) day period, Surety personally delivers notice to District that it intends to perform such work, District shall allow Surety seven (7) days to perform. In an emergency situation, the District may correct such deficiencies without prejudice to other remedies the District may have, including those set forth in Article 14 after providing 48 hours notice to the Contractor. In either case, the Contractor will be invoiced the cost of correcting such deficiencies, including compensation for additional services and expenses made necessary by such default, or neglect. The invoice amount shall be deducted from the next payment due the Contractor. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the District.
ARTICLE 3

THE CONTRACTOR

3.1 SUPERVISION AND CONSTRUCTION PROCEDURES

3.1.1 Contractor.

The Contractor shall continually supervise and direct the Work using the Contractor’s best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, procedures; and shall coordinate all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. The Contractor shall not perform the Work without utilizing the Contract Documents or, where required, approved shop drawings, product data, or samples for any such portion of the work. If any of the Work is performed by contractors retained directly by the District, Contractor shall be responsible for the coordination and sequencing of the work of those other contractors so as to avoid any impact on the project schedule pursuant to the requirements of Article 6 and Article 8. Specific duties of the Contractor shall include those set out in Section 43 of Title 21 of the California Code of Regulations and Section 4-343 of Title 24 of the California Code of Regulations. These duties include, but are not limited to the following:

(a) Responsibilities. It is the duty of the Contractor to complete the Work covered by his or her contract in accordance with the approved drawings and specifications. The Contractor in no way is relieved of any responsibility by the activities of the Architect, Engineer, Inspector or DSA in the performance of their duties.

(b) Performance of the work. The Contractor shall carefully study the approved drawings and specifications and shall plan its schedule of operations well ahead of time. If at any time it is discovered that work is being done which is not in accordance with the approved drawings and specifications, the contractor shall correct the work immediately.

All inconsistencies or times which appear to be in error in the drawings and specifications shall promptly be called to the attention of the Architect or, Engineer, for interpretation or correction. Local conditions which may affect the structure shall be brought to the Architect’s attention at once. In no case, shall the instruction of the Architect be construed to cause work to be done which is not in conformity with the approved drawings, specifications, change orders, construction change directives, and as required by law.

The Contractor shall not carry on Work except with the knowledge of the Inspector of Record.

(c) Verified Reports. The Contractor shall make and submit to the District from time to time, verified reports as required in Section 36 of Title 21 and Section 4-366 of Title 24.

Contractor shall fully comply with any and all reporting requirements of Education Code Sections 81147, et seq., in the manner prescribed by Title 24, as applicable.
3.1.2 Contractor Responsibility.

The Contractor shall be responsible to the District for acts and omissions of the Contractor’s employees, Subcontractors, material and equipment suppliers, and their agents, employees, invitees, and other persons performing portions of the Work under direct or indirect contract with the Contractor or any of its Subcontractors.

3.1.3 Obligations not Changed by Architect’s Actions.

The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect’s administration of the Contract or by tests, inspections, or approvals required or performed by persons other than the Contractor.

3.1.4 Acceptance/Approval of Work.

The Contractor shall be responsible to determine when any completed portions of the Work already performed under this Contract or provided pursuant to Article 6 are suitable to receive subsequent Work thereon.

3.1.5 Performance of Work With Own Force.

Contractor shall perform at least 15% of the Work, exclusive of supervisory and clerical work without the services of any subcontractor. Contractor shall supervise and direct the work competently and efficiently, devoting such attention thereto and applying such skills as may be necessary to perform the Work in accordance with the Contract Documents.

3.2 SUPERVISION

3.2.1 Full Time Supervision.

Unless personally present on the Project site where the Work is being performed, the Contractor shall keep on the Work at all times during its progress a competent construction Superintendent satisfactory to the District. The Superintendent shall be present on a full-time basis, shall be dedicated exclusively to the Project and shall not share superintendency duties with another project or job. The Superintendent shall not be replaced except with written consent of the District. The Superintendent shall represent the Contractor in its absence and shall be fully authorized to receive and fulfill any instruction from the Architect, the Inspector, the District or any other District representative. All Requests for Information shall be originated by the Superintendent and responses thereto shall be given to the Superintendent. No Work shall begin on any day by any Subcontractor or other person on the Project site until the Superintendent has arrived, or shall any Work continue during the day after the Superintendent has departed from the Project site. The Superintendent shall have authority to bind Contractor through the Superintendent’s acts. The Superintendent shall represent the Contractor, and communications given to the Superintendent shall be binding on the Contractor. Before commencing the Work, Contractor shall give written notice to District and Architect of the name and a Statement of Qualifications of such superintendent for District approval. Superintendent shall not be changed except with written consent of District, unless a superintendent proves to be unsatisfactory to Contractor and ceases to be in its employ, in which case, Contractor shall notify District and Architect in

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Diablo Valley College
D-1045E Library Building HVAC
writing. Contractor shall provide a replacement superintendent approved by the District prior to performing additional work.

3.2.2 Staff.

Notwithstanding other requirements of the contract documents, the Contractor and each Subcontractor shall: (1) furnish a competent and adequate staff as necessary for the proper administration, coordination, supervision, and superintendence of its portion of the Work; (2) organize the procurement of all materials and equipment so that the materials and equipment will be available at the time they are needed for the Work; and (3) keep an adequate force of skilled and fit workers on the job to complete the Work in accordance with all requirements of the Contract Documents.

3.2.3 Right to Remove.

District shall have the right, but not the obligation, to require the removal from the Project of any superintendent, staff member, agent, or employee of any Contractor, Subcontractor, material or equipment supplier.

3.3 LABOR AND MATERIALS

3.3.1 Contractor to Provide.

Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, material, equipment, tools, construction equipment and machinery, water, heat, air conditioning, utilities, transportation, and other facilities, services and permits necessary for proper execution and completion of the Work whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

3.3.2 Quality.

Unless otherwise specified, all materials and equipment to be permanently installed in the Project shall be new and shall be of the highest quality or as specifically stated in the Contract Documents. The Contractor shall, if requested, furnish satisfactory evidence as to kind and quality of all materials and equipment within ten (10) days of a written request by the District, including furnishing the District with bona fide copies of invoices for materials or services provided on the Project. All labor shall be performed by workers skilled in their respective trades, and shall be of the same or higher quality as with the standards of other school construction.

3.3.3 Replacement.

Any work, materials, or equipment, which do not conform to these requirements or the standards set forth in the Contract Documents, may be disapproved by the District, in which case, they shall be removed and replaced by the Contractor at no additional cost or extension of time to the District.
3.3.4  Discipline.

The Contractor shall enforce strict discipline and good order among the Contractor's and Subcontractor's employees, and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them. As used in this subsection, "unfit" includes any person who the District concludes is improperly skilled for the task assigned to that person, who fails to comply with the requirements of this article, or who creates safety hazards which jeopardize other persons and/or property.

3.3.5  Noise, Drugs, Tobacco, and Alcohol.

Contractor shall take all steps necessary to insure that employees of Contractor or any of its subcontractors' employees do not use, consume, or work under the influence of any alcohol, tobacco or illegal drugs while on the project. Contractor shall further prevent any of its employees or its subcontractor employees from playing any recorded music devices or radios or wearing any radio headphone devices for entertainment while working on the project. Likewise, Contractor shall prevent its employees or subcontractor's employees from bringing any animal onto the project. Contractors shall not violate any written school policies.

3.3.6  Delivery of Material.

Contractor shall place orders for materials or equipment so that the Work may be completed in accordance with the Construction schedule for the Work as set forth in Article 8 of this Agreement. Contractor shall, upon demand from the Architect, furnish to the Architect documentary evidence including, but not limited to purchase orders, invoices, bills of materials, work orders and bills of lading, showing that orders have been placed.

3.3.7  Liens and Other Security Interests of Subcontractors and Material Suppliers.

No material, supplies, or equipment for the Work shall be purchased subject to any chattel mortgage or under a conditional sale or other agreement by which an interest therein or in any part thereof is retained by seller or supplier. Contractor warrants good title to all material, supplies, and equipment installed or incorporated in Work and agrees upon completion of all Work to deliver premises, together with all improvements and appurtenances constructed or placed thereon by it, to District free from any claims, security interests, liens, or charges. Contractor further agrees that neither it nor any person, firm, or corporation furnishing any materials or labor for any Work covered by this Contract shall have any right to place a lien upon the premises or any improvement or appurtenance thereof, except that Contractor may install metering devices or other equipment of a utility company or political subdivision, title to which is commonly retained by the utility company or political subdivision. In event of installation of any such metering device or equipment, Contractor shall advise District as to its owner within five (5) days of such installation in writing, prior to making the installation.

3.3.8  Title to Materials.

The title to new materials or equipment for the Work of this Contract, and attendant liability for its protection and safety, shall remain with Contractor until incorporated in the Work of this Contract and accepted by the District and Architect; no part of said materials shall be removed from its place of
storage, and Contractor shall keep an accurate inventory of all said materials and equipment in a manner satisfactory to the District or its authorized representative.

3.3.9 Assemblies.

For all material and equipment specified or indicated in the Drawings, the Contractor shall provide all labor, materials, equipment, and services necessary for complete assemblies and complete working systems. Incidental items not indicated on the Drawings, nor mentioned in the Specifications, that can legitimately and reasonably be inferred to belong to the Work described, or be necessary in good practice to provide a complete assembly or system, shall be furnished as though itemized in the Contract Documents in every detail. In all instances, material and equipment shall be installed in strict accordance with each manufacturer’s most recent published recommendations and specifications.

3.4 WARRANTY

3.4.1 The Contractor warrants to the District and Architect that material and equipment furnished under the Contract will be of the highest quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. Contractor’s warranty and guaranty to District includes, but is not limited to the following representations:

3.4.1.1 In addition to any other warranties and guaranties provided elsewhere, Contractor shall, and hereby does, warrant all Work after the date of Notice of Completion of Work by District and shall repair or replace any or all such work, together with any other work, which may be displaced in so doing that may prove defective in workmanship or materials within a one (1) year period from date of completion as defined in Public Contract Code Section 7107(c) without expense whatsoever to District, ordinary wear and tear, unusual abuse or neglect excepted. District will give notice of observed defects with reasonable promptness. Contractor shall notify District upon completion of repairs.

3.4.1.2 In the event of failure of Contractor to comply with above mentioned conditions within one week after being notified in writing, District is hereby authorized to proceed to have defects repaired and made good at expense of Contractor who hereby agrees to pay costs and charges therefore immediately on demand.

3.4.1.3 If, in the opinion of the District, defective Work creates a dangerous condition or requires immediate correction or attention to prevent further loss to the District, the District will attempt to give the notice required by this Article. If the Contractor cannot be contacted or does not comply with the District’s requirements for correction within a reasonable time as determined by the District, the District may, notwithstanding the provisions of this article, proceed to make such correction or attention which shall be charged against Contractor. Such action by the District will not relieve the Contractor of the guarantee provided in this Article or elsewhere in this Contract.
3.4.1.4 This Article does not in any way limit the guarantee on any items for which a longer warranty or guaranty is specified or on any items for which a manufacturer gives a guarantee for a longer period. Contractor shall furnish District all appropriate guaranty or warranty certificates upon completion of the project.

3.4.2 Format - All Warranties/Guaranties and shall include:

3.4.2.1 Contractor, subcontractor, and equipment supplier shall provide Warranties and Guaranties on their original company letterhead with original signature.

3.4.2.2 Contractor shall provide original Warranties and Guaranties. Photo copies, fax and e-mail copies are not acceptable.

3.4.3 Preparation

3.4.3.1 Contractor shall obtain warranties and guaranties, executed in duplicate by each applicable and/or responsible subcontractor(s), supplier(s), and manufacturer(s), within fifteen (15) days after Notice of Substantial Completion of the applicable Work or Phase of Work. Except for items put into use with District’s permission, Contractor shall leave date of beginning of time of warranty or guaranty blank until the date of completion is determined by District.

3.4.3.2 Contractor’s Response to Construction Warranty and Guaranty Service Requirements: Following oral or written notification by the District, respond to construction warranty and guaranty service requirements within 24 hours, or earlier in case of emergency.

3.4.4 Warranty and/or Guaranty Tags.

At the time of installation, tag each warranted or guaranteed item with a durable, oil and water resistant tag approved by the Contracting Officer. Attached each tag with a copper wire and spray with a silicone waterproof coating. The date of Substantial Completion and the Contractor Authorized signature must remain blank until the date the District makes a determination of Substantial Completion. Show the following information on the tag:

WARRANTY/GUARANTY INFORMATION - [insert project number and name on actual tag]

a. Type of product/material______________________________________________.

b. Model number______________________________________________________.

c. Serial number______________________________________________________.

d. Contract number___________________________________________________.

e. Warranty/Guaranty period______(months) from_________to__________________.

f. Inspector’s signature_________________________________________________.

g. Construction Contractor______________________________________________.

Address______________________________________________________________.

Telephone number______________________________________________________.

h. Warranty or Guaranty contact___________________________________________.

Address______________________________________________________________.

Telephone number______________________________________________________.

j. WARNING - PROJECT PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE DURING THE WARRANTY PERIOD.
3.5 **TAXES**

Contractor will pay all applicable Federal, State, and local taxes on all materials, labor, or services furnished by it, and all taxes arising out of its operations under the Contract Documents. District is exempt from Federal Excise Tax, and a Certificate of Exemption shall be provided upon request.

3.6 **PERMITS, FEES AND NOTICES**

3.6.1 **Payment.**

The Contractor shall secure and pay for all permits and governmental fees, licenses, and inspections necessary for proper execution and completion of the Work which are necessary after execution of the Contract and are legally required by any authority having jurisdiction over the Project, except those required by the Division of the State Architect (DSA). District shall be responsible for all testing and inspection as required by the DSA on-site or within the distance limitations set forth in Paragraph 13.5.2, unless a different mileage range is specified in the Special Conditions.

3.6.2 **Compliance.**

The Contractor shall comply with and give notices required by any law, ordinance, rule, regulation, and lawful order of public authorities bearing on performance of the Work.

3.6.3 **Responsibility.**

The Contractor shall perform all Work in conformance with every applicable law, statute, ordinance, building code, rule or regulation. The Contractor shall assume full responsibility for such Work and shall bear the attributable cost of correction or project delay.

3.7 **[RESERVED]**

3.8 **CONTRACTOR’S CONSTRUCTION SCHEDULES**

3.8.1 **Requirements.**

(a) Within ten (10) calendar days after being awarded the contract, Contractor shall submit a progress schedule for District’s approval. The schedule shall not exceed time limits set forth in the Contract Documents and shall comply with all of the scheduling requirements as set forth in the Specifications. Failure to submit a schedule or submittal of a schedule which shows completion of the Work beyond the specified completion date shall be deemed a material breach by the Contractor. The schedule must indicate the beginning and completion of all phases of construction and shall use the "critical path method" (commonly called CPM) for the value reporting, planning and scheduling, of all Work required under the Contract Documents. The scheduling is necessary for the District’s adequate monitoring of the progress of the Work and shall be prepared in accordance with the time frame described in Article 8 of the General Conditions. The architect may disapprove of any schedule or require modification to it if, in the
opinion of the Architect or District, adherence to the progress schedule will not cause the Work to be completed in accordance with the Agreement.

(b) Contractor shall not submit a schedule showing early completion without indicating float time through the date set for Project completion by District. Contractor's schedule shall account for all days past early completion as float which belongs to both District and Contractor. Usage of float shall not entitle Contractor to any delay claim or damages due to delay.

(c) Contractor shall not be granted an extension of time for failure to obtain necessary approvals for deferral approvals due to failure to comply with laws, building codes, and other regulations (including Title 24 of the California Code of Regulations). Contractor shall schedule all deferred approval items and shop drawings in its progress schedule. If Contractor fails to include deferred approval items and shop drawings in its schedule which results in a critical path delay, then Contractor shall be subject to the assessment of liquidated damages.

(d) In addition to providing a schedule update every thirty (30) days, the Contractor, if requested by the Architect or District, shall provide revised schedules within ten (10) days if, at any time, the Architect or District, consider the completion date to be in jeopardy because of "activities behind schedule." The additional schedule shall include a new arrow or precedence diagram and schedule reports conforming to the requirements above, designed to show how the Contractor intends to accomplish the Work to meet the completion date. The form and method employed by the Contractor shall be the same as for the original initial schedule. The Contractor shall modify any portions of the schedule that become infeasible because of "activities behind schedule" or for any other valid reason. An activity that cannot be completed by its original latest completion date shall be deemed to be behind schedule. If Contractor submits a revised schedule showing an earlier completion date for the Project, Architect's acceptance of this revised schedule shall not entitle Contractor to any delay claim or damages due to any such revised schedule.

3.8.2 Failure to Meet Requirements.

Failure of the Contractor to provide proper schedules as required by this Article and Article 9 is a material breach of the contract and grounds for termination pursuant to Article 14. The District, at its sole discretion, may choose, instead, to withhold, in whole or in part, any progress payments or retention amounts otherwise payable to the Contractor.

3.9 [RESERVED]

3.10 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the Site for the District one current copy of the International Building Code, Titles 19, 21 and 24 of the California Code of Regulations and one record copy of the Drawings, Specifications, Addenda, Change Orders, and other Modifications, in good order and marked currently to record changes and selections made during construction. In addition, the Contractor shall maintain at the Site approved Shop Drawings, Product Data, Samples, and similar required submittals. These documents shall be available to the Architect and shall be delivered to the Architect for delivery to the District upon completion of the Work.
3.11 SHOP DRAWINGS, PRODUCT DATA, SAMPLES, AND SUBSTITUTIONS

3.11.1 Submittals defined.

3.11.1.1 Shop Drawings. The term “shop drawings” as used herein means drawings, diagrams, schedules, and other data, which are prepared by Contractor, Subcontractors, manufacturers, suppliers, or distributors illustrating some portion of the Work, and includes: illustrations; fabrication, erection, layout and setting drawings; manufacturer’s standard drawings; schedules; descriptive literature, instructions, catalogs, and brochures; performance and test data including charts; wiring and control diagrams; and all other drawings and descriptive data pertaining to materials, equipment, piping, duct and conduit systems, and methods of construction as may be required to show that the materials, equipment, or systems and their position conform to the requirements of the Contract Documents. The Contractor shall obtain and submit with shop drawings all seismic and other calculations and all product data from equipment manufacturers. “Product data” as used herein are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate a material, product, or system for some portion of the Work. As used herein, the term “manufactured” applies to standard units usually mass-produced, and “fabricated” means items specifically assembled or made out of selected materials to meet individual design requirements. Shop drawings shall: establish the actual detail of all manufactured or fabricated items, indicate proper relation to adjoining work, amplify design details of mechanical and electrical systems and equipment in proper relation to physical spaces in the structure, and incorporate minor changes of design or construction to suit actual conditions.

3.11.1.2 Samples. The term “samples” as used herein are physical examples furnished by Contractor to illustrate materials, equipment, or quality and includes natural materials, fabricated items, equipment, devices, appliances, or parts thereof as called for in the Specifications, and any other samples as may be required by the Architect to determine whether the kind, quality, construction, finish, color, and other characteristics of the materials, etc., proposed by the Contractor conform to the required characteristics of the various parts of the Work. All Work shall be in accordance with the approved samples.

3.11.1.3 Contractor’s Responsibilities. Contractor shall obtain and shall submit all required shop drawings, samples, etc., in accordance with Contractor’s “Schedule for Submission of Shop Drawings and Samples” as required in the scheduling portion of the General Conditions at Articles 3.8 or the Specifications with such promptness as to cause no delay in its own Work or in that of any other contractor or subcontractor but in no event later than ninety (90) days after the execution of the Contract. No extensions of time will be granted to Contractor or any Subcontractor because of its failure to have shop drawings and samples submitted in accordance with the Schedule. Each Subcontractor shall submit all shop drawings, samples, and manufacturer’s descriptive data for the review of the District, the Contractor, and the Architect through the Contractor. By submitting shop drawings, product data, samples, etc., the Contractor represents that it has determined and verified all materials, field measurements, catalog numbers, related field construction criteria, and other relevant data in connection with each such submission, and that it has checked, verified, and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents, including the construction schedule. The submission of the shop drawings, product data, samples, etc., shall not deviate from the requirements of the Contract Documents including detailing and design intent which is specifically outlined in Contract Documents except as specifically authorized by the Architect or through an accepted substitution pursuant to Paragraph 3.10.4. All deviations from
the Contract Documents shall be narratively described in a transmittal accompanying the shop drawings. However, shop drawings shall not be used as a means of requesting a substitution, the procedure for which is defined in Paragraph 3.10.4, "Substitutions." Review by District and Architect shall not relieve the Contractor or any Subcontractor from its responsibility in preparing and submitting proper shop drawings in accordance with the Contract Documents. Any submission, which in Architect’s opinion is incomplete, contains errors, or has been checked superficially will be returned unreviewed by the Architect for resubmission by the Contractor. Contractor shall stamp, sign, and date each submittal indicating its representation that the submittal meets all of the requirements of the Contract Documents and evidence Contractor’s review through execution of the following stamp to be placed on each shop drawings:

"The contractor has reviewed and approved the field dimensions and the construction criteria, and has also made written notation regarding any information in the shop drawings that does not conform to the contract documents. This shop drawing has been coordinated with all other shop drawings received to date by contractor and this duty of coordination has not been delegated to subcontractors, material suppliers, the Architect, or the engineers on this project.

___________________________
Signature of Contractor and date”

3.11.1.4 Extent of Review. In reviewing shop drawings, the Architect will not verify dimensions and field conditions. The Architect will review and approve shop drawings, product data, samples, etc., for aesthetics and for conformance with the design concept of the Work and the information in the Contract Documents. The Architect’s review shall neither be construed as a complete check which relieves the Contractor, Subcontractor, manufacturer, fabricator, or supplier from responsibility for any deficiency that may exist or from any departures or deviations from the requirements of the Contract Documents unless the Contractor has, in writing, called the Architect’s attention to the deviations at the time of submission. The Architect’s review shall not relieve the Contractor or Subcontractors from responsibility for errors of any sort in shop drawings or schedules, for proper fitting of the Work, coordination of the differing subcontractor trades and shop drawings and Work which is not indicated on the shop drawings at the time of submission of shop drawings. Contractor and Subcontractors shall be solely responsible for any quantities which may be shown on the submittals or Contract Documents.

3.11.2 Drawing Submission Procedure.

3.11.2.1 Transmittal Letter and Other Requirements. All shop drawings must be properly identified with the name of the Project and dated, and each lot submitted must be accompanied by a letter of transmittal referring to the name of the Project and to the Specification section number for identification of each item clearly stating in narrative form, as well as “clouding” on the submissions, all qualifications, departures, or deviations from the Contract Documents. Shop drawings, for each section of the Work shall be numbered consecutively and the numbering system shall be retained throughout all revisions. All Subcontractor submissions shall be made through the Contractor. Each drawing shall have a clear space for the stamps of Architect and Contractor.

3.11.2.2 Copies Required. Each submittal shall include one (1) legible, reproducible sepia and five (5) legible prints of each drawing or schedule, table, cut sheet, etc., including fabrication, erection, layout and setting drawings, and such other drawings as required under the
various sections of the Specifications, until final acceptance thereof is obtained. Subcontractor shall submit copies, in an amount as requested by the Contractor, of: (1) manufacturers’ descriptive data for materials, equipment, and fixtures, including catalog sheets showing dimensions, performance, characteristics, and capacities; (2) wiring diagrams and controls; (3) schedules; (4) all seismic calculations and other calculations; and (5) other pertinent information as required by the District or Architect.

3.11.2.3 Corrections. The Contractor shall make all corrections required by Architect and shall resubmit, as required by Architect, corrected copies of shop drawings or new samples until approved. Contractor shall direct specific attention in writing or on resubmitted shop drawings to revisions other than the corrections required by the Architect on previous submissions. Professional services required for more than one (1) re-review of required submittals of shop drawings, product data, or samples are subject to charge to the Contractor pursuant to Paragraph 4.4.

3.11.2.4 Approval Prior to Commencement of Work. No portion of the Work requiring a shop drawing or sample submission or other submittal shall be commenced until the submission has been reviewed by Contractor and Architect and approved by Architect unless specifically directed in writing by the Architect. All such portions of the Work shall be in accordance with approved shop drawings and samples.

3.11.3 Sample Submissions Procedure.

3.11.3.1 Samples Required. In case a considerable range of color, graining, texture, or other characteristics are anticipated in finished products, a sufficient number of samples of the specified materials shall be furnished by the Contractor to indicate the full range of characteristics which will be present in the finished products; and products delivered or erected without submittal and approval of a full range of samples shall be subject to rejection. Except for range samples, and unless otherwise called for in the various sections of the Specifications, samples shall be submitted in duplicate. All samples shall be marked, tagged, or otherwise properly identified with the name of the submitting party, the name of the Project, the purpose for which the samples are submitted and the date, and shall be accompanied by a letter of transmittal containing similar information, together with the Specification section number. Each tag or sticker shall have clear space for the review stamps of Contractor and Architect.

3.11.3.2 Labels and Instructions. All samples of materials shall be supplied with the manufacturer’s descriptive labels and application instructions.

3.11.3.3 Architect’s Review. The Architect will review and, if appropriate, approve submittals and will return them to the Contractor with the Architect’s stamp and signature applied thereto, indicating the timing for review and appropriate action in compliance with the Architect’s (or District’s) standard procedures.

3.11.3.4 Record Drawings and Annotated Specifications. The Contractor will prepare and maintain on a current basis an accurate and complete set of Record Drawings clearly showing all changes, revisions to specifications and substitutions during construction, including, without limitation, field changes and the final location of all electrical and mechanical equipment, utility lines, ducts, outlets, structural members, walls, partitions, and other significant features, and Annotated Specifications showing clearly all changes, revisions, and substitutions during construction. A copy of such Record Drawings in Autocad (or most current version required by OPSC) and Annotated Specifications will be delivered to District in accordance with the Contractor’s approved construction schedule. In case a specification allows Contractor to elect one of several brands, makes, or types of
material or equipment, the annotations shall show which of the allowable items the Contractor has furnished. The Contractor will update the Record Drawings and Annotated Specifications as often as necessary to keep them current, but no less often than weekly. The Record Drawings and Annotated Specifications shall be kept at the Site and available for review and inspection by the District and the Architect. On completion of the Work and prior to Application for Final Payment, the Contractor will provide one complete set of Record Drawings in AutoCad (or most current version required by OPSC) and Annotated Specifications to the District, certifying them to be a complete and accurate reflection of the actual construction conditions of the Work.

3.11.3.5  **Equipment Manuals.** Contractor shall obtain and furnish three (3) complete sets of manuals containing the manufacturers' instructions for maintenance and operation of each item of equipment and apparatus furnished under the Contract Documents and any additional data specifically requested under the various sections of the Specifications for each division of the Work. The manuals shall be arranged in logical, sequential order, labeled, indexed, and placed in three-ring binders. At the completion of its Work, the Contractor shall certify, by endorsement thereon, that each of the manuals is complete, accurate, and covers all of its Work. Prior to submittal of Contractor's Application for Final Payment, and as a further condition to its approval by the Architect, each Subcontractor shall deliver the manuals, arranged in logical, sequential order, labeled, indexed, endorsed, and placed in three-ring binders, to the Contractor, who shall assemble these manuals for all divisions of the Work, review them for completeness, and submit them to the District through the Architect.

3.11.3.6  **District's Property.** All shop drawings, computer disks, annotated specifications, samples and other submittals shall become the District's property upon receipt by the District or Architect.

3.11.4  **Substitutions.**

3.11.4.1  **One Product Specified.** Unless the Specifications state that no substitution is permitted, whenever the Contract Documents indicate any specific article, device, equipment, product, material, fixture, patented process, form, method, or type of construction or any specific name, make, trade name, or catalog number, with or without the words “or equal,” such specification shall be deemed to be used for the purpose of facilitating description of the material, process, or article desired and shall be deemed to be followed by the words “or equal” unless the Contract Documents specify “no substitution allowed”, “no equal”, “no equivalent”, “to match campus standard”, or other language with similar meaning, in which case no substitutions will be allowed. Pursuant to Paragraph 3.11.4.3, the Contractor may, unless otherwise stated, at time of bid offer any material, process, article, etc., which shall be materially equal or better in every respect to that so indicated or specified (“Specified Item”) and will completely accomplish the purpose of the Contract Documents.

3.11.4.2  **Products Specified Which are Commercially Unavailable.** If the Contractor fails to make a request for substitutions for products, prior to the submission of its bid, and such products subsequently become commercially unavailable, the Contractor may request a substitution for such commercially unavailable item. The decision to grant this request is solely at the District’s discretion. The written approval of the District, consistent with the procedure for Change Orders, shall be required for the use of a proposed substitute material. The District may condition its approval of the substitution upon the delivery to District of an extended warranty or guaranty or other assurances of adequate performance of the substitution as well as an equitable deduction in the
contract price should the substituted item cost less than the Specified Item. All risks of delay due the approval of a requested substitution by the DSA, or any other governmental agency having jurisdiction, shall be on the requesting party. All additional costs, all procurement and construction delays, and all costs for review by the Architect or its consultants shall be the responsibility of the Contractor and will be deducted from Contractor’s pay request.

3.11.4.3 Substitution Request Form. Requests for substitutions of products, materials, or processes in place of a Specified Item must be submitted in writing on the District’s Substitution Request Form (“Request Form”) at the time of submitting bids to the District, except as provided for in Paragraph 3.11.4.2.

The Request Form must be accompanied by evidence as to whether the proposed substitution:

1. Is equal in quality/service/ability to the Specified Item;
2. Will entail no changes in detail, construction, and scheduling of related work;
3. Will be acceptable in consideration of the required design and artistic effect;
4. Will provide no cost disadvantage to the District;
5. Will require no excessive or more expensive maintenance, including adequacy and availability of replacement parts; and
6. Will required no change of the construction schedule.

3.11.4.4 In completing the Request Form, the bidder must state, with respect to each requested substitution, whether the bidder will agree to provide the Specified Item in the event that the District denies the bidder’s request for such requested substitution. In the event that the bidder has agreed in the Request Form to provide the Specified Item and the District denies the bidder’s requested substitution for a Specified Item, the bidder shall provide the Specified Item without any additional cost or charge to the District.

3.11.4.5 After bids are opened, the apparent lowest bidder shall provide, within five (5) days of opening such bids, any and all Drawing, Specifications, samples, performance data, calculations, and other information, as may be required to assist the Architect and the District in determining whether the proposed substitution is acceptable. The burden of establishing these facts shall be upon the bidder.

3.11.4.6 After the District’s receipt of such evidence by the bidder, the District will make its final decision as to whether the bidder’s request for substitution for any Specified Items will be granted. The decision as to whether a proposed request for substitution is equal to a Specified Item shall be at the sole discretion of the District. Any request for substitution that is granted by the District shall be documented and processed though a Change Order. The District may condition its approval of any substitution upon delivery to the District of an extended warranty or guaranty or other assurances of adequate performance of the substitution. Any and all risks of delay due to approval by the DSA or any other governmental agency having jurisdiction shall be on the bidder.

3.11.4.7 If the Architect and District accept a proposed substitution, the Contractor agrees to pay for all engineering and design services, including, without limitation, compensation to the Architect and affected engineers for their required time to process such substitution through the Division of the State Architect, if required, and to make all changes and adjustments in materials or the work of all trades directly or indirectly affected by the substituted item or items at no cost to the District.
3.12 INTEGRATION OF WORK

3.12.1 Scope.

The Contractor shall be responsible for cutting, fitting, or patching to complete the Work and to make all parts fit together properly. Contractor shall be responsible for ensuring that all trades are coordinated and scheduled so as to ensure the timely and proper execution of the work. When modifying existing work or installing new Work adjacent to existing work, Contractor shall match, as closely as conditions of Site and materials will allow, the finishes, textures, and colors of the original work, refinishing existing work at no additional cost to District. All cost caused by defective or ill-timed work shall be borne by Contractor. Contractor shall be solely responsible for protecting existing work on adjacent properties and shall obtain all required permits for shoring and excavations near property lines.

3.12.2 Structural Members.

New or existing structural members and elements, including reinforcing bars and seismic bracing, shall not be cut, bored, or drilled except by written authority of the Architect. Work done contrary to such authority is at the Contractor’s risk and subject to replacement at its own expense without reimbursement under the Contract. Schedule delays resulting from Agency approvals for unauthorized work shall be the Contractor’s responsibility.

3.12.3 Subsequent Removal.

Permission to patch any areas or items of the Work shall not constitute a waiver of the District's or the Architect’s right to require complete removal and replacement of the areas of items of the Work if, in the opinion of the Architect or the District, the patching does not satisfactorily restore quality and appearance of the Work or does not otherwise conform to the Contract Documents.

3.13 CLEANING UP

3.13.1 Contractor’s Responsibility.

Contractor at all times shall keep premises free from debris such as waste, dust, excess water, storm water runoffs, rubbish, and excess materials and equipment. Contractor shall not leave debris under, in, or about the premises, but shall promptly remove same from the premises and dispose of it in a lawful manner. Disposal receipts or dump tickets shall be furnished to the Architect within five (5) days of request. Upon completion of Work, Contractor shall clean interior and exterior of buildings, including fixtures, equipment, walls, floors, ceilings, roofs, window sills and ledges, horizontal projections, and any areas where debris has collected, so surfaces are free from foreign material or discoloration; Contractor shall clean and polish all glass, plumbing fixtures, equipment, finish hardware and similar finish surfaces. Upon completion of the Work, Contractor shall also remove temporary utilities, fencing, barricades, planking, sanitary facilities and similar temporary facilities from Site.

Contractor shall remove rubbish and debris resulting from the Work on a daily basis. Contractor shall maintain the structures and Site in a clean and orderly condition at all times until acceptance of the project by the District. Contractor shall keep its access driveways and adjacent streets, sidewalks, gutters and drains free of rubbish, debris and excess water by cleaning and removal each day.
3.13.1.1 In addition to the general cleaning, the following special cleaning shall be done at the completion of the work in accordance with the specifications including, but not limited to:

(a) Remove putty stains from glazing, then wash and polish glazing.
(b) Remove marks, stains, fingerprints and other soil or dirt from painted, stained or decorated work.
(c) Remove temporary protection and clean and polish floors and waxed surfaces.
(d) Clean and polish hardware and plumbing trim; remove stains, dust, dirt, plaster and paint.
(e) Remove spots, soil, plaster and paint from tile work, and wash tile.
(f) Clean all fixtures and equipment, remove excess lubrication, clean light fixtures and lamps, polish metal surfaces.
(g) Vacuum-clean carpeted surfaces.
(h) Remove debris from roofs, down spout and drainage system.

3.13.2 Failure to Cleanup.

If the Contractor fails to clean up as provided in the Contract Documents, the District may do so, and the cost thereof shall be the responsibility of the Contractor and deducted from the next progress payment.

3.14 ACCESS TO WORK

The Contractor shall provide the District, the Architect, Engineers and the Inspector of Record, access to the Work in preparation and progress wherever located. Contractor shall provide safe and proper facilities for such access so that District’s representatives may perform their functions.

CONTRACTOR IS AWARE THAT THIS CONTRACT MAY BE SPLIT INTO SEVERAL PHASES AS ADDRESSED IN ARTICLE 6.

3.15 ROYALTIES AND PATENTS

3.15.1 Payment and indemnity for Infringement.

Contractor shall hold and save the District and its officers, agents, and employees, the Architect, and the Architect’s consultants harmless from liability of any nature or kind, including cost and expense, for or on account of any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the contract, including its use by the District, unless otherwise specifically provided in the contract documents, and unless such liability arises from the sole negligence, or active negligence, or willful misconduct of the District, the Architect, or the Architect’s consultants.
3.15.2 Review.

The review by the Architect of any method of construction, invention, appliance, process, article, device, or material of any kind shall be for its adequacy for the Work and shall not be an approval for the use by the Contractor in violation of any patent or other rights of any person or entity.

3.16 INDEMNIFICATION

3.16.1 Contractor.

Contractor shall defend, indemnify and hold harmless District, Architect, Inspector, the State of California and their officers, employees, agents and independent contractors from all liabilities, claims, actions, liens, judgments, demands, damages, losses, costs or expenses of any kind arising from death, personal injury, property damage or other cause based or asserted upon any act, omission, or breach connected with or arising from the progress of Work or performance of service under this Agreement or the Contract Documents. As part of this indemnity, Contractor shall protect and defend, at its own expense, District, Architect, Inspector, the State of California and their officers, employees, agents and independent contractors from any legal action including attorneys fees or other proceeding based upon such act, omission, or breach.

Furthermore, Contractor agrees to and does hereby defend, indemnify and hold harmless District, Architect, Inspector, the State of California and their officers, employees, agents and independent contractors from every claim or demand made, and every liability, loss, damage, expense or attorneys fees of any nature whatsoever, which may be incurred by reason of:

(a) Liability for (1) death or bodily injury to persons; (2) damage or injury to, loss (including theft), or loss of use of, any property; (3) any failure or alleged failure to comply with any provision of law or the Contract Documents; or (4) any other loss, damage or expense, sustained by any person, firm or corporation or in connection with the Work called for in this Agreement or the Contract Documents, except for liability resulting from the sole or active negligence, or the willful misconduct of the District.

(b) Any bodily injury to or death of persons or damage to property caused by any act, omission or breach of Contractor or any person, firm or corporation employed by Contractor, either directly or by independent contract, including all damages or injury to, loss (including theft), or loss of use of, any property, sustained by any person, firm or corporation, including District, arising out of or in any way connected with Work covered by this Agreement or the Contract Documents, whether said injury or damage occurs either on or off District property, but not for any loss, injury, death or damages caused by the sole or active negligence or willful misconduct of the District.

(c) Any dispute between Contractor and Contractor’s subcontractors/supplies/sureties, including, but not limited to, any failure or alleged failure of the Contractor (or any person hired or employed directly or indirectly by the Contractor) to pay any Subcontractor or Materialman of any tier or any other person employed in connection with the Work and/or filing of any stop notice or mechanic’s lien claims.

Contractor, at Contractor’s own expense, cost, and risk, shall defend any and all claims, actions, suits, or other proceedings that may be brought or instituted against the District, its officers, agents or
employees, on or founded upon any cause, damage, or injury identified herein Section 3.16.1 and shall pay or satisfy any judgment that may be rendered against the District, its officers, agents or employees in any action, suit or other proceedings as a result thereof.

Contractor shall ensure that its contract with each of its subcontractors contains provisions requiring the subcontractors to defend, indemnify and hold harmless the District, Architect, Inspector, the State of California to a minimum level as set forth in this Article and consistent with the language of 3.16.1.

The Contractor’s and Subcontractors’ obligation to defend, indemnify and hold harmless the District, Architect, Inspector, the State of California and their officers, employees, agents and independent contractors hereunder shall include, without limitation, any and all claims, damages, and costs for the following: (1) any damages or injury to or death of any person, and damage or injury to, loss (including theft), or loss of use of, any property; (2) breach of any warranty or guaranty, express or implied; (3) failure of the Contractor or Subcontractors to comply with any applicable governmental law, rule, regulation, or other requirement; and (4) products installed in or used in connection with the Work.

3.17 SUBMISSION OF DAILY REPORTS

3.17.1 General.

At the close of each working day, the Contractor shall submit a daily report to the District and the Inspector, on forms approved by the District, together with applicable delivery tickets, listing all labor, materials, and equipment involved for that day. An attempt shall be made to reconcile the report daily, and it shall be signed by a District representative and the Contractor. In the event of disagreement, pertinent notes shall be entered by each party to explain points which cannot be resolved that day. Each party shall retain a signed copy of the report. Reports by subcontractors or others shall be submitted through the Contractor.

3.17.2 Labor.

The report required by Paragraph 3.17.1 shall show names of workers, classifications, hours worked and hourly rate. Project superintendent expenses are not allowed.

3.17.3 Materials.

The report required by Paragraph 3.17.1 shall describe and list quantities of materials used and unit costs.

3.17.4 Equipment.

The report required by Paragraph 3.17.1 shall show type of equipment, size, identification number, and hours of operation, including loading and transportation, if applicable, and hourly/daily cost. Move-on and move-off fees, if allowable, shall be noted.
3.17.5 Other Services and Expenditures.

Other services and expenditures shall be described in detail as the District requires.

3.18 EXECUTION OF THE WORK

3.18.1 Examination.

3.18.1.1 Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record all observations in writing.

3.18.1.2 Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

3.18.1.3 Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

3.18.1.4 Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.18.2 Existing Site and/or Building Conditions.

The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning Work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

Before construction, verify the location and points of connection of all utility services for each Phase of the Work and the entire Project.

3.18.3 Existing Utilities.

The existence and location of underground and other utilities and construction indicated in the Contract Documents as existing are not guaranteed. Prior to beginning the Work investigate and verify the existence and location of all underground utilities and/or other improvements affecting the Work.

3.18.3.1 Before construction, verify the location and invert all elevations at points of connection of sanitary sewer, storm sewer, and water-service piping; and all underground electrical services.

3.18.3.2 Furnish location data for work related to Project that must be performed by public utilities serving Project site.

3.18.4 Preparation.

Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a written request for information (RFI) to the District and Architect.
Existing Utility Information: Furnish information to the District and Architect that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Contractor shall coordinate with authorities having jurisdiction.

Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, Contractor shall investigate and verify all dimensions of other construction by field measurements before fabrication. Contractor shall coordinate fabrication schedule with construction progress to avoid delaying the Work.

Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Contract Documents. Contractor shall be responsible for all coordination and measurements including means and methods of Construction.

3.18.5 Construction Layout.

Verification: Before proceeding to lay out the Work, Contractor shall verify layout information and Field condition in relation to the Contract documents. Notify District and Architect immediately of any discrepancies.

3.18.6 Installation.

General Contractor shall locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

3.18.6.1 Make vertical work plumb and make horizontal work level.

3.18.6.2 Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

3.18.6.3 Conceal pipes, ducts, and wiring in furnished areas, unless otherwise indicated.

3.18.6.4 Maintain minimum headroom clearance of eight feet in spaces without a suspended ceiling.
3.18.7 Contractor shall comply with manufacturer’s written instructions and recommendations for installing products in applications indicated.

3.18.8 Contractor shall install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for performance until accepted by District.

3.18.9 Contractor shall conduct construction operations so no part of the Work is subjected to damage or loading in excess of that expected during normal conditions of occupancy.

3.18.10 Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

3.18.11 Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.

3.18.12 Allow for building movement, including thermal expansion and contraction.

3.18.13 Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

3.18.14 Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

3.18.15 Hazardous Materials: Use only products, cleaners, and installation materials that are not classified as or considered hazardous.

3.18.16 District-Installed Products

3.18.16.1 Site Access: Provide access to Project site for District’s construction forces.

3.18.16.2 Coordination: Coordinate construction and operations of the Work with work performed by District construction forces.

3.18.16.3 Construction Schedule: Inform District of Contractor’s preferred construction schedule for District’s portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify District and Architect if changes to schedule are required due to differences in actual construction progress.

3.18.16.4 Pre-installation Conferences: Include District’s construction forces at pre-installation conferences covering portions of the Work that are to receive District’s work. Attend pre-installation conferences conducted by District’s construction forces if portions of the Work depend on District’s construction forces.
3.19 DSA VERIFIED REPORTS AND CERTIFICATE OF COMPLIANCE

3.19.1 Contractor Actions.

The Contractor acknowledges and agrees that a material obligation of the Contractor under the Contract Documents is the completion by the Contractor of all actions and activities which by the Contract Documents or by operation of applicable law, code, rule or regulation are the responsibility of the Contractor relating to DSA reporting requirements pursuant to Education Code §81141 (including amendments thereto) and issuance of DSA’s Certificate of Compliance for the Project pursuant to Education Code §81147 (including amendments thereto) upon completion of Project construction. The foregoing shall include without limitation, the timely preparation, completion and filing of Verified Reports during Project construction and the filing of the Final Verified Report with DSA within ten (10) days of the determination of Project Final Completion. The Contractor shall provide the Project Inspector, Architect, Construction Manager retained by the District for the Project and the District with copies of all Verified Reports completed by the Contractor and submitted to DSA; such copies shall be provided to the Project Inspector, Architect, the Construction Manager and the District concurrently with the Contractor’s submission thereof to DSA.


Notwithstanding any provision of the Contract Documents to the contrary, the completion and filing of the Final Verified Report with DSA by the Contractor is an express condition precedent to the District’s disbursement of Twelve Thousand Dollars ($12,000) of the Contract Price due the Contractor under this Agreement (“the Final Verified Report Retention”). The Final Verified Report Retention in addition to, and not in lieu of, retention withheld and retained by the District from Progress Payments disbursed to the Contractor during Project construction. The District’s disbursement of the Final Verified Report Retention to the Contractor shall be made by the District within thirty (30) days of the presentation by the Contractor to the Project Inspector, Architect, Construction Manager and District of reasonably satisfactory written evidence that the Contractor has filed the Contractor’s Final Verified Report with DSA in accordance with the preceding and the submission of a billing statement by the Contractor to the District for payment of the Final Verified Report Retention. If the Contractor fails to file the Final Verified Report with DSA within ten (10) days of the determination of Project Final Completion, notwithstanding the preparation or filing of such Final Verified Report by the Contractor thereafter, the District may in the sole and exclusive discretion of the District retain and withhold from disbursement to the Contractor all or any part of the Final Verified Report Retention as damages for the failure of the Contractor to have timely discharged its obligations hereunder.

3.20 NOISE CONTROL

The Contractor shall be responsible for the installation and maintenance of noise reducing devices on construction equipment. Contractor shall comply with the requirements of the city and county having jurisdiction with regard to noise ordinances governing construction sites and activities. Construction equipment noise is subject to the control of the Environmental Protection Agency’s Noise Control Program (Part 204 of Title 40, Code of Federal Regulations). If classes are in session at any point during the progress of the Project, and, in the District’s reasonable discretion, the noise from such Work disrupts or disturbs the students or faculty or the normal operation of the college, at the District’s request, the Contractor shall schedule the performance of all such Work around normal campus hours.
or make other arrangements so that the Work does not cause such disruption or disturbance. In no event shall Contractor have a right to receive additional compensation or an extension to the contract time as a result of any such rescheduling or the making of such arrangements. These controls shall be implemented during site preparation and construction.

ARTICLE 4

ADMINISTRATION OF THE CONTRACT

4.1 ARCHITECT

4.1.1 Replacement of Architect.

In the case of the termination of the Architect, the District may appoint an architect or another construction professional or may perform such functions with its own licensed professional personnel. The status of the replacement Architect under the Contract Documents shall be the same as that of the former architect.

4.2 ARCHITECT’S ADMINISTRATION OF THE CONTRACT

4.2.1 Status.

Pursuant to Titles 24 and 21 of the California Code of Regulations and as required pursuant to the Field Act, Education Code 81130 et. seq. the Architect will provide administration of the Contract Documents and the Work, and will be a District representative during construction, as well as during the one (1) year period following the commencement of any warranties or guaranties. The Architect will have authority to act on behalf of the District only to the extent provided in the Contract Documents.

4.2.2 Site Visits.

The Architect will visit the Site at intervals necessary in the judgment of the Architect to become generally familiar with the progress and quality of the Work and to determine in general if the Work is being performed in accordance with the Contract Documents.

4.2.3 Limitations of Construction Responsibility.

The Architect shall not have control over, charge of, or be responsible for construction means, methods, techniques, schedules, sequences or procedures, fabrication, procurement, shipment, delivery, receipt, installation, or for safety precautions and programs in connection with the Work, since these are solely the Contractor’s responsibility under the Contract Documents. The Architect shall not be responsible for the Contractor’s, Subcontractors’, material or equipment suppliers’, or any other person’s schedules or failure to carry out the Work in accordance with the Contract Documents. The Architect shall not have control over or charge of acts or omissions of the Contractor, Subcontractors, their agents or employees, or any other persons or entities performing or supplying portions of the Work. The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect’s administration of the Contract Documents, or by tests, inspections, or approvals required or performed by persons other than the Contractor.
4.2.4 Communications Facilitating Contract Administration.

Except as otherwise provided in the Contract Documents the Contractor shall communicate through the District representative. The District representative shall be promptly informed, and shall receive copies of all written communications. Contractor shall not rely upon any communications from the District that is not from the District’s representative. Communications by and with the Architect’s consultants shall be through the Architect. Communications by and with Subcontractors and material or equipment suppliers shall be through the Contractor.

4.2.5 Payment Applications.

The Architect will review and make recommendations to the District regarding the amounts due the Contractor on the Certificates for Payment pursuant to Article 9 and subject to the Inspector’s approval and Architect’s observation.

4.2.6 Rejection of Work.

In addition to the rights, duties, and obligations of the Inspector under this Article, the Architect may recommend to the District that the District reject Work which does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable to achieve the intent of the Contract Documents, the Architect may recommend to the District that the District require additional inspection or testing of the Work in accordance with Paragraph 13.5, whether or not such Work is fabricated, installed, or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons performing portions of the Work.

4.2.7 Warranties and Guaranties Upon Completion.

The Architect, in conjunction with the District and Inspector will conduct field reviews of the Work to determine the date of completion, shall receive and forward to the District for the District’s review and records written warranties, guaranties, and related documents required by the Contract and assembled by the Contractor, and will issue a final Certificate for Payment when the Architect believes the Work has been completed in compliance with the requirements of the Contract Documents. The handling by the Architect of such warranties, guaranties, maintenance manuals, or similar documents shall not diminish or transfer to the Architect any responsibilities or liabilities required by the Contract Documents of the Contractor or other entities, parties, or persons performing or supplying the Work.

The Architect will conduct a field review of the Contractor’s comprehensive list of items to be completed or corrected (final punch list) and one (1) follow-up field review if required. The cost incurred by the District for further field reviews or the preparation of further punch lists by the Architect shall be invoiced to the Contractor and deducted from the final payment.

4.2.8 Interpretation.

The Architect will interpret and decide matters concerning performance and requirements of the Contract Documents.
4.2.9 Additional Instructions.

4.2.9.1 Typical Parts and Sections. Whenever typical parts or sections of the Work are completely detailed on the Drawings, and other parts or sections which are essentially of the same construction are shown in outline only, the complete details shall apply to the Work which is shown in outline.

4.2.9.2 Dimensions. Dimensions of Work shall not be determined by scale or rule. Figured dimensions shall be followed at all times. If figured dimensions are lacking on Drawings, Architect shall supply them on request. The Architect's decisions on matters relating to aesthetic effect will be final.

4.3 INSPECTOR OF RECORD

4.3.1 General.

One or more project inspectors employed by the District and approved by the Division of the State Architect will be assigned to the Work in accordance with the requirements of Title 24 of the California Code of Regulations. The Inspector(s) duties are as specifically defined in Title 24.

4.3.2 Inspector’s Duties.

All Work shall be under the observation of the Inspector. The Inspector shall have free access to any or all parts of the Work at any time. The Contractor shall furnish the Inspector such information as may be necessary to keep the Inspector fully informed regarding progress and manner of Work and character of materials. Such observations shall not, in any way, relieve the Contractor from responsibility for full compliance with all terms and conditions of the Contract, or be construed to lessen to any degree the Contractor’s responsibility for providing efficient and capable superintendence. The Inspector is not authorized to make changes in the drawings or specifications nor shall the Inspector’s approval of the Work and methods relieve the Contractor of responsibility for the correction of subsequently discovered defects, or from its obligation to comply with the Contract Documents.

4.3.3 Inspector’s Authority to Reject or Stop Work.

The Inspector shall have the authority to reject Work whenever provisions of the Contract Documents are not being complied with, and Contractor shall instruct its Subcontractors and employees accordingly. In addition, the Inspector may stop any Work that poses a probable risk of harm to persons or property. The Contractor shall instruct its employees, Subcontractors, material and equipment suppliers, etc., accordingly. The absence of any Stop Work order or rejection of any portion of the Work shall not relieve the Contractor from any of its obligations pursuant to the Contract Documents.

4.3.4 Inspector’s Facilities.

Within seven (7) days after notice to proceed, the Contractor shall provide the Inspector with the temporary facilities as required under Division 1 of the Specifications.
4.3.5 Testing Times.

The District will provide inspection and testing at its cost during the normal eight (8) hour day Monday through Friday (except holidays). Work by the Contractor outside of the normal eight (8) hour day shall constitute an authorization from the Contractor to the District to provide inspection and testing as required outside of the normal eight (8) hour day. Contractor shall reimburse District for any additional costs associated with inspection and testing (including re-inspection and re-testing) outside the normal eight-hour day and for any retests caused by the Contractor.

4.4 RESPONSIBILITY FOR ADDITIONAL CHARGES INCURRED BY THE DISTRICT FOR PROFESSIONAL SERVICES

If at any time prior to the completion of the requirements under the Contract Documents, the District is required to provide or secure additional professional services for any reason by any act of the Contractor, the Contractor shall be invoiced by the District for any costs incurred for any such additional services, which costs shall be deducted from the next progress payment. Such invoicing shall be independent from any other District remedies and shall not be considered a waiver of any District rights or remedies. If payments then or thereafter due to the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the District. Additional services shall include, but shall not be limited to, the following:

(a) Services made necessary by the default of the Contractor.
(b) Services made necessary due to the defects or deficiencies in the Work of the Contractor.
(c) Services required by failure of the Contractor to perform according to any provision of the Contract Documents.
(d) Services in connection with evaluating substitutions of products, materials, equipment, Subcontractors’ proposed by the Contractor, and making subsequent revisions to drawings, specifications, and providing other documentation required (except for the situation where the specified item is no longer manufactured or available).
(e) Services for evaluating and processing claims submitted by the Contractor in connection with the Work outside the established Change Order process.
(f) Services required by the failure of the Contractor to prosecute the Work in a timely manner in compliance within the specified time of completion.
(g) Services in conjunction with the testing, adjusting, balancing and start-up of equipment other than the normal amount customarily associated for the type of Work involved.
(h) Services in conjunction with more than one (1) re-review of submittals of shop drawings, product data, samples, etc.
4.5 DISPUTES

4.5.1 Decision of Architect.

Disputes between District and Contractor involving money or time, including those alleging an error or omission by the Architect, shall be referred initially to the Architect for action as provided in Paragraph 4.5.2. A decision by the Architect, as provided in Paragraph 4.5.5, shall be required as a condition precedent to proceeding with remedies set forth in Paragraph 4.5.6 as to all such matters arising prior to the date final payment is due, regardless of whether such matters relate to execution and progress of the Work, or the extent to which the Work has been completed. The decision by the Architect in response to a Claim shall not be a condition precedent to the remedies under Paragraph 4.5.2 through 4.5.5 in the event: (1) the position of Architect is vacant; (2) the Architect has not received evidence or has failed to render a decision within agreed time limit; (3) the Architect has failed to take action required under Paragraph 4.6.4 within thirty (30) days after the Claim is made, forty-five (45) days have passed after the Claim has been referred to the Architect; or (4) the Claim relates to a Stop Notice Claim not arising from any extra change order or Construction Change Directive for which approval has not been provided.

4.5.2 Architect’s Review.

The Architect will review Claims and take one or more of the following preliminary actions within ten (10) days of receipt of a Claim: (1) request additional supporting data from the Claimant; (2) submit a schedule to the parties indicating when the Architect expects to take action; (3) reject the Claim in whole or in part, stating reasons for rejection; (4) recommend approval of the Claim; or (5) suggest a compromise. The Architect may also, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim.

4.5.3 Documentation if Resolved.

If a Claim has been resolved, the Architect will prepare or obtain appropriate documentation.

4.5.4 Actions if Not Resolved.

If a Claim has not been resolved and all documentation requested pursuant to Paragraph 4.5.2 has been provided, the party making the Claim shall, within ten (10) days after the Architect’s preliminary response, take one or more of the following actions: (1) modify the initial Claim; (2) notify the Architect that the initial Claim stands; or (3) supplement with additional supporting data.

4.5.5 Architect’s Written Decision.

If a Claim has not been resolved after consideration of the foregoing and of other evidence presented by the parties or requested by the Architect, the Architect will notify the parties in writing that the Architect’s decision will be made within twenty (20) days. Upon expiration of such time period, the Architect will render to the parties its written decision relative to the Claim, including any change in the Contract Sum or Contract Time or both. The Architect may, but is not obligated to, notify the surety and request the surety’s assistance in resolving the controversy.
4.5.6 Continuing Contract Performance.

Pending final resolution of a Claim, including, negotiation, mediation, arbitration, or litigation, the Contractor shall proceed diligently with performance of the Contract, and the District shall continue to make any undisputed payments in accordance with the Contract. If the dispute is not resolved, Contractor agrees it will neither rescind the contract nor stop the progress of the work, but Contractor’s sole remedy shall be to submit such controversy to determination by a court of competent jurisdiction in the county where the project is located, after the project has been completed, and not before. At the District’s sole option, the District may submit individual disputes for binding arbitration and Contractor agrees to the resolution determined for each individual dispute by Arbitrator, including resolution of time and delays. If binding arbitration is utilized for individual disputes, such resolution is full and final as to that particular Claim.

4.5.7 Claims for Concealed Trenches or Excavations Greater Than Four Feet Below the Surface.

When any excavation or trenching extends greater than four feet below the surface or if any condition involving hazardous substances are encountered:

(a) Immediately upon discovery, The Contractor shall promptly, and before the following conditions are disturbed, notify the District, by telephone and in writing, of the condition except:

1. If such condition is a hazardous waste condition, and Contractor’s bid includes removal or disposal of hazardous substances. Material that the Contractor believes may be a material that is hazardous waste, as defined in Section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with the provisions of existing law. In such case, the notice bulletin procedures of Article 7 apply.

2. Subsurface or latent physical conditions at the Site differing from those indicated.

3. Unknown physical conditions at the Site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in Work of the character provided for in the Contract.

(b) The District shall investigate the conditions, and if District finds that the conditions do materially so differ, do involve hazardous waste, and cause a decrease or increase in the Contractor’s cost of, or the time required for, performance of any part of the Work shall issue a change order or construction change directive under the procedures described in the Contract.

(c) In the event that a dispute arises between the District and the Contractor whether the conditions materially differ, involve hazardous waste, or cause a decrease or increase in the Contractor’s cost of, or time required for, performance of any part of the work, the Contractor shall not be excused from any scheduled completion date provided for by the Contract, but shall proceed with all Work to be performed under the Contract. The Contractor shall retain any and
all rights provided either by Contract or by law which pertain to the resolution of disputes and
protests between the contracting parties.

4.5.8 Claims for Extension of Time.

If Contractor and District cannot agree upon an extension of time, whether compensable or not,
then Contractor must have first completed the procedures set forth in Paragraph 8.4. Upon completion
of the procedures set forth under Paragraph 8.4, Contractor must then comply with the requirements in
this Article including those set forth under Paragraph 4.5.9.

4.5.9 Claims Procedures.

4.5.9.1 Procedure applicable to all Claims:

(a) Definition of Claim: A “Claim” means a separate demand by the Contractor for (1) time
extension, (2) 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 expressly
provided for or the Claimant is not otherwise entitled to, or (3) and amount the payment of
which is disputed by the District.

(b) Filing Claim is Not Basis To Discontinue Work: The Contractor shall promptly comply
with Work under the Contract or Work requested by the District even though a written C laim
has been filed. The Contractor and the District 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, in writing, with the District stating clearly the basis for the Claim. 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. Claims
submitted after the final payment date shall also be considered null and void by the District. All
Claims shall be reviewed pursuant to Paragraph 4.5.1, 4.5.2, and 4.5.5. In order to qualify as a
Claim, the written notice must state that it is a Claim submitted under this paragraph of these
General Conditions.

(d) Formal Claim Appeal Submission: If the Contractor does not concur with the District's
decision regarding the Claim Notification, the Contractor will issue a formal Claim Appeal within
fourteen (14) days of receipt of the District's decision and all detailed information in support of
the Claim Appeal within thirty (30) days. All appeals shall be submitted before final payment. If
the Claim Appeal is not submitted within fourteen (14) calendar days and detailed information
within thirty (30) days, the Contractor shall be deemed to have waived its right to assert the
Claim and the Claim shall be denied. Contractor’s failure to submit any detailed information
which is in the possession of Contractor shall render such information inadmissible by
Contractor at trial or arbitration.

(e) Appeal 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 Appeal shall
be as follows:

(1) Cover letter.
(2) Summary of factual basis of Claim and amount of Claim.

(3) Summary of the basis of the Claim, including the specific clause and 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
   e. Analysis of claim merit.
   f. Analysis of claim cost.
   g. For Claims relating to time extensions, an analysis and supporting documentation evidencing any effect upon the critical path.
   h. Certification.
   i. Chronology of events and related correspondence.
   j. Daily reports and logs.

(f) Certification: The Contractor (and subcontractors, if applicable) shall submit with the Claim a certification under penalty of perjury:
   (1) That the Contractor has reviewed the Claim and that such Claim is made in good faith;
   (2) Supporting data are accurate and complete to the best of the Contractor's knowledge and belief;
   (3) The amount requested accurately reflects the amount of compensation for which the Contractor believes the District is liable.
   (4) That the Contractor is familiar with Government Code Sections 12650 et seq. and Penal Code Section 72 and that false Claims can lead to substantial fines and/or imprisonment.

(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) Mandatory Claim Appeal Procedure: The Contractor’s Claim Appeal shall be denied if it fails to provide the written basis of the Claim and certification as set forth herein.

(i) District May Request Additional Information: Within thirty (30) days of receipt of the Claim Appeal and the information under this Article, the District may request in writing any additional documentation supporting the Claim or documentation relating to defenses to the Claim which the District may assert.

4.5.9.2 Binding Arbitration of Individual Claim Issues. At the District’s sole option, the District may submit individual disputes, or Claims, to binding arbitration and
Contractor agrees to the resolution determined for each individual dispute by Arbitrator, including resolution of time and delays. If binding arbitration is utilized, such resolution is a full and final resolution of the particular Claim or dispute. Under no circumstances may the Contractor stop work, rescind its contract or otherwise slow the progress of Work during resolution of individual Claims in binding Arbitration.

4.5.9.3 Resolution of Disputes in Court of Competent Jurisdiction. If Claims are not resolved under the procedure set forth and pursuant to Article 4.5.9.2, such Claim or controversy shall be submitted to a court in the county of competent jurisdiction after the Project has been completed, and not before.

4.5.9.4 Warranties, Guaranties and Obligations. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto, and, in particular but without limitation, the warranties, guaranties and obligations imposed upon Contractor by the General Conditions and amendments thereto; and all of the rights and remedies available to District and Architect thereunder, are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by laws or regulations by special warranty or guaranty or by other provisions of the Contract Documents, and the provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply.

ARTICLE 5

SUBCONTRACTORS

5.1 DEFINITIONS

5.1.1 Subcontractual Relations

By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the same obligations and responsibilities, assumed by Contractor pursuant to the Contract Documents. Each subcontract agreement shall preserve and protect the rights of the District and the Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound. Upon written request of the Subcontractor, the Contractor shall identify to the Subcontractor the terms and conditions of the proposed subcontract agreement, which may be at variance with the Contract Documents. Subcontractors shall similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

5.1.2 Subcontractor Licenses.

All subcontractors shall be properly licensed by the California State Licensing Board.
5.1.3 Substitution of Subcontractor

Substitution of Subcontractors shall be permitted only as authorized under Public Contract Code §§ 4107 et. Seq. Any substitutions of Subcontractors shall not result in any increase in the Contract Price or result in the granting of any extension of time for the completion of the Project.

5.1.4 Contingent Assignment of Subcontracts and Other Contracts

Each subcontract and other contract or agreement for any portion of the Work is hereby assigned by the Contractor to the District provided that:

(a) Such assignment is effective only after termination of this contract with the Contractor by the District as provided herein and only for those subcontracts and other contracts and agreements that the District accepts by notifying the Subcontractor or Materialman (as may be applicable) in writing; and

(b) Such assignment is subject to the prior rights of the Surety(ies) obligated under the Payment Bond and Performance Bond.

The Contractor shall include adequate provisions for this contingent assignment of subcontracts and other contracts and agreements in each such document.

ARTICLE 6

CONSTRUCTION BY DISTRICT OR BY SEPARATE CONTRACTORS

6.1 DISTRICT'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

6.1.1 Separate Contracts.

(a) District reserves the right to let other contracts in connection with this Work. Contractor shall afford other contractors reasonable opportunity for (1) introduction and storage of their materials; (2) access to the Work; and (3) execution of their work. Contractor shall properly connect and coordinate its work with that of other Contractors.

(b) If any part of Contractor’s Work depends on proper execution or results of any other contractor, the Contractor shall inspect and within seven (7) days or less, report to Architect, in writing, any defects in such work that render it unsuitable for proper execution of Contractor’s work. Contractor will be held accountable for damages to District for that work which it failed to inspect or should have inspected. Contractor’s failure to inspect and report shall constitute its acceptance of other contractors’ work as fit and proper for reception of its work, except as to defects which may develop in other contractors’ work after execution of Contractor’s work.

(c) To ensure proper execution of its subsequent Work, Contractor shall measure and inspect Work already in place and shall at once report to the Architect in writing any discrepancy between executed Work as built and the Contract Documents.

(d) Contractor shall ascertain to its own satisfaction the scope of the Project and nature of any other contracts that have been or may be awarded by District in prosecution of the Project and the potential impact of such work on Contractor’s schedule.
(e) Nothing herein contained shall be interpreted as granting to Contractor the exclusive occupancy at the site of Project. Contractor shall not cause any unnecessary hindrance or delay to any other contractor working on the Project Site. If execution of any contract by the District is likely to cause interference with Contractor’s performance of its contract, District shall decide which contractor shall cease work temporarily and which contractor shall continue, or whether work can be coordinated so that contractors may proceed simultaneously.

(f) District shall not be responsible for any damages suffered or extra costs incurred by Contractor resulting directly or indirectly from award or performance or attempted performance of any other contract or contracts at the Project, or caused by any decision or omission of District respecting the order of precedence in performance of contracts.

CONTRACTOR IS AWARE THAT THIS CONTRACT MAY BE SPLIT INTO SEVERAL PHASES. IF THE CONTRACT IS SPLIT INTO PHASES THEN CONTRACTOR HAS MADE ALLOWANCE FOR ANY DELAYS OR DAMAGES WHICH MAY ARISE FROM COORDINATION WITH CONTRACTORS FOR OTHER PHASES. IF ANY DELAYS SHOULD ARISE FROM ANOTHER CONTRACTOR WORKING ON A DIFFERENT PHASE, CONTRACTOR’S SOLE REMEDY FOR DAMAGES, INCLUDING DELAY DAMAGES, SHALL BE AGAINST THE CONTRACTOR WHO CAUSED SUCH DAMAGE AND NOT THE DISTRICT. CONTRACTOR SHALL PROVIDE ACCESS TO OTHER CONTRACTORS FOR OTHER PHASES AS NECESSARY TO PREVENT DELAYS AND DAMAGES TO OTHER CONTRACTORS WORKING ON OTHER PHASES OF CONSTRUCTION.

6.1.2 District’s Right to Carry Out the Work.

See Paragraph 2.2.

6.1.3 Designation as Contractor.

When separate contracts are awarded to contractors on the Project Site, the term “Contractor” in the Contract Documents in each case shall mean the Contractor who executes each separate District/Contractor Agreement.

6.1.4 Contractor Duties.

The Contractor shall have overall responsibility to reasonably coordinate and schedule Contractor’s activities with the activities of the District’s own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the District in reviewing their construction schedules when directed to do so. The Contractor shall make any revisions to the construction schedule and Contract Sum deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors, and the District until subsequently revised. Additionally, Contractor shall coordinate with Architect and District inspector to ensure timely and proper progress of work.
6.2 **CONSTRUCTIVE OWNERSHIP OF PROJECT SITE AND MATERIAL**

Upon commencement of Work, the Contractor becomes the constructive owner of the entire site, improvements, material and equipment on Project site. Contractor must ensure proper safety and storage of all materials and assumes responsibility as if Contractor was the owner of the Project site. All risk of loss or damage shall be borne by Contractor during the Work until the date of Completion. As construction owner, Contractor must carry adequate insurance in case of calamity and is not entitled to rely on the insurance requirements as set forth in this agreement as being adequate coverage in case of calamity.

6.3 **DISTRICT’S RIGHT TO CLEAN UP**

If a dispute arises among the Contractor, separate contractors, and the District as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish as described in Paragraph 3.12, the District may clean up and allocate the cost among those it deems responsible.

**ARTICLE 7**

**CHANGES IN THE WORK**

7.1 **CHANGES**

7.1.1 **No Changes Without Authorization.**

There shall be no change whatsoever in the drawings, specifications, or in the Work without an executed Change Order, Construction Change Directive, or order by the Architect for a minor change in the Work as herein provided. District shall not be liable for the cost of any extra work or any substitutions, changes, additions, omissions, or deviations from the Drawings and Specifications unless the District’s Governing Board has authorized the same and the cost thereof approved in writing by Change Order or executed Construction Change Directive. No extension of time for performance of the Work shall be allowed hereunder unless claim for such extension is made at the time changes in the Work are ordered, and such time duly adjusted in writing in the Change Order. The provisions of the Contract Documents shall apply to all such changes, additions, and omissions with the same effect as if originally embodied in the Drawings and Specifications. Notwithstanding anything to the contrary in this Article 7, all Change Orders shall be prepared and issued by the Architect and shall become effective when executed by the District’s Governing Board, the Architect, and the Contractor.

Should any Change Order result in an increase in the Contract price, the cost of such Change Order shall be agreed to, in writing, in advance by Contractor and District and be subject to the monetary limitations set forth in Public Contract Code Section 20659. In the event that Contractor proceeds with any change in Work without first notifying District and obtaining the Architect’s and District’s consent to a Change Order, Contractor waives any claim of additional compensation for such additional work.

**CONTRACTOR UNDERSTANDS, ACKNOWLEDGES, AND AGREES THAT THE REASON FOR THIS NOTICE REQUIREMENT IS SO THAT DISTRICT MAY HAVE AN OPPORTUNITY TO ANALYZE THE**
WORK AND DECIDE WHETHER THE DISTRICT SHALL PROCEED WITH THE CHANGE ORDER OR ALTER THE PROJECT SO THAT SUCH CHANGE IN WORK BECOMES UNNECESSARY.

7.1.2 Architect Authority.

The Architect will have authority to order minor changes in the Work not involving any adjustment in the Contract Sum, or an extension of the Contract Time, or when a change which is inconsistent with the intent of the Contract Documents. Such changes shall be effected by written Change Order and shall be binding on the District and the Contractor. The Contractor shall carry out such written orders promptly.

7.2 CHANGE ORDERS (“CO”)

A CO is a written instrument prepared by the Architect and signed by the District (as authorized by the District’s Governing Board), the Contractor, the Architect, and the DSA (if necessary), stating their agreement upon all of the following:

(a) A description of a change in the Work;
(b) The amount of the adjustment in the Contract Sum, if any; and
(c) The extent of the adjustment in the Contract Time, if any.

7.3 CONSTRUCTION CHANGE DIRECTIVE

7.3.1 Definition.

A Construction Change Directive is a written order prepared by the Architect and signed by the District and the Architect, directing a change in the Work and stating a proposed basis for adjustment, if any, in the Contract Sum or Contract Time, or both. The District may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions within. If applicable, the Contract Sum and Contract Time will be adjusted accordingly. In the case of a Construction Change Directive being issued, Contractor must commence Work immediately or delays from failure to perform Construction Change Directive shall be the responsibility of Contractor. Any dispute as to the sum of Construction Change Directive or timing of payment, shall be resolved pursuant to Paragraph 4.5.

7.3.2 Use to Direct Change

A Construction Change Directive shall be used in the absence of agreement on the terms of a CO. A copy of a proposed form is provided at the end of this Article.

7.4 REQUEST FOR INFORMATION (“RFI”)

7.4.1 Definition.

An RFI is a written request prepared by the Contractor requesting the Architect to provide additional information necessary to clarify or amplify an item which the Contractor believes is not
clearly shown or called for in the drawings or specifications, or to address problems which have arisen under field conditions.

7.4.2 Scope.

The RFI shall reference all the applicable Contract Documents including specification section, detail, page numbers, drawing numbers, and sheet numbers, etc. The Contractor shall make suggestions and interpretations of the issue raised by the RFI. An RFI cannot modify the Contract Cost, Contract Time, or the Contract Documents.

7.4.3 Response Time.

The Architect must respond to a RFI within a reasonable time after receiving such request. If the Architect's response results in a change in the Work, then such change shall be effected by a written CO or Construction Change Directive, if appropriate. If the Architect cannot respond to the RFI within a reasonable time, the Architect shall notify the Contractor, with a copy to the Inspector and the District, of the amount of time that will be required to respond.

7.4.4 Costs Incurred.

The Contractor shall be responsible for any costs incurred for professional services, which shall be deducted from the next progress payment, if an RFI requests an interpretation or decision of a matter where the information sought is equally available to the party making such request. District, at its sole discretion, shall invoice Contractor for all such professional services arising from this Article.

7.5 REQUEST FOR PROPOSAL (“RFP”)

7.5.1 Definition.

An RFP is a written request prepared by the Architect requesting the Contractor to submit to the District and the Architect an estimate of the effect of a proposed change on the Contract Price and the Contract Time.

7.5.2 Scope.

An RFP shall contain adequate information, including any necessary drawings and specifications, to enable Contractor to provide the cost breakdowns required by Paragraph 7.7. The Contractor shall not be entitled to any Additional Compensation for preparing a response to an RFP, whether ultimately accepted or not.

7.6 CHANGE ORDER REQUEST (“COR”)

7.6.1 Definition.

A COR is a written request prepared by the Contractor requesting that the District and the Architect issue a CO based upon a proposed change called for in an RFP or a claim pursuant to Paragraph 4.5.
7.6.2 Changes in Price.

A COR shall include breakdowns per Paragraph 7.7 to validate any change in Contract Price due to proposed change or claim.

7.6.3 Changes in Time.

A COR shall also include any additional time required to complete the Project. Any additional time requested shall not be the number of days to make the proposed change, but must be based upon the impact to the Project Schedule as defined in Paragraph 3.8 of the General Contract. If contractor fails to request a time extension in a COR, then the Contractor is thereafter precluded from requesting or claiming a delay.

7.7 COST OF CHANGE ORDERS

7.7.1 Scope.

Within ten (10) days after a request is made for a change that impacts the Contract Sum as defined in Paragraph 9.1, the critical path, or the Contract Time as defined in Paragraph 8.4.2, the Contractor shall provide the District and the Architect, with a written estimate of the effect of the proposed CO upon the Contract Sum and the actual cost of construction, which shall include a complete itemized cost breakdown of all labor and material showing actual quantities, hours, unit prices, and wage rates required for the change, and the effect upon the Contract Time of such CO. Changes may be made by District by an appropriate written CO, or, at the District's option, such changes shall be implemented immediately upon the Contractor's receipt of an appropriate written Construction Change Directive.

District may, as provided by law and without affecting the validity of this Agreement, order changes, modification, deletions and extra work by issuance of written Construction Change Directives from time to time during the progress of the Project, contract sum being adjusted accordingly. All such work shall be executed under conditions of the original Agreement except that any extension of time caused thereby shall be adjusted at time of ordering such change. District has discretion to order changes on a "time and material" basis with adjustments to time made after Contractor has justified through documentation the impact on the critical path of the Project.

7.7.2 Determination of Cost.

The amount of the increase or decrease in the Contract Price from a CO, if any, shall be determined in one or more of the following ways as applicable to a specific situation:

(a) Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation. If an agreement cannot be reached within fifteen (15) days after submission and negotiation of Contractor's proposal, Contractor may submit pursuant to Paragraph 7.7.3. Submission of sums which have no basis in fact are at the sole risk of Contractor and may be a violation of the False Claims Act set forth under Government Code Section 12650 et. seq.);
(b) By unit prices contained in Contractor's original bid and incorporated in the Project documents or fixed by subsequent agreement between District and Contractor;

(c) Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee. However, in the case of disagreement, Contractor must utilize the procedure under section 7.7.3; or

(d) By cost of material and labor and percentage of overhead and profit. If the value is determined by this method the following requirements shall apply:

1. **Basis for Establishing Costs.**

   a. Labor will be the actual cost for wages prevailing locally for each craft or type of workers at the time the extra Work is done, plus employer payments of payroll taxes and insurance, health and welfare, pension, vacation, apprenticeship funds, and other direct costs resulting from Federal, State, or local laws, as well as assessments or benefits required by lawful collective bargaining agreements. The use of a labor classification which would increase the extra Work cost will not be permitted unless the Contractor establishes the necessity for such additional costs. Labor costs for equipment operators and helpers shall be reported only when such costs are not included in the invoice for equipment rental.

   b. Materials shall be at invoice or lowest current price at which such materials are locally available and delivered to the Site in the quantities involved, plus sales tax, freight, and delivery.

      The District reserves the right to approve materials and sources of supply or to supply materials to the Contractor if necessary for the progress of the Work. No markup shall be applied to any material provided by the District.

   c. Tool and Equipment Rental. No payment will be made for the use of tools which have a replacement value of $250 or less.

      Regardless of ownership, the rates to be used in determining equipment rental costs shall not exceed listed rates prevailing locally at equipment rental agencies or distributors at the time the Work is performed.

      The rental rates paid shall include the cost of fuel, oil, lubrication, supplies, small tools, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, and all incidentals.

      Necessary loading and transportation costs for equipment used on the extra Work shall be included. If equipment is used intermittently and, when not in use, could be returned to its rental source at less expense to the District than holding it at the Work Site, it shall be returned unless the Contractor elects to keep it at the Work Site at no expense to the District.

      All equipment shall be acceptable to the Inspector, in good working condition, and suitable for the purpose for which it is to be used. Manufacturer's
ratings and modifications shall be used to classify equipment, and equipment shall be powered by a unit of at least the minimum rating recommended by the manufacturer.

d. Other Items. The District may authorize other items which may be required on the extra work. Such items include labor, services, material, and equipment which are different in their nature from those required by the Work, and which are of a type not ordinarily available from the Contractor or any of the Subcontractors. Invoices covering all such items in detail shall be submitted with the request for payment.

e. Invoices. Vendors’ invoices for material, equipment rental, and other expenditures shall be submitted with the COR. If the request for payment is not substantiated by invoices or other documentation, the District may establish the cost of the item involved at the lowest price which was current at the time of the Daily Report.

f. Overhead. Overhead, including direct and indirect costs, shall be submitted with the COR and include: home office overhead, off-site supervision, CO preparation/negotiation/research, time delays, project interference and disruption, additional guaranty and warranty durations, on-site supervision, additional temporary protection, additional temporary utilities, additional material handling costs, and additional safety equipment costs.

7.7.3 Format for Proposed Cost Change.

The following format shall be used as applicable by the District and the Contractor to communicate proposed additions and deductions to the Contract. A copy of a proposed Construction Change Directive form is provided at the end of this Article.

<table>
<thead>
<tr>
<th>Item</th>
<th>Extra</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Material (attach itemized quantity and unit cost plus sales tax)</td>
<td>_______</td>
<td>_______</td>
</tr>
<tr>
<td>(b) Labor (attach itemized hours and rates)</td>
<td>_______</td>
<td>_______</td>
</tr>
<tr>
<td>(c) Equipment (attach invoices)</td>
<td>_______</td>
<td>_______</td>
</tr>
<tr>
<td>(d) Subtotal</td>
<td>_______</td>
<td>_______</td>
</tr>
<tr>
<td>(e) If Subcontractor performed Work, add Subcontractor’s overhead and profit to portions performed by Sub-contractor, not to exceed fifteen percent (15%) of item (d).</td>
<td>_______</td>
<td>_______</td>
</tr>
</tbody>
</table>
Liability and Property Damage Insurance, Worker’s, Compensation Insurance, Social Security, and Unemployment Taxes, not to exceed as follows: FICA @ 6.2% - with a wage ceiling of $84,900; Medicare @ 1.45% - no wage ceiling; FUTA @ .8% - with a wage ceiling of $7,000; ETT and SUI @ 2.3% - with a wage ceiling of $7,000; Workers’ Compensation @ 5.94%; Liability and Property Damage @ 2.5%. **Total not-to-exceed is 19.19%. (Note: Modifications to these percentages will be evaluated and possibly modified only on a case-by-case basis and only after proper proof of alternate percentages are documented and approved in advance. In addition, as wage ceilings are met, those corresponding percentages must drop from the “burden” calculations).**

Subtotal

General Contractor’s Overhead and Profit: Not to exceed fifteen percent (15%) of Item (g) if Contractor performed the work. No more than five percent (5%) of Item (g) if Subcontractor performed the work. If work was performed by Contractor and Subcontractors, portions performed by Contractor shall not exceed fifteen percent (15%) if Item (g), and portions performed by Subcontractor shall not exceed five percent (5%) of Item (g)

Subtotal

Bond not to exceed one percent (1%) of Item (g)

**TOTAL**

Time

The undersigned Contractor approves the foregoing Construction Change Directive as to the changes, if any, and the contract price specified for each item and as to the extension of time allowed, if any, for completion of the entire work on account of said Construction Change Directive, and agrees to
furnish all labor, materials and service and perform all work necessary to complete any additional work specified therein, for the consideration stated herein. It is understood that said Construction Change Directive shall be effective when approved by the Governing Board of the District.

It is expressly understood that the value of such extra Work or changes, as determined by any of the aforementioned methods, expressly includes any and all of the Contractor's costs and expenses, both direct and indirect, resulting from additional time required on the Project or resulting from delay to the Project. Any costs, expenses, damages or time extensions not included are deemed waived.

The Contractor expressly acknowledges and agrees that any change in the Work performed shall not be deemed to constitute a delay or other basis for claiming additional compensation based on theories including, but not limited to, acceleration, suspension or disruption to the Project.

7.7.4 Deductive Change Orders

All deductive Change Order(s) must be prepared pursuant to Paragraph 7.7.3. Contractor will be allowed a maximum of 5% total profit and overhead. If subcontractor work is involved, subcontractors shall be entitled to a maximum of 5% profit and overhead on the deducted work. Any deviation from this Article shall not be allowed.

7.7.5 Discounts, Rebates, and Refunds.

For purposes of determining the cost, if any, of any change, addition, or omission to the Work hereunder, all trade discounts, rebates, refunds, and all returns from the sale of surplus materials and equipment shall accrue and be credited to the Contractor, and the Contractor shall make provisions so that such discounts, rebates, refunds, and returns may be secured, and the amount thereof shall be allowed as a reduction of the Contractor's cost in determining the actual cost of construction for purposes of any change, addition, or omissions in the Work as provided herein.

7.7.6 Accounting Records.

With respect to portions of the Work performed by COs and Construction Change Directives on a time-and-materials, unit-cost, or similar basis, the Contractor shall keep and maintain cost-accounting records satisfactory to the District, which shall be available to the District on the same terms as any other books and records the Contractor is required to maintain under the Contract Documents.

7.7.7 Notice Required.

If the Contractor desires to make a claim for an increase in the Contract Price, or any extension in the Contract Time for completion, it shall notify the District pursuant to Paragraph 4.5 and this Article. No claim shall be considered unless made in accordance with this subparagraph. Contractor shall proceed to execute the Work even though the adjustment may not have been agreed upon. Any change in the Contract Price or extension of the Contract Time resulting from such claim shall be authorized by a CO.
7.7.8 Applicability to Subcontractors.

Any requirements under this Article 7 shall be equally applicable to COs or Construction Change Directives issued to Subcontractors by the Contractor to the same extent required by the Contractor.

7.7.9 Alteration to Change Order Language.

Contractor shall not alter Change Orders or reserve time in Construction Change Directives. Contractor shall execute finalized Change Orders and proceed under Paragraph 7.7.7 and Paragraph 4.5 with proper notice. If Contractor intends to reserve time, without an approved CPM schedule prepared pursuant to Paragraph 3.8 then Contractor may be prosecuted pursuant to the False Claim Act.

ARTICLE 8

TIME

8.1 DEFINITIONS

8.1.1 Contract Time.

Unless otherwise provided, Contract Time is the period of time, in calendar days, including authorized adjustments, allotted in the Contract Documents for Completion of the Work.

8.1.2 Notice to Proceed.

District may give a notice to proceed within three (3) months of the award of the bid by District. Once Contractor has received the notice to proceed, Contractor shall complete the Work in the period of time referenced in the Contract Documents.

In the event that District desires to postpone the giving of the notice to proceed beyond this three-month period, it is expressly understood that with reasonable notice to the Contractor, the giving of the date to proceed may be postponed by District. It is further expressly understood by Contractor, that Contractor shall not be entitled to any Claim of additional compensation as a result of the postponement of the giving of the notice to proceed.

If the Contractor believes that a postponement will cause a hardship to Contractor, Contractor may terminate the contract with written notice to District within 10 days after receipt by Contractor of District’s notice of postponement. It is further understood by Contractor that in the event that Contractor terminates the Contract as a result of postponement by the District, the District shall only be obligated to pay Contractor for the Work that Contractor had performed at the time of notification of postponement. Should Contractor terminate the contract as a result of a notice of postponement, District shall have the authority to award the contract to the next lowest responsible bidder.
8.1.3 Computation of Time.

The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

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 year in question as established by National Oceanic and Atmospheric Administration (NOAA) weather data. No less than [edit] work days allocated equally across the Contract Time will be identified as non-working weather days in the contractor's schedule for the entire contract period of performance. The weather days shall be shown on the schedule and if not used will become float for the Project's use. 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 to protect the Work under construction from the effects of inclement weather.

If the weather is unusually severe and is in excess of the NOAA data norm and prevents the Contractor from beginning work at the usual daily starting time, or prevents the Contractor from proceeding with seventy-five (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 Architect will designate such time as unavoidable delay and grant one (1) work-day extension.

8.2 HOURS OF WORK.

8.2.1 Sufficient Forces.

Contractors and Subcontractors shall continuously furnish sufficient forces to ensure the prosecution of the Work in accordance with the Construction Schedule.

8.2.2 Performance During Working Hours.

Work shall be performed during regular working hours as permitted by the appropriate governmental agency except that in the event of an emergency, or when required to complete the Work in accordance with job progress, Work may be performed outside of regular working hours with the advance written consent of the District and approval of any required governmental agencies.

8.2.3 Costs for After Hours Inspections.

If the Contract Documents require Work to be done outside the Inspector's regular working hours, the costs of any after hour inspections, shall be borne by the District.

If the District allows the Contractor to do Work outside regular working hours for the Contractor's convenience, or if required to maintain schedule, the costs of any inspections required outside regular working hours shall be invoiced to the Contractor by the District and deducted from the next Progress Payment.
If the Contractor elects to perform Work outside the Inspector’s regular working hours, costs of any inspections required outside regular working hours shall be invoiced to the Contractor by the District and deducted from the next Progress Payment.

8.3 PROGRESS AND COMPLETION.

8.3.1 Time of the Essence.

Time limits stated in the Contract Documents are of the essence to the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

8.4 EXTENSIONS OF TIME – LIQUIDATED DAMAGES

8.4.1 Liquidated Damages.

Contractor and District hereby agree that the exact amount of damages for failure to complete the Work within the time specified is extremely difficult or impossible to determine. If the Work is not completed within the time specified in the Contract Documents, it is understood that the District will suffer damage. It being impractical and unfeasible to determine the amount of actual damage, it is agreed the Contractor shall pay to District as fixed and liquidated damages, and not as a penalty, the amount specified in the Construction Agreement for each calendar day of delay in completion. Any liquidated damages recovered by the District shall not, however, limit the District’s right to separately recover any actual out-of-pocket damages it suffers due to Contractor’s delay. Contractor and his surety shall be liable for the amount thereof pursuant to Government Code section 53069.85.

8.4.2 Excusable Delay.

Contractor shall not be charged for liquidated damages because of any delays in completion of Work which are not the fault or negligence of Contractor or its subcontractors, including acts of God, as defined in Public Contract Code Section 7107, acts of enemy, epidemics and quarantine restrictions. Contractor shall within five (5) calendar days of beginning of any such delay notify District in writing of causes of delay; thereupon District shall ascertain the facts and extent of delay and grant extension of time for completing Work when, in its judgment, the findings of fact justify such an extension. Extensions of time shall apply only to that portion of Work affected by delay, and shall not apply to other portions of Work not so affected. An extension of time may only be granted after proper compliance with Paragraph 3.8 requiring preparation and submission of a properly prepared CPM schedule.

No extended overhead, general conditions costs, impact costs, out-of-sequence costs or any other type of compensation, by any name or characterization, shall be paid to the Contractor for any delay to any activity not designated as a critical path item on the latest approved Project schedule.

The Contractor shall notify the Architect in writing of any anticipated delay and its cause, in order that the Architect may take immediate steps to prevent, if possible, the occurrence or continuance of 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 might be delayed thereby.

Contra Costa Community College District
Diablo Valley College
D-1045E Library Building HVAC
In the event the Contractor requests an extension of Contract time for unavoidable delay, such request shall be submitted in accordance with the provisions in the Contract Documents governing changes in work. When requesting time, i.e., extensions, for proposed Change Orders, they must be submitted with the proposed Change Order with full justification and documentation. If the Contractor fails to submit justification with the proposed Change Order it waives its 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 the 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:

(a) The duration of 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.

(b) 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. (A fragment of any delay of over ten (10) days must be provided.)

The Contractor and District understand and expressly agree that insofar as Public Contract Code Section 7102 may apply to changes in the Work or delays under this contract, the actual delays and damages, if any, and time extensions are intended to, and shall provide, the exclusive and full method of compensation for changes in the Work and construction delays.

8.4.3 Notice by Contractor Required.

The Contractor shall within five (5) calendar days of beginning of any such delay notify the District in writing of causes of delay with justification and supporting documentation. District will then ascertain the facts and extent of the delay and grant an extension of time for completing the Work when, in its judgment, the findings of fact justify such an extension. Extensions of time shall apply only to that portion of the Work affected by the delay and shall not apply to other portions of the Work not so affected. The sole remedy of Contractor for extensions of time under Paragraph 8.4.2 shall be an extension of the Contract Time at no cost to the District.

Claims relating to time extensions shall be made in accordance with applicable provisions of Article 7.

8.4.4 No Additional Compensation for Delays within Contractor’s Control

CONTRACTOR IS AWARE THAT GOVERNMENTAL AGENCIES, SUCH AS THE DEPARTMENT OF GENERAL SERVICES, GAS COMPANIES, ELECTRICAL UTILITY COMPANIES, WATER DISTRICTS AND OTHER AGENCIES MAY HAVE TO APPROVE CONTRACTOR PREPARED DRAWINGS OR APPROVE A PROPOSED INSTALLATION. CONTRACTOR HAS INCLUDED DELAYS AND DAMAGES WHICH MAY BE CAUSED BY SUCH AGENCIES IN CONTRACTOR’S BID. THUS, CONTRACTOR IS NOT ENTITLED TO MAKE CLAIM UPON THE DISTRICT FOR DAMAGES OR DELAYS ARISING FROM THE DELAYS CAUSED BY SUCH AGENCIES. FURTHERMORE, THE CONTRACTOR HAS SCHEDULED FOR SUCH DELAYS AND IS NOT ENTITLED TO AN EXTENSION OF TIME FOR DELAYS CAUSED BY GOVERNMENTAL AGENCIES WHICH CONTRACTOR MUST OBTAIN APPROVALS FROM AND, THUS, CONTRACTOR IS NOT ENTITLED TO AN EXTENSION OF TIME.
CONTRACTOR SHALL ONLY BE ENTITLED TO COMPENSATION FOR DELAY WHEN THE FOLLOWING CONDITIONS ARE MET: (1) THE DISTRICT IS RESPONSIBLE FOR THE DELAY; (2) THE DELAY IS UNREASONABLE UNDER THE CIRCUMSTANCES INVOLVED; AND (3) THE DELAY WAS NOT WITHIN THE CONTEMPLATION OF DISTRICT AND CONTRACTOR.

ARTICLE 9

PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the District to the Contractor for performance of the Work under the Contract Documents.

9.2 COST BREAKDOWN

9.2.1 Required Information.

On forms or software programs (e.g., Microsoft Project or Primavera) approved by the District, the Contractor shall furnish the following:

(a) Within ten (10) days of the award of the Contract, a detailed breakdown of the Contract Price (hereinafter "Schedule of Values") for each Project or Site;

(b) Within ten (10) days of the award of the Contract, a schedule of estimated monthly payment requests due the Contractor showing the values and construction time of the various portions of the Work to be performed by it and by its Subcontractors or material and equipment suppliers containing such supporting evidence as to its correctness as the District may require;

(c) Within ten (10) days of the award of the Contract, the name, address, telephone number, telex number, California State Contractors License number, classification and monetary value of all Subcontracts for parties furnishing labor, material, or equipment for completion of the Project.

9.2.2 District Approval Required.

The District shall review all submissions received pursuant to Paragraph 9.2.1 in a timely manner. All submissions must be approved by the District before becoming the basis of any payment. Contractor may request to District representation, prior to submission, to submit information required by paragraph 9.2.1 in a spreadsheet (Microsoft Excel) format. Approval of an alternate format is entirely at District’s discretion.

9.3 PROGRESS PAYMENTS

9.3.1 Payments to Contractor.

Within thirty (30) days after approval of the Request for Payment, Contractor shall be paid a sum equal to ninety-five percent (95%) of the value of the Work performed (as certified by Architect and
Inspector and verified by Contractor) up to the last day of the previous month, less the aggregate of previous payments. The value of the Work completed shall be Contractor’s best estimate. No inaccuracy or error in said estimate shall operate to release the Contractor, or any surety upon any bond, from damages arising from such Work, or from the District’s enforcement of each and every provision of this Contract, and the District shall have the right subsequently to correct any error made in any estimate for payment.

The Contractor shall not be entitled to have any payment requests processed, or be entitled to have any payment made for work performed, so long as any lawful or proper direction given by the District concerning the Work, or any portion thereof, remains incomplete.

The SOV items of Work shall include a prorated portion of Contractor’s home office and field office overhead, profit, insurance, (except to the extent expressly identified in a Proposal Item) and/or other financing, as well as General Conditions costs, (e.g., Site cleanup and maintenance, temporary roads, access, signage off-Site access roads, temporary power and lighting, security, and the like). The SOV shall not include separate line items for labor, submittals, or other non-Work items unless expressly identified in these Contract Documents.

Costs for each item of Work shall be indicated on a single line that breaks out labor, materials, and equipment for that item of Work, with all items noted in the paragraph above prorated into each line. Unless otherwise allowed, the SOV shall reflect that the District shall only pay for installed items of Work at the Project site. All other costs shall be prorated through all activities and all Phases of the Project so that the sum of all Schedule of Values line items equals the total Contract Price.

Notwithstanding anything to the contrary stated above, the Contractor may include in its Request for Payment the value of any structural steel, mail order materials, G.F.R.C. panels and other such custom-made materials prepared specifically for the Project and unique to the Project so long as all of the following requirements are satisfied:

(a) No payment shall be made for materials stored off-site without the written approval of the District to be given or withheld in the District’s sole discretion;
(b) Title to such materials shall be vested in the District as evidenced by documentation satisfactory in form and substance to the District, including, without limitation, recorded financing statements, UCC filings and UCC searches;
(c) With each Contractor Request for Payment, the Contractor shall submit to the District a written list identifying each location where materials are stored off-site (which must be a bonded warehouse) and the value of the materials at each location. The Contractor shall procure insurance satisfactory to the District (in its reasonable discretion) for materials stored off-site in an amount not less than the total value thereof;
(d) The consent of any Surety shall be obtained to the extent required prior to payment for any materials stored off-site;
(e) Representatives of the District shall have the right to make inspections of the storage areas at any time; and
(f) Such materials shall be (1) protected from diversion, destruction, theft and damage to the reasonable satisfaction of the District; (2) specifically marked for use on the Project; and (3) segregated from other materials at the storage facility.

9.3.2 Purchase of Materials and Equipment.

The Contractor is required to order, obtain, and store materials and equipment sufficiently in advance of its Work at no additional cost or advance payment from District to assure that there will be no delays.

9.3.3 No Waiver.

No payment by District hereunder shall be interpreted so as to imply that District has inspected, approved, or accepted any part of the Work. Notwithstanding any payment, the District may enforce each and every provision of this Contract. The District may correct any error subsequent to any payment.

9.3.4 Issuance of Certificate of Payment.

The Architect shall, within seven (7) days after receipt of the Contractor’s Application for Payment, either approve such payment or notify the Contractor in writing of the Architect’s reasons for withholding approval in whole or in part as provided in Paragraph 9.6. The review of the Contractor’s Application for Payment by the Architect is based on the Architect’s observations at the Site and the data comprising the Application for Payment that the Work has progressed to the point indicated and that, to the best of the Architect’s knowledge, information, and belief, the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to (1) an evaluation of the Work for conformance with the Contract Documents, (2) results of subsequent tests and inspections, (3) minor deviations from the Contract Documents correctable prior to completion, and (4) specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified.

9.4 APPLICATIONS FOR PROGRESS PAYMENTS

9.4.1 Procedure.

9.4.1.1 Application for Progress. On or before the fifth (5th) day of each calendar month during the progress of the Work, Contractor shall submit to the Architect an itemized Application for Progress Payment for operations completed in accordance with the Schedule of Values. Such application shall be notarized, if required, and supported by the following or such portion thereof as Architect requires:

(a) The amount paid to the date of the Application to the Contractor, to all its Subcontractors, and all others furnishing labor, material, or equipment for its Contract;

(b) The amount being requested under the Application for Payment by the Contractor on its own behalf and separately stating the amount requested on behalf of each of the Subcontractors and all others furnishing labor, material, and equipment under the Contract;

(c) The balance that will be due to each of such entities after said payment is made;
(d) A certification that the Record Drawings and Annotated Specifications are current;
(e) Itemized breakdown of work done for the purpose of requesting partial payment;
(f) An updated construction schedule in conformance with Paragraph 3.8;
(g) The additions to and subtractions from the Contract Price and Contract Time;
(h) A summary of the retentions held;
(i) Material invoices, evidence of equipment purchases, rentals, and other support and
details of cost as the District may require from time to time;
(j) The percentage of completion of the Contractor’s Work by line item; and
(k) An updated Schedule of Values from the preceding Application for Payment.

9.4.2 Prerequisites for Progress Payments.

9.4.2.1 First Payment Request. The following items, if applicable, must be completed before the first payment request will be accepted for processing:

(a) Installation of the Project sign;
(b) Receipt by Architect of submittals;
(c) Installation of field office;
(d) Installation of temporary facilities and fencing;
(e) Submission of documents listed in the Paragraph 9.2 relating to Cost Breakdown;
(f) Preliminary schedule analysis, due within 10 days after Notice to Proceed;
(g) Contractor’s Construction Schedule (Progress Schedule to be CPM based in
conformance with Paragraph 3.8);
(h) Schedule of unit prices, if applicable;
(i) Submittal Schedule;
(j) Copies of necessary permits;
(k) Copies of authorizations and licenses from governing authorities;
(l) Initial progress report;
(m) Surveyor qualifications;
(n) Written acceptance of District’s survey of rough grading, if applicable;
(o) List of all subcontractors, with names, license numbers, telephone numbers, and scope
of work;
(p) All bonds and insurance endorsements; and
(q) Resumes of General Contractor’s Project Manager, and if applicable, job site Secretary,
Record Documents Recorder, and job site Superintendent.
9.4.2.2 Second Payment Request. The second payment request will not be processed until all submittals and shop drawings have been accepted for review by the Architect.

9.4.2.3 All Payment Requests. No payment requests will be processed unless Contractor has submitted copies of the Certified Payroll records for the Work which correlates to the payment request and a proper CPM schedule pursuant to Paragraph 3.8 is submitted.

9.4.2.4 Any payments made to Contractor where criteria set forth in Paragraph 9.4.2.1 or 9.4.2.2 have not been met shall not constitute a waiver of said criteria by District. Instead, such payment shall be construed as a good faith effort by District to resolve differences so Contractor may pay its Subcontractors and suppliers and that Contractor agrees that failure to submit such items may constitute a breach of contract by Contractor and may subject Contractor to termination.

9.5 WARRANTY OF TITLE

The Contractor warrants title to all work. The Contractor further warrants that all work is free and clear of liens, claims, security interests, or encumbrances in favor of the Contractor, Subcontractors, material and equipment suppliers, or other persons or entities making a claim by reason of having provided labor, materials, and equipment relating to the Work. Failure to keep work free of liens, claims, security interests or encumbrances is grounds to make a claim against Contractor’s payment and performance bond to immediately remedy and defend.

If a lien or stop notice of any nature should at any time be filed against the Work or any District property, by any entity which has supplied material or services at the request of the Contractor, Contractor and Contractor’s surety shall promptly, on demand by District and at Contractor’s and surety’s own expense, take any and all action necessary to cause any such lien or stop notice to be released or discharged immediately therefrom.

If the Contractor fails to furnish to the District within ten (10) calendar days after demand by the District, satisfactory evidence that a lien or stop notice has been so released, discharged, or secured, then District may discharge such indebtedness and deduct the amount required therefor, together with any and all losses, costs, damages, and attorney’s fees and expense incurred or suffered by District from any sum payable to Contractor under the Contract.

9.6 DECISIONS TO WITHHOLD PAYMENT

9.6.1 Reasons to Withhold Payment.

The District may withhold payment in whole, or in part, to the extent reasonably necessary to protect the District if, in the District’s opinion, the representations to the District required by Paragraph 9.4 cannot be made. The District may withhold payment, in whole, or in part, to such extent as may be necessary to protect the District from loss because of, but not limited to:

(a) Defective Work not remedied;
(b) Stop Notices served upon the District;
(c) Liquidated damages assessed against the Contractor;
(d) The cost of completion of the Contract if there exists reasonable doubt that the Work can be completed for the unpaid balance of any Contract Price or by the completion date;

(e) Damage to the District or other contractor;

(f) Unsatisfactory prosecution of the Work by the Contractor;

(g) Failure to store and properly secure materials;

(h) Failure of the Contractor to submit on a timely basis, proper and sufficient documentation required by the Contract Documents, including, without limitation, acceptable monthly progress schedules, shop drawings, submittal schedules, schedule of values, product data and samples, proposed product lists, executed Construction Change Directives, and verified reports;

(i) Failure of the Contractor to maintain record drawings;

(j) Erroneous estimates by the Contractor of the value of the Work performed, or other false statements in an Application for Payment;

(k) Unauthorized deviations from the Contract Documents;

(l) Failure of the Contractor to prosecute the Work in a timely manner in compliance with established progress schedules and completion dates.

(m) Failure to properly pay prevailing wages as defined in Labor Code section 1720, et seq.;

(n) Failure to properly maintain or clean up the Site;

(o) Payments to indemnify, defend, or hold harmless the District;

(p) Any payments due to the District including but not limited to payments for failed tests, or utilities changes or permits;

(q) Failure to submit an acceptable schedule in accordance with Paragraph 3.8; or

(r) Failure to pay Subcontractor or suppliers as required by Paragraph 9.8.1.

9.6.2 Reallocation of Withheld Amounts.

District may, in its discretion, apply any withheld amount to payment of outstanding claims or obligations as defined in Paragraphs 9.6.1 and 9.5. In so doing, District shall make such payments on behalf of Contractor. If any payment is so made by District, then such amount shall be considered as a payment made under Contract by District to Contractor and District shall not be liable to Contractor for such payments made in good faith. Such payments may be made without prior judicial determination of claim or obligation. District will render Contractor an accounting of such funds disbursed on behalf of Contractor.

If Contractor defaults or neglects to carry out the Work in accordance with the contract documents or fails to perform any provision thereof, District may, after ten (10) calendar days written notice to the Contractor and without prejudice to any other remedy make good such deficiencies. The District shall adjust the total Contract price by reducing the amount thereof by the cost of making good such deficiencies. If District deems it inexpedient to correct Work which is damaged, defective, or not
done in accordance with Contract provisions, an equitable reduction in the Contract price (of at least 150% of the estimated reasonable value of the nonconforming work) shall be made therefor.

9.6.3 Payment After Cure.

When the grounds for declining approval are removed, payment shall be made for amounts withheld because of them. No interest shall be paid on any retainage or amounts withheld due to the failure of the Contractor to perform in accordance with the terms and conditions of the Contract Documents.

9.7 NONCONFORMING WORK

Contractor shall promptly remove from premises all Work identified by District as failing to conform to the Contract whether incorporated or not. Contractor shall promptly replace and re-execute its own Work to comply with the Contract without additional expense to District and shall bear the expense of making good all work of other contractors destroyed or damaged by such removal or replacement.

If Contractor does not remove such Work which has been identified by District as failing to conform to the Contract Documents within a reasonable time, fixed by written notice, District may remove it and may store the material at Contractor’s expense. If Contractor does not pay expenses of such removal within ten (10) calendar days' time thereafter, District may, upon ten (10) calendar days' written notice, sell such materials at auction or at private sale and shall account for net proceeds thereof, after deducting all costs and expenses that should have been borne by Contractor.

9.8 SUBCONTRACTOR PAYMENTS

9.8.1 Payments to Subcontractors.

No later than ten (10) days after receipt, or pursuant to Business and Professions Code Section 7108.5 and Public Contract Code section 7107, the Contractor shall pay to each Subcontractor, out of the amount paid to the Contractor on account of such Subcontractor’s portion of the Work, the amount to which said Subcontractor is entitled. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

9.8.2 No Obligation of District for Subcontractor Payment.

The District shall have no obligation to pay, or to see to the payment of, money to a Subcontractor except as may otherwise be required by law.

9.8.3 Payment Not Constituting Approval or Acceptance.

An approved Request for Payment, a progress payment, or partial or entire use or occupancy of the Project by the District shall not constitute acceptance of Work not in accordance with the Contract Documents.
9.8.4 Joint Checks.

District shall have the right, if necessary for the protection of the District, to issue joint checks made payable to the Contractor and Subcontractors and material or equipment suppliers. The joint check payees shall be responsible for the allocation and disbursement of funds included as part of any such joint payment. In no event shall any joint check payment be construed to create any contract between the District and a Subcontractor of any tier, any obligation from the District to such Subcontractor, or rights in such Subcontractor against the District.

9.9 PROJECT RECORD DOCUMENTS

This section includes administrative and procedural requirements for Project Record Documents, including but not limited to the following where applicable:

9.9.1 Record Drawings
9.9.2 Record Specifications
9.9.3 Record Product Data
9.9.4 Record MEP & Structural coordination documents
9.9.5 Project Record Documents include, but are not limited to, the following:
   9.9.5.1 Marked-up copies of Drawings
   9.9.5.2 Marked up copy of the Project Specifications
   9.9.5.3 Marked-up copies of Shop Drawings
   9.9.5.4 Newly prepared Drawings and Specifications
   9.9.5.5 Marked-up Product Data submittals
   9.9.5.6 Field records, such as photographs, for variable and concealed conditions
   9.9.5.7 Record information for Work that is only schematically shown
   9.9.5.8 Maintenance forms for equipment

Contractor shall dedicate one complete full size set of the Contract Drawings and one complete Project Manual for use in recording as-built conditions.

Contractor shall submit to District in hard copy one original and two copies of all Project Record Documents. In addition, one electronic copy in electronic media format shall be submitted to District. District reserves the right to require resubmittal in accordance with these General Conditions if the documents are inaccurate or incomplete, or otherwise fail to meet the requirements of these Contract Documents.

9.9.6 Project Record Drawings

Mark-up Procedure: During the construction period, maintain a complete, current set of full size blackline prints of Contract Drawings and Shop Drawings for Project Record Documents purposes. Label
each document (on first sheet or format page) "Project Record" in 2-inch high printed letters. Keep all record documents current.

A reference by number to a Change Order, CCD, RFI, RFQ, RFP, Field Order or other such document is not acceptable as sufficient record information on any record document. Do not conceal any Work until required record information has been recorded.

Contractor shall mark Record Drawings to indicate the actual installation where the installation varies appreciably from the installation shown originally. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later. Items required to be marked include, but are not limited to:

9.9.6.1 Dimensional changes to the Contract Drawings (horizontal and/or vertical)
9.9.6.2 Revisions or any modification to details shown on the Contract Drawings
9.9.6.3 Depths of various elements of foundations in relation to main floor level or survey datum.
9.9.6.4 Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
9.9.6.5 Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
9.9.6.6 Locations of underground work, points of connection with existing utilities, changes in direction, valves, manholes, catch basins, capped stub outs, invert elevations and similar items
9.9.6.7 Final, actual numbering of each electrical circuit
9.9.6.8 Revisions to routing of piping and conduits
9.9.6.9 Revisions to electrical circuitry
9.9.6.10 Actual equipment locations
9.9.6.11 Duct size and routing
9.9.6.12 Changes made by Change Order, CCD, ASI, or any other directive
9.9.6.13 Details not on original Contract Drawings

Contractor shall mark completely and accurately Project Record Drawing prints of Contract Drawings or Shop Drawings, whichever is the most capable of showing actual physical conditions. Where Shop Drawings are marked, show cross-reference on Contract Drawings location.

Contractor shall mark Project Record Drawing sets with red, erasable colored pencil; use other colors to distinguish between changes for different categories of the Work at the same location.
Contractor shall be responsible for Mark-up: Where feasible, the individual or entity who obtained Project Record Drawing data, whether the individual or entity is the installer, Subcontractor or similar entity, is required to prepare the mark-up on Project Record Drawings.

Contractor shall prepare Record Drawings: Immediately prior to inspection for Certification of Substantial Completion of the Work, review completed marked-up Project Record Drawings with District, Project Inspector, Construction Manager, and Architect to ensure accuracy of information. Once accuracy of information is confirmed, prepare and submit a full set of as-built Contract Drawings and Shop Drawings.

Incorporate changes and additional information previously marked on print sets. Delete, redraw, and/or add details and notations where applicable. Identify and date each Drawing; include the printed designation "PROJECT RECORD DRAWING" and the date prepared in a prominent location on each Drawing.

Distribution: Whether or not changes and additional information were recorded, organize and bind original marked-up set of prints that were maintained during the construction period into manageable sets. Bind the set with durable paper cover sheets, with appropriate identification, including titles, dates and other information on cover sheets and submit to District.

9.9.7 Project Record Specification

Contractor shall, during the construction period, maintain one copy of the Project Specifications, including all addenda and all other modifications issued for Project Record Documents purposes.

Contractor shall mark the Project Record specifications to indicate the actual installation where the installation varies substantially from that indicated in Specifications and/or modifications issued. Note related Project Record Drawing information, where applicable. Give particular attention to substitutions, selection of product options, Change Order and Construction Change Directive Work, and information on concealed installation that would be difficult to identify, measure, and record later.

9.9.8 Project Record Product Data

Contractor shall, during the construction period, maintain one copy of each Project Record Product Data submittal for "Project Record Document" purposes.

Contractor shall arrange Project Record Product Data by Specification Section number, and provide names, addresses, fax numbers, emails addresses, and telephone number of Subcontractors and suppliers. Information to be provided includes:

9.9.8.1 Trade Names
9.9.8.2 Model or type numbers
9.9.8.3 Assembly diagrams
9.9.8.4 Operating instructions
9.9.8.5 Cleaning instructions
9.9.8.6 Maintenance instructions
9.9.8.7 Recommended spare parts
9.9.8.8 Product data

9.9.9 Miscellaneous Project Record Submittals

Refer to other Specification Sections for miscellaneous record keeping requirements and submittals. Immediately prior to Substantial Completion of the Work complete miscellaneous records and place in good order, properly identified, ready for use and reference. Submit to the District for District’s records, in Adobe PDF format.

9.9.10 Electronic Media Format

Electronic Media Format: Electronic media format for all Project Record Documents shall be Adobe PDF, with chapter markers and/or bookmarks inserted in place of the equivalent hard copy section tabs. Electronic copy shall include all tables, charts, drawings, codes and all other matters reflected in hard copies. Electronic media files shall be delivered on a unique CD-ROM or flash drive.

9.10 COMPLETION OF THE WORK

9.10.1 Contract Closeout Submittals include, but are not limited to: [Edit As Needed]

9.10.1.1 Color prints of full size contractor Marked-up Contract Drawings
9.10.1.2 Color prints of full size contractor marked-up Shop Drawings
9.10.1.3 Professionally Drafted As-Built Record Drawings
9.10.1.4 Dated marked-up copies of Conformed Specifications
9.10.1.5 Marked-up Project Data submittals
9.10.1.6 Record Samples
9.10.1.7 Field records for variable and concealed conditions
9.10.1.8 Project record documents. See Section 01780.
9.10.1.9 Operating and maintenance manuals and data
9.10.1.10 Warranties, guaranties, and bonds
9.10.1.11 Warranty Tags
9.10.1.12 Spare Parts Data
9.10.1.13 Service and maintenance contracts
9.10.1.14 Certified and approved fire inspection documents, when required

9.10.2 Initial Punch List and Inspection

When Contractor considers Work to be Substantially Complete, submit written notice to District’s Representative requesting an Initial Inspection and listing items remaining to be completed or corrected listed by room number and item number (hereinafter “Initial Punch List”). The Contractor
and/or its Subcontractors shall proceed promptly to complete and correct items on the list without waiting for District review of the Initial Punch List and inspection of the Work. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

The Contractor shall not submit a notice requesting an Initial Inspection unless the Work is Substantially Complete.

9.10.2.1 Before calling for final inspection, Contractor shall determine that the following Work has been performed:

a. The Work has been completed.
b. All life safety items are completed and in working order.
c. Mechanical and electrical Work complete, fixtures in place, connected and ready for tryout and test.
d. Electrical circuits scheduled in panels and disconnect switches labeled.
e. Painting and special finishes complete.
f. Doors complete with hardware, cleaned of protective film relieved of sticking or binding and in working order.
g. Tops and bottoms of doors sealed.
h. Floors waxed and polished as specified.
i. Broken glass replaced and glass cleaned.
j. Grounds cleared of Contractor’s equipment, raked clean of debris, and trash removed from Site.
k. Work cleaned, free of stains, scratches, and other foreign matter, replacement of damaged and broken material.
l. Finished and decorative work shall have marks, dirt and superfluous labels removed.
m. Final cleanup.

9.10.2.2 Furnish a letter to District stating that a responsible representative of District [give name and position] has been instructed in working characteristics of mechanical and electrical equipment.

Should District’s Representatives determine that Work is not Substantially Complete, the Architect or Project Manager will promptly notify Contractor in writing, listing Work that must be completed prior to Substantial Completion. Any inspection list that is submitted to the District that does not result in a District determination of Substantial Completion will not be considered an accepted Initial Punch List. If the Work or Phase of Work is determined to not be Substantially Complete, Contractor shall complete all Work as directed prior to requesting an additional Initial Inspection by the District to determine Substantial Completion per this Specification Section.

Upon receipt of the Contractor’s Initial Punch List, and not before, the Architect, Project Manager, and Inspector will make an Initial Inspection to determine whether the Work, or Phase of Work, is Substantially Complete.

9.10.2.3 1. All fire and life safety items, manufactured units, equipment and systems that require startup must have been started, run, tested, and
operational for periods prescribed by the Contract Documents before a request for Initial Inspection is accepted by the District.

9.10.2.4 2. If additional Initial Inspections are required to review Initial Punch List items due to incompleteness of the Work by Contractor, Contractor will reimburse District for all costs associated with these inspections if additional services fees by District consultants are required. The costs of such District additional service fees will be deducted from the Contract Sum by Change Order.

9.10.3 Substantial Completion

When District determines that the Work is Substantially Complete, District will issue a Certificate of Substantial Completion, accompanied by Final Punch List of items to be completed or corrected as verified and/or appended by Architect and District.

When the Work is Substantially Complete, the District will file a Notice of Completion.

9.10.3.1 Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work unless otherwise provided in the Notice of Completion.

9.10.3.2 The Notice of Completion shall be submitted to the Contractor for their written acceptance of responsibilities assigned to them in such Notice prior to District filing the Notice of Completion for purposes of initiating the release of Retention for the Work or Phase of Work.

9.10.3.3 The District shall withhold from Contractor payment the value of remaining Work, Work to be corrected, incomplete Work, and an amount identified for Punch List Work, and as otherwise identified in Public Contract Code.

The Contractor shall complete the items listed in the Final Punch List within ten (10) working days of the Certificate of Substantial Completion. The Contractor shall execute the Work such that the District can occupy the Work within seven (7) calendar days of the date of the Certificate of Substantial Completion.

9.10.4 Final Inspection

When Contractor considers the items listed in the Final Punch List to be complete the Contractor shall submit written notice to District’s Representative requesting a Final Inspection.

Operations and Maintenance Manuals and Warranty and Guaranty documents. At least ten (10) days prior to final inspection, three (3) copies of complete operations and maintenance manuals, repair parts lists, service instructions for all electrical and mechanical equipment, and equipment warranties shall be submitted. All installation, operating, and maintenance information and drawings shall be bound in 8½” x 11” binders. Provide a table of contents in front and all items shall be indexed with tabs. Each manual shall also contain a list of subcontractors, with their addresses and the names of persons to contact in cases of emergency. Identifying labels shall provide names of manufactures, their addresses, ratings, and capacities of equipment and machinery. Additional requirements for Operations and Maintenance manuals may be found in other Specifications and Sections of the Contract Documents.
Upon receipt of the Contractor’s request for Final Inspection, and not before, the Contractor, Architect, and Project Manager, shall meet to go over the Contract Documents to identify the administrative requirements for contract close-out.

9.10.4.1 The Project Manager will prepare a list of requirements remaining for administrative close-out and shall provide the list to the Contractor. This list may be general in nature, and shall not serve to relieve the Contractor from any of the administrative requirements of the Contract.

9.10.4.2 The Contractor shall complete all items on the administrative close-out list within twenty-one (21) days

Subsequent to the meeting to identify administrative close-out requirements, Architect, Project Manager, Campus Representatives, and Inspector will inspect the Work to determine whether the Work identified on the Final Punch List is complete.

If additional Final Inspections are required to review the Final Punch List items due to incompleteness of the Work by Contractor, Contractor will reimburse District for all costs associated with these inspections if additional services fees by District consultants are required. The costs of such District additional service fees will be deducted from the Contract Sum by Change Order.

When the Architect determines that all final punch list items have been completed, a final Project Inspection Report will be issued. Any outstanding administrative close-out requirements will be identified and a value for withholding from Progress Payment or Final Payment will be assigned.

The Project Inspector (IOR), the Project Manager, and the Contractor shall, at all times, be together during all inspections. The Contractor shall give 24-hour notice to the District for such inspections.

9.10.5 Final Completion

Final Completion occurs when all Work meets all requirements of the Contract Documents. When Contractor considers all Work complete and all close-out requirements have been performed, submitted, and accepted, submit written certification to District that:

9.10.5.1 Contractor has inspected Work for compliance with Contract Documents, and all requirements for Final Acceptance have been met.

9.10.5.2 Except for Contractor maintenance and Deferred or Seasonal Testing, after Final Acceptance, all Work has been completed in accordance with Contract Documents and deficiencies listed with any Certificate of Substantial Completion have been corrected. Equipment and systems have been tested in the presence of Architect, Project Inspector (IOR), Project Manager, Construction Manager, and District Representatives and are operative.

Should District determine that the Work is incomplete or defective or that administrative requirements have not been completed:
9.10.5.3 District’s Representative promptly will so notify Contractor, in writing, listing the incomplete or defective items.

9.10.5.4 Contractor shall promptly remedy all incomplete and/or defective Work and notify the District when it is ready for re-inspection. District’s Representatives will then re-inspect the Work. If deficiencies previously noted are found not to be corrected, Contractor shall pay all District costs for the re-inspection.

9.10.5.5 When District determines that all Work and requirements are complete under the Contract Documents, District or Project Manager will request Contractor to make a request for Final Payment.

9.11 PARTIAL OCCUPANCY OR USE

9.11.1 District’s Rights.

The District may occupy or use any completed or partially completed portion of the Work at any stage. The District and the Contractor shall agree in writing to the responsibilities assigned to each of them for payments, security, maintenance, heat, utilities, damage to the Work, insurance, the period for correction of the Work, and the commencement of warranties required by the Contract Documents. If District and Contractor cannot agree as to responsibilities such disagreement shall be resolved pursuant to Paragraph 4.5.1. When the Contractor considers a portion complete, the Contractor shall prepare and submit a Punch List to the District as provided under Paragraph 9.9.1.

9.11.2 Inspection Prior to Occupancy or Use.

Immediately prior to such partial occupancy or use, the District, the Contractor, and the Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

9.11.3 No Waiver.

Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of the Work not complying with the requirements of the Contract Documents.

9.12 COMPLETION AND FINAL PAYMENT

9.12.1 Final Inspection.

Contractor shall comply with all Punch List and Inspection procedures under Paragraph 9.10, and maintain the presence of project superintendent and project manager until the punch list is complete to ensure proper and timely completion of the punch list. Under no circumstances shall Contractor demobilize its forces prior to completion of the punch list. Upon receipt of Contractor's written notice that all of the Punch List items have been fully completed and the Work is ready for final inspection and acceptance, Architect shall inspect the Work and shall submit to Contractor and District a final inspection report noting the work, if any, required in order to complete in accordance with the
Contract Documents. Absent unusual circumstances, this report shall consist of the Punch List items not yet satisfactorily completed.

Upon completion of the Work contained in the final inspection report, the Contractor shall notify the District and Architect, who shall again inspect such Work. If the Architect and the District finds the Work contained in such final inspection report acceptable under the Contract Documents and, therefore, the Work fully completed, it shall notify Contractor, who shall then submit to the Architect its final Application for Payment.

Upon receipt and approval of such final Application for Payment, the Architect shall issue a final Certificate of Payment stating that to the best of its knowledge, information, and belief, and on the basis of its observations, inspections, and all other data accumulated or received by the Architect in connection with the Work, such Work has been completed in accordance with the Contract Documents. The District shall thereupon inspect such Work and either accept the Work as complete or notify the Architect and the Contractor in writing of reasons why the Work is not complete. Upon acceptance of the Work of the Contractor as fully complete (which, absent unusual circumstances, will occur when the Punch List items have been satisfactorily completed), the District shall record a Notice of Completion with the County Recorder, and the Contractor shall, upon receipt of payment from the District, pay the amounts due Subcontractors.

9.12.2 Retainage.

The retainage, less any amounts disputed by the District or which the District has the right to withhold Pursuant to Paragraph 9.6, shall be paid after approval of the District by the Architect’s Certificate of Payment, after the satisfaction of the conditions set forth in Article 9, and after thirty-five (35) days after the acceptance of the Work and recording of the Notice of Completion by District. No interest shall be paid on any retainage, or on any amounts withheld due to a failure of the Contractor to perform, in accordance with the terms and conditions of the Contract Documents, except as provided to the contrary in any Escrow Agreement between the District and the Contractor pursuant to Public Contract Code § 22300.

9.12.3 Procedures for Application for Final Payment.

9.12.3.1 Prerequisites for Final Payment. The following conditions must be fulfilled prior to Final Payment:

(a) A full and final waiver or release of all Stop Notices in connection with the Work shall be submitted by Contractor, including a release of Stop Notice in recordable form, together with (to the extent permitted by law) a copy of the full and final release of all Stop Notice rights.

(b) The Contractor shall have made all corrections to the Work which are required to remedy any defects therein, to obtain compliance with the Contract Documents or any requirements of applicable codes and ordinances, or to fulfill any of the orders or directions of District required under the Contract Documents.

(c) Each Subcontractor shall have delivered to the Contractor all written guarantees, warranties, applications, and bonds required by the Contract Documents for its portion of the Work.
(d) Contractor must have completed all requirements set forth in Paragraph 9.9.1.2.
(e) Architect shall have issued a Final Certificate of Payment.
(f) The Contractor shall have delivered to the District all manuals and materials required by the Contract Documents.
(g) The Contractor shall have completed final clean up as required by Paragraph 3.12.

9.13 SUBSTITUTION OF SECURITIES

The District will permit the substitution of securities in accordance with the provisions of Public Contract Code section 22300.

ARTICLE 10

PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

10.1.1 Contractor Responsibility.

The Contractor is constructive owner of Project site. The Contractor shall be responsible for all damages to persons or property that occur as a result of its fault or negligence in connection with the prosecution of this Contract and shall take all necessary measures and be responsible for the proper care and protection of all materials delivered and work performed until completion and final acceptance by the District. All work shall be solely at the Contractor’s risk, with the exception of damage to the work caused by “acts of God” as defined in Public Contract Code Section 7105(b)(2).

Contractor shall take, and require subcontractor to take, all necessary precautions for safety of workers on the Work and shall comply with all applicable federal, state, local and other safety laws, standards, orders, rules, regulations, and building codes to prevent accidents or injury to persons on, about, or adjacent to premises where Work is being performed and to provide a safe and healthful place of employment. In addition to meeting all requirements of OSHA, Cal-OSHA, state, and local codes, Contractor shall furnish, erect and properly maintain at all times, as directed by District or Architect or required by conditions and progress of work, all necessary safety devices, safeguards, construction canopies, signs, audible devices for protection of the blind, safety rails, belts and nets, barriers, lights, and watchmen for protection of workers and the public, and shall post danger signs warning against hazards created by such features in the course of construction. Contractor shall designate a responsible member of its organization on the Work, whose duty shall be to post information regarding protection and obligations of workers and other notices required under occupational safety and health laws, to comply with reporting and other occupational safety requirements, and to protect the life, safety and health of workers. The name and position of person so designated shall be reported to District by Contractor. Contractor shall correct any violations of safety laws, rules, orders, standards, or regulations. Upon the issuance of a citation or notice of violation by the Division of Occupational Safety and Health, such violation shall be corrected promptly.

The Contractor and Subcontractors shall continuously protect the Work, the District’s property, and the property of others, from damage, injury, or loss arising in connection with operations under the
Contract Documents. The Contractor and Subcontractors, at their own expense, shall make good any such damage, injury, or loss, except such as may be solely due to, or caused by, agents or employees of the District.

10.1.2 Subcontractor Responsibility.

Contractor shall require that Subcontractors participate in, and enforce, the safety and loss prevention programs established by the Contractor for the Project, which will cover all Work performed by the Contractor and its Subcontractors. Each Subcontractor shall designate a responsible member of its organization whose duties shall include loss and accident prevention, and who shall have the responsibility and full authority to enforce the program. This person shall attend meetings with the representatives of the various Subcontractors employed to ensure that all employees understand and comply with the programs.

10.1.3 Cooperation.

All Subcontractors and material or equipment suppliers, shall cooperate fully with Contractor, the District, and all insurance carriers and loss prevention engineers.

10.1.4 Accident Reports.

Subcontractors shall immediately, within two (2) days, report in writing to the Contractor all accidents whatsoever arising out of, or in connection with, the performance of the Work, whether on or off the Site, which caused death, personal injury, or property damage, giving full details and statements of witnesses. In addition, if death or serious injuries or serious damages are caused, the accident shall be reported within four (4) days by telephone or messenger. Contractor shall thereafter immediately, within two (2) days, report the facts in writing to the District and the Architect giving full details of the accident.

10.1.5 First-Aid Supplies at Site.

The Contractor will provide and maintain at the Site first-aid supplies which complies with the current Occupational Safety and Health Regulations.

10.1.6 Material Safety Data Sheets and Compliance with Proposition 65.

(a) Contractor is required to have material safety data sheets available in a readily accessible place at the job site for any material requiring a material safety data sheet per the Federal “hazard communication” standard, or employees’ “right-to-know law.” The Contractor is also required to properly label any substance brought into the job site, and require that any person working with the material, or within the general area of the material, is informed of the hazards of the substance and follows proper handling and protection procedures.

Contractor is required to comply with the provisions of California Health and Safety Code section 25249, et seq., which requires the posting and giving of notice to persons who may be exposed to any chemical known to the State of California to cause cancer. The Contractor agrees to familiarize itself with the provisions of this section, and to comply fully with its requirements.
10.1.7 Non-Utilization of Asbestos Material.

NO ASBESTOS OR ASBESTOS-CONTAINING PRODUCTS SHALL BE USED IN THIS CONSTRUCTION OR IN ANY TOOLS, DEVICES, CLOTHING, OR EQUIPMENT USED TO EFFECT THIS CONSTRUCTION.

Asbestos and/or asbestos-containing products shall be defined as all items containing, but not limited to, chrysotile, amosite, anthophyllite, tremolite, and antinolite.

Any or all material containing greater than one-tenth of one percent (.1%) asbestos shall be defined as asbestos-containing material.

All Work or materials found to contain asbestos or Work or material installed with asbestos-containing equipment will be immediately rejected and this Work will be removed at no additional cost to the District.

Decontamination and removal of Work found to contain asbestos or Work installed with asbestos-containing equipment shall be done only under supervision of a qualified consultant, knowledgeable in the field of asbestos abatement and accredited by the Environmental Protection Agency.

The asbestos removal contractor shall be an EPA accredited contractor qualified in the removal of asbestos and shall be chosen and approved by the asbestos consultant, who shall have sole discretion and final determination in this matter.

The asbestos consultant shall be chosen and approved by the District, who shall have sole discretion and final determination in this matter.

The Work will not be accepted until asbestos contamination is reduced to levels deemed acceptable by the asbestos consultant.

Interface of Work under this Contract with work containing asbestos shall be executed by the Contractor at his risk and at his discretion, with full knowledge of the currently accepted standards, hazards, risks, and liabilities associated with asbestos work and asbestos-containing products. By execution of this Contract, the Contractor acknowledges the above and agrees to hold harmless District and its assigns for all asbestos liability which may be associated with this work and agrees to instruct his employees with respect to the above-mentioned standards, hazards, risks, and liabilities.

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.1 The Contractor.

The Contractor shall take reasonable precautions for the safety of, and shall provide reasonable protection to prevent damage, injury, or loss to:

(a) Employees on the Work and other persons who may be affected thereby;
(b) The Work, material, and equipment to be incorporated therein, whether in storage on or off the Site, under the care, custody, or control of the Contractor or the Contractor’s Subcontractors or Sub-subcontractors; and

(c) Other property at the Site or adjacent thereto such as trees, shrubs, lawns, walks, pavement, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

Contractor is constructive owner of Project site as more fully discussed in Paragraph 6.2.

10.2.2 Contractor Notices.

The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations, and lawful orders of public authorities bearing on the safety of persons or property or their protection from damage, injury, or loss.

10.2.3 Safety Barriers and Safeguards.

The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations, and notifying owners and users of adjacent sites and utilities.

10.2.4 Use or Storage of Hazardous Material.

When use or storage of explosives, other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel. The Contractor shall notify the District any time that explosives or hazardous materials are expected to be stored on Site. Location of storage shall be coordinated with the District and local fire authorities.

10.2.5 Protection of Work.

The Contractor and Subcontractors shall continuously protect the Work, the District's property, and the property of others, from damage, injury, or loss arising in connection with operations under the Contract Documents. The Contractor and Subcontractors, at their own expense, shall make good any such damage, injury, or loss, except such as may be solely due to, or caused by, agents or employees of the District.

The Contractor, at Contractor's expense, will remove all mud, water, or other elements as may be required for the proper protection and prosecution of its Work.

Contractor shall take adequate precautions to protect existing roads, sidewalks, curbs, pavements, utilities, adjoining property and structures (including, without limitation, protection from settlement or loss of lateral support), and to avoid damage thereto, and repair any damage thereto caused by construction operations. All permits, licenses, or inspection fees required for such repair Work shall be obtained and paid for by Contractor.
10.2.6 Requirements for Existing Sites.

Contractor shall (unless waived by the District in writing):

(a) When performing construction on existing sites, become informed and take into specific account the maturity of the students on the Site; and perform Work which may interfere with campus routine before or after campus hours, enclose working area with a substantial barricade, and arrange Work to cause a minimum amount of inconvenience and danger to students and faculty in their regular campus activities. The Contractor shall comply with specifications and directives of the District regarding the timing of certain construction activities in order to avoid unnecessary interference with the campus’ functions.

(b) Provide substantial barricades around any shrubs or trees indicated to be preserved.

(c) Deliver materials to building area over route designated by Architect.

(d) Take preventive measures to eliminate objectionable dust, noise, or other disturbances.

(e) Confine apparatus, the storage of materials, and the operations of workers to limits indicated by law, ordinances, permits or directions of Architect; and not interfere with the Work or unreasonably encumber premises or overload any structure with materials; and enforce all instructions of District and Architect regarding signs, advertising, fires, and smoking and require that all workers comply with all regulations while on the Project site.

(f) Take care to prevent disturbing or covering any survey markers, monuments, or other devices marking property boundaries or corners. If such markers are disturbed by accident, they shall be replaced by an approved land surveyor or civil engineer and all maps and records required therefrom shall be filed with county and local authorities, at no cost to the District. All filing and plan check fees shall be paid by Contractor.

(g) Provide District on request with Contractor’s written safety program and safety plan for each site.

10.2.7 Shoring and Structural Loading.

The Contractor shall not impose structural loading upon any part of the Work under construction or upon existing construction on or adjacent to the Site in excess of safe limits, or loading such as to result in damage to the structural, architectural, mechanical, electrical, or other components of the Work. The design of all temporary construction equipment and appliances used in construction of the Work and not a permanent part thereof, including, without limitation, hoisting equipment, cribbing, shoring, and temporary bracing of structural steel, is the sole responsibility of the Contractor. All such items shall conform with the requirements of governing codes and all laws, ordinances, rules, regulations, and orders of all authorities having jurisdiction. The Contractor shall take special precautions, such as shoring of masonry walls and temporary tie bracing of structural steel work, to prevent possible wind damage during construction of the Work. The installation of such bracing or shoring shall not damage the Work in place or the Work installed by others. Any damage which does occur shall be promptly repaired by the Contractor at no cost to the District.
10.2.8 Conformance Within Established Limits.

The Contractor and Subcontractors shall confine their construction equipment, the storage of materials, and the operations of workers to the limits indicated by laws, ordinances, permits, and the limits established by the District or the Contractor, and shall not unreasonably encumber the premises with construction equipment or materials.

10.2.9 Subcontractor Enforcement of Rules.

Subcontractors shall enforce the District's and the Contractor's instructions, laws, and regulations regarding signs, advertisements, fires, smoking, the presence of liquor, and the presence of firearms by any person at the Site.

10.2.10 Site Access.

The Contractor and the Subcontractors shall use only those ingress and egress routes designated by the District, observe the boundaries of the Site designated by the District, park only in those areas designated by the District, which areas may be on or off the Site, and comply with any parking control program established by the District, such as furnishing license plate information and placing identifying stickers on vehicles.

10.3 EMERGENCIES

10.3.1 Emergency Action.

In an emergency affecting the safety of persons or property, the Contractor shall take any action necessary, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 7.

10.3.2 Accident Reports.

The Contractor shall promptly report in writing to the District all accidents arising out of or in connection with the Work, which caused death, personal injury, or property damage, giving full details and statements of any witnesses in conformance with Article 10.1.4. In addition, if death, serious personal injuries, or serious property damages are caused, the accident shall be reported in accordance with Paragraph 10.1.4, immediately by telephone or messenger to the District.

10.4 HAZARDOUS MATERIALS

10.4.1 Discovery of Hazardous Materials.

In the event the Contractor encounters or suspects the presence on the job site of material reasonably believed to be asbestos, polychlorinated biphenyl (PCB), or any other material defined as being hazardous by § 25249.5 of the California Health and Safety Code, which has not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the District and the Architect in writing, whether or not such material was generated by the Contractor or the District. The Work in the affected area shall not thereafter be resumed, except by written
agreement of the District and the Contractor, if in fact the material is asbestos, polychlorinated biphenyl (PCB), or other hazardous material, and has not been rendered harmless. The Work in the affected area shall be resumed only in the absence of asbestos, polychlorinated biphenyl (PCB), or other hazardous material, or when it has been rendered harmless by written agreement of the District and the Contractor.

If hazardous materials are encountered, they shall be handled in accordance with applicable local, state and federal regulation which may include: (1) CCR Title 8, Division 4, Chapter 4, Sections 5163 through 5167 and 5192 (Hazardous Waste Operations and Emergency Response); (2) CCR Title 22, Division 4.5, Chapters 10 through 13 and 18 (Environmental Health Standards for Management of Hazardous Waste); and (3) CCR Title 23, Division 3, Chapter 15 (Discharges of Hazardous Waste to Land).

Should the discovery of contaminants cause delay to Contractor’s operation, extension of Contract Time will be granted by District in accordance with these General Conditions. Contractor may not be entitled to damages or additional payment due to such delays. District may, if it believes appropriate in its sole discretion, grant an extension of Contract Time.

The Contractor shall take all measures to avoid and/or mitigate delays due to Hazardous Materials/Waste finds such as; avoiding the area of the find and proceeding with other work on the project; developing “work around” plans; and documenting his best efforts to avoid and/or mitigate delays.

10.4.2 Hazardous Material Work Limitations.

In the event that the presence of hazardous materials is suspected or discovered on the Site (except in cases where asbestos and other hazardous material work in the Contractor’s responsibility), the District shall retain an independent testing laboratory to determine the nature of the material encountered and whether corrective measures or remedial action is required. The Contractor shall not be required pursuant to Article 7 to perform without consent any Work in the affected area of the Site relating to asbestos, polychlorinated biphenyl (PCB), or other hazardous material, until any known or suspected hazardous material has been removed, or rendered harmless, or determined to be harmless by District, as certified by an independent testing laboratory and approved by the appropriate government agency.

10.4.3 Indemnification by Contractor for Hazardous Material Caused by Contractor.

In the event the hazardous materials on the Project Site is caused by the Contractor, the Contractor shall pay for all costs of testing and remediation, if any, and shall compensate the District for any additional costs incurred as a result of Contractor’s generation of hazardous material on the Project Site. In addition, the Contractor shall defend, indemnify and hold harmless District and its agents, officers, and employees from and against any and all claims, damages, losses, costs and expenses incurred in connection with, arising out of, or relating to, the presence of hazardous material on the Project Site.

10.4.4 Terms of Hazardous Material Provision.

The terms of this Hazardous Material provision shall survive the completion of the Work and/or any termination of this Contract.
ARTICLE 11

INSURANCE AND BONDS

11.1 CONTRACTOR’S LIABILITY INSURANCE

11.1.1 Insurance Requirements.

Before the commencement of the Work, the Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in California as admitted carriers with a financial rating of at least an A status as rated in the most recent edition of Best’s Insurance Reports or as amended by the Supplementary General Conditions, such insurance as will protect the District from claims set forth below, which may arise out of or result from the Contractor’s operations under the Contract and for which the Contractor may be legally liable, whether such operations are by the Contractor, by a Subcontractor, by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

(a) Claims for damages because of bodily injury, sickness, disease, or death of any person District would require indemnification and coverage for employee claim;
(b) Claims for damages insured by usual personal injury liability coverage, which are sustained by a person as a result of an offense directly or indirectly related to employment of such person by the Contractor or by another person;
(c) Claims for damages because of injury or destruction of tangible property, including loss of use resulting therefrom, arising from operations under the Contract Documents;
(d) Claims for damages because of bodily injury, death of a person, or property damage arising out of the ownership, maintenance, or use of a motor vehicle, all mobile equipment, and vehicles moving under their own power and engaged in the Work;
(e) Claims involving contractual liability applicable to the Contractor’s obligations under the Contract Documents, including liability assumed by and the indemnity and defense obligations of the Contractor and the Subcontractors; and
(f) Claims involving Completed Operations, Independent Contractors’ coverage, and Broad Form property damage, without any exclusions for collapse, explosion, demolition, underground coverage, and excavating. (XCU)
(g) Claims involving sudden or accidental discharge of contaminants or pollutants.

11.1.2 Subcontractor Insurance Requirements.

The Contractor shall require its Subcontractors to take out and maintain similar public liability insurance and property damage insurance required under Paragraph 11.1.1 in like amounts. A “claims made” or modified “occurrence” policy shall not satisfy the requirements of Paragraph 11.1.1 without prior written approval of the District.
11.1.3 Additional Insured Endorsement Requirements.

The Contractor shall name, on any policy of insurance required under Paragraph 11.1, the District, Architect, Inspector, the State of California, their officers, employees, agents and independent contractors as additional insureds. Subcontractors shall name the Contractor, the District, Architect, Inspector, the State of California, their officers, employees, agents and independent contractors as additional insureds. The Additional Insured Endorsement included on all such insurance policies shall be a CG 2010 (11/85) or CG 2010 (10/93) form and state that coverage is afforded the additional insured with respect to claims arising out of operations performed by or on behalf of the insured. If the additional insureds have other insurance which is applicable to the loss, such other insurance shall be on an excess or contingent basis. The insurance provided by the Contractor pursuant to 11.1.1 must be designated in the policy as primary to any insurance obtained by the District. The amount of the insurer's liability shall not be reduced by the existence of such other insurance.

11.1.4 Specific Insurance Requirements. [EDIT]

Contractor shall take out and maintain and shall require all subcontractors, if any, whether primary or secondary, to take out and maintain:

1. Comprehensive General Liability Insurance with a combined single limit per occurrence of not less than $1,000,000.00 and $2,000,000.00 project specific aggregate, or Commercial General Liability Insurance (including automobile insurance) which provides limits of not less than:
   
   (a) Per occurrence (combined single limit) ........................................ $1,000,000.00
   
   (b) Project Specific Aggregate (for this project only) .................. $2,000,000.00
   
   (c) Products and Completed Operations ........................................ $1,000,000.00

2. Insurance Covering Special Hazards

   The following Special hazards shall be covered by riders or riders to above mentioned public liability insurance or property damage insurance policy or policies of insurance, in amounts as follows:

   (a) Automotive and truck where operated in amounts .................. $1,000,000.00

   (b) Material Hoist where used in amounts ................................. $1,000,000.00

   (c) Explosion, Collapse and Underground (XCU coverage) ........................................ $1,000,000.00

3. In addition, provide Excess Liability Insurance coverage in the amount of Two Million Dollars ($2,000,000.00).

11.2 WORKERS’ COMPENSATION INSURANCE

During the term of this Contract, the Contractor shall provide workers’ compensation insurance for all of the Contractor’s employees engaged in Work under this Contract on or at the Site of the Project and, in case any of the Contractor’s Work is subcontracted, the Contractor shall require the Subcontractor to provide workers’ compensation insurance for all the Subcontractor’s employees.
engaged in Work under the subcontract. Any class of employee or employees not covered by a Subcontractor’s insurance shall be covered by the Contractor’s insurance. In case any class of employees engaged in Work under this Contract on or at the Site of the Project is not protected under the Workers’ Compensation laws, the Contractor shall provide or cause a Subcontractor to provide adequate insurance coverage for the protection of those employees not otherwise protected. The Contractor shall file with the District certificates of insurance as required under Paragraph 11.6 and in compliance with Labor Code § 3700.

11.3 **BUILDER’S RISK/ “ALL RISK” INSURANCE**

11.3.1 Course-of-Construction Insurance Requirements.

The Contractor, during the progress of the Work and until final acceptance of the Work by District upon completion of the entire Contract, shall maintain Builder’s Risk, Course of Construction or similar first party property coverage issued on a replacement cost value basis consistent with the total replacement cost of all insurable Work and the Project included within the Contract Documents. Coverage is to insure against all risks of accidental direct physical loss, and must include, by the basic grant of coverage or by endorsement, the perils of vandalism, malicious mischief (both without any limitation regarding vacancy or occupancy), fire, sprinkler leakage, civil authority, sonic boom, earthquake, flood, collapse, wind, lightning, smoke and riot. The coverage must include debris removal, demolition, increased costs due to enforcement of building ordinance and law in the repair and replacement of damage and undamaged portions of the property, and reasonable costs for the Architect’s and engineering services and expenses required as a result of any insured loss upon the Work and Project which is the subject of the Contract Documents, including completed Work and Work in progress, to the full insurable value thereof. Such insurance shall include the District and the Architect as additional named insureds, and any other person with an insurable interest as designated by the District.

The Contractor shall submit to the District for its approval all items deemed to be uninsurable. The risk of the damage to the Work due to the perils covered by the “Builder’s Risk/All Risk” Insurance, as well as any other hazard which might result in damage to the Work, is that of the Contractor and the surety, and no claims for such loss or damage shall be recognized by the District nor will such loss or damage excuse the complete and satisfactory performance of the Contract by the Contractor.

11.4 **FIRE INSURANCE**

Before the commencement of the Work, the Contractor shall procure, maintain, and cause to be maintained at the Contractor’s expense, fire insurance on all Work subject to loss or damage by fire. The amount of fire insurance shall be sufficient to protect the Project against loss or damage in full until the Work is accepted by the District.

11.5 **OTHER INSURANCE**

The Contractor shall provide all other insurance required to be maintained under applicable laws, ordinances, rules, and regulations.
11.6 PROOF OF INSURANCE

The Contractor shall not commence Work nor shall it allow any Subcontractor to commence Work under this Contract until all required insurance and certificates have been obtained and delivered in duplicate to the District for approval subject to the following requirements:

(a) Certificates and insurance policies shall include the following clause:
   “This policy shall not be non-renewed, canceled, or reduced in required limits of liability or amounts of insurance until notice has been mailed to the District. Date of cancellation or reduction may not be less than thirty (30) days after the date of mailing notice.”

(b) Certificates of insurance shall state in particular those insured, the extent of insurance, location and operation to which the insurance applies, the expiration date, and cancellation and reduction notices.

(c) Certificates of insurance shall clearly state that the District and the Architect are named as additional insureds under the policy described and that such insurance policy shall be primary to any insurance or self-insurance maintained by District.

(d) The Contractor and its Subcontractors shall produce a certified copy of any insurance policy required under this Section upon written request of the District.

11.7 COMPLIANCE

In the event of the failure of any contractor to furnish and maintain any insurance required by this Article 11, the Contractor shall be in default under the Contract. Compliance by Contractor with the requirement to carry insurance and furnish certificates or policies evidencing the same shall not relieve the Contractor from liability assumed under any provision of the Contract Documents, including, without limitation, the obligation to defend and indemnify the District and the Architect.

11.8 WAIVER OF SUBROGATION

Contractor waives (to the extent permitted by law) any right to recover against the District for damages to the Work, any part thereof, or any and all claims arising by reason of any of the foregoing, but only to the extent that such damages and/or claims are covered by property insurance and only to the extent of such coverage (which shall exclude deductible amounts) by insurance actually carried by the District.

The provisions of this section are intended to restrict each party to recovery against insurance carriers only to the extent of such coverage and waive fully and for the benefit of each, any rights and/or claims which might give rise to a right of subrogation in any insurance carrier. The District and the Contractor shall each obtain in all policies of insurance carried by either of them, a waiver by the insurance companies thereunder of all rights of recovery by way of subrogation for any damages or claims covered by the insurance.
11.9 PERFORMANCE AND PAYMENT BONDS

11.9.1 Bond Requirements.

Unless otherwise specified in the Contract Documents, prior to commencing any portion of the Work, the Contractor shall furnish separate payment and performance bonds for its portion of the Work which shall cover 100% faithful performance of and payment of all obligations arising under the Contract Documents and/or guaranteeing the payment in full of all claims for labor performed and materials supplied for the Work. All bonds shall be provided by a corporate surety authorized and admitted to transact business in California as sureties.

To the extent, if any, that the Contract Price is increased in accordance with the Contract Documents, the Contractor shall, upon request of the District, cause the amount of the bonds to be increased accordingly and shall promptly deliver satisfactory evidence of such increase to the District. To the extent available, the bonds shall further provide that no change or alteration of the Contract Documents (including, without limitation, an increase in the Contract Price, as referred to above), extensions of time, or modifications of the time, terms, or conditions of payment to the Contractor will release the surety. If the Contractor fails to furnish the required bonds, the District may terminate the Contract for cause.

11.9.2 Surety Qualification.

Only bonds executed by admitted Surety insurers as defined in Code of Civil Procedure § 995.120 shall be accepted. Surety must be a California-admitted surety and listed by the U.S. Treasury with a bonding capacity in excess of the Project cost.

11.9.3 Alternate Surety Qualifications.

If a California-admitted surety insurer issuing bonds does not meet these requirements, the insurer will be considered qualified if it is in conformance with § 995.660 of the California Code of Civil Procedure and proof of such is provided to the District.

ARTICLE 12

UNCOVERING AND CORRECTION OF WORK

12.1 UNCOVERING OF WORK

12.1.1 Uncovering Work for Required Inspections.

If a portion of the Work is covered without Inspector or Architect approval or not in compliance with the Contract Documents, it must, if required in writing by the Inspector or the Architect, be uncovered for the Inspector's or the Architect's observation and be replaced at the Contractor's expense without change in the Contract Sum or Time.
12.1.2 Costs for Inspections not Required.

If a portion of the Work has been covered which the Inspector or the Architect has not specifically requested to observe prior to its being covered, the Inspector or the Architect may request to see such Work, and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncover and replacement shall, by appropriate Change Order, be charged to the District. If such Work is not in accordance with Contract Documents, the Contractor shall pay such costs unless the condition was caused by the District or a separate contractor, in which event the District shall be responsible for payment of such costs to the Contractor.

12.2 CORRECTION OF WORK

12.2.1 Correction of Rejected Work.

The Contractor shall promptly correct the Work rejected by the Inspector or the District upon recommendation of the Architect as failing to conform to the requirements of the Contract Documents, whether observed before or after Completion and whether or not fabricated, installed, or completed. The Contractor shall bear costs of correcting the rejected Work, including additional testing, inspections, and compensation for the Inspector’s or the Architect’s services and expenses made necessary thereby.

12.2.2 One-Year Warranty or Guaranty Corrections.

If, within one (1) years after the date of Completion of the Work or a designated portion thereof, or after the date for commencement of warranties and guaranties established under this Contract, or by the terms of an applicable special warranty or guaranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the District to do so unless the District has previously given the Contractor a written acceptance of such condition. This period of one (1) years shall be extended with respect to portions of the Work first performed after Completion by the period of time between Completion and the actual performance of the Work. This obligation under this Paragraph 12.2.2 shall survive acceptance of the Work under the Contract and termination of the Contract. The District shall give such notice promptly after discovery of the condition.

12.2.3 District’s Rights if Contractor Fails to Correct.

If the Contractor fails to correct nonconforming Work within a reasonable time, the District may correct it, pursuant to Article 9.

ARTICLE 13

MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW AND REGULATIONS

The Contract shall be governed by the law of the place where the Project is located.
13.1.1 Specific reference in the Specifications to codes and regulations or requirements of regulatory agencies shall mean the latest printed edition of each adopted by the regulatory agency in effect at the time of the opening of Proposals, except as may be otherwise specifically stated in the Contract Documents.

13.1.2 No change order shall be considered for any change in any applicable federal, state or local code or regulation if similar language existed in an alternate applicable regulation in force at the time of opening of Bids.

13.1.3 Contractor shall not allow design or construction of any conditions wherein the finished Work will not comply with current applicable codes. No change order shall be considered by District for the Work correction of any Work not complying with code.

13.1.4 This section shall cover the general requirements for regulatory requirements pertaining to the Work and is supplementary to all other regulatory requirements mentioned or referenced elsewhere in the Contract Documents.

13.1.5 Code, laws, ordinances, rules and regulations referred to shall have full force and effect as though printed in full in these Specifications. Code, laws, ordinances, rules and regulations are not furnished to Contractor because Contractor is assumed to be and shall be familiar with these requirements, including readily available access to these requirements. The listing of applicable codes, laws, and regulations for hazardous waste abatement Work in the Contract Documents is supplied to Contractor as a courtesy and shall not limit Contractor’s responsibility for complying with all applicable laws, regulations or ordinances having application to the Work. Where conflict among the requirements or with these Specifications occurs, the most stringent requirements shall be used with no change in Contract Sum or Contract Time.

13.1.6 Contractor shall conform to all applicable federal, state, and local codes, laws, ordinances, rules and regulations, whether or not referenced in the Contract Documents.

13.1.7 Precedence:

13.1.7.1 Where specified requirements differ from the requirements of applicable codes, ordinances and standards, the more stringent requirements shall take precedence.

13.1.7.2 Where Contract Documents require or describe products or execution of better quality, higher standard or greater size than required by applicable codes, ordinances and standards, Contract Documents shall take precedence so long as such increase is legal.

13.1.7.3 Where no requirements are identified on Contract Documents, comply with all requirements of applicable codes, ordinances and standards of governing authorities have jurisdiction.
13.2 **SUCCESSORS AND ASSIGNS**

The District and the Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to the other party hereto and to partners, successors, assigns, and legal representatives of such other party in respect to covenants, agreements, and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

13.3 **WRITTEN NOTICE**

In the absence of specific notice requirements in the Contract Documents, written notice shall be deemed to have been duly served if delivered in person to the individual, member of the firm or entity, or to an officer of the corporation for which it was intended, or if delivered at or sent by registered or certified mail to the last business address known to the party giving notice.

13.4 **RIGHTS AND REMEDIES**

13.4.1 Duties and Obligations Cumulative.

Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

13.4.2 No Waiver.

No action or failure to act by the Inspector, the District, or the Architect shall constitute a waiver of a right or duty afforded them under the Contract Documents, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

13.5 **TESTS AND INSPECTIONS**

13.5.1 Compliance.

Tests, inspections, and approvals of portions of the Work required by the Contract Documents will comply with Title 24, and with all other laws, ordinances, rules, regulations, or orders of public authorities having jurisdiction.

13.5.2 Independent Testing Laboratory.

The District will select and pay an independent testing laboratory to conduct all tests and inspections required by regulatory agencies. Selection of the materials required to be tested shall be made by the laboratory and not by the Contractor. All costs for all other tests shall be included in the Bid Price and shall be paid for by the Contractor. Any costs or expenses of inspection or testing required by regulatory agencies, incurred outside of a fifty (50) mile radius from the Project Site or not located in a contiguous county to the Site, whichever distance is greater, shall be paid for by the District, invoiced by the District to the Contractor, and deducted from the next Progress Payment.
13.5.3 Contractor Responsibilities

13.5.3.1 All sampling shall be done by the laboratory exclusively. Samples shall be selected by laboratory personnel. Allow proper time for selecting samples, and making tests or considerations.

13.5.3.2 Cooperate with laboratory personnel, and provide access to work and to manufacturer’s facilities.

13.5.3.3 Provide incidental labor and facilities to provide access to work to be tested, as selected by laboratory personnel at the site or at source of products to be tested, to facilitate tests and inspections, and for storage and curing of test samples.

13.5.3.4 Schedule all tests and inspections with the testing and inspections firm and to notify Project Manager and Project Inspector a minimum of 3 working days prior to expected time for operations requiring inspection and testing services. Do not allow work to be covered prior to inspection and testing.

13.5.3.5 Cooperate fully with the testing laboratory’s personnel and with special inspectors in inspection any part of the construction and in taking any samples of materials required to be tested. Provide access to the work.

13.5.3.6 Alert the testing laboratory 3 working days in advance as to the times and location of the required sampling, tests and inspections so as to not delay the work of the project, and make sure that the required sampling, tests inspections are promptly completed.

13.5.4 Test/Inspection Reports: Contractor paid non-DSA related test/inspection reports.

13.5.4.1 Reports will comply with Section 4-335(d), Part 1, Title 24, CCR.

13.5.4.2 Include every test and inspection made regardless of whether such tests and inspections indicate that the material and procedures are satisfactory or unsatisfactory.

13.5.4.3 Include records of special sampling operations as required.

13.5.4.4 Indicate that materials were sampled and tested in accordance with requirements of CCR regulations and Construction Documents.

13.5.4.5 Indicate specified design strength of materials such as masonry, concrete and steel.

13.5.4.6 State whether or not materials and procedures comply with requirements of the Construction Documents.

13.5.4.7 Submit copies of reports to DSA, Construction Manager, District, Architect, Project Inspector, Structural Engineer, Civil Engineer, Soils Engineer and Contractor within 14 days of tests. Submit copies of reports of non-complying materials and procedures immediately.
13.5.5 Advance Notice to Inspector.

The Contractor shall notify the Inspector a sufficient time in advance of its readiness for required observation or inspection so that the Inspector may arrange for same. The Contractor shall notify the Inspector a sufficient time in advance of the manufacture of material to be supplied under the Contract Documents which must, by terms of the Contract Documents, be tested in order that the Inspector may arrange for the testing of the material at the source of supply.

13.5.6 Testing Off-Site.

Any material shipped by the Contractor from the source of supply, prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice from said Inspector that such testing and inspection will not be required, shall not be incorporated in the Work.

13.5.7 Additional Testing or Inspection.

If the Inspector, the Architect, the District, or public authority having jurisdiction determines that portions of the Work require additional testing, inspection, or approval not included under Paragraph 13.5.1, the Inspector will, upon written authorization from the District, make arrangements for such additional testing, inspection, or approval. The District shall bear such costs except as provided in Paragraph 13.5.7.

13.5.8 Costs for Retesting.

If such procedures for testing, inspection, or approval under Paragraphs 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, the Contractor shall bear all costs arising from such failure, including those of re-testing, re-inspection, or re-approval, including, but not limited to, compensation for the Architect's services and expenses. Any such costs shall be paid by the District, invoiced to the Contractor, and deducted from the next Progress Payment.

13.5.9 Retesting Covered Work.

Re-examination of previously tested and inspected work may be ordered by the District, Architect, or by the Project Inspector. The Contractor shall uncover such work if retesting is ordered. If work is found in accordance with Contract Documents, the District will pay costs of uncovering, removing, retesting and replacing. If work is found not in accordance with Contract Documents, the District will deduct the cost of retesting from the Contract Sum by Change Order and the Contractor will bear the costs of uncovering, removing and replacing work.

13.5.10 Costs for Premature Test.

In the event the Contractor requests any test or inspection for the Project and is not completely ready for the inspection, the Contractor shall be invoiced by the District for all costs and expenses resulting from that testing or inspection, including, but not limited to, the Inspector’s and Architect’s fees and expenses, and the amount of the invoice of shall be deducted from the next Progress Payment.
13.6 **TRENCH EXCAVATION**

13.6.1 Trenches Greater Than Five Feet.

Pursuant to Labor Code § 6705, if the Contract Price exceeds $25,000 and involves the excavation of any trench or trenches five (5) feet or more in depth, the Contractor shall, in advance of excavation, submit to the District or a registered civil or structural engineer employed by the District or Architect, a detailed plan showing the design of shoring for protection from the hazard of caving ground during the excavation of such trench or trenches.

13.6.2 Excavation Safety.

If such plan varies from the Shoring System Standards established by the Construction Safety Orders, the plan shall be prepared by a registered civil or structural engineer, but in no case shall such plan be less effective than that required by the Construction Safety Orders. No excavation of such trench or trenches shall be commenced until said plan has been accepted in writing by the District or by the person to whom authority to accept has been delegated by the District.

13.6.3 No Tort Liability of District.

Pursuant to Labor Code § 6705, nothing in this Article shall impose tort liability upon the District or any of its employees.

13.6.4 No Excavation Without Permits.

The Contractor shall not commence any excavation Work until it has secured all necessary permits including the required CAL OSHA excavation/shoring permit. Any permits shall be prominently displayed on the Site prior to the commencement of any excavation.

13.7 **WAGE RATES, TRAVEL, AND SUBSISTENCE**

13.7.1 Wage Rates.

Pursuant to the provisions of Article 2 (commencing at § 1720), Chapter 1, Part 7, Division 2, of the Labor Code, the District has obtained the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work in the locality in which this public works project is to be performed for each craft, classification, or type of worker needed for this Project from the Director of the Department of Industrial Relations (“Director”). These rates are on file at the administrative office of the DISTRICT and are also available from the Director of the Department of Industrial Relations. Copies will be made available to any interested party on request. The Contractor shall post a copy of such wage rates at appropriate, conspicuous, weatherproof points at the Site.

Any worker employed to perform work on the Project, but such work is not covered by any classification listed in the published general prevailing wage rate determinations or per diem wages determined by the Director of the Department of Industrial Relations, shall be paid not less than the minimum rate of wages specified therein for the classification which most nearly corresponds to the employment of such person in such classification.
13.7.2 Holiday and Overtime Pay.

Holiday and overtime work, when permitted by law, shall be paid for at the rate set forth in the prevailing wage rate determinations issued by the Director of the Department of Industrial Relations or at least one and one-half (1½) times the specified basic rate of per diem wages, plus employer payments, unless otherwise specified in the contract documents or authorized by law.

13.7.3 Wage Rates Not Affected by Subcontracts.

The Contractor shall pay and shall cause to be paid each worker engaged in the execution of the Work on the Project not less than the general prevailing rate of per diem wages determined by the Director, regardless of any contractual relationship which may be alleged to exist between the Contractor or any Subcontractor and such workers.

13.7.4 Per Diem Wages.

The Contractor shall pay and shall cause to be paid to each worker needed to execute the Work on the Project per diem wages including, but not limited to, employer payments for health and welfare, pensions, vacation, travel time and subsistence pay as provided for in Labor Code §1773.1.

13.7.5 Forfeiture and Payments.

Pursuant to Labor Code §1775 and the District’s Labor Compliance Program, the Contractor shall forfeit to the District, not more than Fifty Dollars ($50.00) for each calendar day, or portion thereof, for each worker paid less than the prevailing wages rates as determined by the Director of the Department of Industrial Relations, for the work or craft in which the worker is employed for any Work done under the Agreement by the Contractor or by any Subcontractor under it. The amount of the penalty shall be determined by the Labor Commissioner and shall be based on consideration of: (1) whether the Contractor or Subcontractor’s failure to pay the correct rate of per diem wages was a good faith mistake and, if so, the error was promptly and voluntarily correct upon being brought to the attention of the Contractor or Subcontractor; and (2) whether the Contractor or Subcontractor has a prior record of failing to meet its prevailing wage obligations. Further details regarding the enforcement of paying prevailing wage rates, reporting violations, withholding contract payments, forfeitures and hearing to review withholding of contract payments are set forth in the District’s Labor Compliance Program.

13.8 RECORDS OF WAGES PAID

13.8.1 Payroll Records.

(a) Pursuant to §1776 of the Labor Code, each Contractor and Subcontractor shall keep an accurate payroll record showing the name, address, social security number, work classification and straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker or other employee employed by him or her in connection with the Project.

(b) All payroll records shall be certified and submitted to the District with each application for payment, but shall not be submitted less than once per month. All payroll records shall be
available for inspection at all reasonable hours at the principal office of the Contractor on the following basis:

(1) A certified copy of an employee's payroll record shall be made available for inspection or furnished to the employee or his or her authorized representative on request.

(2) A certified copy of all payroll records shall be made available for inspection or furnished upon request to a representative of District, the Division of Labor Standards Enforcement or the Division of Apprenticeship Standards of the Department of Industrial Relations.

(3) A certified copy of all payroll records shall be made available upon request by the public for inspection or for copies thereof. However, a request by the public shall be made through the District, the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement. If the requested payroll records have not been provided pursuant to Paragraph (2) above, the requesting party shall, prior to being provided the records, reimburse the costs, according to law for the preparation by the Contractor, Subcontractor(s), and the entity through which the request was made. The public shall not be given access to such records at the principal office of the Contractor.

(c) The certified payroll records shall be on forms provided by the Division of Labor Standards Enforcement or shall contain the same information as the forms provided by the Division of Labor Standards Enforcement.

(d) The Contractor or Subcontractor(s) shall file a certified copy of all payroll records with the entity that requested such records within 10 calendar days after receipt of a written request.

(e) Any copy of records made available for inspection as copies and furnished upon request to the public or any public agency by the District, the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement shall be marked or obliterated to prevent disclosure of an individual's name, address and social security number. The name and address of the Contractor awarded the Contract or the Subcontractor(s) performing the Contract shall not be marked or obliterated. Any copy of records made available for inspection by, or furnished to, a joint labor-management committee established pursuant to the federal Labor Management Cooperation Act of 1978 (Section 175a of Title 29 of the United States Code) shall be marked or obliterated only to prevent disclosure of an individual's name and social security number.

(f) The Contractor shall inform the District of the location of all payroll records, including the street address, city and county, and shall, within five working days, provide a notice of a change of location and address.

(g) The Contractor or Subcontractor(s) shall have 10 calendar days in which to comply subsequent to receipt of a written notice requesting payroll records. In the event that the Contractor or Subcontractor(s) fails to comply within the 10-day period, the Contractor or Subcontractor(s) shall, as a penalty to the District, forfeit Twenty-Five Dollars ($25.00) for each
calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement, these penalties shall be withheld from progress payments then due.

Responsibility for compliance with this Article and the District’s Labor Compliance Program shall rest upon the Contractor.

13.8.2 Withholding of Contract Payments & Penalties.

The District may withhold or delay contract payments to the Contractor and/or any Subcontractor if:

(a) The required prevailing rate of per diem wages determined by the Director of the Department of Industrial Relations is not paid to all workers employed on the Project; or
(b) The Contractor or Subcontractor(s) fail to submit all required certified payroll records with each application for payment, but not less than once per month; or
(c) The Contractor or Subcontractor(s) submit incomplete or inadequate payroll records; or
(d) The Contractor or Subcontractor(s) fail to comply with the Labor Code requirements concerning apprentices; or
(e) The Contractor or Subcontractor(s) fail to comply with the District’s Labor Compliance Program; or
(f) The Contractor or Subcontractor(s) fail to comply with any applicable state laws governing labor on public works projects.

Any withholding of contract payments and penalties are set forth in the District’s Labor Compliance Program.

13.9 APPRENTICES

13.9.1 Apprentice Wages and Definitions.

All apprentices employed by the Contractor to perform services under the Contract shall be paid the standard wage paid to apprentices under the regulations of the craft or trade for which he or she is employed, and as determined by the Director of the Department of Industrial Relations, and shall be employed only at the Work of the craft or trade to which he or she is registered. Only apprentices, as defined in §3077 of the Labor Code, who are in training under apprenticeship standards that have been approved by the Chief of the Division of Apprenticeship Standards and who are parties to written apprenticeship agreements under Chapter 4 (commencing with §3070) of Division 3, are eligible to be employed under this Contract. The employment and training of each apprentice shall be in accordance with the apprenticeship standards and apprentice agreements under which he or she is training, or in accordance with the rules and regulations of the California Apprenticeship Council.

13.9.2 Employment of Apprentices.

Contractor agrees to comply with the requirements of Labor Code §1777.5. The Contractor awarded the Project, or any Subcontractor under him or her, when performing any of the Work under
the Contract or subcontract, employs workers in any apprenticeable craft or trade, the Contractor and Subcontractor shall employ apprentices in the ratio set forth in Labor Code §1777.5. The Contractor or any Subcontractor must apply to any apprenticeship program in the craft or trade that can provide apprentices to the Project site for a certificate approving the Contractor or Subcontractor under the apprenticeship standards for the employment and training of apprentices in the area or industry affected. However, the decision of the apprenticeship program to approve or deny a certificate shall be subject to review by the Administrator of Apprenticeship. The apprenticeship program or programs, upon approving the Contractor or Subcontractor, shall arrange for the dispatch of apprentices to the Contractor or Subcontractor. The Contractor or Subcontractor covered by an apprenticeship program’s standards shall not be required to submit any additional application in order to include additional public works contracts under that program. “Apprenticeable craft or trade” as used in this Article means a craft or trade determined as an apprenticeable occupation in accordance with the rules and regulations prescribed by the California Apprenticeship Council. The ratio of work performed by apprentices to journeyman employed in a particular craft or trade on the Project shall be in accordance with Labor Code §1777.5.

13.9.3 Submission of Contract Information.

Prior to commencing work on the Project, the Contractor and Subcontractors shall submit contract award information to the applicable apprenticeship program(s) that can supply apprentices to the Project and make the request for the dispatch of apprentices in accordance with the Labor Code. The information submitted shall include an estimate of journeyman hours to be performed under the Contract, the number of apprentices proposed to be employed, and the approximate dates the apprentices would be employed. A copy of this information shall also be submitted to the District. Within 60 days after concluding work on the Project, the Contractor and Subcontractors shall submit to the District, if requested, and to the apprenticeship program a verified statement of the journeyman and apprentice hours performed on the Project.

13.9.4 Apprentice Fund.

The Contractor or any Subcontractor under him or her, who, in performing any of the Work under the Contract, employs journeymen or apprentices in any apprenticeable craft or trade shall contribute to the California Apprenticeship Council the same amount that the Director determines is the prevailing amount of apprenticeship training contributions in the area of the Project. The Contractor and Subcontractors may take as a credit for payments to the California Apprenticeship Council any amounts paid by the Contractor or Subcontractor to an approved apprenticeship program that can supply apprentices to the Project. The Contractor and Subcontractors may add the amount of the contributions in computing his or her bid for the Contract.

13.9.5 Prime Contractor Compliance.

The responsibility of compliance with Article 13 and §1777.5 of the Labor Code for all apprenticeable occupations is with the Prime Contractor. Any Contractor or Subcontractor that knowingly violates the provisions of this Article or Labor Code §1777.5 shall be subject to the penalties set forth in Labor Code §1777.7 and the District’s Labor Compliance Program.
13.10 ASSIGNMENT OF ANTITRUST CLAIMS

13.10.1 Application.

Pursuant to Government Code § 4551, in entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to a public works contract, the Contractor or Subcontractor offers and agrees to assign to the District all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act, (15 U.S.C. § 15) or under the Cartwright Act (Chapter 2 [commencing with § 16700] of Part 2 of Division 7 of the Business and Professions Code), arising from the purchase of goods, services, or materials pursuant to the public works contract or the subcontract. This assignment shall be made and become effective at the time the awarding body tenders final payment to the Contractor, without further acknowledgment by the parties. If the District receives, either through judgment or settlement, a monetary recovery for a cause of action assigned under Chapter 11 (commencing with § 4550) of Division 5 of Title 1 of the Government Code, the assignor shall be entitled to receive reimbursement for actual legal costs incurred and may, upon demand, recover from the District any portion of the recovery, including treble damages, attributable to overcharges that were paid by the assignor but were not paid by the District as part of the bid price, less the expenses incurred in obtaining that portion of the recovery.

13.10.2 Assignment of Claim.

Upon demand in writing by the assignor, the District shall, within one (1) year from such demand, reassign the cause of action assigned pursuant to this Article if the assignor has been or may have been injured by the violation of law for which the cause of action arose and the District has not been injured thereby or the District declines to file a court action for the cause of action.

13.11 STATE AUDIT

Pursuant to and in accordance with the provisions of Government Code § 10532, or any amendments thereto, all books, records, and files of the District, the Contractor, or any Subcontractor connected with the performance of this Contract involving the expenditure of state funds in excess of Ten Thousand Dollars ($10,000.00), including, but not limited to, the administration thereof, shall be subject to the examination and audit of the Office of the Auditor General of the State of California for a period of three (3) years after final payment is made under this Contract. Contractor shall preserve and cause to be preserved such books, records, and files for the audit period.

13.12 NOTE USED

13.13 INDUSTRY STANDARDS

13.13.1 Applicability of Standards.

Unless the Contract Documents specify more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
13.13.2 Publication Dates.

Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.

13.13.3 Conflicting Requirements.

If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

13.13.4 Minimum Quantity or Quality Levels.

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

13.13.5 Copies of Standards.

Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not contained within the Contract Documents. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source and make them available on request.

13.13.6 Abbreviations and Acronyms for Industry Organizations.

Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."
13.14 **PRODUCTS**

13.14.1 All products are to be new and not previously incorporated into or used in any other project or facility. Products salvaged or recycled from other projects are not considered new products and are not permitted.

13.14.2 The term product, as used in the Contract Documents, includes materials, equipment, systems, and like terms of similar intent.

13.14.3 Products include materials, machinery, components, equipment, fixtures and systems forming the Work and purchased for incorporation into the Work.

13.14.4 Do not reuse materials and/or equipment removed from existing premises except as specifically permitted by the Contract Documents.

13.14.5 Provide interchangeable components of the same manufacturer, for similar components.

13.14.6 Named products are items identified in the Contract Documents by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.

13.14.7 TRANSPORTATION AND HANDLING

13.14.7.1 Transport and handle products in accordance with manufacturer’s instructions.

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

13.14.8 SHIPPING REQUIREMENTS

13.14.8.1 Preparation for Shipment: All equipment shall be suitably packaged to facilitate handling and to protect against damage during transit and storage. All equipment shall be protected from exposure to the elements and shall be kept dry at all times.

13.14.8.2 Painted and coated surfaces shall be protected against impact, abrasion, discoloration, and other damage. Painted and coated surfaces which are damaged prior to acceptance of equipment shall be repainted to the satisfaction of District at the expense of Contractor.

13.14.9 PRODUCT DELIVERY, STORAGE, AND HANDLING

13.14.9.1 Store products only in staging area per provisions of the Contract Documents.
13.14.9.2 Handle, store, and protect products in accordance with manufacturer’s instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate-controlled enclosures.

13.14.9.3 For exterior storage of fabricated products, place on appropriate supports, above ground.

13.14.9.4 Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.

13.14.9.5 Deliver, store and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer’s written instructions.

13.14.9.6 Contractor shall comply with the following without limitation:

(a) Contractor shall bear the responsibility for delivery of equipment, spare parts, special tools, and materials to the Site and shall comply with the requirements specified herein and provide required information concerning the shipment and delivery of the materials specified in the Contract Documents.

(b) Electrical equipment and all equipment with antifriction or sleeve bearings shall be stored in weather-tight structures maintained at a temperature above 60 degree Fahrenheit. Electrical equipment controls and insulation shall be protected against moisture and water damage. All space heaters furnished in or with equipment shall be connected and operated continuously or according to manufacturer's requirements.

(c) Equipment and materials shall not have any pitting, rust, decay, or other deleterious effects of storage when installed in the Work.

(d) Store products to allow for inspection, measurement, and/or counting of units.

(e) Store materials in a manner that will not endanger adjacent Work.

(f) Store products that are subject to damage by the elements, under cover in a weather-tight enclosure above ground, with ventilation adequate to prevent condensation.

(g) Store cementitious products and materials on elevated platforms.

(h) Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

ARTICLE 14

TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR FOR CAUSE

14.1.1 Grounds for Termination.

The Contractor may terminate the Contract if the Work is stopped for a period of thirty (30) consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their
agents or employees, or any other persons performing portions of the Work for whom the Contractor is contractually responsible, for only the following reasons:

(a) Issuance of an order of a court or other public authority having jurisdiction; or
(b) An act of government, such as a declaration of national emergency.

14.1.2 Notice of Termination.

If one of the above reasons exists, the Contractor may, upon written notice of seven (7) additional days to the District, terminate the Contract and recover from the District payment for Work executed and for reasonable costs verified by the Architect with respect to materials, equipment, tools, construction equipment, and machinery, including reasonable overhead, profit, and damages.

14.2 TERMINATION BY THE DISTRICT FOR CAUSE

14.2.1 Grounds for Termination.

The District may terminate the Contractor and/or this Contract for the following reasons:

(a) Persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
(b) Persistently or repeatedly is absent, without excuse, from the job site;
(c) Fails to make payment to Subcontractors, suppliers, materialmen, etc.;
(d) Persistently disregards laws, ordinances, rules, regulations, or orders of a public authority having jurisdiction; or
(e) Becomes bankrupt or insolvent, including the filing of a general assignment for the benefit of creditors; or
(e) Otherwise is in substantial breach of a provision of the Contract Documents.

14.2.2 Notification of Termination.

When any of the above reasons exist, the District may, without prejudice to any other rights or remedies of the District and after giving the Contractor and the Contractor’s surety, if any, written notice of seven (7) days, except in the event of an emergency or critical path delay to the schedule in which case the District may give written notice of forty-eight (48) hours, terminate the Contract and may, subject to any prior rights of the surety:

(a) Take possession of the Project and of all material, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
(b) Accept assignment of Subcontracts. Contractor acknowledges and agrees that if the District (in its sole and absolute discretion) decides to takeover completion of the Project, the Contractor agrees to immediately assign all subcontracts to the District which the District has chosen to accept; and
(c) Complete the Work by any reasonable method the District may deem expedient, including contracting with a replacement contractor or contractors.

14.2.3 Payments Withheld.

If the District terminates the Contract for one of the reasons stated in Paragraph 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is complete. All costs associated with the termination and completion of the Project shall be the responsibility of the Contractor and/or its surety.

14.2.4 Payments Upon Completion.

If the unpaid balance of the Contract Sum exceeds costs of completing the Work, including compensation for professional services and expenses made necessary thereby, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the District. The amount to be paid to the Contractor, or District, as the case may be, shall be certified by the Architect upon application. This payment obligation shall survive completion of the Contract.

14.3 TERMINATION OF CONTRACT BY DISTRICT (CONTRACTOR NOT AT FAULT)

14.3.1 Termination for Convenience.

District may terminate the Contract upon fifteen (15) calendar days of written notice to the Contractor and use any reasonable method the District deems expedient to complete the project, including contracting with replacement contractor or contractors, if it is found that reasons beyond the control of either the District or Contractor make it impossible or against the District’s interest to complete the work. In such a case, the Contractor shall have no claims against the District except: (1) the actual cost for labor, materials, and services performed which may be documented through timesheets, invoices, receipts, or otherwise, and (2) ten percent (10%) profit and overhead, and (3) five percent (5%) termination cost of the total of items (1) and (2). Contractor acknowledges and agrees that if the District (in its sole and absolute discretion) decides to takeover completion of the Project, the Contractor agrees to immediately assign all subcontracts to the District which the District has chosen to accept.

14.3.2 Non-Appropriation of Funds/ Insufficient Funds.

In the event that sufficient funds are not appropriated to complete the Project or the DISTRICT determines that sufficient funds are not available to complete the Project, DISTRICT may terminate or suspend the completion of the Project at any time by giving written notice to the Contractor. In the event that the DISTRICT exercises this option, the DISTRICT shall pay for any and all work and materials completed or delivered onto the site for which value is received, and the value of any and all work then in progress and orders actually placed which cannot be canceled up to the date of notice of termination. The value of work and materials paid for shall include a factor of fifteen percent (15%) for the Contractor’s overhead and profit and there shall be no other costs or expenses paid to Contractor. All work, materials and orders paid for pursuant to this provision shall become the property of the DISTRICT. DISTRICT may, without cause, order Contractor in writing to suspend, delay or interrupt the Project in whole or in part for such period of time as DISTRICT may determine. Adjustment shall be
made for increases in the cost of performance of the Agreement caused by suspense, delay or interruption.

14.4 REMEDIES OTHER THAN TERMINATION

If a default occurs, the District may, without prejudice to any other right or remedy, including, without limitation, its right to terminate the Contract pursuant to Article 14.2, do any of the following:

(a) Permit the Contractor to continue under this Contract, but make good such deficiencies or complete the Contract by whatever method the District may deem expedient, and the cost and expense thereof shall be deducted from the Contract Price or paid by the Contractor to the District on demand;

(b) If the workmanship performed by the Contractor is faulty or defective materials are provided, erected or installed, then the District may order the Contractor to remove the faulty workmanship or defective materials and to replace the same with work or materials that conform to the Contract Documents, in which event the Contractor, at its sole costs and expense, shall proceed in accordance with the District’s order and complete the same within the time period given by the District in its notice to the Contractor; or

(c) Initiate procedures to declare the Contractor a non-responsible bidder for a period of two to five years thereafter.

All amounts expended by the District in connection with the exercise of its rights hereunder shall accrue interest from the date expended until paid to the District at the maximum legal rate. The District may retain or withhold any such amounts from the Contract Price. If the Contractor is ordered to replace any faulty workmanship or defective materials pursuant to Paragraph (b) above, the Contractor shall replace the same with new work or materials approved by the Architect and the District, and, at its own cost, shall repair or replace, in a manner and to the extent the Architect and the District shall direct, all work or material that is damaged, injured or destroyed by the removal of said faulty workmanship or defective material, or by the replacement of the same with acceptable work or materials. In no event shall anything in this Paragraph be deemed to constitute a waiver by the District of any other rights or remedies that it may have at law or in equity, it being acknowledged and agreed by the Contractor that the remedies set forth in this Paragraph are in addition to, and not in lieu of, any other rights or remedies that the District may have at law or in equity.

END OF SECTION 00700
SECTION 01010  
SUMMARY OF WORK  

PART 1 - GENERAL  

1.1 RELATED DOCUMENTS  
A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Specification Sections shall apply to this Section without limitation.  

1.2 WORK DESCRIPTIONS WITHOUT FORCE  
A. All general descriptions and/or general summaries of the work noted in this section, or elsewhere within the Contract Documents, are without force and effect on the Contract Work described and indicated in detail the Construction Documents. These general descriptions and summaries are for general reference and descriptive purposes only and in no way offer the complete and concise description of all the Work required by the Contract Documents.  

1.3 WORK COVERED BY CONTRACT DOCUMENTS  
A. The intent of the Contract Documents includes but is not limited to: 

In general, the Work consists of replacing the existing heating hot water boiler, water cooled chiller, cooling tower, and air handling unit with newer, higher efficiency models; replacing the heating hot water circulation pumps, chilled water pump, and condenser water pump; modifying and replacing associated hot water, chilled water, and condenser water piping; removing unnecessary supply and return ductwork for the air handling unit; and installing associated systems controls. Install new main building switchboard.  

1.4 CONTRACTS  
A. Perform the work under a single, fixed-price Contract.  

1.5 WORK SEQUENCE  
A. During construction operations, various adjoining areas will be occupied and their functions maintained. Temporary construction separations such as walls for sound and dust control, as well as pathway barricades, signage and clearly marked temporary pedestrian path of travel detours will be required and provided by the contractor.  

B. Scheduling of Contractor's use of the areas and times involved shall be determined in cooperation with the District. Notify the District a minimum of 10-days prior to commencement of work.  

C. Construction activities shall be performed between the hours of 7AM and 5PM, Monday through Friday, unless otherwise required. No Work shall be performed outside the above hours without prior written authorization from the Construction Manager/Project Manager.
1.6 Not used

1.7 Not used

1.8 USE OF PREMISES
A. Contractor shall only use the premises for work, storage, staging areas, and vehicular parking as designated in the Contract Documents.

1.9 EXISTING AREA CONDITION SURVEY
A. Prior to commencement of work, jointly survey the existing area to be remodeled with the District and Architect, noting and recording existing damage such as cracks, sags, and other damage (on Site Plan/Floor Plans).
B. This record shall serve as a basis for determination of subsequent damage to these items due to settlement, movement, demolition, or Contractor’s operations.
C. Existing damage observed shall be marked and the official record of existing damage shall be signed by the parties making the survey.
D. Cracks, sags, and damage to the area and other items not noted in the original survey but subsequently observed shall be reported immediately to the Architect.

1.10 PROTECTION OF EXISTING STRUCTURES AND UTILITIES
A. The Drawings may not show all existing water, gas, electrical, and hot water lines, and other items known or suspected to exist in the area of the work.
B. Contractor shall locate these installations before proceeding with demolition 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.
C. In addition to notification, if a structure or utility is damaged, take appropriate action as specified in the General Conditions.

1.12 USE AND OCCUPANCY OF WORK PRIOR TO ACCEPTANCE BY DISTRICT
A. The District may use and occupy the building before formal acceptance under the following conditions:
   1. A Certificate of Substantial Completion shall be prepared and executed as provided in the Contract Documents. See Section 01770 Contract Closeout Procedures. The Certificate of Substantial Completion shall be accompanied by a written endorsement of the Contractor’s insurance carrier and surety permitting occupancy by the District during the remaining period of the work.
   2. Occupancy by the District shall not be construed as being an acceptance of that part of the Work occupied.
   3. The Contractor will not be held responsible for damage to the occupied part of the Work resulting from the District’s occupancy.
   4. Occupancy by the District shall not be deemed to constitute a waiver of existing claims the District or Contractor may have against each other.
6. The District will pay for utility costs associated with occupancy during construction.

1.13 PROTECTION OF EXISTING IMPROVEMENTS
A. Provide barricades, coverings, or other types of protection necessary to prevent damage to existing improvements indicated to remain in place.
B. Protect improvements on adjoining properties as well as those on the District’s property.
C. Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line.
D. Restore any improvements damaged by this work to their original condition as acceptable to the District or other parties or authorities having jurisdiction.

1.14 HAZARDOUS MATERIALS
A. Asbestos-containing materials and lead containing materials have been found in the work areas and equipment. See Specification 1412 Hazardous Materials and the Limited Hazardous Materials Abatement Specification Workplan.

1.15 MISCELLANEOUS PROVISIONS
A. Items shown or scheduled to be salvaged will remain the property of the District. Store as directed by the Project Manager.

PART 2 - PRODUCTS
Not Used.

PART 3 - EXECUTION
Not Used.

END OF SECTION 01010
SECTION 01050
FIELD ENGINEERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Specification Sections shall apply to this Section without limitation.

1.2 SUBMITTALS
A. Contractor shall submit name and address of Surveyor and professional Engineer to District and Architect for approval prior to their work on the Project.
B. On request of District and Architect, Contractor shall submit documentation to verify accuracy of field engineering work, at no additional cost to the District.
C. At completion of the Work, Contractor shall submit a certificate signed by a licensed engineer or surveyor certifying that all elevations and locations of improvements are in conformance with Contract Documents.

1.3 REQUIREMENTS
A. Contractor shall provide and pay for field engineering services by an engineer licensed in the State of California, required for the Project, including, without limitation:
   1. Survey work required in execution of the Project.
   2. Civil or other professional engineering services specified, or required to execute Contractor’s construction methods.

1.4 QUALIFICATIONS OF SURVEYOR OR ENGINEERS
A. Contractor shall only use a qualified licensed engineer or registered land surveyor, approved by the District, of the discipline required for specific service on Project, licensed in the State of California.
B. Submit evidence of Engineer's errors and omissions insurance coverage to District, in the form of a current Insurance Certificate.

1.5 SURVEY REFERENCE POINTS
A. Existing basic horizontal and vertical control points for the project are those designated on the Drawings.
B. Contractor shall locate and protect control points prior to starting Site Work and preserve all permanent reference points during construction. In addition Contractor shall:
   1. Make no changes or relocation without prior written notice to District and Architect.
   2. Report to District and Architect when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
3. Require surveyor to replace project control points based on original survey control that may be lost or destroyed.

4. Contractor to locate and protect existing survey control and reference points.

5. Control datum for survey is that indicated on Drawings.

6. Protect survey control points prior to starting Site Work; preserve permanent reference points during construction.

7. Promptly report to Architect, District, and Project Inspector the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

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

1.6 PROJECT RECORD DOCUMENTS
A. Maintain complete, accurate log of control and survey work as it progresses. Indicate dimensions, locations, angles, and elevations of construction and Site Work.
B. Submit Record Documents as required under provisions of these Contract Documents.

1.7 EXAMINATION
A. Verify locations of survey control points prior to starting Work. Promptly notify Architect of any discrepancies discovered.

1.8 SURVEY REQUIREMENTS
A. Provide field engineering services. Utilize recognized engineering survey practices.
B. Establish a minimum of two permanent bench marks on Site, referenced to established control points. Record locations, with horizontal and vertical data, on Project Record documents.
C. Establish lines and levels, locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, and ground floor elevations.
D. Periodically verify layouts by same means.

PART 2 – PRODUCTS - Not Used

PART 3 – EXECUTION
3.1 Contractor is responsible for meeting all applicable codes, OSHA, and other safety and shoring requirements.

3.2 Contractor is responsible for any re-surveying required by correction of nonconforming work with no additional cost to the District or its representatives.

END OF SECTION 01050
SECTION 01140
WORK RESTRICTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Division 1 Specification Sections shall apply to this Section without limitation.

1.2 SUMMARY OF WORK RESTRICTION REQUIREMENTS
A. Prior to the start of Work, Contractor shall familiarize himself with the Work Restrictions as they relate to all Work required by the Contract Documents.
   1. Within 10 days of the Notice to Proceed, the Contractor shall submit a preliminary construction schedule and a Work Restricted Activity Plan indicating how the Work Restrictions for all other Work Restricted Activities will be implemented. This preliminary schedule and Plan must be approved in writing by the Architect and the District prior to commencement of any Work covered by these Work Restrictions.
   2. Contractor shall also refer to Additional Work Schedule Requirements in Specification Section 01010, Summary of Work. Failure to include sufficient costs in the bid, or failure to sufficiently provide resources during Work Restricted Activities requiring grave yard shift work shall not relieve the Contractor from properly complying with all Work Restrictions. Grave yard work shall be pre-approved by the District and tracked in meeting minutes and on construction schedules.
B. Work Restricted Activity Plans shall include:
   3. Full size drawings (36"x42") of site plans showing the locations and dimensions of temporary facilities including but not limited to all site trailers, equipment and material storage area (onsite and offsite), access for pedestrians and vehicles, avenues of ingress/egress to the campus and Project construction sites, all temporary signage, fenced area(s), and details of the fence installation. Indicate if the use of supplemental or other staging area is required. See Section 01500 for Temporary Facilities and Control.
   4. The Contractor shall provide a weekly updated Plan including updated preliminary construction schedule for each of the Work Restricted Activities until those Activities are complete.
   5. Contractor shall submit (5) sets of the initial submittal of the preliminary schedule and Work Restricted Activity Plan for review by: Project Manager, Construction Manager, Project Inspector, Campus Buildings & Grounds personnel, and Campus Representatives.
C. Contractor shall perform all Work during all Work Restricted Activities to ensure the following:
   1. The continuous and uninterrupted use of all occupied areas, including but not limited to the applicable power, data, telephone, waterline, fire alarm system, fire sprinkler system mechanical, gas, storm, sewage, plumbing, and electrical systems serving these areas.
2. Protection of students, staff, faculty and personnel in occupied areas from the hazards and dust associated with construction.

3. The work areas, roads, parking lots, and streets are to be kept clear, clean, and free of loose debris, construction materials and partially installed work which would create a safety hazard or interfere with sub-contractor and personnel duties and traffic. The Contractor shall sweep the areas clean at the end of each work day and make every effort to keep dust and noise to a minimum at all times.

4. Prior to starting work, the Contractor shall provide a schedule of temporary interruptions or shutdown of any utility or electrical/mechanical systems to Engineer, District and Campus representatives, Project Manager, Campus Buildings and Grounds Manager, and Project Inspector. The Contractor shall provide written request (21) working days prior to the desired time. Work should be performed at times other than the College's normal hours of operation or as directed by the Project Manager.

1.3 SUMMARY OF WORK RESTRICTIONS

A. **General:** Work Restrictions are comprised of various Work Restricted Activities. The Contractor shall perform the Work in each Work Restricted Activity as described below. All Work must be completed within the timelines, work shift times, and the scheduled time period for each Work Restricted Activity. A detailed narrative description of each Work Restricted Activity is as follows:

B. **Time Essential Work Restrictions.** Work in these Work Restricted Activities will be required to be completed at the outset of the project following approval of the contract by the District's Governing Board. The Activities that are essential to protect the campus community and minimize disruption to the College's daily operations.

1. This project must be completed prior to the start of the Fall Semester on August 8, 2016 and field work can start no earlier than May 31, 2016. Contractor is expected to work weekends and/or extended shifts in order to meet this deadline and is to include all necessary premium time in their bid. At a minimum, contractor is to include all additional costs to work six days per week between May 31, 2016 to August 6, 2016.

2. Hazardous Material Abatement and Demolition activities within the building interior areas must be initiated on or after May 31, 2016. A pre-abatement meeting with the District Team, Contractor, and Contractor's subcontractors (abatement contractor, demolition contractor), and District's Environmental Consultant is mandatory prior to starting Hazardous Material Abatement and Demolition activities.

3. Any work which requires the shutdown of any building system, including but not limited to HVAC, plumbing, electrical, fire alarm, data, or phone, must occur on a Friday, Saturday, or Sunday or outside of the hours identified below. Written approval from the District Project Manager is required a minimum of three (3) weeks in advance of any scheduled shut down. Under no circumstances may any building system be shut down during the following periods. Contractor is expected to provide temporary systems during these times.

   a. 7AM and 5 PM on Monday through Thursday.
4. The replacement of the Air Handling Unit (AHU) shall be completed between 5/31/16 and 6/17/16 or between 7/28/16 and 8/5/16. In the event it cannot be completed during that time, a temporary AHU shall be installed to maintain a working HVAC system in the affected area.

5. All exterior underground work is to occur between 5/31/16 and 6/17/16. Any trench that is located in the fire lane must be able to be covered with heavy duty, traffic rated trench plates at all times. No materials or spoils may be stored in the fire lane. All trenches are to be covered with trench plates anytime work is not occurring on or in the trench.

6. All interior work, except that in Room 128 and Room 144, is required during non-business hours. Summer business hours for the Library are as follows:
   a. 5/31/16 to 6/16/16 – Monday to Thursday, 10 AM – 4 PM. Closed Friday, Saturday, and Sunday.
   b. 6/17/16 to 7/28/16 – Monday to Thursday, 8 AM – 4 PM. Closed Friday, Saturday, and Sunday.

   Work shall be completely cleaned up by Contractor after each night shift, including the removal of all debris, dust, tools, equipment, and materials.

7. There will be a concurrent project to install a new generator adjacent to this project. Contractor will be required to coordinate work activities with this concurrent project and share access to the site at all times. Contractor will attend necessary coordination meetings with the District’s contractor as needed.

PART 2 - PRODUCTS

2.1 MATERIALS
   A. All labor, equipment, materials, and all other requirements shall be provided and will be the sole responsibility of the Contractor for execution of entire work including all Requirements of each Work Restricted Activity.

PART 3 - EXECUTION

3.1 MEANS AND METHODS OF CONSTRUCTION
   A. Contractor to provide and shall be responsible for any and all means and methods that will be constructed, implemented and/or maintained on the site for all Work Restricted Activities.

END OF SECTION 01140
SECTION 01311

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Specification Sections shall apply to this Section without limitation.

1.2 SUMMARY

A. This Section specifies the administrative requirements and includes descriptions of required Project Coordination for the work and all Phases of Project including, but not limited to, the following:
   1. Coordination
   2. Pre-construction Conference
   3. Project Meetings
   4. Coordination of Contract Closeout

1.3 COORDINATION

A. Coordinate scheduling, submittals, and Work of the various Sections of Specifications to assure efficient and orderly sequence of Work, with provisions for accommodating items to be installed later and for accommodating items to be installed by other District Contractors.

B. Resolve differences or disputes concerning coordination, interference, or extent of Work of the various Sections of the Specifications. Contractor’s decisions if consistent with requirements of the Contract Documents shall be final.

C. Coordinate completion and clean up of Work of separate Sections in preparation for substantial Completion.

D. Coordinate requests for substitutions to assure compatibility of space, of operating elements, and effect on work of other sections.

E. Cooperate with District and District suppliers and/or contractors during move-in and occupancy of the completed Work at each Phase.

F. Contractor shall coordinate construction operations and means and method of construction included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Coordinate structural, mechanical, and electrical elements prior to installation. All penetrations of structural elements must first receive approval of Architect and District. Rerouting of ductwork, piping, or conduit and resulting changes to other work caused by failure to coordinate beforehand is the responsibility of the Contractor and shall not be considered justification for either additional cost or time.
2. Schedule construction operations in sequence required to obtain the best constructed results where installation of one part of the Work depends on installation of other components, before or after its own installation.

3. Coordinate installation of different components with other contractors or other trades to ensure maximum and appropriate accessibility for required maintenance, service, and repair. Where availability of space is limited, coordinate installation of different components to ensure maximum and appropriate performance and accessibility for required maintenance, service, operations, and repair of all components, and building systems.

4. Make adequate provisions to accommodate items scheduled for later installation.

5. The manner in which the Specifications are divided into Divisions and Sections is not intended to indicate division of work between trades nor indicate trade union or jurisdictional agreements.
   a. Assign and subcontract construction activities, and employ workers in a manner that will not risk jurisdictional disputes that could result in conflicts, delays, claims, or losses.

1.4 PRECONSTRUCTION CONFERENCE

A. The District Project Manager will schedule a conference after Notice to Proceed and prior to the start of Work.

B. Attendance Required: District representatives, Architect and consultants, DSA Project Inspector, District Project Manager, Contractor, certain Subcontractors as requested by the District and others as appropriate.

1.5 ADMINISTRATIVE COORDINATION

A. Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work.

1.6 COORDINATION OF THE WORK

A. Coordinate use of project space and sequence of installation of mechanical, electrical, structural, and other Work which is indicated diagrammatically on Drawings. Follow routings shown for pipes, ducts, and conduits as closely as practicable, with due allowance for available physical space; make runs parallel with lines of building. Utilize space efficiently for maximum and appropriate accessibility for other installations, for maintenance, service, operations, and for repairs.

B. Contractor shall use large scale drawings, if their preparation is required as part of Work of these specifications, together with shop drawings if applicable and layout drawings of other affected sections of these specifications to check, to coordinate, and to integrate the Work of various sections to prevent interferences.

C. Perform and complete checking and coordination before commencing construction in the affected areas.
D. In finished areas, except as otherwise shown, conceal pipes, ducts, and wiring in the construction. Coordinate locations of plumbing, fixtures, electrical fixtures, and fixtures and outlets with finish elements.

1.7 CONSERVATION

A. Contractor shall coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
   1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as District’s property.

1.8 MEANS AND METHODS

A. Contractor is solely responsible for construction means, methods, techniques, sequences, and procedures for performing all Work.

1.9 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. Contractor shall provide other administrative and supervisory personnel as required for proper performance of the Work.
   1. Include specific or dedicated personnel required for coordination of operations with other contractors.

1.10 COORDINATION WITH WORK BY DISTRICT

A. Coordinate service connections for District furnished and District installed equipment. Verify that service connections are correct sizes and in required locations.

B. Coordinate support and anchorage for equipment furnished and installed by the District. Provide blocking and backing as shown or directed to facilitate installation of equipment by others.

1.11 PERIODIC VERIFIED REPORTS

A. The Contractor shall complete and submit the Final Verified Report required by DSA when applicable. In addition to other conditions precedent to Final Payment, the Contractor’s completion and submission of the Final Verified Report is an express condition precedent to the District’s obligation to make the Final Payment. In addition to completion and submission of the Final Verified Report, as a material obligation under the Contract Documents, the Contractor shall comply all DSA requests for reports or other data relating to the Work, the status thereof or conformity of the Work to the Contract Documents.

PART 2 - PRODUCTS - Not Used.

PART 3 - EXECUTION - Not Used.

END OF SECTION 01311
SECTION 01312
PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and Specification Sections shall apply to this Section without limitation.

1.2 SUMMARY
A. This Section specifies administrative requirements and provides descriptions of the required project meetings for the Work and all Phases of the project. These meetings include, but not limited to, the following:
   1. Preconstruction Meeting
   2. Schedule Review Meetings
   3. Weekly Project Progress Meetings
   4. Progress Schedule and Application for Payment Meetings
   5. Special Meetings

1.3 PRECONSTRUCTION CONFERENCE
A. District will schedule and conduct the Preconstruction Conference at a time and place to be determined.
B. Contractor and all major subcontractors shall attend the Preconstruction Conference. This includes, but is not limited to, the following:
   1. Mechanical Subcontractor
   2. Electrical Subcontractor
   3. Plumbing Subcontractor
   4. Hazardous Material Abatement Subcontractor
C. Meeting agenda will include, but is not limited to, discussion of the following items:
   1. Schedules and coordination
   2. Personnel and vehicle permit procedures
   3. Use of premises
   4. Location of Contractor's on-Site facilities
   5. Security
   6. Housekeeping
   7. Submittal and RFI procedures
   8. Inspection and testing procedures, on-Site and off-Site
   9. Utility and building shutdown procedures
10. Control and reference point survey procedures
11. Injury and Illness Prevention Program
12. Initial Schedule
13. Schedule of Values
14. Schedule of Submittals
15. Project Directory
16. Emergency Contact List

1.4 SCHEDULE OF VALUES AND INITIAL SCHEDULE MEETING
A. Contractor shall meet with District and Architect within 10 days of submittal of the draft Schedule of Values and Initial Schedule to review and evaluate the Schedule of Values and the Initial Schedule.

1.5 SHOP DRAWINGS & SUBMITTALS SCHEDULE MEETING
A. Contractor shall meet with District and Architect within 10 days of submittal of the draft Shop Drawings and Submittals Schedule to review and evaluate the Shop Drawings and Submittals Schedule.

1.6 WEEKLY PROGRESS MEETINGS
A. Weekly Progress Meetings will be scheduled throughout duration of Work and all phases of the project at a time acceptable to the District. Progress meetings will be held weekly unless otherwise directed by District.
   1. Meetings shall be held at Project Manager’s on-site office unless otherwise directed by the District.
   2. The Project Manager will prepare an agenda and distribute it 2 working Days in advance of meeting to Contractor.
   3. The Architect will record meeting notes of the Weekly Progress Meeting. Within 3 working Days after the meeting, the Architect will distribute minutes to District via e-mail, and to those affected by decisions made at the meeting. Attendees can either submit comments or additions to the minutes within 3 working days. The minutes will constitute a final documentation of the results of meeting.
B. Progress meetings shall be attended by the Contractor’s project manager, project engineer, and job superintendent, District Project Manager, Architect and Engineers, the Inspector of Record, and others as appropriate to agenda topics for each meeting.
C. Agenda will contain the following items, as appropriate:
   1. Review, revise as necessary, and approve previous meeting minutes
   2. Review of Work progress since last meeting
   3. Status of Construction Work Schedule, delivery schedules, adjustments
   4. Submittal, RFI, and Change Order status
   5. Review of the Contractor’s safety program activities and results, including report on any serious injury and/or damage accidents
   6. Review of non-conforming Work (if any)
1.7 SPECIAL MEETINGS

A. Contractor or District may call special meetings by notifying the desired participants. Notify District no less than 5 work days in advance, and provide the reason for the meeting. Special meetings may be held without advance notice in emergency situations.

B. At any time during the progress of Work, District shall have authority to require Contractor to attend a meeting with any or all of the Subcontractors engaged in the Work or in other work, and notice of such meeting shall be duly observed and complied with by Contractor.

C. Contractor shall schedule and conduct his own periodic coordination meetings as necessary to discharge coordination responsibilities.

D. Contractor shall give District 5 work days written notice of his coordination meetings. Contractors shall maintain and distribute minutes of coordination meetings to District. Attendees shall have 3 work Days to submit comments or additions to minutes. Minutes will constitute final documentation of results of coordination meetings.

1.8 GUARANTEES/WARRANTIES, BONDS, AND SERVICE & MAINTENANCE CONTRACTS REVIEW MEETING

A. Ten Months following date of final acceptance, Contractor to hold a meeting to review guarantees/warranties, bonds, and service maintenance contracts for materials and equipment. Implement repair or replacement of defective items, and extend service and maintenance contracts, as desired by District.

B. Attending shall be:
   1. District Project Representatives
   2. Architect and Architect’s consultants, as appropriate
   3. DVC-Buildings & Ground Representatives
   4. Contractor
   5. Subcontractors, as appropriate
   6. Others, as appropriate

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01312
SECTION 01330

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Division 1 Specification Sections shall apply to this Section without limitation.

1.2 RELATED DOCUMENTS SPECIFIED IN OTHER SECTIONS

A. Section 01010 – “Summary of Work”
B. Section 01400 – ”Quality Control Requirements”
C. Section 01770 – ”Project Closeout Procedures”
D. Section 01780 – ”Project Record Documents”
E. Section 01820 – ”Demonstration and Training”
F. Divisions 2 through 16 sections for Submittal Procedures requirements for the work in these sections

1.3 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other Submittals.

1.4 DEFINITIONS

A. Action Submittals, as used herein are written and/or graphic information that requires Architect and/or District responsive action. Submittals may be rejected for not complying with requirements. Prepare and submit Action Submittals as required by individual Specification Sections.

B. Informational Submittals, as used herein are written and/or graphic information that does not require Architect responsive action. Submittals may be rejected for not complying with requirements. Prepare and submit Informational Submittals as required by individual Specification Sections.

C. Manufactured, as used herein applies to standard units usually mass-produced, and “fabricated” means items specifically assembled or made out of selected materials to meet individual design requirements.

D. Submittal Descriptions: Submittals requirements are specified in the technical sections. Submittals are identified by description as follows:
   1. Preconstruction Submittals, as used herein are submittals which are required following a Notice to Proceed and prior to commencing Work or any Phase of the Work on site. Examples include, but are not limited to:
      a. Certificates of insurance
b. Surety bonds

c. List of proposed products

d. Construction Schedule

e. Submittal Log (listing submittal schedule, including shop drawings and samples)

f. Schedule of prices

g. Safety plan

h. Waste Management Plan

i. Quality Control Plan

j. Others as required by the Contract Documents

2. Shop Drawings, as used herein are drawings, diagrams, schedules, and other data, which are prepared by Contractor, Subcontractors, manufacturers, fabricators, suppliers, or distributors illustrating some portion of the Work, and include: illustrations; fabrication, erection, layout and setting drawings; manufacturer's standard drawings; schedules; descriptive literature, instructions, catalogs, and brochures; performance and test data including charts; wiring and control diagrams; and all other drawings and descriptive data pertaining to materials, equipment, piping, duct and conduit systems, and methods of construction as may be required to show that the materials, equipment, or systems and their position conform to the requirements of the Contract Documents.

a. Shop drawings shall establish the actual detail of all manufactured or fabricated items, indicate proper relation to adjoining work, amplify design details of mechanical and electrical systems and equipment in proper relation to physical spaces in the structure, and incorporate minor changes of design or construction to suit actual conditions.

3. Product data, as used herein are catalog cuts, illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate a material, product, or system for some portion of the Work. This includes samples of warranty language when the contract requires extended product warranties.

4. Samples, as used herein are physical examples furnished by Contractor to illustrate materials, equipment, or quality and includes natural materials, fabricated items, equipment, devices, appliances, or parts thereof as called for in the Specifications, and any other samples as may be required by the Architect to determine whether the kind, quality, construction, finish, color, and other characteristics of the materials, etc., proposed by the Contractor conform to the required characteristics of the various parts of the Work. All Work shall be in accordance with the approved samples.

5. Design Data, as used herein are design calculations, mix designs, analyses or other data pertaining to a part of Work.

6. Test Reports, as used herein, include:

   a. Reports signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. (Testing must have been within three years of date of contract award for the project.)
b. Reports which include findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.

c. Reports which include findings of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

d. Investigation reports.

e. Daily performance logs.

f. Manufacturer or Installer checklists.

g. Manufacturer's Factory or Field Reports, including documentation of the testing and verification actions taken by manufacturer at the factory or manufacturer's representative at the job site, in the vicinity of the job site, or on a sample taken from the job site, on a portion of the work, during or after installation, to confirm compliance with manufacturer's standards or instructions. The documentation must be signed by an authorized official of a testing laboratory or agency and must state the test results; and indicate whether the material, product, or system has passed or failed the test.

h. Final acceptance test and operational test procedure.

7. Manufacturer's Instructions. Preprinted material describing installation of a product, system or material, including special notices, checklists, and Material Safety Data sheets concerning impedances, hazards and safety precautions.

8. Operation and Maintenance Data. Data that is furnished by the manufacturer or the system provider to the equipment operating and maintenance personnel, including manufacturer's help and product line documentation necessary to maintain and install equipment. This data is needed by District operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item. This data is intended to be incorporated in the Operations and Maintenance manual submittals.

9. Closeout Submittals. Documentation to record compliance with technical or administrative requirements in order to meet all requirements necessary to properly close out the Construction Contract. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase contract. These include, but are not limited to:

a. Record Drawings

b. As-built drawings

c. Others as required by the Contract Documents. See Section 01770 Contract Closeout Procedures.

1.5 PREPARATION AND FORMAT

A. Transmit each submittal, except sample installations and sample panels to the District Project Manager.

B. Transmit submittals with transmittal form prescribed by District and standard for the Project.
1. On the transmittal form identify Contractor, indicate date of submittal, and include information prescribed by transmittal form and required in paragraph entitled "Identifying Submittals." Process transmittal forms to record actions regarding sample[s].

C. Identifying Submittals: When submittals are provided by a Subcontractor, the Contractor shall prepare, review and stamp with Contractor’s approval stamp all specified submittals prior to submitting for District approval. Identify submittals, except sample installations and sample panels, with the following information permanently adhered to or noted on each separate component of each submittal and noted on transmittal form. Mark each copy of each submittal identically, with the following:

1. District Project Number and title.
2. Construction contract number.
3. Date of the drawings and revisions.
4. Product identification and location in project.
5. Name, address, and telephone number of subcontractor, supplier, manufacturer and any other second tier Contractor associated with submittal.
6. Section number of the specification section which requires the submittal.
7. When a resubmission, add numeric revision suffix on submittal description, for example, submittal 18 would become 18R1, to indicate resubmission.

D. Format for Shop Drawings

1. Shop drawings are not to be less than 8 1/2 by 11 inches nor more than 30 by 42 inches, except for full size patterns or templates. Prepare drawings to accurate size, with scale indicated, unless other form is required.
2. Drawings are to be suitable for reproduction and be of a quality to produce clear, distinct lines and letters with dark lines on a white background.
3. Present 8 1/2 by 11 inches sized shop drawings as part of the bound volume for submittals required by section. Present larger drawings in sets.
4. Include on each drawing the drawing title, number, date, and revision numbers and dates, in addition to information required in paragraph entitled "Identifying Submittals."
5. Number drawings in a logical sequence. Each drawing is to bear the number of the submittal in a uniform location adjacent to the title block. Place the District Project number and number in the margin, immediately below the title block, for each drawing.
6. Reserve a blank space on the right hand side of each sheet for the Architect’s disposition stamp.
7. Dimension drawings, except diagrams and schematic drawings and prepare drawings demonstrating interface with other trades to scale. Use the same unit of measure for shop drawings as indicated on the contract drawings. Identify materials and products for work shown.
8. Include the nameplate data, size and capacity on drawings. Also include applicable federal, military, industry and technical society publication references.

E. Format of Product Data and Manufacturer’s Instructions
1. Present product data submittals for each section as a complete, bound volume. Include table of contents, listing page and catalog item numbers for product data.

2. Indicate by prominent notation each product which is being submitted; indicate specification section number and paragraph number to which it pertains.

3. Supplement product data with material prepared for Project to satisfy submittal requirements for which product data does not exist. Identify this material as developed specifically for project, with information and format as required for submission of Certificates.

4. Include the manufacturer's name, trade name, place of manufacture, and catalog model or number on all product data. Also include applicable industry and technical society publication references. Should manufacturer's data require supplemental information for clarification, include such information in the submittal.

5. Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations such as American National Standards Institute (ANSI), ASTM International (ASTM), National Electrical Manufacturer's Association (NEMA), Underwriters Laboratories (UL), and Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance.
   a. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the District Project Manager. State on the certificate that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

6. Collect required data submittals for each specific material, product, unit of work, or system into a single submittal and marked for choices, options, and portions applicable to the submittal. Mark each copy of the product data identically. Partial submittals will [not] be accepted for expedition of construction effort.

7. Submit manufacturer's instructions prior to installation.

F. Format of Samples

1. Furnish samples in sizes below, unless otherwise specified or unless the manufacturer has prepackaged samples of approximately same size as specified:
   a. Sample of Equipment or Device: Full size.
   b. Sample of Materials Less Than 2 by 3 inches: Built up to 8 1/2 by 11 inches.
   c. Sample of Materials Exceeding 8 1/2 by 11 inches: Cut down to 8 1/2 by 11 inches and adequate to indicate color, texture, and material variations.
   d. Sample of Linear Devices or Materials: 10 inch length or length to be supplied, if less than 10 inches. Examples of linear devices or materials are conduit and handrails.
   e. Sample of Non-Solid Materials: Pint. Examples of non-solid materials are sand and paint.
   f. Color Selection Samples: 2 by 4 inches. Where samples are specified for selection of color, finish, pattern, or texture, submit the full set of available choices for the
material or product specified. Sizes and quantities of samples are to represent their respective standard unit.

g. Sample Panel: 4 by 4 feet.
h. Sample Installation: 100 square feet.

2. Samples Showing Range of Variation: Where variations in color, finish, pattern, or texture are unavoidable due to nature of the materials, submit sets of samples of not less than three units showing extremes and middle of range. Mark each unit to describe its relation to the range of the variation.

3. Reusable Samples: Incorporate returned samples into work only if so specified, indicated, or approved by Architect and District. Incorporated samples are to be in undamaged condition at time of use.

4. Recording of Sample Installation: Note and preserve the notation of area constituting sample installation but remove notation at final clean-up of project.

G. Format of Design Data and Certificates. Provide design data and certificates on 8 1/2 by 11 inches paper. Provide a bound volume for submittals containing numerous pages.

H. Format of Test Reports and Manufacturer’s Field Reports
   1. Provide reports on 8 1/2 by 11 inches paper in a complete bound volume.
   2. Indicate by prominent notation, each report in the submittal. Indicate specification number and paragraph number to which it pertains.

I. Format of Operation and Maintenance Data shall comply with the requirements specified in Section 01785 Operation and Maintenance data for O&M Data format.

J. Format of Preconstruction Submittals and Closeout Submittals.
   1. When submittal includes a document which is to be used in Project or become part of Project Record, other than as a submittal, do not apply Contractor's approval stamp to document, but to a separate sheet accompanying document.
   2. Provide all dimensions in English units only.

1.6 QUANTITY OF SUBMITTALS

A. Number of Copies of Shop Drawings. Submit six (6) requiring review and approval by Architect or District.

B. Number of Copies of Product Data and Manufacturer’s Instructions. Submit in compliance with quantity requirements specified for shop drawings.

C. Number of Samples.
   1. Submit two (2) samples, or three (3) sets of samples showing range of variation, of each required item. One approved sample or set of samples will be retained by District and one will be returned to Contractor.
   2. Submit one sample panel or provide one sample installation where directed. Include components listed in technical section or as directed.
   3. When required by Contract Documents, provide one sample installation where directed by Architect or District.
4. Submit one sample of non-solid materials.

D. Number of Copies Design Data and Certificates. Submit in compliance with quantity requirements specified for shop drawings.

E. Number of Copies Test Reports and Manufacturer’s Field Reports. Submit in compliance with quantity and quality requirements specified for shop drawings.

F. Number of Copies of Operation and Maintenance Data. Submit three (3) copies of O&M Data to the District Project Manager for review and approval.

G. Number of Copies of Preconstruction Submittals and Closeout Submittals. Unless otherwise specified, submit three (3) sets of administrative submittals.

1.7 SUBMITTALS, GENERAL

A. Contractor shall obtain and shall submit all required shop drawings, samples, technical data, and other submittals as required by the Contract Documents with such promptness as to cause no delay in its own Work or in that of any other contractor or subcontractor.

1. As required by the Contract Documents, the Contractor shall obtain and submit with shop drawings all seismic and other calculations, and all product data from equipment manufacturers.

B. Prepare a complete Submittal Log and maintain it as the Work progresses. Submit the initial Submittal Log for approval by District at the same time as the Initial Schedule (See Section 01310 Construction Scheduling). Include the Contractor’s anticipated submission dates and the approval needed dates (if approval is required).

1. Re-submit submittal log and annotate monthly by the Contractor with actual submission and approval dates. When all items on the log have been fully approved, no further re-submittal is required.

2. Carefully control procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved “Submittal Log.”

3. Except as specified otherwise, allow review period of at least fifteen (15) working days for submittals requiring Architect or District approval. Period of review for submittals requiring approval begins when District receives submittal from Contractor.

4. For submittals requiring review by fire protection engineer and/or DSA, allow review period, beginning when District receives submittal thirty (30) calendar days for return of submittal to the Contractor.

5. Period of review for each resubmittal is the same as for initial submittal.

C. The District may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections.

D. Units of weights and measures used on all submittals are to be the same as those used in the contract drawings.

E. Each submittal is to be complete and in sufficient detail to allow ready determination of compliance with contract requirements.
F. No extensions of time will be granted to Contractor or any Subcontractor because of its failure to have shop drawings, samples, product data and/or other required submittals submitted in accordance with the approved Submittal Log and Master Construction Schedule.

G. Each Subcontractor shall submit all shop drawings, samples, product data and other required submittals for the review by the District and the Architect through the Contractor.

H. By submitting shop drawings, samples, product data and other required submittals, the Contractor represents that it has determined and verified all materials, field measurements, catalog numbers, related field construction criteria, and other relevant data in connection with each such submission, and that it has checked, verified, and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents, including the construction schedule.

I. Quality Control Certification. Stamp each sheet of each submittal with a quality control certifying statement, except that data submitted in bound volume or on one sheet printed on two sides may be stamped on the front of the first sheet only. When approving authority is Architect or District, Contractor shall certify submittals with the following certifying statement:

"I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated with contract Number [_______], is in compliance with the Contract Documents, does not constitute an unapproved substitution, deviation, or variation, can be installed in the allocated spaces, and is submitted for District approval.

I further certify that I have reviewed and approved the field dimensions and the construction criteria, and have also made written notation regarding any information in the shop drawings that does not fully conform to the Contract Documents. This submittal has been coordinated with all other submittals received to date, and this duty of coordination has not been delegated to subcontractors, material suppliers, the Architect, or the Engineers on this project.

For the Contractor:

Certified by Submittal Reviewer _____________________, Date _______
(Signature)

Certified by QC Manager _____________________________, Date ______
(Signature)

J. Partial submittals are not acceptable, will be considered non-responsive, and will be returned without review by either District or Architect.

K. Mark each copy of each submittal to show which products and options are applicable.

L. The submission of the shop drawings, samples, product data and other required submittals, shall not deviate from the requirements of the Contract Documents including detailing and design intent which is specifically outlined in Contract Documents except as specifically authorized by the Architect or through an accepted substitution, per the requirements of the Contract Documents.

M. Deviations from the Contract Documents
1. Any deviations from the Contract Documents shall be fully described in a transmittal accompanying the shop drawings, samples, product data and other required submittals. However, such submittals shall not be used as a means of requesting a substitution, the procedure for which is defined elsewhere in the Contract Documents.

2. Architect and District approval is required for any proposed deviation from the accepted design which still complies with the Contract Documents before the Contractor is authorized to proceed with material acquisition or installation. If necessary to facilitate the project schedule, the Contractor and the Architect may discuss a submittal proposing a deviation with the District Project Manager prior to officially submitting it to the District. However, the District reserves the right to review the submittal before providing an opinion, if deemed necessary. In any case, the District will not formally agree to or provide a preliminary opinion on any deviation without either the Architect’s approval or recommended approval.

3. The District reserves the right to reject any deviation which may impact furniture, furnishings, equipment selections, and/or operations decisions that were made previously and based on the District reviewed and approved Project design.

4. Contractor is responsible for the dimensions and design of connection details and construction of work. Failure to point out deviations may result in the District requiring rejection and removal of such work at the Contractor’s expense.

5. After submittals have been accepted by the Architect, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

N. Review by District and Architect shall not relieve the Contractor or any Subcontractor from its responsibility in preparing and submitting proper submittals in accordance with the Contract Documents.

O. Any submission, which in Architect’s opinion is incomplete, contains errors, or been superficially checked will be returned by the Architect without review for resubmission by the Contractor.

P. Electronic copies of the stamped and signed Contract Documents will not be provided by District or Architect for Contractor’s use unless:
   1. Contractor shall first request and obtain written approval from Architect prior to use of any Architect’s CAD files, drawings, or other documents for submittal purposes.
   2. Contractor shall be responsible for all reproduction, printing, and delivery cost associated with the use of any requested drawings and/or CAD files.
   3. Contractor provides disclaimer letters to the Architect and District (15) working days in advance of any proposed use of Architect’s documents and/or digital files. Such disclaimer letter shall be in a form acceptable to Architect and District.
   4. Contractor shall not reuse any Architect’s documents and/or electronic files for submittal purposes without prior written approval.

Q. Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
   a. Architect and Project Manager reserve the right to withhold action on, or return without review, a submittal requiring coordination with other submittals until all such related submittals are received. No extension of the Contract Time will be authorized.
   b. Architect and Project Manager will return incomplete submittals to the Contractor without review. No extension of Contract Time will be authorized due to incomplete Contractor submittals.

R. Submittals Schedule
   1. Initial Review: Allow (15) working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will, through the Project Manager, advise Contractor when a submittal review must be delayed for coordination reasons.
   2. Intermediate Review: If intermediate submittal review is necessary, process it in the same manner as an initial submittal.
   3. Re-submittal Review: Allow (10) working days for review of each re-submittal.
   4. Sequential Review: Where sequential review of submittals by Architect’s consultants, District, or other parties is indicated, allow (15) working days for initial review of each submittal.

S. Re-submittals: Make re-submittals in same form and number of copies as initial submittal.
   1. Note date and content of previous submittal.
   2. Note date and content of revision in label or title block and clearly indicate extent of revision(s).
   3. Resubmit submittals until they are marked "No Exceptions Taken" or "Make Corrections Noted" by the Architect.

T. After submittals have been accepted by the Architect, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

1.8 ARCHITECT’S REVIEW
   A. Architect's review is for general conformance with design concept only, and does not relieve Contractor in any way from compliance with Contract Documents, nor does it in any way constitute grounds for a Change Order. Contractor remains solely responsible for details and accuracy of all quantities and dimensions, and selection of fabrication and/or installation processes.
   B. The Architect's review shall neither be construed as a complete check which relieves the Contractor, Subcontractor, manufacturer, fabricator, or supplier from responsibility for any deficiency that may exist or from any departures or deviations from the requirements of the Contract Documents unless the Contractor has, in writing, called the Architect's attention to the deviations at the time of submission.
C. The Architect’s review shall not relieve the Contractor or Subcontractors from responsibility for errors of any sort in any required submittals, for proper fitting of the Work, coordination of the differing subcontractor trades, and Work which is not indicated on any submittal at the time of submission.

D. In reviewing shop drawings, samples, product data and other required submittals, the Architect will not verify dimensions and field conditions.

E. The Architect will review and approve shop drawings, samples, product data and other required submittals for aesthetics and for conformance with the design concept of the Work and the Contract Documents.

F. Architect will review each submittal, make marks to indicate corrections or modifications required, and return it.

G. Contractor and Subcontractors shall be solely responsible for any quantities which may be shown on either the submittals or the Contract Documents.

H. Architect will not review submittals that do not bear Contractor’s approval stamp and will return them to the Contractor without review.

I. Architect will stamp each submittal appropriately to indicate action to be taken, as follows:
   1. No Exceptions Taken: Work covered by submittal may proceed provided it complies with the requirements of the Contract Documents. Compliance with Contract Documents is a condition of acceptance of the Work.
   2. Make Corrections Noted: Work covered by the submittal may proceed provided it complies with Architect and or Engineer notations and/or corrections. Contractor shall make all noted corrections. Compliance with Contract Documents is a condition of acceptance of the Work.
   3. Revise and Resubmit: Do not proceed with any Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise the submittal in accordance with Architect and/or Engineer notations and resubmit without delay. Repeat if necessary.
   4. Rejected. See Remarks: Do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Prepare a new submittal in accordance with Architect/Engineer’s notations and resubmit without delay.

J. Use of Submittals for Construction: Use only final submittals with Architect’s mark indicating “No Exceptions Taken” or “Make Corrections Noted.”

K. Informational Submittals: Architect will review each submittal but will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

1.9 REJECTED SUBMITTALS

A. Contractor shall make corrections required by the Architect and resubmit.

B. If the Contractor considers any correction or notation on the returned submittals to constitute a change to the contract drawings or specifications, he shall provide notice to the Architect and District.
C. If changes are necessary to submittals, the Contractor shall make such revisions and submission of the submittals in accordance with the procedures above. No item of work requiring a submittal change is to be accomplished until the changed submittals are approved.

1.10 NO EXCEPTIONS TAKEN OR MAKE CORRECTIONS NOTED SUBMITTALS
A. Acceptance will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor is responsible for the satisfactory construction of all work.

1.11 NO EXCEPTIONS TAKEN OR MAKE CORRECTIONS NOTED SAMPLES
A. Acceptance of a sample is only for the characteristics or use named in such acceptance and is not construed to change or modify any contract requirements. Before submitting samples, the Contractor to assure that the materials or equipment will be available in quantities required in the project. No change or substitution will be permitted after a sample has been accepted.

B. Match the accepted samples for Materials and equipment incorporated in the work. If requested, accepted samples, including those which may be damaged in testing, will be returned to the Contractor, at his expense, upon completion of the contract. Samples not accepted will also be returned to the Contractor at its expense, if so requested. Failure of any materials 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. District reserves the right to disapprove any material or equipment which previously has proved unsatisfactory in service.

C. Samples of various materials or equipment delivered on the site or in place may be taken by the District Project Manager for testing. Samples failing to meet contract requirements will automatically void previous acceptance, and Contractor shall replace such materials or equipment at Contractor expense to meet contract requirements.

D. Acceptance of the Contractor's samples by the AOR or District does not relieve the Contractor of his responsibilities under the contract.

1.12 WITHHOLDING OF PAYMENT
A. Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

B. No payment for materials incorporated in the work will be made if all required Designer of Record or required District approvals have not been obtained.

C. No payment will be made for any materials incorporated into the work for any conformance review submittals or information only submittals found to contain errors or deviations from the Solicitation or Accepted Proposal.

1.13 SUBMITTAL REQUIREMENTS
A. Shop Drawings
   1. Transmittal Letter and Other Requirements. All shop drawings must be properly identified with the name of the Project and dated, and each lot submitted must be accompanied by a letter of transmittal referring to the name of the Project and to the Specification section number for identification of each item clearly stating in narrative form, as well as "clouding" on the submissions, all qualifications, departures, or deviations from the Contract
Documents. Shop drawings, for each section of the Work shall be numbered consecutively and the numbering system shall be retained throughout all revisions. All Subcontractor submissions shall be made through the Contractor. Each drawing shall have a clear space for the stamps of Architect and Contractor.

2. Copies Required. Each submittal shall include one (1) original drawing, one (1) PDF format digital file, and five (5) legible prints of each drawing or schedule, table, cut sheet, etc., including fabrication, erection, layout and setting drawings, and such other drawings as required under the various sections of the Specifications, until final acceptance thereof is obtained. Subcontractor shall submit copies, in an amount as requested by the Contractor, of: (1) manufacturers’ descriptive data for materials, equipment, and fixtures, including catalog sheets showing dimensions, performance, characteristics, and capacities; (2) wiring diagrams and controls; (3) schedules; (4) all seismic calculations and other calculations; and (5) other pertinent information as required by the District or Architect.

3. Corrections. The Contractor shall make all corrections required by Architect and shall resubmit, as required by Architect, corrected copies and digital files of shop drawings or new samples until approved. Contractor shall direct specific attention in writing or on resubmitted shop drawings to revisions other than the corrections required by the Architect on previous submissions. Professional services required for more than one (1) re-review of required submittals of shop drawings, product data, or samples are subject to charge to the Contractor by the District.

4. Approval Prior to Commencement of Work. No portion of the Work requiring a shop drawing or sample submission or other submittal shall be commenced until the submission has been reviewed by Contractor and Architect and approved by Architect unless specifically directed in writing by the Architect. All such portions of the Work shall be in accordance with approved shop drawings and samples.

5. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed detail.

6. Fully illustrate requirements of the Contract Documents. Include the following information, as applicable:
   a. Dimensions
   b. Weights and measures
   c. Identification of products
   d. Fabrication and installation drawings
   e. Roughing-in and setting diagrams
   f. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring
   g. Electrical power requirements
   h. Shopwork manufacturing instructions
   i. Templates and patterns
   j. Schedules
   k. Design calculations
   l. Compliance with specified standards
m. Notation of coordination requirements
n. Notation of dimensions established by field measurement
o. Relationship to adjoining construction clearly indicated
p. Seal and signature of California professional engineer or other engineer if specified
q. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring
r. Other information as necessary or required by the Contract Documents

B. Samples

1. Samples Required. In case a considerable range of color, graining, texture, or other characteristics are anticipated in finished products, a sufficient number of samples of the specified materials shall be furnished by the Contractor to indicate the full range of characteristics which will be present in the finished products; and products delivered or erected without submittal and approval of a full range of samples shall be subject to rejection by the District.
   a. Except for range samples, and unless otherwise called for in the various sections of the Specifications, samples shall be submitted in duplicate.
   b. All samples shall be marked, tagged, or otherwise properly identified with the name of the submitting party, the name of the Project, the purpose for which the samples are submitted and the date, and shall be accompanied by a letter of transmittal containing similar information, together with the Specification section number. Each tag or sticker shall have clear space for the review stamps of Contractor and Architect.
2. Labels and Instructions. All samples of materials shall be supplied with the manufacturer’s descriptive labels and application instructions.
3. Architect’s Review. The Architect will review and, if appropriate, approve submissions and will return them to the Contractor with the Architect’s stamp and signature applied thereto, indicating the timing for review and appropriate action in compliance with the Contract Documents.
4. Identification: Attach label on unexposed side of Samples that includes the following information:
   a. Generic description of Sample
   b. Product name and name of manufacturer
   c. Sample source
   d. Number and title of appropriate Specification Section
   e. District Project name and number
   f. Contractor’s name
   g. Date of submittal
5. Disposition: Maintain sets of all approvedSamples at Project site, available for quality-control comparisons throughout the course of the Project. Sample sets may be used to determine final acceptance of construction associated with each sample or sample set.
a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.

b. Samples not incorporated into the Work, if any, or otherwise designated as District’s property, are the property of Contractor.

6. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit 6 full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer’s product line.

7. Samples for Verification: Where required by the Contract Documents, submit full-size units of Samples, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Unless indicated otherwise, submit six sets of Samples. Architect will retain two Sample sets; remaining four sets will be returned.
   i) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
   ii) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by Sample, submit at least four sets of paired units that show approximate limits of variations.

8. District’s Property. All shop drawings, computer disks, annotated specifications, samples, and other submittals shall become the District’s property upon receipt by the District or Architect.

C. Other Submittals

1. General: Prepare and submit Submittals required by other Specification Sections.
   a. Test and Inspection Reports: Comply with requirements specified in Section 01400 Quality Control Requirements.
   b. Coordination Drawings: Comply with requirements specified in Section 01311 Project Management and Coordination.
      i) Coordination Drawings are required where limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

2. Product Data: Submit manufacturer's printed literature in original form as required in the Contract Documents. Submittal shall include specifications, physical dimensions, and ratings of all equipment. Furnish performance curves for all fans and pumps. Where
printed literature describes items in addition to that item being submitted, submitted item shall be clearly marked on submittal and superfluous information shall be crossed out in the same manner on all copies. Equipment submittals shall be complete and include space requirements, weight, electrical and mechanical requirements, performance data, and any supplemental information that may be available or requested.

3. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.


5. Installer Certificates: Prepare written statements on manufacturer’s letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

6. Manufacturer Certificates: Prepare written statements on manufacturer’s letterhead certifying that product complies with requirements in the Contract Documents.

7. Material Certificates: Prepare written statements on manufacturer’s letterhead certifying that material complies with requirements in the Contract Documents.

8. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency’s standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

9. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

10. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
   a. Name of evaluation organization
   b. Date of evaluation
   c. Time period when report is in effect
   d. Product and manufacturer’s names
   e. Description of product
   f. Test procedures and results
   g. Limitations of use

11. Schedule of Tests and Inspections: Comply with requirements specified in Section 01400 Quality Control Requirements.

12. Preconstruction Test Reports: Prepare test reports written by a qualified testing agency, on testing agency’s standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
13. Compatibility Test Reports: Prepare test reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

14. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product after product is installed in its final location, for compliance with requirements in the Contract Documents.

15. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Section 01785 (Operation and Maintenance Data.)

16. Manufacturer's Installation and Operations Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Manufacturer's Instructions shall be available for review on site at all times. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
   a. Preparation of substrates
   b. Required substrate tolerances
   c. Sequence of installation or erection
   d. Required installation tolerances
   e. Required adjustments
   f. Recommendations for cleaning and protection

17. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
   a. Name, address, and telephone number of factory-authorized service representative making report.
   b. Statement on condition of substrates and their acceptability for installation of product.
   c. Statement that products at Project site comply with requirements.
   d. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
   e. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   f. Statement whether conditions, products, and installation will affect warranty.
   g. Other required items indicated in individual Specification Sections.

**PART 2 - PRODUCTS:** Not Used

**PART 3 - EXECUTION:** Not used
END OF SECTION 01330
SECTION 01340
ADMINISTRATIVE FORMS & LOGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Specification Sections shall apply to this Section without limitation.

1.2 SUMMARY

A. This section specifies the information and format requirements for administrative forms and logs.

1.3 ADMINISTRATIVE FORMS & LOGS

A. The Contractor shall use District provided administrative forms for the Work. Administrative forms and logs include, but are not limited to, the following:

1. Transmittal Form
2. Submittal Transmittal Form
3. Request for Information Form
4. Substitution Request Form
5. 3-Week Projected Construction Schedule Form
6. 3-Week Testing & Inspection Schedule Form
7. Proposed Change Order Form*
8. Change Order Form*
9. Request for Information Log Form
10. Submittal Log Form
11. Proposed Change Order Log Form
12. Change Order Log Form
13. Contractor's Proposal for Contract Modification Form* (includes sample numbers to demonstrate calculations only)
14. Contractor Production Report
15. Construction Directive Form
16. Proposition 39 Job Creation Tracking Report (Form J)

B. Forms generated by project management software may be substituted if substitution forms contain essentially the same information as shown in these contract documents. Allowance for the use of substitute forms is at the sole discretion of the District, and shall be requested and approved before use of the substitute form. Forms marked with an asterisk (*) may NOT be substituted under any condition.
C. Microsoft Excel files of these forms are available for Contractor use from the District.

1.4 FORMS INCORPORATED BY REFERENCE

A. Forms available from the California Department of General Services, Division of the State Architect, http://www.dgs.ca.gov/dsa/Forms.aspx, related to administration, construction, testing, and inspection of public work school facilities are hereby incorporated by reference into these Contract Documents.

1.5 CONTRACTOR RESPONSIBILITIES

A. Nothing in this Section 01340 including, but not limited to the above forms and log forms shall be construed to limit, relieve, or release Contractor from liability to District for any damages sustained as a result of inaccurate or incorrect information supplied by the Contractor.

PART 2 – PRODUCTS - Not Used.

PART 3 – EXECUTION - Not Used.

END OF SECTION 01340
SECTION 01400
QUALITY CONTROL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Division 1 Specification Sections shall apply to this Section without limitation.

1.2 SUMMARY

A. This Section includes Administrative and Procedural Requirements for Quality Control and Quality Assurance Services includes, but not limited to, the followings:
   1. Quality assurance and control of installation.
   2. References.
   3. Inspection and testing laboratory services
   4. Manufacturers' field services and reports
   5. Field sample
   6. DSA Project Inspector
   7. Inspection by the Division of the State Architect
   8. Conflicts
   9. Proposition 39

1.3 QUALITY ASSURANCE/CONTROL OF INSTALLATION

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

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

C. When manufacturers' instructions conflict with Contract Documents, request clarification from District's Representative before proceeding.

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

E. All Work shall be performed by persons qualified to produce workmanship of specified quality.

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

G. Contractor's Line of Authority: Contractor shall provide one person who shall be both knowledgeable and responsible for all work to be performed on the Project at all times during normal work hours. In Contractor's absence, Contractor's appointed representative shall be responsible for all directions given him and said directions shall be binding as if given to the Contractor. Contractor's representative shall be responsible to coordinate all Work to be performed on the Project.
H. Shop and field work shall be performed only by mechanics skilled and experienced in the fabrication and installation of the work involved. All work on this Project shall be done in accordance with the best practices of the various trades involved and in accordance with the Contract Documents, approved shop drawings and these specifications.

I. All work shall be erected and installed plumb, level, square and true and in proper alignment and relationship to the work of other trades. All finished work shall be free from defects. The District’s Representatives reserve the right to reject any materials and workmanship that are not considered to be of the highest standards of the trades involved. Any such inferior material or workmanship shall be removed and replaced at no additional cost or time impact to the District.

J. The specifications and recommendations of the manufacturer whose materials are used shall be strictly adhered to during the application or installation of materials. Manufacturer’s specifications, installation instructions, and testing and startup directions shall be available for inspection on Site.

K. Any additional work beyond that specified or illustrated in the Contract Documents, or any modification thereto, that is necessary to obtain the guarantees specified in the Contract Documents shall be provided by the Contractor without any additional cost or time impact to the District.

1.4 REFERENCES

A. Conform to reference standards in force on the most recent date of issue of the approved Contract Documents.

B. When specified reference standards conflict with Contract Documents, request clarification from District’s Representative before proceeding.

C. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

D. The Contractor shall be responsible for being current and knowledgeable for all building codes involved for all trades under his direction.

E. Provide all work and materials in full in accordance with the latest applicable Rules and Regulations of the California Code of Regulations Title 24 Building Code Standards, the State Fire Marshal, Safety Orders of the Division of Industrial Safety, and any other applicable laws or regulations. Nothing in these plans or specifications is to be construed to permit Work not conforming to these Codes.

F. American Society for Testing and Materials (ASTM):

   1. 29 CFR 1910, Subpart A, Section 1910.7: Definitions and Requirements for a National Recognized Testing Laboratory.

H. NIST: National Institute of Standards and Technology.

I. Furnish all material and labor required to comply with these Rules and Regulations without any additional cost to District.
1.5 MANUFACTURERS’ FIELD SERVICES AND REPORTS
A. When specified in individual Specification Sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, testing, adjusting, and balancing of equipment as applicable, and to provide instructions when necessary.
B. Provide five (5) sets of Manufacturer’s Field Representative report to District and Architect for review within 5 days of field observation.
C. Manufacturer’s Field Service: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01330 (Submittal Procedures.)

1.6 FIELD SAMPLES
A. Install field samples at the site for District and Architect review as required by individual Specifications Sections.
B. Samples accepted by the Architect in writing represent the quality level required for the Work.
C. Where a field sample is specified in individual sections to be removed, clear area after field sample has been accepted by Architect.

1.7 PROJECT INSPECTOR
A. District will employ a Project Inspector in accordance with the regulations of the DSA and subject to the provision of Part 1, Title 24, CCR. Project Inspector’s authority, rights and duties shall be as set forth in Section 4-342, Part 1, Title 24, CCR.

1.8 INSPECTION BY THE DIVISION OF THE STATE ARCHITECT
A. Work will be monitored and observed through periodic site visits by the Division of the State Architect Field Inspector according to Section 4-334, Part 1, Title 24, CCR.

1.9 CONFLICTS
A. Contractor shall comply with rules of documents interpretation as indicated in Contract General Conditions including, but not limited to the following items:
   1. Contract Documents take precedence over statutory requirements or standard when requiring materials of higher quality or performance, or larger sizes or capacity, or greater protection, safety or quantity than required by said codes or standards.
   2. This shall not operate to allow deviations from code requirements, prior approvals and other provisions as specified.
   3. Modifications to published statutory requirements currently adopted or enforced by regulating agencies having jurisdiction shall take precedence over said published requirements.
B. Conflicts within Contract Documents and/or between Project Manual (including specifications) Drawings, Addenda: The more stringent requirement shall govern.
C. Subcontractor, supplier, and installer work may be called for in any section of the Contract Documents; Project Manual Specifications, Drawings and Addenda. Work by any one discipline is not limited to any specification section of the Project Manual, Drawings, Addenda, and Contract Documents shall be bid in total and not in parts.

D. If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding. Contractor shall, within (15) working days, notify the Architect in writing for the context of requirements.

E. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Contractor shall, within (15) working days, notify any uncertainties to the Architect and District for a decision before proceeding.

1.10 QUALITY CONTROL, GENERAL

A. District will provide inspections, tests, and similar quality control services required performed by the Division of the State Architect. All other tests are Contractor’s responsibility. Costs for District-provided inspections and tests are not included in Contract Sum.

1. District will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and description of types of testing and inspecting they are engaged to perform.

2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Where tests and inspections are indicated as Contractor’s cost and/or responsibility, provide quality-control services specified and those required by authorities having jurisdiction

1. Where services are indicated as Contractor’s responsibility, engage a qualified testing agency to perform these quality-control services.

   a. Contractor shall not employ same entity engaged by District, unless agreed to in writing by District.

2. Testing of equipment, systems, components, assemblies, and other non-structural elements of the Work that require testing shall be performed in accordance with the Contract Documents and Manufacturer’s recommended testing protocols. The Contractor shall submit Manufacturer’s Installation Instructions and Manufacturer’s recommended tests in accordance with Section 01330, Submittal Procedures, prior to installation and testing of equipment, systems, components, assemblies, and other non-structural elements of the Work. Test results shall be recorded and submitted original Manufacturer’s documents.

3. Notify Project Inspector and testing agencies, at least (5) working days or as indicated otherwise in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor’s responsibility, submit a certified written report, in duplicate, of each quality-control service.

5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor’s responsibility.

6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Retesting/Re-inspecting:
   1. Where quality-control services are Contractor’s responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaces or is necessitated by Work that failed to comply with the Contract Documents.
   2. Where quality-control services are District’s responsibility, costs for retesting and re-inspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, by way of a deductive Change Order.

D. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work
   2. Incidental labor and facilities necessary to facilitate tests and inspections
   3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
   4. Facilities for storage and field curing of test samples.
   5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
   6. Security and protection for samples and for testing and inspecting equipment at Project site.

E. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities. Provide timely notice of the Work’s readiness for all required tests and inspections.

F. Testing and Inspection Log: The Contractor shall provide a detailed list of all Tests and Inspections required by the Contract Documents for each of the Project Phases. Submit the Test and Inspection Log with the submittal of the Master CPM Schedule.
   1. Distribution: Distribute schedule to District, Architect, Project Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.
1.11 QUALITY CONTROL: LABORATORY, TESTS, AND REPORTING REQUIREMENTS

A. Construction materials testing laboratories must be accredited by a laboratory accreditation
   authority and will be required to submit a copy of the Certificate of Accreditation and Scope of
   Accreditation.

   1. The laboratory’s scope of accreditation must include the appropriate ASTM standards (E
      329, C 1077, D 3666, D 3740, A 880, E 543) listed in the technical sections of the
      specifications.

B. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and
   EPA. The policy applies to the specific laboratory performing the actual testing, not just the
   Corporate Office.

C. Laboratory Accreditation Authorities: Laboratory Accreditation Authorities include the National
   Voluntary Laboratory Accreditation Program (NVLAP) administered by the National Institute of
   Standards and Technology at: http://ts.nist.gov/ts/htdocs/210/214/214.htm the American
   Association of State Highway and Transportation Officials (AASHTO) program at
   http://www.transportation.org/aashto/home.nsf/frontpage , International Accreditation
   Services, Inc. (IAS) at http://www.iasonline.org, the American Association for Laboratory
   Accreditation (A2LA) program at http://www.a2la.org/.

D. Capability Check: The District retains the right to check laboratory equipment in the proposed
   laboratory and the laboratory technician's testing procedures, techniques, and other items
   pertinent to testing, for compliance with the standards set forth in this Contract.

E. Test Results: Cite applicable Contract requirements, tests or analytical procedures used. Provide
   actual results and include a statement that the item test or analyzed conforms or fails to
   conform to specified requirements.

   1. If the item fails to conform, notify the District immediately. Conspicuously stamp the
      cover sheet for each report in large red letters "CONFORMS" or "DOES NOT CONFORM"
      to the specification requirements, whichever is applicable.

   2. Test results must be signed by a testing laboratory representative authorized to sign
      certified test reports.

   3. Furnish the signed reports, certifications, and other documentation to the District via the
      QC Manager.

   4. Furnish the signed reports, certifications, and a summary report of field tests at the end
      of each month to the District. Attach a copy of the summary report to the last daily
      Contractor Quality Control Report of each month.

1.12 PROPOSITION 39

A. All work done on this project must comply with the California Building Standards
   Code, Title 24 2013, California Code of Regulations (CCR), Part 6, California Energy
   Code. Requirements include, but are not limited to, Section 110.2 (Mandatory
   Requirements for Space-Conditioning Equipment), Section 110.3 (Mandatory
   Requirements for Service Water-Heating Systems and Equipment), Section 120.2
   (Required Controls for Space-Conditioning Systems), and Section 140.4 (Prescriptive
   Requirements for Space Conditioning Systems).
B. Contractor is responsible for complying with all Proposition 39 requirements, including report of all on-site full time employee and trainee/apprentice hours as well as the number of employees who worked on this project on a Form J after project completion. Each contractor must complete the sections at the top and bottom of the form and sign the form. See Section 01349 Administrative Forms-Logs for ‘D-1045E Form J’ for reference on what will be required from the contractor at the end of the project. If there are multiple contractors, each contractor, including all subcontractors and their subcontractors, shall separately fill out and sign Form J for their own work and submit the completed form.

C. Itemized invoices showing itemized costs for the Proposition 39 scope of work is required to be provided to meet PG&E and Proposition 39 requirements. If invoices are found to not be in enough detail, the contractor will be required to revise the invoices and submit new ones. Separate, itemized invoices showing at the very least the equipment ordered, the number of each type of equipment, and the cost per line item should be provided. Invoices should also itemize all labor-related costs.

D. All work on the cooling tower and electrical switchboard is to be excluded from Prop 39 labor and material reporting.

1.13 NOTIFICATION ON NON-COMPLIANCE

A. The District will notify the Contractor of any detected non-compliance with the Contract. Take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the District may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders will be made the subject of claim for extension of time for excess costs or damages by the Contractor.

PART 2 - PRODUCTS - Not Used.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work constitutes acceptance of existing conditions by the Contractor.

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

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

D. Verify utility services are available, of correct characteristics, and in correct locations.

3.2 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special Inspector conducting test or inspection.

B. Maintain test and inspection log at project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect and Project Manager’s reference during normal working hours.

3.3 PREPARATION

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

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

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

3.4 PREPARATION AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes. See also Section 01730, Cutting and Patching.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor’s responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01400
SECTION 01412
HAZARDOUS MATERIALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. All Contract documents shall be reviewed for applicable provisions related to the provisions in this document, and provision in the General Conditions and other Division 1 Specification Sections shall apply to this Section without limitation.

1.2 RELATED REQUIREMENTS SPECIFIED IN OTHER SECTIONS
A. Section 01010 – “Summary of Work”
B. Section 01311 – “Project Management and Coordination”
C. Section 01420 – “References”
D. Divisions 2 through 16 Sections for Hazardous Materials requirements for the work in those Sections.

1.3 SUMMARY
A. This Section describes Project requirements applicable to Work and the expected and unexpected discovery of hazardous materials, hazardous waste, asbestos and asbestos-containing materials, lead-based paint, polychlorinated biphenyls, petroleum-contaminated soils and materials, construction and demolition debris and any other hazardous substance or hazardous waste. This Section supplements the requirements elsewhere in the Contract Documents.

1.4 DISCOVERY OF HAZARDOUS MATERIALS
A. In the event the Contractor encounters or suspects the presence on the job site of material reasonably believed to be asbestos, polychlorinated biphenyl (PCB), or any other material defined as being hazardous by § 25249.5 of the California Health and Safety Code, which has not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the District and the Architect in writing, whether or not such material was generated by the Contractor or the District. The Work in the affected area shall not thereafter be resumed, except by written agreement of the District and the Contractor, if in fact the material is asbestos, polychlorinated biphenyl (PCB), or other hazardous material, and has not been rendered harmless. The Work in the affected area shall be resumed only in the absence of asbestos, polychlorinated biphenyl (PCB), or other hazardous material, or when it has been rendered harmless by written agreement of the District and the Contractor.

B. If hazardous materials are encountered, they shall be handled in accordance with applicable local, state and federal regulation which may include: (1) CCR Title 8, Division 4, Chapter 4, Sections 5163 through 5167 and 5192 (Hazardous Waste Operations and Emergency
Response); (2) CCR Title 22, Division 4.5, Chapters 10 through 13 and 18 (Environmental Health Standards for Management of Hazardous Waste); and (3) CCR Title 23, Division 3, Chapter 15 (Discharges of Hazardous Waste to Land).

C. Should the discovery of unexpected contaminants cause delay to Contractor’s operation, extension of Contract Time will be granted by District in accordance with Section 00700 (General Conditions). Contractor may not be entitled to damages or additional payment due to such delays. District may, if it believes appropriate in its sole discretion, grant an extension of Contract Time.

D. The Contractor shall take all measures to avoid and/or mitigate delays due to Hazardous Materials/Waste finds such as; avoiding the area of the find and proceeding with other work on the project; developing “work around” plans; and documenting his best efforts to avoid and/or mitigate delays.

1.5 SUBSURFACE HAZARDOUS MATERIALS

A. If Contractor encounters surface contamination, the following provisions and precautionary measures shall be implemented during construction.

1. Contractor’s personnel shall be alert for and cease work in the area and immediately report to District’s Representative any detectable chemical odors, unusual debris, or discolored soil.

1.6 HAZARDOUS MATERIAL WORK LIMITATIONS

A. In the event that the presence of hazardous materials is suspected or discovered on the Site (except in cases where asbestos and other hazardous material work is the Contractor’s responsibility), the District shall retain an independent testing laboratory to determine the nature of the material encountered and whether corrective measures or remedial action is required. The Contractor shall not be required to perform without consent any Work in the affected area of the Site relating to asbestos, polychlorinated biphenyl (PCB), or other hazardous material, until any known or suspected hazardous material has been removed, or rendered harmless, or determined to be harmless by District, as certified by an independent testing laboratory and approved by the appropriate government agency.

1.7 INDEMNIFICATION BY CONTRACTOR FOR HAZARDOUS MATERIAL CAUSED BY CONTRACTOR

A. In the event the hazardous materials on the Project Site is caused by the Contractor, the Contractor shall pay for all costs of testing and remediation, if any, and shall compensate the District for any additional costs incurred as a result of Contractor’s generation of hazardous material on the Project Site. In addition, the Contractor shall defend, indemnify and hold harmless District and its agents, officers, and employees from and against any and all claims, damages, losses, costs and expenses incurred in connection with, arising out of, or relating to, the presence of hazardous material on the Project Site.

1.8 TERMS OF HAZARDOUS MATERIAL PROVISION

A. The terms of this Hazardous Material provision shall survive the completion of the Work and/or any termination of this Contract.
1.9 NON-UTILIZATION OF ASBESTOS MATERIAL

A. NO ASBESTOS OR ASBESTOS-CONTAINING PRODUCTS SHALL BE USED IN THIS CONSTRUCTION OR IN ANY TOOLS, DEVICES, CLOTHING, OR EQUIPMENT USED TO EFFECT THIS CONSTRUCTION.

B. Asbestos and/or asbestos-containing products shall be defined as all items containing, but not limited to, chrysotile, amosite, anthophyllite, tremolite, and antinolite.

C. Any or all material containing greater than one-tenth of one percent (>.1%) asbestos shall be defined as asbestos-containing material.

1.10 REMOVAL OF CONTRACTOR INSTALLED ASBESTOS MATERIALS

A. All Work or materials found to contain asbestos or Work or material installed with asbestos-containing equipment will be immediately rejected and this Work will be removed at no additional cost to the District.

1. Decontamination and removal of Work found to contain asbestos or Work installed with asbestos-containing equipment shall be done only under supervision of a qualified consultant, knowledgeable in the field of asbestos abatement and accredited by the Environmental Protection Agency.

2. The asbestos removal contractor shall be appropriately licensed and registered, qualified in the removal of asbestos and shall be approved by the asbestos consultant, who shall have sole discretion and final determination in this matter.

3. The asbestos consultant shall be approved by the District, who shall have sole discretion and final determination in this matter.

1.11 NATURALLY OCCURRING ASBESTOS

A. To protect construction workers and members of the public from exposure to known areas of naturally-occurring asbestos (NOA), all ground disturbing activities will be undertaken in accordance with all applicable Cal-OSHA standards, contained in Title 8 of the California Code of Regulations (CCR). In addition, any ground-disturbing activity in an area that meets one or more of the applicability criteria for the Asbestos Airborne Toxic Control Measure (ATCM) for Construction, Grading, Quarrying and Surface Mining Operations, as adopted by the California Air Resources Board (CARB), is subject to the requirements therein. Per Section 93105 (b) of the ATCM, these criteria are as follows:

1. The area to be disturbed is located in a geographic ultramafic rock unit; or

2. The area to be disturbed has naturally-occurring asbestos, serpentine, or ultramafic rock as determined by the owner/operator, or the Air Pollution Control Officer (APCO); or

3. Naturally-occurring asbestos, serpentine, or ultramafic rock is discovered by the District, a registered geologist, or the APCO in the area to be disturbed after the start of any construction, grading, quarrying, or surface mining operation.
PART 2 - PRODUCTS
Not Used.

PART 3 - EXECUTION
Not Used.

END OF SECTION 01412
PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in
      this document, and provisions in the General Conditions and other Division 1 Specification
      Sections shall apply to this Section without limitation.

1.2 SUMMARY
   A. In Compliance with CEQA requirements, the District conducted an Initial Study to ascertain if the
      project may have an effect on the environment. The Initial Study identified potential impacts on
      the environment. However, all potential impacts of the proposed Project can be avoided or
      reduced to a less-than-significant level by implementation of the following mitigation measures.
      Contractor shall conform with the following mitigation measures, including but not limited to,
      the following:
      1. Noise Control
      2. Dust Control
      3. Traffic Control
      4. Spill Prevention, Control and Countermeasures
      5. Tree Protection
      6. Migratory Bird Protection
      7. Cultural Resources Protection

   B. In no case shall the restrictions identified in this Section limit the Contractor’s responsibility for
      compliance with all Federal, state, and local safety ordinances and regulations.

1.3 NOISE CONTROL
   A. The intent of this Section is to minimize construction noise within construction areas, lay-down
      areas, and communities adjacent to the construction site. To this end, the Contractor and all
      subcontractors, suppliers, and vendors, are required to comply with all applicable noise
      regulations, specification requirements, and the noise level limits specified herein.

   B. The Contractor shall use equipment with efficient noise-suppression devices and employ other
      noise abatement measures such as enclosures and barriers necessary for the protection of the
      public, as necessary.

   C. The Contractor shall schedule and conduct operations in a manner that will minimize, to the
      greatest extent feasible, the disturbance to the public in areas adjacent to the Work and to
      occupants of buildings in the vicinity of the Work.

   D. Noise Control Measures. Contractor shall implement the following noise-control measures to
      reduce and control noise generated from construction, demolition, and construction related
      activities:
      1. Restrict noise-producing construction activities to between 7:00 a.m. and 7:00 p.m. on
         weekdays. If construction is scheduled for Saturdays or Sundays to avoid disrupting college
         operations, restrict noise-producing construction activities to between 9:00 a.m. and 5:00
p.m. Construction on Sundays shall be avoided, if possible, and there will be no construction on public holidays without prior written request submitted to and written approval returned by the District, at its sole discretion. A decision by the District to deny Sunday or holiday work shall not be deemed to cause a delay in the Contract Time. When activities must occur outside the hours specified above, conform with notification requirements of this Section and utilize local barriers around equipment and other noise attenuating devices if necessary to limit noise to acceptable levels.

2. Comply with all City of Pleasant Hill requirements regarding both allowable hours of Work and noise level limitations.

3. All construction equipment shall have appropriate mufflers, intake silencers, and other required noise-control features, shall be properly maintained and in compliance with State standards.

4. Vehicles and other gas or diesel powered equipment shall be prohibited from unnecessary warming up, idling, and engine revving.

5. Impact tools shall utilize "quiet technology" to minimize noise.

E. Secure written permission from Project Manager at least three (3) working days prior to using noisy and vibratory equipment, such as jackhammers, concrete saws, impact tools, and high frequency electrical equipment. Cooperate with District if the use of noisy equipment becomes objectionable to college employees and/or students.

F. The work must be conducted so that nearby residents and college operations in surrounding facilities and classrooms will not be disturbed at any time during any Phase of the Work including, but not limited to, the following requirements:
   1. Do not use loud vocal or mechanical signals. Use of outside speakers, loud radios and similar devices are prohibited.
   2. Work shall be performed in a manner to prevent nuisance conditions such as noise which exhibits a specific audible frequency or tone (e.g., backup alarms, poorly maintained equipment, brake squeal, etc.) or impact noise (e.g., jackhammers, hoe rams). The District will make any final interpretation concerning whether or not nuisance noise conditions exist. Only the District representatives and specifically designated College representatives have the authority to stop the Work until nuisance noise conditions are resolved, without additional Contract Time or compensation for the Contractor.

1.4 DUST CONTROL

A. Contractor shall implement dust control measures to protect air quality during construction to control dust emissions generated during construction, implement the following Bay Area Air Quality Management District (BAAQMD) measures for construction emissions of particulate matter over 10 microns in size (PM10).

1.5 TRAFFIC CONTROL

A. Contractor shall implement traffic control to minimize the effects of construction traffic on the campus and surrounding residential areas, as appropriate.

B. Contractor shall notify the District, Architect, Project Manager, Project Inspector, Campus Police Department, city and county agencies, as applicable, a minimum of five (5) working days in advance of performing work which necessitates closing or interfering with traffic on public
thoroughfares, parking areas, driveways and walks. Obtain written permission prior to effecting such closures and interruptions.

1.6 SPILL PREVENTION, CONTROL AND COUNTERMEASURES

A. Contractor shall implement Spill Prevention, Control and Countermeasures to minimize the potential for and effects from spills of hazardous, toxic or petroleum substances during construction and demolition activities.

B. The federal reportable spill quantity for petroleum products, as defined in 40 CFR 110, is any oil spill that includes any of the following:
   1. Violates applicable water quality standards.
   2. Causes a film or sheen on or discoloration of the water surface or adjoining shoreline.
   3. Causes a sludge or emulsion to be deposited beneath the surface of the water or adjoining shorelines.

C. If a spill is reportable, notify the District's Representative and take action to contact appropriate safety and clean-up crews.
   1. A written description of reportable releases must be submitted to the District's Representative and to the San Francisco Bay Regional Water Quality Control Board (RWQCB). This submittal must contain a description of the spill, including the type of material and an estimate of the amount spilled, the date of the release, an explanation of why the spill occurred and a description of the steps taken to prevent and control future releases. Document the releases on a spill report form.
   2. If a reportable spill has occurred and results determine that project activities have adversely affected surface water or groundwater quality, the District will engage a registered environmental assessor at Contractor's expense for a detailed analysis to identify the likely cause of contamination. This analysis will conform to American Society for Testing and Materials (ASTM) standards and will include recommendations for reducing or eliminating the source or mechanisms of contamination.
   3. Based on this analysis, the Contractor shall select and implement measures to control contamination, with a performance standard that groundwater quality must be returned to baseline conditions. These measures will be subject to approval by the District.

1.7 TREE PROTECTION

A. Definitions:
   1. Dripline: If applicable, the area on the ground from the trunk of any tree to the point directly below the outermost tips of the foliage of that tree.
   2. Root Protection Zone ("RPZ"): If applicable, the areas enclosed with tree protection fencing as designated on the drawing(s).
   3. Tree damage: If applicable, tree damage shall include, but not limited to, the following: Significant injury to the root system or other parts of a tree including burning, application of toxic substances, damaging through contact with equipment or machinery, changing the natural grade within the Dripline or RPZ, compacting the soil within the Dripline or RPZ, interfering with the normal water requirements of the tree, unauthorized trenching or excavating within the Dripline or RPZ, or unauthorized removal of more than 1/3 of the live wood, foliage or roots.
B. Root Protection: No storage of materials or equipment will be allowed within the Dripline. Whenever possible, excavation shall be on a radial line, diverging from the tree trunk. For items of Work delayed materially beyond Date of Substantial Completion, provide update submittal within 14 Days after acceptance, listing date of acceptance as start of warranty period.

C. Exposure to harmful substances: No storage or dumping of any substances that may be harmful to trees shall occur at any location on the Site.

D. Where construction is to be performed in the vicinity of trees and shrubbery, the Work shall be carried on in a manner that will cause minimum damage. District will designate trees that are to be removed. Under no circumstances are additional trees to be removed without written permission from District. Trees and shrubbery that are not to be removed shall be protected from injury or damage resulting from Contractor’s operations.

E. Any tree that is removed without District’s permission or is irreparably damaged, in the opinion of District, shall cost Contractor in damages [$100.00] per square inch of cross section, measured at 4½ feet above ground, but not less than [$250.00], such cost to be deducted from monies due or to become due under the Contract. If tree protection is not performed or is not performed adequately and District determines that a tree has been irreparably damaged, Contractor shall pay the same amount of damages as for unauthorized removal of a tree. Contractor shall immediately report all tree damage to District, so that District may determine applicable damages.

1.8 MIGRATORY BIRD PROTECTION
A. If applicable, conduct tree removal and building demolition outside of the migratory bird nesting season. The typical nesting season for migratory birds in this part of California is April 15 through July 31.

B. If tree removal or building demolition must take place during the nesting season, these activities shall be preceded by a survey for nesting migratory birds. If bird nests are discovered in the trees or on the buildings, they shall not be removed while the nest(s) are active.

1.9 CULTURAL RESOURCES PROTECTION
A. If buried cultural resources, such as chipped or ground stone, historic debris, building foundations or human bones or paleontological resources are discovered inadvertently during ground-disturbing activities, Contractor shall avoid any further disturbance of the materials and immediately discontinue earthwork within 100 feet of the find. Contractor shall notify District’s Representative immediately upon encountering cultural resources. Contractor shall be prepared to move on to another location or phase of work, allowing sufficient time for District’s Representative to evaluate the nature and significance of the find and implement appropriate management procedures.

B. In the event that prehistoric human remains are encountered, further excavation or disturbance of the site shall cease immediately, pursuant to Health and Safety Code 7050.5. Contractor shall notify District’s Representative immediately upon encountering human remains. Contractor shall move on to another location or phase of Work to allow proper assessment of the situation.

C. If human remains of Native American origin are discovered during project construction, it will be necessary to comply with State laws relating to the disposition of Native American burials, which fall under the jurisdiction of the NAHC (Public Resources Code (PRC) Section 5097. Consequently, if any human remains are discovered or recognized in any location other than a dedicated
cemetery, there will be no further excavation or disturbance of the site or any nearby areas reasonably suspected to overlie adjacent human remains:

1. Until the Contra Costa County Coroner has been informed and has determined that no investigation of the cause of death is required;

2. If the remains are of Native American origin;
   a. The descendants of the deceased Native American(s) have made a recommendation to the landowner or the person responsible for the excavation work regarding means of treating or disposing of, with appropriate dignity, the human remains and any associated grave goods as provided in PRC Section 5097.98 or
   b. The NAHC has been unable to identify a descendent or the descendent failed to make a recommendation within 24 hours after being notified by the NAHC.

PART 2 – PRODUCTS - Not Used.

PART 3 – EXECUTION - Not Used.

END OF SECTION 01416
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Specification Sections shall apply to this section without limitation.

1.2 REQUIRED TEMPORARY FACILITIES AND CONTROLS

A. Contractor shall provide and maintain all temporary facilities, utilities, and controls as required to perform the Work and as required herein. Materials, installation, and maintenance of temporary utilities and facilities shall be in compliance with all applicable local and State regulatory requirements. Remove temporary utilities and facilities, including associated materials and equipment, when no longer required. Restore and recondition existing facilities used during construction and areas of the Site, roads, driveways, parking lots, landscaping, and any other existing improvements either damaged or disturbed by the installation of temporary facilities or utilities to their original condition. Remove and properly dispose of debris resulting from removal and reconditioning operations.

B. Contractor shall furnish and install requirements for temporary utilities, facilities, security, and protection which include but are not limited to the following:

1. Temporary Electric Power and Lighting
   a. The District will pay for electric power required to complete the Work. The installation and removal of all temporary distributions of power throughout the Site shall be the sole responsibility of the Contractor without adjustment to the Contract Price or the Contract Time. The Contract Price shall not be adjusted on account of any disruption, reduction or elimination of electrical power service to the Site, unless the same is caused by the District's non-payment of undisputed utility charges for such electrical power service. Contractor shall provide power outlets for construction operations, with branch wiring and distribution boxes located as required to complete the Work.
   b. Contractor shall provide and maintain electrical power at the Site for construction purposes, for temporary facilities and trailers, and for any other site offices or trailers required by the Contract Documents. Contractor shall provide all necessary wiring and appurtenances for connection to District’s system. Connect to District power at location(s) as directed by District.
   c. Contractor shall provide temporary power main service disconnect and over current protection at convenient locations and as required by governing codes.
   d. The Contractor shall be responsible for providing temporary facilities as required to deliver power service from the point of connection to the point(s) of intended use.
   e. Contractor shall verify characteristics of District power available for temporary service use, and provide all transformers and/or other equipment necessary to modify District
power for temporary use by the Contractor. Contractor shall pay all costs associated with any necessary modifications to District power for temporary use on the Work.

2. **Temporary Water**
   a. The District will furnish and pay for water during the course of the work to the extent water is available on the Site. The Contractor shall be responsible for providing all temporary facilities required to deliver District water from the point of connection to point of intended use on the Project.
   b. Contractor shall provide and use backflow preventers on water lines at point of connection to any District water supply. Backflow preventers shall comply with requirements of California Uniform Plumbing Code. The installation and removal of all temporary backflow preventers on the Site shall be the sole responsibility of the Contractor without any adjustment to either the Contract Price or the Contract Time. Before final acceptance, all temporary connections and piping installed by Contractor shall be removed in a manner approved by District’s Representative.

3. **Temporary Fences**
   a. Temporary Fencing: Contractor shall provide temporary fencing around specified construction areas for safety and protection. Provide chain link fencing not less than six (6) feet in height, complete with metal posts and required bracing, anchorage, visual screening, and with truck and pedestrian gates. All vehicle and Pedestrian gates and openings shall have gates secured after hours of operation.
   b. Contractor shall provide padlocks used for securing all gates. Padlocks shall be designed to prohibit cutting of shackle. Contractor shall coordinate keying strategy with District.
   c. Contractor will be responsible for maintaining security by limiting number of keys and restricting distribution to authorized personnel.
   d. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft and similar violation of security.
   e. Contractor shall provide secure lockup for stored materials and equipment which are of value or attractive for theft.
   f. Contractor shall be responsible for project security for materials, tools, equipment, supplies and completed and partially completed Work.
   g. All temporary HVAC equipment shall be fenced in completely to prevent public access to the equipment.

4. **Temporary Protection of Public and Private Property**
   a. Contractor shall protect, shore, brace, support and maintain all existing underground utilities including but not limited to the following: all pipes, conduits, drains and other underground construction uncovered or otherwise affected by construction operations.
   b. All pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires, fences and other surfaces structures affected by construction operations, together with all sod and shrubs in yards, planting areas, and medians, shall be restored to their
original condition, wherever affected by construction operations. All replacements shall be made with new materials.

c. Contractor shall be responsible for all damage to streets, roads, highways, shoulders, ditches, embankments, culverts, bridges and other public or private property, regardless of location or character, which may be caused by transporting equipment, materials, or workers to or from the Work, Site or any part thereof, whether by Contractor or Subcontractors. Contractor shall be solely responsible without adjustment of the Contract Price or the Contract Time to make satisfactory and acceptable arrangements with the District, or the agency or authority having jurisdiction over the damaged property, concerning its repair or replacement or payment of costs incurred in connection with the damage.

d. All fire hydrants and water control valves shall be kept free from obstruction and available for use at all times.

5. **Temporary Sanitary Facilities**
   a. Contractor shall provide and maintain temporary sanitary toilets for use of all workers throughout the course of the Work.
   b. Sanitary facilities shall be of reasonable capacity, properly maintained throughout the Project, and obscured from public view to the greatest practical extent. Contractor shall enforce the use of such sanitary facilities by all personnel at the Site.
   c. Contractor shall comply with all minimum requirements of the Contra Costa Health Department, Cal OSHA, or other public agency having jurisdiction.
   d. Maintain temporary facilities in a sanitary condition at all times during the Project.
   e. Contractor will keep sanitary facilities free from graffiti.
   f. Contractor is not permitted to use existing campus toilet facilities.
   g. All Portable toilets shall be located within fenced areas of the Project Site

6. **Temporary Barriers and Enclosures**
   a. Contractor shall provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent improvements from damage during construction operations.
   b. Contractor shall provide barricades as required by the Contract Documents, governing agencies, and/or field conditions in order to protect public access pathways to existing buildings scheduled to remain open during any Phase of the Work.
   c. Contractor shall protect vehicular traffic, stored materials, Site, and existing structures from damage.
   d. Contractor shall provide and maintain temporary enclosures to prevent public entry to any construction area, and to protect all persons using other existing buildings and portions of the Site and/or Premises Contractor shall maintain safe access to all existing facilities to remain in operation during any Phase of the Work.

7. **Temporary Pollution Control**
   a. Contractor shall prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris and other substances resulting from construction activities. No
sanitary wastes shall be permitted to enter any drain or watercourses other than sanitary sewers. No sediment, debris or other substance shall be permitted to enter sanitary sewers without authorization of the receiving sanitary sewer service and all possible Best Management Practices (BMPs) shall be taken to prevent such materials from entering any drain to watercourse. Rate of discharge for storm water may be not increased by the Project during or following construction.

b. In the event that dewatering of excavations is required, Contractor shall obtain the necessary approval and permits for discharge of the dewatering effluent from the local jurisdiction. Contractor shall be responsible for assuring that water quality of such discharge meets the appropriate permit requirements prior to any discharge.

8. **Construction Aids**
   a. Contractor shall furnish, install, maintain and operate all construction aids as required for the performance of the Work. Such construction aids include, but are not limited to, elevators and hoists, cranes, temporary enclosures, swing staging, scaffolding, and temporary stairs.

9. **Erosion Control**
   a. Contractor shall comply with the District Storm Water Pollution Prevention Plan for this Project, if applicable.
   b. Contractor shall prevent soil erosion on the Site and adjacent property resulting from its construction activities to the maximum extent practical, including implementation of Best Management practices. Effective measures shall be initiated prior to the commencement of clearing, grading, excavation or other operations that will disturb the natural protection.

10. **Vehicular and Pedestrian Traffic Controls**
    a. The college campus is an active site, with vehicular and pedestrian traffic occurring at all times of the day and all days of the week. Contractors shall coordinate with District’s Representative concerning vehicular traffic associated with the construction in order to minimize disruption to college operations. Delivery trucks and large equipment shall enter the Contractors access gate and shall use the route mutually agreed upon between District and Contractor at the beginning of the work. Contractor shall provide signage directing construction and delivery traffic to this gate. Contractor shall provide information regarding sign types, size, material, text and locations to be reviewed and approved by the District Representative prior to installation.
    b. Contractor shall keep all required fire department and emergency vehicle access paths free from obstruction at all times during the Project.

11. **Temporary Signage**
    a. All signs must be reviewed and approved by the District prior to installation.
    b. Contractor shall provide temporary directional signs for construction personnel and visitors.
    c. Contractor shall maintain and touch-up signs so they are legible at all times.
12. **Temporary Heat and Ventilation**
   a. Provide temporary heat as required to maintain adequate environmental conditions to facilitate progress of the work, to meet specified minimum environmental conditions for the Work and to protect materials and finishes from damage due to improper temperature and humidity conditions.
   b. Provide adequate forced ventilation of enclosed areas as required for proper installation and curing of materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors and gases.
   c. HVAC Equipment: Contractor shall provide temporary HVAC equipment during all times when the existing building HVAC equipment being replaced in this project are not functioning. See plans and Section 01140 Work Restrictions for additional information.

**PART 2 – PRODUCTS**

2.1 **MATERIALS** - Not used

**PART 3 - EXECUTION**

3.1 **INSTALLATION, GENERAL**
   A. Locate contractor facilities where they will serve Project adequately and result in minimum interference with performance of Work. Relocate and modify facilities as required by progress of the Work during entire project including all phases of project.
   B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
   C. Contractor shall verify and coordinate all relocation of facilities with the District, Project Manager.

3.2 **OPERATION, TERMINATION AND REMOVAL**
   A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
   B. Maintenance: Maintain facilities in good operating condition until removal.
      1. Where appropriate, maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
   C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion and acceptance by the District.
   D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use a permanent facility or no later than Final completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.

**END OF SECTION 01500**
PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Specification Sections shall apply to this Section without limitation.

1.2 SUMMARY
A. The District has established that this Project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors shall be employed.
B. Of the inevitable waste that is generated, as many of the waste materials as economically feasible shall be reused, salvaged, or recycled. Waste disposal in landfills shall be minimized.

1.3 WASTE MANAGEMENT GOALS FOR THE PROJECT
A. The District has established that this Project shall minimize the creation of construction and demolition waste, and shall divert a minimum of 75% of Project generated waste from landfills. Factors that contribute to waste such as over packaging, improper storage, ordering error, poor planning, breakage, mishandling, and contamination, shall be minimized. Of the inevitable waste that is generated, as many of the waste materials as economically feasible shall be reused, salvaged, or recycled. Waste disposal in landfills shall be minimized. Both recycled and waste need to be logged and documented by volume and weight.
B. Diversion Goals: A minimum 75% of total Project waste shall be diverted from landfill. The following waste categories, at a minimum, shall be diverted from landfill. These materials include, but not limited to:
   1. Landscape and land clearing debris (green wood materials)
   2. Asphalt pavement
   3. Gravel and aggregate products
   4. Concrete
   5. Masonry scrap and rubble (brick, concrete, masonry, stone)
   6. Metals (ferrous and nonferrous)
   7. Clean wood (dimensional lumber, sheet goods, millwork, scrap, pallets)
   8. Plastics (films, containers, PVC products, polyethylene products)
   9. Asphalt/Bituminous roofing
   10. Insulation Materials
   11. Glass (un-tempered)
   12. Door and window assemblies
   13. Carpet and carpet pad
   14. Fibrous acoustic materials
   15. Ceiling Tiles
   16. Plumbing fixtures and equipment
   17. Mechanical equipment
18. Lighting fixtures and electrical components
19. Cardboard packing and packaging
20. Furniture
21. Sheet Rock
22. Electronic Waste
23. Universal Waste
24. Paper

1.4 REFERENCES AND RESOURCES

A. This information is provided for Contractor’s convenience only, and the District does not warrant its accuracy. County specific information is available on the Contra Costa County Waste Reduction and Recycling web page at http://www.co.contra-cost.ca.us/depart/cd/recycle/index.html. Additional information may also be found at the county conservation web page at http://www.cccounty.us/index.aspx?NID=285. Refer to the Contra Costa County Builder’s Guide to Reuse & Recycling and the Contra Costa County Recycling Guide.

B. The following sources provided for references:
1. BuildingGreen.com
2. California Integrated Waste Management Board
3. EPA Office of Solid Waste and Energy Response

1.5 QUALITY ASSURANCE:

A. Regulatory Requirements. Comply with applicable requirements of the State of California, local ordinances and regulations concerning management of construction, clearing, and inert materials.

B. Disposal Site, Recyclers and Waste Materials Processors. Use only facilities properly permitted by the State of California, and/or by local authorities where applicable.

1.6 WASTE DIVERSION DOCUMENTATION

A. Provide the District with delivery receipts for the recovered materials and waste materials sent to the permitted recycling facilities, processing facilities, or landfill with the following information on a form to be approved by the District:
1. Name of firm accepting the recovered materials or waste materials
2. Specify type of facility (e.g. retail facility, recycler, processor, Class III landfill, MRF)
3. Location of the facility
4. Type of materials
5. Net weights (or volume) of each type of material
6. Date of delivery

B. Application for Progress Payments: Contractor shall submit with each Application for Progress Payment a Summary of the project waste generated. Failure to submit this information shall render the Application for Payment incomplete and shall delay Progress Payment. The District
and its representatives shall not be responsible for delaying Progress Payments. With each Application for Payment, submit required Progress Documentation, including:

1. manifest,
2. weight tickets,
3. receipts,
4. and invoices specifically identifying the project and waste material.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION

3.1 STORAGE AND HANDLING

A. Site Storage

1. Remove materials for recycling and recovery from the work locations to approved containers or storage area as required. Failure to remove waste or recovered materials will be considered cause for withholding payment and termination of Contract.

2. Position containers for recyclable and recoverable waste materials at a designated location on the Project Site. If materials are sorted on site, also provide a sorting area and necessary storage containers.

3. Change-out loaded containers for empty containers, as demand requires.

4. If recovered materials are stored on-site for project duration provide adequate security from pilferage.

B. Handling

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

2. Insure all recovered materials are made safe for handling and storage.

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

3.2 PROJECT CONDITIONS

A. Site Condition:

1. Signs and instructions should be clear, and easy to understand. All recycling containers should be clearly labeled and lists of acceptable and unacceptable materials will be posted throughout the site. Whenever possible, they should be in multiple-languages, especially in Spanish, and in graphic symbols.

2. The Contractor shall ensure the safety of all personnel involved in the waste management process.
3. A site management plan shall be created including: work areas, materials processing areas, materials storage and disposal areas, worker hand-washing and changing stations, first aid and medical information.

END OF SECTION 01505
SECTION 01740
WARRANTIES/GUARANTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Division 1 Specification Sections shall apply to this Section without limitation.

1.2 RELATED DOCUMENTS SPECIFIED IN OTHER SECTIONS

A. Section 01010 – “Summary of Work”
B. Section 01770 – “Contract Closeout Procedures”
C. Section 01780 – “Project Record Documents”
D. Divisions 2 through 16 Sections for Warranties/Guaranties requirements for the Work in those Sections.

1.3 SUMMARY OF WORK

A. The Contractor warrants to the District and Architect that material and equipment furnished under the Contract will be of the highest quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective.

B. Contractor hereby warrants and guaranties to District all Work performed on this Project, including all material and equipment incorporated therein, as set forth below:

C. Pursuant to the requirements of this Section and other section of the Contract Documents, Contractor agrees to unconditionally warranty and guaranty the quality and adequacy of all of Work provided under this Contract including, without limitation, all labor, materials and equipment provided by the Contractor and Subcontractors of all tiers in connection with the Work.

D. Contractor’s Warranty and/or Guaranty shall become effective on the first day following District’s issuance of a written Notice of Substantial Completion of a specifically defined Phase of the Project, or on such other date as may be specified elsewhere in the Contract Documents, and once effective, the Warranties and/or Guaranties shall remain operative and shall bind Contractor as further described herein for a period of one (1) year, and/or more as specified in the Contract Documents.

E. This Section does not in any way limit the Guarantee on any items for which a longer Warranty or Guaranty is specified or on any items for which a manufacturer gives a Guarantee for a longer period. Contractor shall furnish District all appropriate Guaranty or Warranty Certificates upon completion of the project.
F. Neither final payment nor use or occupancy of the Work performed by the Contractor shall constitute an acceptance of Work not done in accordance with Contract Documents, nor relieve Contractor of liability in respect to any express warranties and/or guaranties or responsibilities for faulty materials or workmanship.

G. Contractor shall remedy any defects in the Work and repair any associated damage resulting therefrom, and pay all costs for any such Work which shall become evident within any Project Warranty and/or Guaranty period. If any Work is found to be defective within any Project Warranty and/or Guaranty period, Contractor shall, without cost to District, promptly correct such defective Work.

H. Contractor shall remove any defective Work rejected by District and replace it with Work that complies in all respects to the requirements of the Contract Documents. Remove and replace any damage to other Work or the Work of others resulting therefrom.

I. If Contractor fails to promptly comply with the terms of such instructions, District may have the defective Work corrected or the rejected Work removed and replaced. Contractor shall pay for all costs, losses and damages caused by or resulting from such removal and replacement within the Warranty and/or Guaranty period.

J. If, in the opinion of the District, defective Work creates a dangerous condition or requires immediate correction or attention to prevent further loss to the District, the District will attempt to give the notice required by this Section. If the Contractor cannot be contacted or does not comply with the District’s requirements for correction within a reasonable time as determined by the District, the District may, notwithstanding the provisions of this Section, proceed to make such correction or attention which shall be charged against Contractor. Such action by the District will not relieve the Contractor of the Guarantee provided in this Section or elsewhere in this Contract.

K. Where Contractor fails to correct defective Work, or defects are discovered outside the Warranty and/or Guaranty period, District shall have all rights and remedies granted by law.

L. Inspection of the Work shall not relieve Contract of any of its obligations under the Contract Documents. Even though equipment, materials, or Work required to be provided under the Contract Documents have been inspected, accepted, and paid for, Contractor shall, at its own expense, replace or repair any such equipment, material, or Work found to be defective or otherwise not to comply with the requirements of the Contract Documents up to the end of the guaranty period.

M. These Warranties and/or Guaranties are in addition to any other warranty or guaranty requirements contained in the Contract Documents, and not in lieu of any other liability imposed on Contractor under the Contract Documents and governing laws with respect to Contractor’s duties, obligations, and performance under the Contract Documents.

1.4 FORMAT

A. All Warranties/Guaranties and shall include:

1. Contractor, subcontractor, and equipment supplier shall provide Warranties and Guaranties on their original company letterhead with original signature.

2. Contractor shall provide original Warranties and Guaranties. Photo copies, fax and e-mail copies are not acceptable.
1.5 PREPARATION

A. Contractor shall obtain warranties and guaranties, executed in duplicate by each applicable and/or responsible subcontractor(s), supplier(s), and manufacturer(s), within fifteen (15) days after Notice of Substantial Completion of the applicable Work or Phase of Work. Except for items put into use with District’s permission, Contractor shall leave date of beginning of time of warranty or guaranty blank until the date of completion is determined by District.

B. Contractor’s Response to Construction Warranty and Guaranty Service Requirements
   1. Following oral or written notification by the District, respond to construction warranty and guaranty service requirements.

C. Warranty and/or Guaranty Tags
   1. At the time of installation, tag each warranted or guaranteed item with a durable, oil and water resistant tag approved by the Contracting Officer. Attached each tag with a copper wire and spray with a silicone waterproof coating. The date of Substantial Completion and the Contractor Authorized signature must remain blank until the date the District makes a determination of Substantial Completion. Show the following information on the tag:

WARRANTY/GUARANTY INFORMATION - D-1045E

a. Type of product/material_____________________________________.
b. Model number_________________________________________________.
c. Serial number_________________________________________________.
d. Contract number_______________________________________________.
e. Warranty/Guaranty period______(months) from_________to_________________.
f. Inspector’s signature___________________________________________.
g. Construction Contractor_______________________________________.
Address_______________________________________________________.
Telephone number_______________________________________________.
h. Warranty or Guaranty contact_______________________________________________.
Address_______________________________________________________.
Telephone number_______________________________________________.
i. Warranty or Guaranty response time priority code_________________________.

j. WARNING - CAMPUS PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE DURING THE WARRANTY PERIOD.

PART 2 - PRODUCTS
Not Used.

PART 3 - EXECUTION
Not Used.

END OF SECTION 01740
SECTION 01770
CONTRACT CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Division 1 Specification Sections shall apply to this Section without limitation.

1.2 RELATED REQUIREMENTS SPECIFIED IN OTHER SECTIONS
   A. Section 01010 – “Summary of Work”
   B. Section 01290 – “Payment Procedures”
   C. Section 01710 – “Cleaning Requirements”
   D. Section 01740 – “Warranties and Guaranties”
   E. Section 01780 – “Project Record Documents”
   F. Divisions 2 through 16 Sections for Contract Closeout Procedure requirements for the work in those Sections.

1.3 SUMMARY
   A. This section specifies administrative and procedural requirements for Contract closeout.

1.4 CONTRACT CLOSEOUT SUBMITTALS
   A. Color prints of full size contractor Marked-up Contract Drawings
   B. Color prints of full size contractor marked-up Shop Drawings
   C. Professionally Drafted As-Built Record Drawings
   D. Dated marked-up copies of Conformed Specifications
   E. Marked-up Project Data submittals
   F. Record Samples
   G. Field records for variable and concealed conditions
   H. Project record documents. See Section 01780.
   I. Operating and maintenance manuals and data
   J. Warranties and bonds
   K. Warranty Tags
   L. Spare Parts Data
   M. Service and maintenance contracts
1.5 REMOVAL OF TEMPORARY CONSTRUCTION FACILITIES
   A. When appropriate, remove temporary materials, equipment, services, and construction prior to Initial Inspection.

1.6 INITIAL PUNCH LIST AND INSPECTION
   A. When Contractor considers Work to be Substantially Complete, submit written notice to District’s Representative requesting an Initial Inspection and listing items remaining to be completed or corrected listed by room number and item number (hereinafter “Initial Punch List”). The Contractor and/or its Subcontractors shall proceed promptly to complete and correct items on the list without waiting for District review of the Initial Punch List and inspection of the Work. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

   B. The Contractor shall not submit a notice requesting an Initial Inspection unless the Work is Substantially Complete.

   C. Should District’s Representatives determine that Work is not Substantially Complete, the Architect or Project Manager will promptly notify Contractor in writing, listing Work that must be completed prior to Substantial Completion. Any inspection list that is submitted to the District that does not result in a District determination of Substantial Completion will not be considered an accepted Initial Punch List. If the Work or Phase of Work is determined to not be Substantially Complete, Contractor shall complete all Work as directed prior to requesting an additional Initial Inspection by the District to determine Substantial Completion per this Specification Section.

   D. Upon receipt of the Contractor’s Initial Punch List, and not before, the Architect, Project Manager, and Inspector will make an Initial Inspection to determine whether the Work, or Phase of Work, is Substantially Complete.

      1. All fire and life safety items, manufactured units, equipment and systems that require startup must have been started, run, tested, and operational for periods prescribed by the Contract Documents before a request for Initial Inspection is accepted by the District.

      2. If additional Initial Inspections are required to review Initial Punch List items due to incompleteness of the Work by Contractor, Contractor will reimburse District for all costs associated with these inspections if additional services fees by District consultants are required. The costs of such District additional service fees will be deducted from the Contract Sum by Change Order.

1.7 SUBSTANTIAL COMPLETION
   A. When District determines that the Work is Substantially Complete, District will issue a Certificate of Substantial Completion, accompanied by Punch List of items to be completed or corrected as verified and/or appended by Architect and District.

   B. When the Work is Substantially Complete, the District will file a Notice of Completion.

      1. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work unless otherwise provided in the Notice of Completion.
2. The Notice of Completion shall be submitted to the Contractor for their written acceptance of responsibilities assigned to them in such Notice prior to District filing the Notice of Completion for purposes of initiating the release of Retention for the Work or Phase of Work.

3. The District shall withhold from Contractor payment the value of remaining Work, Work to be corrected, incomplete Work, and an amount identified for Punch List Work, and as otherwise identified in Public Contract Code.

C. The Contractor shall complete the items listed in the Punch List within ten (10) working days of the Certificate of Substantial Completion. The Contractor shall execute the Work such that the District can occupy the Work within seven (7) calendar days of the date of the Certificate of Substantial Completion.

1.8 FINAL INSPECTION

A. When Contractor considers the items listed in the Final Punch List to be complete the Contractor shall submit written notice to District’s Representative requesting a Final Inspection.

B. Upon receipt of the Contractor’s request for Final Inspection, and not before, the Contractor, Architect, and Project Manager, shall meet to go over the Contract Documents to identify the administrative requirements for contract close-out.

1. The Project Manager will prepare a list of requirements remaining for administrative close-out and shall provide the list to the Contractor.

2. The Contractor shall complete all items on the administrative close-out list within twenty-one (21) days.

C. Subsequent to the meeting to identify administrative close-out requirements, Architect, Project Manager, Campus Representatives, and Inspector will inspect the Work to determine whether the Work identified on the Final Punch List is complete.

D. If additional Final Inspections are required to review the Final Punch List items due to incompleteness of the Work by Contractor, Contractor will reimburse District for all costs associated with these inspections if additional services fees by District consultants are required. The costs of such District additional service fees will be deducted from the Contract Sum by Change Order.

E. When the Architect determines that all final punch list items have been completed, a final Project Inspection Report will be issued. Any outstanding administrative close-out requirements will be identified and a value for withholding from Progress Payment or Final Payment will be assigned.

F. The Project Inspector (IOR), the Project Manager, and the Contractor shall, at all times, be together during all inspections. The Contractor shall give 24-hour notice to the District for such inspections.

1.9 FINAL COMPLETION

A. Final Completion occurs when all Work meets all requirements of the Contract Documents. When Contractor considers all Work complete and all close-out requirements have been performed, submitted, and accepted, submit written certification to District that:
1. Contractor has inspected Work for compliance with Contract Documents, and all requirements for Final Acceptance have been met.

2. Except for Contractor maintenance and Deferred or Seasonal Testing, after Final Acceptance, all Work has been completed in accordance with Contract Documents and deficiencies listed with any Certificate of Substantial Completion have been corrected. Equipment and systems have been tested in the presence of Architect, Project Inspector (IOR), Project Manager, Construction Manager, and District Representatives and are operative.

B. Should District determine that the Work is incomplete or defective or that administrative requirements have not been completed:

1. District’s Representative promptly will so notify Contractor, in writing, listing the incomplete or defective items.

2. Contractor shall promptly remedy all incomplete and/or defective Work and notify the District when it is ready for re-inspection. District’s Representatives will then re-inspect the Work. If deficiencies previously noted are found not to be corrected, Contractor shall pay all District costs for the re-inspection.

3. When District determines that all Work and requirements are complete under the Contract Documents, District or Project Manager will request Contractor to make a request for Final Payment.

1.10 FINAL CLEANING
Contractor shall comply with all applicable requirements for final cleaning.

1.11 PROJECT RECORD DOCUMENTS
Contractor shall comply with all applicable requirements in Section 01780 (Project Record Documents.)

1.12 PROJECT WARRANTY
A. Requirements for Contractor’s Warranty of completed Work are included in the General Conditions and Section 01740.

1.13 Not used

1.14 RETURN OF DISTRICT KEYS, PARKING PERMITS AND IDENTIFICATION
Contract Documents will not be closed out and final payment will not be made until all personnel identification media, vehicle permits, and keys issued to Contractor during prosecution of Work are returned to the District Project Manager.

1.15 RELEASE OF CLAIMS
A. Contract Documents will not be closed out and final payment will not be made until Agreement and Release of Any and All Claims is completed and executed by Contractor and District.
1.16 FIRE INSPECTION COORDINATION
   A. Coordinate required fire inspection(s) with governing agencies and provide sufficient notice to District Project Manager to permit convenient scheduling (if applicable.)

1.17 PROJECT RECORD DRAWINGS, SPECIFICATIONS AND PRODUCT DATA
   A. Comply with requirements of Section 01780 Project Record Documents.

1.18 OPERATION TESTS
   A. Conduct operational tests as required to demonstrate that all systems have been completed and are in compliance with all requirements.
   B. Furnish a written record of test results using recording type instruments where applicable and as directed.

1.19 OPERATION AND MAINTENANCE MANUALS
   A. Comply with requirements of Section 01780 Project Record Documents.

1.20 MATERIALS, EQUIPMENT AND FINISHES MANUAL
   A. Comply with requirements of Section 01780 Project Record Documents.

1.21 SERVICE AND MAINTENANCE CONTRACTS
   A. If applicable, compile, review, and submit specified service and maintenance contracts as specified for warranties and bonds.

1.22 MISCELLANEOUS PROJECT RECORD SUBMITTALS
   A. Refer to other Specification Sections for miscellaneous record keeping requirements and submittals. Immediately prior to Final Completion complete miscellaneous records and place them in good order, properly identified and bound or filed, ready for District use and reference. Submit to the Architect for review and approval.

1.23 EXTRA MATERIALS
   A. Where specified, provide extra materials in the quantities and manner specified.
   B. Delivery and certification of extra materials shall be prerequisite to Substantial Completion.

PART 2 - PRODUCTS
Not Used.

PART 3 - EXECUTION
Not Used.

END OF SECTION 01770
SECTION 01780
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Division 1 Specification Sections shall apply to this Section without limitation.

1.2 RELATED REQUIREMENTS SPECIFIED IN OTHER SECTIONS
A. Section 01010 – “Summary of Work”
B. Section 01740 – “Warranties and Guaranties”
C. Section 01745 – “Warranty/Guaranty Form”
D. Section 01770 – “Contract Closeout Procedures”
E. Section 01785 – “Operation and Maintenance Data”
F. Divisions 2 through 16 Sections for Project Record Documents requirements for the work in those Sections.

1.3 SUMMARY
A. This section includes administrative and procedural requirements for Project Record Documents, including but not limited to the following where applicable:
   1. Record Drawings
   2. Record Specifications
   3. Record Product Data
   4. Record MEP & Structural coordination documents
   5. Proposition 39 Documentation and Reports
B. Project Record Documents requirements that revise the Contract Documents include, but are not limited to, the following:
   1. Marked-up copies of Drawings
   2. Marked-up copies of Shop Drawings
   3. Newly prepared Drawings
   4. Marked-up Product Data submittals
   5. Field records, such as photographs, for variable and concealed conditions
   6. Record information for Work that is only schematically shown
   7. Maintenance forms for equipment
C. Other Project closeout requirements are included in Section 01770, Contract Closeout Procedures.

D. Contractor shall dedicate one complete full size set of the Contract Drawings and one complete Project Manual for use in recording as-built conditions.

1.4 PROJECT RECORD DRAWINGS

A. Mark-up Procedure: During the construction period, maintain a complete, current set of full size blackline prints of Contract Drawings and Shop Drawings for Project Record Documents purposes. Label each document (on first sheet or format page) “Project Record” in 2-inch high printed letters. Keep all record documents current.

B. A reference by number to a Change Order, CCD, RFI, RFQ, RFP, Field Order or other such document is not acceptable as sufficient record information on any record document. Do not conceal any Work until required record information has been recorded.

1. Contractor shall mark Record Drawings to indicate the actual installation where the installation varies appreciably from the installation shown originally. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later. Items required to be marked include, but are not limited to:

   a. Dimensional changes to the Contract Drawings (horizontal and/or vertical)
   b. Revisions or any modification to details shown on the Contract Drawings
   c. Depths of various elements of foundations in relation to main floor level or survey datum.
   d. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
   e. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
   f. Locations of underground work, points of connection with existing utilities, changes in direction, valves, manholes, catch basins, capped stub outs, invert elevations and similar items
   g. Final, actual numbering of each electrical circuit
   h. Revisions to routing of piping and conduits
   i. Revisions to electrical circuitry
   j. Actual equipment locations
   k. Duct size and routing
   l. Changes made by Change Order, CCD, ASI, or any other directive
   m. Details not on original Contract Drawings

2. Contractor shall mark completely and accurately Project Record Drawing prints of Contract Drawings or Shop Drawings, whichever is the most capable of showing actual physical conditions. Where Shop Drawings are marked, show cross-reference on Contract Drawings location.

3. Contractor shall mark Project Record Drawing sets with red, erasable colored pencil; use other colors to distinguish between changes for different categories of the Work at the same location.
4. Contractor shall be responsible for Mark-up: Where feasible, the individual or entity who obtained Project Record Drawing data, whether the individual or entity is the installer, Subcontractor or similar entity, is required to prepare the mark-up on Project Record Drawings.

C. Contractor shall prepare Record Drawings: Immediately prior to inspection for Certification of Substantial Completion of the Work, review completed marked-up Project Record Drawings with District, Project Inspector, Construction Manager, and Architect to ensure accuracy of information. Once accuracy of information is confirmed, prepare and submit a full set of as-built Contract Drawings and Shop Drawings.

1. Incorporate changes and additional information previously marked on print sets. Delete, redraw, and/or add details and notations where applicable. Identify and date each Drawing; include the printed designation “PROJECT RECORD DRAWING” and the date prepared in a prominent location on each Drawing.

2. Distribution: Whether or not changes and additional information were recorded, organize and bind original marked-up set of prints that were maintained during the construction period into manageable sets. Bind the set with durable paper cover sheets, with appropriate identification, including titles, dates and other information on cover sheets and submit to District.

1.5 PROJECT RECORD SPECIFICATION

A. Contractor shall, during the construction period, maintain one copy of the Project Specifications, including all addenda and all other modifications issued for Project Record Documents purposes.

B. Contractor shall mark the Project Record specifications to indicate the actual installation where the installation varies substantially from that indicated in Specifications and/or modifications issued. Note related Project Record Drawing information, where applicable. Give particular attention to substitutions, selection of product options, Change Order and Construction Change Directive Work, and information on concealed installation that would be difficult to identify, measure, and record later.

1.6 PROJECT RECORD PRODUCT DATA

A. Contractor shall, during the construction period, maintain one copy of each Project Record Product Data submittal for “Project Record Document” purposes.

B. Contractor shall arrange Project Record Product Data by Specification Section number, and provide names, addresses, fax numbers, emails addresses, and telephone number of Subcontractors and suppliers. Information to be provided includes:

1. Trade Names
2. Model or type numbers
3. Assembly diagrams
4. Operating instructions
5. Cleaning instructions
6. Maintenance instructions
7. Recommended spare parts
8. Product data

1.7 MISCELLANEOUS PROJECT RECORD SUBMITTALS
   A. Refer to other Specification Sections for miscellaneous record keeping requirements and submittals. Immediately prior to Substantial Completion of the Work complete miscellaneous records and place in good order, properly identified, ready for use and reference. Submit to the District for District’s records, in Adobe PDF format.

1.8 INSTALLATION, OPERATION, AND MAINTENANCE MANUALS
   A. Submit Installation, Operation, and Maintenance Manuals in accordance with this Section, Section 01330, Submittal Procedures and Section 01785, Operation and Maintenance Data.

1.9 ELECTRONIC MEDIA FORMAT
   A. Electronic Media Format: Electronic media format shall be Adobe PDF, with chapter markers and/or bookmarks inserted in place of the equivalent hard copy section tabs. Electronic copy shall include all tables, charts, drawings, codes and all other matters reflected in hard copies. Electronic media files shall be delivered on a unique CD-ROM.

1.10 PROPOSITION 39 DOCUMENTATION
   A. Contractor shall follow all Proposition 39 requirements, include tracking and reporting of labor and actual material costs. Labor must be backed up by daily and payroll reports. Material, labor, and other soft costs must be supported by itemized invoices, including those from vendors, subcontractors, and direct contractor costs. This information must be reported on Form J included in Section 01340 Administrative Forms-Logs.

PART 2 - PRODUCTS
Not Used.

PART 3 - EXECUTION
Not Used

END OF SECTION 01780
SECTION 01785
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Specification Sections shall apply to this Section without limitation.

1.2 SUMMARY

A. This section includes administrative and procedural requirements for Operation and Maintenance (O&M) data and documents.

1.3 FORMAT

A. Contractor shall compile O&M manuals for all building equipment including mechanical, plumbing and electrical equipment, commissioned or not.

B. Submit O&M Data specifically applicable to this contract and a complete and concise depiction of the provided equipment, product, or system, stressing and enhancing the importance of system interactions, troubleshooting, and long-term preventative maintenance and operation. Organize and present information in sufficient detail to clearly explain O&M requirements at the system, equipment, component, and subassembly level. Include an index preceding each submittal. Submit in accordance with this section and Section 01330 SUBMITTAL PROCEDURES.

1. Package Quality. Documents must be fully legible. Poor quality copies and material with hole punches obliterating the text or drawings will not be accepted.

2. Package Content. Data package content shall be as shown in the paragraph titled "Schedule of Operation and Maintenance Data Packages." Comply with the data package requirements specified in the individual technical sections, including the content of the packages and addressing each product, component, and system designated for data package submission.

3. Changes to Submittals. Manufacturer-originated changes or revisions to submitted data shall be furnished by the Contractor if a component of an item is so affected subsequent to acceptance of the O&M Data. Changes, additions, or revisions required by the Architect or District Project Manager for final acceptance of submitted data, shall be submitted by the Contractor within 30 calendar days of the notification of this change requirement.

1.4 SYSTEMS COVERED

A. The Contractor shall supply the required information for all systems identified in the technical specification sections and in this section. A separate manual or chapter shall be provided for each applicable system as follows:

1. Chillers
2. Cooling Towers
3. Boilers
4. Pumps
5. Air Handling Units (include sequence of operation, one line diagram and area served in a plastic pouch for mounting on equipment or in equipment room)
6. Exhaust fans
7. Supply Air Fans (excluding Air Handling Units)
8. Valves and Pipe Specialties (include valve identification chart)
9. Variable Frequency Drives (VFD)
10. Building Management/Temperature Control System (BMS)
11. HVAC, Testing Adjusting and Balancing.

1.5 COMPUTER PROGRAMS
A. When any equipment requires operation by computer programs, submit copy of original program on CD, with a hard-copy and an electronic copy (Adobe PDF format) of all user manuals and guides for operating the programs. Program shall be Windows XP compatible. Provide required licenses to District at no additional cost.

1.6 SUPPLEMENTAL DATA
A. Contractor shall prepare written text and/or special drawings to provide necessary information when manufacturer’s standard printed data is not available and/or additional information is necessary for a proper understanding and operation and maintenance of equipment or systems, or when it is necessary to supplement data included in the manual or Project documents.

1.7 SCHEDULE OF INFORMATION FOR OPERATION AND MAINTENANCE DATA PACKAGES
A. Supply all of the following, when and where applicable, for each O&M data package:
1. Safety precautions
2. Operator prestart
3. Startup, shutdown, and post-shutdown procedures
4. Normal operations
5. Emergency operations
6. Operator service requirements
7. Environmental conditions
8. Lubrication data
9. Preventive maintenance plan and schedule
10. Cleaning recommendations
11. Troubleshooting guides and diagnostic techniques
12. Wiring diagrams and control diagrams
13. Maintenance and repair procedures
14. Removal and replacement instructions
15. Spare parts and supply list
16. Special tools required to service or maintain the equipment
17. Corrective maintenance man-hours
18. Product submittal data
19. O&M submittal data
20. Parts identification
21. Warranty information
22. Personnel training requirements
23. Testing equipment and special tool information
24. Testing and performance data
25. Installing Subcontractor information
PART 2 - PRODUCTS - Not Used.
PART 3 - EXECUTION - Not Used.

END OF SECTION 01785
SECTION 01820

DEMONSTRATION AND TRAINING PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Specification Sections shall apply to this Section without limitation.

1.2 SUMMARY
A. This Section includes administrative and procedural requirements for instructing District’s personnel, including the following:
   1. Demonstration of operation of systems, subsystems, and equipment
   2. Training in operation and maintenance of systems, subsystems, and equipment
   3. Demonstration and training videos

1.3 SUBMITTALS
A. At completion of training, provide two complete training manuals for the District's use.
B. Attendance Record: For each training module, provide list of participants and length of instruction time.

1.4 QUALITY ASSURANCE
A. Instructor Qualifications: A factory-authorized service representative or District approved equivalent, complying with requirements in Section 01400 (Quality Control Requirements,) and experienced in operation and maintenance procedures and training for Project specific systems and equipment.
B. Contractor shall coordinate instruction schedule and verify availability of educational materials, instructor’s personnel, audiovisual equipment, and facilities needed to avoid delays.
C. For instruction that must occur outdoors, review weather forecast and provide alternatives if conditions are unfavorable.

1.5 COORDINATION
A. Contractor shall coordinate instruction schedule with District Project Manager.
B. Provide written notice (15) working days in advance to Project Manager, District and Architect prior to any scheduling instruction sessions. District Project Manager shall furnish Contractor with names and positions of intended participants.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM
A. Program Structure: Contractor shall develop and provide instruction program that includes group training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
1. Heat generation including, but not limited to, the following:
   a. Boilers
   b. Pumps
   c. Water distribution piping
2. Refrigeration systems including, but not limited to, the following:
   a. Chillers
   b. Cooling towers
   c. Condensers
   d. Pumps
   e. Distribution piping
3. HVAC systems including, but not limited to, the following:
   a. Air-handling equipment
   b. Air distribution systems
   c. Terminal equipment and devices
4. HVAC instrumentation and controls, including BAS. See Section 23 09 23.
5. Electrical service and distribution including, but not limited to, the following:
   a. Transformers
   b. Switchboards
   c. Panelboards
   d. Motor controls

B. Training Modules: Contractor shall develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Review basis of system design
2. Operational requirements and criteria, including:
   a. System, subsystem, and equipment descriptions
   b. Operating standards
   c. Regulatory requirements
   d. Operating characteristics
   e. Limiting conditions
   f. Performance curves
3. Detailed review of documentation, including:
   a. Emergency manuals and procedures
   b. Operations manuals and procedures
   c. Maintenance manuals and procedures
   d. Identification systems
   e. Warranties and Guarantees
   f. Maintenance service agreements and similar continuing commitments
   g. Normal shutdown instructions
   h. Required sequences for electric or electronic systems
   i. Special operating instructions and procedures
   j. Troubleshooting and diagnostics
   k. Test and inspection procedures
PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

B. Set up as required at instructional location.

END OF SECTION 01820
Limited Hazardous Materials Abatement Specification Workplan

Diablo Valley College
Library Mechanical Rooms L-128 & L-144 and Affected Cooling Tower
321 Golf Club Road
Pleasant Hill, California

RGA Project No: R1158089

Prepared for:
Mr. P.J. Roach
Contra Costa Community College District Facilities Project Manager
500 Court Street
Martinez, CA 94553

Prepared by:
RGA Environmental, Inc.
1466 66th Street
Emeryville, CA 94608

October 19, 2015

Report Prepared by: William Frieszell
Industrial Hygienist, CAC #12-4853

Report Reviewed by: Steffen Steiner
Office Manager, CAC #92-0850
PART 1 - GENERAL

1.1 COMPLIANCE AND INTENT

A. The Contractor is responsible for repair, to the satisfaction of the Owner, of surfaces not scheduled for demolition that become damaged as a result of the work. All unscheduled repair work shall be at no increase to contract price.

B. Contractor shall coordinate removal with all site requirements related to protection of existing finishes. Water and encapsulants used during abatement work must not migrate beyond established regulated work area barriers. All protection work must be completed prior to work the start of abatement work on each floor and any pathways of travel on other floors.

C. This project deals with abatement of asbestos-containing materials (ACMs). It is necessary for the Contractor to coordinate all abatement work with the project drawings and specifications. During all work, provide monitoring and worker protective equipment in accordance with the California Occupational Safety and Health Administration (Cal-OSHA) and as required by this specification. Where there is conflict, the most stringent requirement shall apply.

D. This document includes minimum requirements for hazardous materials handling, control, and abatement activities, as applicable, including, but not limited to:

- Handling and disposal of asbestos-containing building materials (ACBM).
- Removal and disposal of existing lighting ballasts containing PCBs.
- Handling, disposal or recycling of mercury-containing lamps and thermostats.
- Handling and disposal of materials coated with lead containing paints.
- Handling, disposal or recycling of HVAC refrigerant compounds.
- Criteria for clearance

E. Hazardous materials shall be removed and disposed of according to all federal, state and local regulations. The Contractor shall determine if additional hazardous materials will be impacted by the scope of the abatement work. The cleanup of any incidental asbestos found in areas undergoing abatement of asbestos that become separated from the building during the dismantling process are part of the work.

F. All contractor personnel conducting abatement activities shall receive EPA-accredited training and be certified for asbestos abatement work. Any contractors involved in the demolition or preparation of painted surfaces shall conduct all work in accordance with DOSH’s lead construction standard, Title 8 CCR 1532.1. All workers handling other hazardous chemicals shall have received the proper Hazardous Waste Operations Training per CCR 5194 and 29 CFR 1910.120.
G. Furnish all labor, materials, facilities, equipment, services, employee training, medical monitoring, permits and agreements necessary to perform the work required for asbestos abatement in accordance with this specification.

H. Comply with all federal, state, and local regulations pertaining to asbestos removal, storage, transportation and disposal; employee health and safety; Contractor certifications; and all licenses, permits, and training.

I. Work on the premises shall be confined to areas designated in the Contract Documents. Materials and equipment shall be stored within areas designated by the Owner. Should additional space be required, the Contractor shall request permission for additional space and shall adequately safeguard occupants from associated health and safety hazards.

J. Perform all work specified herein with competent persons trained, knowledgeable and qualified in state-of-the-art techniques relating to asbestos abatement, handling, and the subsequent cleaning of contaminated areas.

K. During removal activities, the Contractor shall protect against contamination of soil, water, plant life, sensitive building finishes, adjacent building areas, and shall ensure that there is no airborne release of dusts. The Owner may collect air samples in the building and in adjacent areas to evaluate the Contractor’s performance. Evidence of settled dust or airborne levels of contaminants above background will require the implementation of additional controls at no increase to contract price.

L. It is the Contractor's responsibility to determine the quantities of ACMs that will require removal prior to commencement of the project. The Contractor shall conduct a site visit to determine exact locations of materials that will require abatement. This section provides appropriate protocols for handling and disposal of ACMs. All ACMs shall be removed according to the procedures outlined in this specification. If additional suspect ACMs are discovered during the course of the abatement work, immediately notify the Owner and/or the Owner's Environmental Consultant.

M. The work of this section shall be performed by an entity that holds a current, valid asbestos abatement license (C-22) issued by the California State Contractor’s Licensing Board (SCLB) and a current valid Certificate of Registration for Asbestos-Related Work issued by the California Department of Industrial Relations-Division of Occupational Safety and Health (Cal-OSHA), unless other specified. Display copies of CSLB license and Cal-OSHA Registration in a visible place at the job-site.

N. ACMs removed during the abatement activities shall be disposed of in an approved manner complying with all applicable federal, state, and local regulations. Appropriate waste manifests or letters of salvage shall be furnished to the Owner thereby limiting Owner’s liability for improperly salvaged items. Materials are conveyed to the Contractor "as is," without any warranty, expressed or implied, including but not limited to, any warranty to marketability or fitness for a particular purpose, or any purpose.

O. All interior asbestos abatement work shall be conducted using a negative pressure enclosure and three stage decontamination units unless otherwise specified. The removal of exterior ACM shall be conducted from within in a regulated area with poly drop sheets and asbestos warning signs, exterior ACM removed using mechanical methods or aggressive methods that
render the material friable must be removed in a negative-pressure enclosure. The removal of asbestos-containing roofing materials shall be conducted using wet methods and allowing no visible emissions or runoff to storm drains. Evidence of the release of asbestos above the background level will necessitate additional controls including but not limited to an enclosure.

1.2 DEFINITIONS

A. The following definitions pertain to work of this section.

1. Abatement: Process of controlling fiber release from ACMs including encapsulation, enclosure, controlled renovation procedures, removal, clean-up and disposal.

2. ACM: Asbestos-containing material

3. Aggressive Sampling: Air sampling either during or following the agitation of the air.


5. Airlock: A system for permitting ingress and egress with minimum air movement between a contaminated area and uncontaminated areas. Typically consists of two curtained or gasketed doorways separated by a distance of at least six feet such that one passes through one doorway into the airlock, allowing the doorway to close off the opening. This airlock must be maintained in uncontaminated condition at all times.

6. Ambient Air Quality: The quality of air (in terms of airborne fiber content) that is present in a given space.

7. Area Monitoring: Sampling of airborne asbestos fiber concentrations within the work area and outside the work area. Sampling shall represent airborne concentrations that may reach the breathing zone.

8. Asbestos Fibers: Refers to asbestos fibers having an aspect ratio of 3:1, and those fibers longer than five (5) microns.

9. Asbestos Permissible Exposure Limit (PEL): A level of airborne fibers specified by OSHA as an occupational exposure standard for asbestos. This level represents the 8-hour time-weighted average of 0.1 fibers per cubic centimeter of air as measured by Phase Contrast Microscopy (PCM) analytical method.

10. Asbestos-Containing Material (ACM): Those manufactured products and construction materials including structural and mechanical building materials, as well as packings and gaskets that contain more than one percent (1.0%) asbestos by weight.

11. Asbestos: Asbestos includes asbestiform varieties of serpentine (chrysotile), riebeckite (crocidolite), cummingtonite-gunerite (amosite), anthophylite, tremolite, and actinolite. For the purposes of determining worker respiratory protection, both the asbestiform and non-asbestiform of the above minerals, and any chemically treated or altered materials shall be considered as asbestos.

12. Authorized Visitor: Designated employees or consultants for the Owner and representatives of any federal, state or local regulatory or other agency having jurisdiction over the project.

13. Baseline: Refers to the background levels of asbestos monitored before abatement.
14. Breathing Zone: A hemisphere forward of the shoulders and head with a radius of approximately six to nine inches.

15. Breach: A rift or gap in the critical or secondary barriers that allow egress of air from the containment to outside, or vice versa.

16. Bridging Encapsulant: An encapsulant that forms a discrete layer on the surface of an in-situ asbestos matrix.


18. Chain-of-Custody: A legal concept involving documentation of the physical possession of a sample(s) from the moment it is collected, transported, analyzed, and ultimately stored in an archive.

19. Change Rooms: Refers to the two chambers in the decontamination area used to change into and out of protective clothing.

20. Certified Industrial Hygienist (CIH): A person certified by the American Board of Industrial Hygiene.

21. Clean Room: An uncontaminated area or room that is part of the worker decontamination enclosure system, with provisions for storage of workers’ street clothes and protective equipment.

22. Clearance Level: Clearance level for samples analyzed by PCM will be less than 0.01 fibers per cubic centimeter of air and for TEM will be less than 70 structures per square millimeter (<70 s/mm²). Samples may be collected by aggressive or non-aggressive sampling methods and the minimum air volume shall be 1,200 liters.

23. Competent Person: One who is capable of identifying existing and predictable hazards and who has the authority to take prompt corrective measures to eliminate them.

24. Critical Barrier: A unit of temporary construction that provides the only separation between asbestos work area and an adjacent potential occupied space. This includes the decontamination unit, perimeter walls, ceilings, penetrations and any temporary critical barriers between the work area and the uncontaminated environment.

25. CSLB: Contractors State Licensing Board

26. Decontamination Area: Area which is constructed to provide the means for workers to store clothing, equipment and other articles, and to properly remove contamination upon concluding work activities that result in exposure to these hazardous materials.

27. DOP: Dioctylphthalate, the challenge aerosol used to perform on-site leak testing of HEPA filtration equipment.

28. DOT: Federal Department of Transportation.

29. DOSH: Division of Occupational Safety & Health (see also Cal-OSHA)

30. Decontamination Unit: Refers to system of airlocks used to decontaminate personnel, waste bags, equipment, etc. when exiting the work area. A decontamination unit shall be set up for each containment area.

31. Demolition: The wrecking or taking out of any load-supporting structural member of a facility together with any related handling operations or the intentional burning of any facility.
32. Disposal Bag: Minimum six (6) mil thick leak-tight plastic bags used for transporting asbestos waste from a work area to disposal or shipping container. Each disposal bag must have required labels according to Title 8 CCR 1529 (Cal-OSHA asbestos rule), 5194 (HAZCOM). RACM waste must be additionally labeled according to 49 CFR 171-179 (USDOT), and 40 CFR 61 Subpart M (NESHAP). Hazardous waste disposal bags must be labeled with generator’s name, address, site location, generator number, and the following information:

CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD
AVOID BREATHING AIRBORNE ASBESTOS
RQ WASTE ASBESTOS, 9 NA 2212 PG III
(Class 9 placard)
HAZARDOUS WASTE
STATE AND FEDERAL LAW
PROHIBITS IMPROPER DISPOSAL
IF FOUND, CONTACT THE NEAREST
POLICE OR PUBLIC SAFETY
AUTHORITY OR THE CALIFORNIA
DEPARTMENT OF TOXIC SUBSTANCES CONTROL

33. Encapsulant: A liquid material that can be applied to ACMs that controls the possible release of asbestos fibers from the material either by creating a membrane over the surface (bridging) or by penetrating into the material and binding its components together (penetrating encapsulant).

34. Encapsulation: A specified procedure necessary to coat ACMs or asbestos contaminated surfaces with an encapsulant to control the possible release of asbestos fibers into the ambient air.

35. Enclosure: The construction of an airtight, impermeable, permanent barrier surrounding the ACM to prevent the release of asbestos fibers into the air.

36. Equipment Decontamination Enclosure System: A decontamination enclosure system for materials and equipment, typically in a designated area of the work area, and including a washroom, a holding area, and an uncontaminated area.

37. Equipment Room: A contaminated area or room that is part of the worker decontamination enclosure system, with provisions for storage of contaminated clothing and equipment. The equipment room shall be kept clean from asbestos-containing debris at all times.

38. Excursion Limit: A California Code of Regulations (Title 8 CCR 1529) requirement that ensures no employee exposed to airborne concentrations of asbestos in excess of 1.0 fibers per cubic centimeter of air as averaged over a sampling period of thirty (30) minutes.

39. Filter: A media component used in respirators to remove solid or liquid particles from the inspired air.

40. Fixed Object: A unit of equipment or furniture in the work area that cannot be removed from the work area.
41. Friable Asbestos-Containing Material: Material that contains more than 1.0% asbestos by weight, and that can be crumbled, pulverized or reduced to powder by hand pressure when dry.

42. Foreman: An individual who typically fulfills the duties of “competent person” as defined by Title 8 CCR 1529. This individual must supply documentation of a passing grade in an Cal-OSHA accredited course in Asbestos Contractor/Supervisor training. The foreman must be on-site during all abatement work.

43. Glove Bag: A polyethylene bag with two inward projecting long sleeve gloves, designed to enclose an object from which an ACM is to be removed. Bags shall be seamless at the bottom, have a minimum thickness of 6 mil, and shall be labeled appropriately.

44. Glove Bag Technique: A method for removing ACM from heating, ventilation and air conditioning (HVAC) ducts, piping runs, valves, joints, elbows, and other non-planar surfaces. The glove bag is constructed and installed in such a manner that it surrounds the object or material to be removed and contains all asbestos fibers released during the process. Secondary containment shall be provided for all glove bag work unless otherwise noted.

45. Gross or Full Abatement: Designated rooms, spaces, or areas of the project that have been totally sealed, contained in polyethylene, equipped with decontamination enclosure systems, and placed under negative pressure.

46. HEPA: High Efficiency Particulate Air filter capable of filtering out airborne particulate 0.3 microns or greater in diameter at 99.97 percent efficiency.

47. Manifest: The document authorized by both Federal and State authorities for tracking the movement of ACMs.

48. Movable Object: A unit of equipment or furniture in the work area that can be removed from the work area (e.g., smoke detectors, lights, etc.)

49. Negative Pressure Respirator: A respirator in which the air pressure inside the respiratory inlet covering is positive during exhalation in relation to the air pressure of the outside atmosphere, and negative during inhalation in relation to the air pressure of the outside atmosphere.

50. Negative Pressure: Air pressure lower than surrounding areas, generally caused by exhausting air from a sealed space (work area).


52. NIOSH: National Institute for Occupational Safety and Health: Sets test standards, analytical methods, and certifies performance of various respirator designs (research institute within Federal OSHA).

53. NIST: National Institute of Standards and Technology: Administers the NVLAP Program.

54. NOA – Naturally Occurring Asbestos. Found in soil, fill and concrete.

55. NVLAP: National Voluntary Laboratory Accreditation Program – evaluates and certifies laboratories doing PLM and TEM analyses.
56. Owner: CCCCD, The Contra Costa Community College District

57. Owner's Environmental Consultant: Environmental Consulting firm and its representatives retained to provide compliance oversight and monitoring for the Contractor's asbestos abatement work activities.

58. Passive Sampling: Refers to air sampling with no air agitation.

59. Permissible Exposure Limits (PEL): A level of airborne fibers specified by OSHA as an occupational exposure standard for asbestos. This level represents the 8-hour time-weighted average of 0.1 fibers per cubic centimeter of air and 30 minute excursion limit of 1.0 fibers per cubic centimeter of air as measured by Phase Contrast Microscopy (PCM) analytical method.

60. Phase Contrast Microscopy (PCM): Technique using a light microscope equipped to provide enhanced contrast between the fibers and the background. Filters are cleared with a chemical solution and viewed through the microscope at a magnification of approximately 400X. This method does not distinguish between fiber types and only counts those fibers longer than 5 microns and wider than approximately 0.25 microns. Because of these limitations, fiber counts by PCM typically provide only an index of the total concentration of airborne asbestos in the environment monitored.

61. Polarized Light Microscopy (PLM): An optical microscope technique used to identify asbestos content and distinguish between different types of asbestos fibers by their shape and unique optical properties.

62. Powered Air Purifying Respirator (PAPR): A full facepiece respirator that has the breathing air powered to the wearer after it has been purified through a filter.

63. Protection Factor: The ratio of the ambient concentration of an airborne substance to the concentration of the substance inside the respirator at the breathing zone of the wearer. The protection factor is a measure of the degree of protection provided by a respirator to the wearer.

64. Remodel: Replacement or improvement of an existing building or portion thereof where exposure to airborne asbestos may result. Remodel includes, but is not limited to, installation of materials, demolition, cutting, patching, and removal of building materials.

65. Respirator: A device designed to protect the wearer from the inhalation of harmful atmospheres.

66. Shower Room: A room between the clean room and the equipment room in the work decontamination enclosure system. This room contains hot and cold or warm running water and soap suitably arranged for complete showering during decontamination. The shower room comprises an airlock between contaminated and clean areas.

67. Surfactant: A chemical wetting agent added to water to improve penetration, this reducing the quantity of water required for a given operation or area.

68. Transmission Electron Microscopy (TEM): Asbestos structure analysis for a specified volume of air. TEM is a technique that focuses an electron beam onto a thin sample. As the beams transmits through certain areas of the sample, an image resulting from varying densities of the sample is projected onto a fluorescent screen. TEM is the state-of-the-art analytical method for identifying asbestos fibers collected in air
samples in non-industrial settings. TEM microscopes equipped with selected area electron diffraction (SAED) capabilities also can provide information on the crystal structure of an individual particle.

69. TSI – Thermal Systems Insulation

70. Visible Emissions: Any emission containing particulate material that is visually detectable without the aid of instruments. This does not include condensed uncombined water vapor.

71. Visual Inspection: A visual inspection by Owner’s Environmental Consultant, of the work area under adequate lighting to ensure that the work area is free of visible ACM material, debris, and dust.

72. Washroom: A room between the work area and the holding area in the equipment decontamination enclosure system equipped with water for decontamination of equipment and sealed waste containers. The washroom or shower room comprises one airlock.

73. Water Filtration: Refers to water filtration to as small a particulate size as technically feasible, but not more than 5 microns.

74. Wet Cleaning: The process of eliminating asbestos contamination from building surfaces and objects by using cloths, mops, HEPA vacuuming, or other cleaning utensils dampened with amended water and afterward thoroughly decontaminated or disposed of as asbestos contaminated waste.

75. Work Area: The area where asbestos removal is performed and that is defined or isolated to prevent the spread of asbestos fibers, dust or debris, and entry by unauthorized personnel. Work area is a regulated area as defined by Title 8 CCR 1529.

1.3 REFERENCES

The publications listed below form a part of this specification by reference. The publications are referred to in the text by basic designation only. If there is a conflict between any of the listed regulations or standards, then the most stringent or restrictive shall apply.

A. American National Standards Institute (ANSI) and American Society for Testing and Materials (ASTM)

2. ANSI Z87.1, 2003, Occupational and Educational Eye and Face Protection
3. ANSI Z88.2 1992, Respiratory Protection
4. ANSI Z89.1, 1986, Requirements for Protective Headgear for Industrial Workers
5. ANSI Z41, 1999, Personal Protection – Protective Footwear
6. ANSI Z88.6, 1984, Respiratory Protection – Respiratory Use Physical Qualifications for Personnel
9. ASTM D 1331, Solutions of Surface-Active Agents
10. ASTM D 2794, 1993 Resistance of Coatings to the Effects of Rapid Deformation (Impact)


15. ASTM E849, 1986 Safety and Health Requirement Relating to Occupational Exposure to Asbestos


B. California Assembly Bills (CAB)
   1. CAB 040, Yearly Registration of Contractors

C. California Code of Regulations (CCR)
   1. Title 8 CCR 5208, General Industry – Asbestos
   2. CCR CARS, Carcinogen and Asbestos Registration Sections 340-344.53, 341.6 Amended, and 341.9 Amended Through 341.14
   3. CCR ESO, Electrical Safety Orders, Chapter 4, Subchapter 5
   4. CCR 1523, Illumination
   5. CCR 1529, Asbestos in the Construction Industry
   6. CCR 1531, Construction Respiratory Protective Equipment
   7. CCR 3203, Injury and Illness Prevention Program
   8. CCR 3204, Access to Employee Exposure and Medical Records
   9. CCR 3220, Emergency Action Plan
   10. CCR 3221, Fire Prevention Plan
   11. CCR 5144, Respiratory Protection Equipment Standard
   12. CCR 5194, Hazard Communication Standard
   13. CCR 6003, Accident Prevention Signs
   14. Title 22, Division 4, Minimum Standards for Management of Hazardous and Extremely Hazardous Waste

D. California Health Services (CHS) Titles 22 and 23, California Administrative Code Disposal Requirements
   1. CHS 25123, Section 25123
   2. CHS 25124, Section 25124
   3. CHS 25143, Section 25143
   4. CHS 25163, Section 25163
   5. CHS 66508, Section 66508
6. CHS 66510, Section 66510
7. CHS DIV 4, Division 4, Commencing with Section 66000, "Disposal"

E. California Health and Safety Code (CHSC)
   1. CHSC 20, Division 20, Commencing with Section 24200

F. California Labor Code (CLC)
   1. CLC DIVISION 5, Part 1, commencing with 6300

G. California Propositions (CP)
   1. CP 65, Proposition 65

H. California State Board of Equalization (CSBE)
   1. CSBE ETU, Excise Tax Unit

I. California State License Board (CSLB)
   1. CSLB CBPC, California Business and Professional Code Sections 7058.5 and 7058.7, "Certification"

J. Code of Federal Regulations (CFR)
   1. 29 CFR 1910.134, Respiratory Protection
   2. 29 CFR 1910.141, Sanitation
   3. 29 CFR 1910.145, Accident Prevention Signs and Tags
   4. 29 CFR 1926.21, Safety Training and Education
   5. 29 CFR 1926.55, Gases, Vapors, Fumes, Dusts, and Mists
   6. 29 CFR 1926.65, Hazardous Waste Operations and Emergency Response
   7. 29 CFR 1926.59, Hazard Communication
   8. 29 CFR 1910.1000, Air Contaminants
   9. 29 CFR 1926.1101, Asbestos
   11. 40 CFR 61-SUBPART M, National Emission Standard for Asbestos
   13. 40 CFR 745, Lead; Requirements for Lead-Based Paint Activities
   14. 40 CFR 763, Asbestos Containing Material in Schools

K. State and Local Regulations
   1. Rule 902, Sacramento Metropolitan Air Quality Management District

L. Underwriters Laboratories, Inc. (UL)
   1. UL 586-96, 1996 Test Performance of High-Efficiency Particulate Air Filter Units

1.4 SUBMITTALS PRIOR TO START OF WORK
A. The reviews by the Owner or Owner’s Environmental Consultant are intended to be only for general conformance with the requirements. The Owner or Owner’s Environmental Consultant assumes no responsibility for permits, licenses, notices, materials and methods, equipment or temporary construction required to execute the work described in this section of the specification or in other sections of the specification or in other documents included in the contract documents.

B. Before commencing work involving the abatement of asbestos, submit the following for review by the Owner or Owner’s Environmental Consultant.

1. Provide a detailed asbestos abatement work plan that follows Attachment A – Asbestos Abatement Work Plan Outline.

2. Provide an asbestos site safety plan prior to project initiation. The site safety plan shall deal with, at a minimum: site safety and health hazards; fiber release incidents; control of water leakage or discharge within and/or from the work area; medical emergency; asbestos handling procedures; fall protection; electrical safety; Contractor's internal administrative and inspection procedures; earthquakes and/or fire emergency procedures; protocol for responding to complaints or questions from interested parties; 24-hour emergency telephone numbers for company officers with authority to respond to emergencies.

3. Competent Person (as defined by Title 8 CCR 1529): Demonstrate education and specialized training with successful completion of examination of a Cal-OSHA accredited asbestos training course.

4. Submit current certificates (less than 11 months) signed by each employee and trainer that the employee has received proper training in the handling of materials that contain asbestos. Include documentation showing that the worker understands the following; health implications and risks involved (including the illnesses possible from exposure to airborne asbestos fibers), the use and limits of the respiratory equipment to be used, and the results of monitoring of airborne quantities of asbestos concerning health and respiratory equipment.

5. Proof of Respirator Fit Testing: Provide proof of respirator fit testing. Fit testing records must be less than eleven (11) months old and document testing on the type of respiratory protective equipment used for this project. Fit testing records must be signed by the Competent Person.

6. Foreman Training: Submit evidence that the foreman to be used on the job fulfills the qualifications detailed in this specification and has experience in similar jobs.

7. Medical Examinations: Submit evidence signed by a physician that each employee used on the job has received an appropriate medical examination as detailed in Title 8 CCR 1529. The submitted document must be less than eleven (11) months old.

8. Written Notification to Fire and Police Departments: Provide documentation showing notification to local fire and police departments of the abatement three (3) days before commencement.

9. Rental Equipment: When rental equipment is to be used in the abatement areas or to transport hazardous waste, the Contractor shall provide written notification regarding intended use of the rental equipment to the rental agency before use, with copies to the Owner’s Environmental Consultant.
10. Certificates of Compliance: Submit manufacturer's certification that vacuums, ventilation equipment, and other equipment required to contain airborne asbestos fibers conform to ANSI Z9.2. Submit results of onsite DOP testing of all HEPA-filtered ventilation equipment.

11. Satisfactory proof that written notification and subsequent updates have been provided to the Bay Area Air Quality Management District (BAAQMD), in accordance with Regulation 11, Rule 2, Cal-OSHA, and Title 40 CFR Part 61 Subparts A&M, National Emission Standards for hazardous Air Pollutant, U.S. EPA.

12. Licenses: Submit copies of state and local licenses, evidence of Cal-OSHA registration and permits necessary to carry out the work of this contract.

13. Notification of Other Contractors: If other contractors are working at the job site, before beginning any work the Contractor must inform all other contractors in writing regarding the location, nature, and requirements of the work areas.

14. Material Safety Data Sheets/Specification Sheets: The Contractor shall submit Material Safety Data and Specification Sheets for all chemicals, encapsulants, etc. to be used for this project.

1.5 SCOPE OF WORK

A. Provide the removal of ACMs as specified in this section. Reference all other sections of the Specifications and other documents included in the contract documents for information and requirements that affect the work of this Section.

B. Table I below provides estimated quantities of ACMs requiring removal. These quantities were provided as general estimates at the time of the survey and are not necessarily all inclusive of all possible conditions present at the site. The Contractor is responsible for field verifying quantities of ACMs and difficulty in abating the same, prior to providing a bid for this project. Contractors shall be expected to work within the cost budget provided at the start of the project.

| TABLE I |
| ASBESTOS-CONTAINING MATERIALS |

<table>
<thead>
<tr>
<th>Material</th>
<th>Typical Locations</th>
<th>Analytical Concentration</th>
<th>Approximate Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling Tower</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gray Seam Sealant</td>
<td>Cooling Tower Exterior Panel Seams</td>
<td>20% CH</td>
<td>~200 lf</td>
</tr>
<tr>
<td>Pipe Flange Gasket</td>
<td>Pipes Associated with Cooling Tower</td>
<td>30% CH</td>
<td>~ 20 Fittings</td>
</tr>
</tbody>
</table>
### Material

<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Mechanical Room L-128</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermal System Insulation, Hard Packing Inside Pipe Collars</td>
<td>Pipes Associated with Cold Water Supply Pump 30 and Vertical Risers at Northeast Corner</td>
<td>2% CH</td>
<td>~150 If</td>
</tr>
<tr>
<td>Tan Mastic Associated Fiberglass Panels</td>
<td>Walls of Mechanical Rooms Behind Fiberglass</td>
<td>2% CH</td>
<td>~500 sf (Impact not anticipated)</td>
</tr>
<tr>
<td>Drywall with Joint Compound</td>
<td>Western Wall of Mechanical Room L-128</td>
<td>Drywall: ND Joint Compound: 2% CH</td>
<td>~500 sf (Impact not anticipated)</td>
</tr>
<tr>
<td>Black Flange Gasket</td>
<td>Central Chiller Compressor 1 (Assumed Present at All Gasketed Pipe Flanges)</td>
<td>30% CH</td>
<td>~40 Fittings</td>
</tr>
<tr>
<td>Roofing Field System - White Single Ply Membrane with Asphaltic Materials Assumed Present Beneath</td>
<td>Material is Present throughout Library Building Roofing Systems</td>
<td>NOT SAMPLED: ASSUMED</td>
<td>Disturbance of up to 25 sf anticipated during removal of L-128 Boiler Flue</td>
</tr>
<tr>
<td>Boiler Insulation Materials</td>
<td>Material is Assumed Present throughout Boiler Unit</td>
<td>NOT SAMPLED: ASSUMED</td>
<td>1 Boiler Unit</td>
</tr>
</tbody>
</table>

sf - square feet; If = linear feet; CH - Chrysotile Asbestos

C. The following materials shall be disposed of as regulated asbestos-containing material (RACM): drywall with ACM joint compound (if impacted), thermal system insulation materials, all assumed boiler insulation materials, and all other Category I and Category II materials rendered friable during the removal process.

D. The following materials can be disposed of as Category I Non-friable ACMs if not rendered friable during removal: asphaltic roofing materials present beneath white single ply membrane system.

E. The following materials can be disposed of as Category II Non-friable ACMs if not rendered friable during removal: Fiberglass wall pin mastic, pipe flange gaskets, sealant materials associated with the central cooling system.

F. Assumed building materials may be sampled prior to beginning of the project in order to ascertain asbestos contents.

G. Polychlorinated biphenyl containing light balasts and mercury materials:
1. Fluorescent light ballasts may contain PCBs. Remove and properly dispose of all light ballasts that are not specifically labeled “No PCBs”.

2. Fluorescent light tubes and thermostat switches contain mercury. Remove light tubes from all fixtures and switches from all thermostats. Package carefully for proper disposal or recycling.

H. The painted materials listed in Table II have been determined to contain lead in concentrations provided. For the purposes of this project, all painted surfaces impacted during the scope of this project shall be assumed to contain lead. The contractor will be required to comply with the Cal-OSHA lead in construction standard and provide for appropriate classification of generated wastes, if applicable.

### TABLE II

**LEAD CONTAINING PAINTS**

<table>
<thead>
<tr>
<th>Description</th>
<th>Location</th>
<th>Result (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>White Paint on Drywall</td>
<td>Western Wall of Mechanical Room L-128</td>
<td>670</td>
</tr>
<tr>
<td>Off-White Paint on Metal</td>
<td>Chiller Unit</td>
<td>920</td>
</tr>
<tr>
<td>Silver Paint on Metal Pipe</td>
<td>Pipe Associated with Chiller</td>
<td>220</td>
</tr>
<tr>
<td>Gray Paint on Metal Pipe</td>
<td>Cooling Tower Water Supply Pipe</td>
<td>250</td>
</tr>
<tr>
<td>Black Paint on Metal Pipe</td>
<td>Pipe Associated with Cooling Tower</td>
<td>110,000</td>
</tr>
</tbody>
</table>

I. Refrigerants:

1. Refrigerant lines are not anticipated to be impacted by the pending equipment replacement project. However, all HVAC associated equipment shall be inspected by the contractor in order to identify refrigerants in charged systems for either disposal or reclamation. For the purposes of the project, contractor is to assume that both the air handling unit in Mechanical Room L-144, the chiller unit in L-128 and the exterior cooling tower are all charged with various forms of Freon.

1.6 SUBMITTALS AT THE COMPLETION OF THE PROJECT
A. Upon completion of on-site work, Contractor shall provide a detailed project summary that will include each of the items listed below. The project Summary shall be submitted and approved by the Owner prior to acceptance of final pay request and shall include the following:

1. Copies of the Security and Safety Logs showing names of persons entering the workspace. The logs shall include date and time of entry and exit, supervisor's record of any accident (detailed description of accident).
2. Chain of custody documentation and laboratory reports for all analyses performed.
3. Emergency evacuations and any other safety or health incident.
4. Submit uniform hazardous and non-hazardous waste manifests prepared, signed and dated by an agent of the landfill. The manifest must certify the amount of hazardous materials delivered to the landfill. The manifest must be provided to the Owner or Owner’s Environmental Consultant within ten (10) working days after delivery.
5. Personal air sample results.
6. Pressure differential strip chart readings for each differential recording device on the site.
7. Project Summary:
   a. Abatement contractor’s name and address, certification number (CSLB), registration number (DOSH) and Tax ID number.
   b. Hazardous waste hauler certifications (DOT).
   c. Name, address and registration number of hazardous waste hauler.
   d. Laboratory performing analyses (NVLAP).
   e. Contract number and name of project.
   f. Specific inventory (including locations and approximate quantities) of the hazardous materials which were removed or handled.
   g. Number of employees working on the project.
   h. Dates of commencement and completion of on-site work.
   i. Work method employed (i.e., glove bag, mini-containment, full containment with negative air and decontamination enclosure system, etc.)
   j. Name, location, telephone number and EPA registration of waste disposal site(s) used.
   k. DOP testing results.

1.7 CONTRACTOR MONITORING

A. The Owner or Owner’s Environmental Consultant reserves the right to perform air sampling in selected areas during the course of the project. Owner or Owner’s Environmental Consultant reserves the right to stop work within an area if in the course of performing monitoring, the Owner or Owner’s Environmental Consultant observes instances of substantial non-conformance with the this section or other sections of the specification presenting health hazards to workers, the general public or the surrounding areas. Work shall not resume until the corrective measures have been enforced. Instances of substantial non-conformance shall include, but not be limited to, the following:
1. Activities or misconduct imperiling worker's safety and health.
2. Airborne fiber concentrations as measured by PCM outside of the containment area exceeding background or 0.01 f/cc whichever is greater. Airborne concentrations as measured by TEM outside of the containment area exceeding background or 70 S/mm², whichever is greater.
3. Loss of negative pressurization for more than two minutes.
4. Breaches in containment resulting in potential release of asbestos to non-work areas.

B. The Owner’s Environmental Consultant may perform air sampling inside and outside the hazardous materials work area during all phases of the work. The Contractor shall cooperate fully with the Owner’s Environmental Consultant and ensure the cooperation of its workers during collection of air samples and work area inspections.

C. When visual inspections or air monitoring are specified, the Contractor shall notify the Owner or Owner’s Environmental Consultant in writing 24 hours in advance of the day and time when the Contractor will be ready for such inspections or monitoring. Such requests shall be initiated by the Contractor's Competent Person or Foreman indicating that the work area has been previously inspected and is ready for inspection/testing.

D. Air monitoring generated by the Owner or Owner’s Environmental Consultant shall not be used by the Contractor to represent compliance with regulatory agency requirements for monitoring of workers exposure to airborne asbestos, nor shall any other activity on the part of the Owner or Owner’s Environmental Consultant be construed to meet the Contractor's compliance with applicable health and safety regulations.

PART 2 - PRODUCTS

2.1 SIGNS AND LABELS:

E. Provide labeling in accordance with State and Federal EPA requirements. Provide the required signs, labels, warnings, placards or posted instructions for containers used to transport hazardous material to the landfill.

F. Location of Caution Signs and Labels: Provide bilingual caution signs at all approaches to work areas in languages used by the Contractor’s employees. Locate signs at such a distance that personnel may read the sign and take the necessary protective steps required before entering the area. Provide labels and affix to all asbestos-containing materials, scrap, waste, debris, and other products contaminated with hazardous materials.

G. Warning Sign Format: Vertical format conforming to Title 8 CCR 1529:

```
DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED IN THIS AREA
```
H. Warning Label Format: Provide labels that comply with Title 8 CCR 1529 of sufficient size to be clearly legible, displaying the following legend:

**DANGER**
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST
AVOID CREATING DUST

2.2 ENCAPSULANTS

A. Encapsulants shall be U.L. Listed, in full-scale E-119 fire test.

B. Average depth of penetration shall meet manufacturer's recommendations.

C. Dry mil thickness of bridging encapsulating systems (if used) shall be as indicated in the specific treatment instructions included in this specification, and as recommended by the manufacturer.

D. Performance Requirements: Classification - penetrating encapsulant; spray applied and brushable. Product shall be tested and listed by EPA and possess the following characteristics:
   2. Fire classification - UL Class A approved in the specific or similar assembly to its intended application.
   3. Product shall be tested and rated non-toxic and non-irritating under the Federal Hazardous Substances Control Act and contain no methylene chloride.
   4. Material shall be tinted sufficiently to provide a readable contrast to background color to which it is applied.

2.3 PLASTIC SHEETING:

A. Use fire-retardant (FR) polyethylene (poly) film.
   1. Thickness - 6-mil, minimum, NO EXCEPTIONS.
   2. Flame Resistance/Flame Spread Rate <25.
   3. Conforms to NFPA #701 and Tested in accordance with ASTM E-84.

2.4 TAPE, ADHESIVE, SEALANTS:

A. Tape, 2” or wider, shall be capable of sealing joints of adjacent sheet of polyethylene and shall attach polyethylene sheet to finished or unfinished surfaces or similar materials. Tape shall be capable of adhering under dry and wet conditions, including use of amended water. Taping to critical or sensitive surfaces shall be completed using preservation sealing tape.

B. Spray adhesive for sealing polyethylene to polyethylene shall contain no methylene chloride or methyl chloroform (1,1,1-trichloroethane) compounds.
2.5 STRIP CHART RECORDER(S):

A. Where interior work areas are required, each shall have a minimum differential pressure of 0.025 inches water gage at all times. Fluctuations below 0.025 inches of water column are unacceptable and may require temporary cessation of work until conditions are corrected.

B. Multiple manometers shall be used to document the level of pressure difference between the containment space and all other spaces as deemed necessary by the Owner or Owner’s Environmental Consultant. Defective or non-operating instrumentation may require temporary cessation of work until instrumentation is repaired or replaced.

C. The manometers will be checked a minimum of four times per day by a person familiar with the operation.

D. Differential air pressure systems shall be in accordance with Appendix J of EPA’s “Guidance for Controlling Asbestos-Containing Materials in Buildings, EPA 560/5-85-024. The Differential pressure system shall be continuously monitored by the Contractor using a recording instrument. The recording instrument shall be connected to an audible alarm that will activate at a pressure differential of -0.025 inches water gauge air pressure.

2.6 VACUUM EQUIPMENT:

A. All vacuum equipment used in the work area shall use HEPA filtration systems and be of the wet-dry type. The Contractor shall provide on-site independent DOP testing to document the effectiveness of the vacuum units. The test results shall be signed by the individual performing the testing. Repeat DOP testing every thirty (30) days after initial testing. Provide documentation to the Owner or Owner’s Environmental Consultant with 24 hours of DOP testing.

2.7 LOCAL EXHAUST SYSTEM:

A. Where containments are required, sufficient High Efficiency Particulate Absolute (HEPA) ventilation units shall be used to maintain the negative pressure in each interior work area at 0.025 inches of water column and a minimum of four (4) air changes per hour.

B. The ventilation system shall remain in operation 24 hours a day until the work area has passed the specified clearance criteria. HEPA filtered air which is exhausted to maintain negative pressure shall be exhausted from the building at locations approved by the Owner or Owner’s Environmental Consultant. Exhausted air shall not be near or adjacent to other building intake vents or louvers or at entrances to buildings. Other HEPA units shall operate within the enclosure to circulate air and control fiber counts.

C. The Contractor shall provide on-site independent DOP testing to document the effectiveness of the air filtration units. The test results shall be signed by the individual performing the testing. Repeat testing if the unit or the air filtration units have been repaired or replaced. Repeat DOP testing every thirty (30) days after initial testing. Provide documentation to the Owner or Owner’s Environmental Consultant with 24 hours of DOP testing.
2.8 RESERVE EQUIPMENT:

A. Contractor shall have the following equipment on site: two reserve, functioning and DOP-tested HEPA Filter Vacuum Cleaning Units, two reserve and DOP-tested HEPA area filtration units for every four containments. Contractor shall also have sufficient polyethylene (poly), respirators, protective equipment, tape, tools, decontamination enclosure systems for each work area.

B. Provide authorized visitors requiring access to the work area with suitable protective clothing, headgear, eye protection, as described in this specification, whenever the visitor must enter the work area. The Contractor shall have available and maintain at all times a minimum of three (3) suits and other suitable protective equipment for this purpose. All protective equipment shall be new and for the exclusive use of visitors.

C. The Contractor shall document that each visitor has been trained and fit-tested prior to entering an abatement area.

2.9 SCAFFOLDING:

A. Scaffolding, as required to do the specified work, shall meet all applicable safety regulations and DOSH standards. A non-skid surface shall be furnished on all scaffold surfaces subject to foot traffic. Scaffolding shall be adequately protected to prevent contamination of planking and framing.

2.10 TRANSPORTATION EQUIPMENT:

A. Transportation equipment, as required, shall be lockable and suitable for loading, temporary storage, transit and unloading of contaminated waste without exposure to persons or property. Any vehicle used to transport asbestos waste shall be properly registered with all applicable controlling agencies.

2.11 CONNECTIONS TO WATER SUPPLY:

A. Contractor shall assure that all connections to the site's water system shall include backflow protection. Valves shall be temperature and pressure rated for operation of the temperatures and pressures encountered. After use, connections and fittings shall be removed without damage or alteration to existing water piping and equipment. Leaking or dripping valves shall be piped to the nearest drain or located over an existing sink or grade where water shall not damage existing finishes or equipment.

B. Employ heavy-duty abrasion-resistant hoses with a pressure rating greater than the maximum pressure of the water distribution system in each work area. Provide fittings as required to allow for connection to existing wall hydrants or spouts.

2.12 WATER HEATER:

A. The hot water supply must be adequate to allow for 15 minutes of continuous usage while maintaining a water temperature of 85°F. At minimum provide UL rated 40-gallon electric water heater to supply hot water for the decontamination unit shower. Provide relief valve compatible with water heater operation; pipe relief valve down to drip pan on floor with type
L copper. Drip pans shall consist of a 24 inch X 24 inch X 6 inch deep pan, made of 19 gauge galvanized steel with handles. Drip pan shall be securely fastened to the water heater with bailing wire or similar material. Wiring of the water heater shall comply with NEMA, NEC and UL standards.

2.13 OTHER TOOLS AND EQUIPMENT:

A. The Contractor shall provide other suitable tools for the stripping, removal and disposal activities.

B. Prohibited Equipment: The following equipment is prohibited from use on this project unless accepted in writing by the Owner or Owner’s Environmental Consultant:

1. High or low pressure water blasting equipment for hosing of work areas.
2. Uncontained abrasive blasting methods.
3. Vacuum-powered removal or collection equipment located outside the asbestos work area, such as a “Vacu-Loader”.
4. Gasoline, propane, diesel or other fuel powered equipment inside the building, unless previously approved in writing by the Owner or Owner’s Environmental Consultant.
5. Equipment that creates excessive noise or vibration that would affect the safety of the building or generate complaints from neighboring building occupants. No equipment shall exceed an A-weighted sound level of 85 dB as measured at 3 ft. from the radiating source without written permission of the Owner or Owner’s Environmental Consultant.
7. Flammable solvents with a flash point below 140 degrees F or materials containing ethylene glycol ether, methylene chloride, ethyl chloroform (1,1,1-trichloroethane), or other hazardous substances.
8. Non-fire retardant polyethylene sheeting.
9. Polyurethane spray foam for application in fire-rated assemblies, including but not limited to penetrations into stairwells, mechanical rooms, electrical closets, rated floor-to-floor assemblies, etc.

PART 3 - EXECUTION

3.1 INITIAL AREA ISOLATION

A. The Owner or Owner’s Environmental Consultant reserves the right to inspect and approve all containment setups before any abatement is undertaken.

B. If a containment area is breached (failure of polyethylene seals, visible dust emission, fiber counts above background level, etc.), the Contractor shall take immediate action to control the breach and clean the area to the satisfaction of the Owner or Owner’s Environmental Consultant.
C. If sample results indicate that conditions have exceeded the baseline or clearance criteria, as determined by the Owner or Owner’s Environmental Consultant, all work shall cease. Work shall not recommence until the condition(s) causing the increase have been corrected.

D. Verify that all electrical power, gas, sewage, water, phone lines, fire life safety lines and sprinkler systems to the work area have been shut down and disconnected so that there is no possibility of reactivation and electrical shock.

E. Provide all connections for temporary utilities in the work area needed throughout abatement. Temporary electrical power shall be according to OSHA and the National Electrical Code for Wet Environments.

F. Contractor shall conform to the Owner's lockout requirements, and secure the work area at all times. Area entrances and exits shall be secured by the Contractor throughout the abatement phase. Unauthorized visitors are strictly prohibited. Only the Contractor, Owner or Owner’s designative representatives are permitted at the job site. Contractor shall ensure that all doors, gates, windows, and potential entrances to the work areas and the designated waste location areas are secured and locked at the end of each workday.

G. Contractor shall store all materials, equipment, and supplies for the project inside the building or in areas designated by the Owner and in accordance with Owner’s requirements.

H. As required, establish designated limits for the abatement work area with continuous barriers. Use barrier tape (3-inch) with a pre-printed asbestos warning throughout exterior asbestos abatement activities. Provide signs around the perimeter of all the interior works areas according to EPA and Cal-OSHA.

I. Contractor shall provide temporary sanitary services of adequate capacity to handle the maximum estimated crew size plus an additional twenty percent. Contractor shall maintain the temporary facilities throughout the duration of the project.

J. The Contractor shall be responsible for identifying all HVAC components (if applicable) that lead into or out of the work areas. All components shall be disconnected and sealed airtight for the duration of the abatement work. All openings shall be sealed with two (2) layers of 6 mil polyethylene secured with duct tape, as applicable.

K. Pre-clean the work area and fixed objects in the work area using HEPA filtered vacuums and/or wet cleaning methods. Protect fixed objects with protective barriers (as appropriate) and cover with 6 mil poly sealed with tape.

3.2 CONTAINMENT SET-UP PROCEDURES

A. Containment is not required for the following exterior abatement work if removed in a non-friable state: asphalt roofing materials if present under single ply system as well as non-friable gasket materials and exterior sealants associated with the cooling tower unit. However, all work shall be conducted within an asbestos regulated area as required by Cal-OSHA. Contractor shall seal operable windows and air intakes within 50 feet of the work area with 6-mil polyethylene sealed with tape.
B. Contractor shall construct a full negative pressure containment for the removal of asbestos-containing materials, including but not limited to, pipe insulation, drywall systems, thermal system insulation and interior fiberglass pin mastics. Install critical barriers consisting of one layer of 6-mil poly on windows and doors. Cover floor and wall surfaces with 6-mil poly sealed with tape (as appropriate). Cover floors first so that plastic extends up the walls at least 12 inches, then cover walls with 6-mil poly to the floor level, thus overlapping the floor material by a minimum of 12 inches. Pony walls shall be constructed with 6-mil poly if the perimeter walls of the containment area do not extend to the deck above. The work area(s) shall be placed under negative pressure as outlined in this specification throughout the abatement work period.

C. Exterior sealants removed substantially intact may be performed under Class III work type control procedures.

D. Any disturbance of ACMs must be performed within a regulated area. If dust or debris is generated from asbestos related activity, work must be performed in a mini-enclosure with negative pressure or critical barrier containment.

E. To permit the inspector to view the majority of the work area, the Contractor shall provide easily accessible viewing ports from the clean space into each abatement area. Viewing ports must be a minimum of 2’ x 2’, clear-see-through plastic with no scratches, tape or glue marks.

F. Pressure differential recorders with strip charts are required to monitor the pressure differential in the work area. The recorders must be calibrated prior to arriving on site.

G. A three-chambered decontamination unit shall be required during the abatement work conducted in full containment. The unit shall be located immediately outside the contained area. A pre-fabricated unit is acceptable. Chambers shall be arranged as follows: (1) a clean/change room shall be the first chamber entered from outside the work area, (2) a shower shall be located between the clean/change room and the dirty/change room, and (3) a dirty/change room shall be the last chamber before entering the work area.

1. The clean/change room of the worker decontamination unit shall be of sufficient size to accommodate the work crew and their belongings. It shall include a respirator storage area and be fully equipped with reserve equipment and materials such as clean suits, towels, soap, tape, and respirator filters.

2. Worker decontamination unit walls shall be a minimum of two layers of 6-mil fire retardant poly and floors shall be constructed with a minimum of three layers of fire retardant poly. All entry and exit doorways shall consist of at least two sheets of overlapping, fire resistant poly. At no time shall the flapped doors be taped open in order to expedite material or personnel load-out.

H. All water from the shower and bag wash area shall be filtered to the technically feasible limit but not more than five (5) microns before disposal. In addition, the Contractor shall comply with all current local, state and federal codes relating to waste water release. All water connections must be verified for leaks and turned-off at the conclusion of each shift. All shower water shall be drained from the shower pan at the end of each shift.

I. A two-chamber decontamination unit may be allowed, unless noted elsewhere, during the abatement work conducted in critical barrier containments. The unit shall be located
immediately outside the contained area and shall contain a wash down area. A pre-fabricated unit is acceptable.

J. Contractor shall construct an equipment decontamination enclosure system consisting of a washroom, holding area and clean room separated by airlocks.

K. Approved fire extinguishers (Class ABC, multi-purpose, dry chemical type, rated: 4A; 60BC) shall be readily available to workers (maximum travel distance of 50 feet) inside and adjacent to work area(s). Personnel and emergency exits shall be clearly indicated on the inside of the containment area. The emergency exit plan shall be approved by the Owner’s Environmental Consultant prior to the set up of any work areas.

L. A decontamination area shall be established on the roof for abatement of asphalt roofing materials and immediately adjacent to all exterior regulated work areas. Decontamination areas shall include a wash area. All wash water shall be captured and disposed or filtered as specified above.

3.3 PERSONNEL PROTECTION

A. Informed Workers:
   1. All workers shall be informed of the hazards of ACMs and any other hazardous materials exposure. Workers shall also be instructed in the use and fitting of respirators, protective clothing, decontamination procedures, and all other aspects associated with the abatement work.

B. Personal Hygiene Practices:
   1. The Contractor shall enforce and follow good personal hygiene practices during the abatement of ACMs. These practices will include but not be limited to the following: no eating, drinking, smoking or applying cosmetics in the work area. The Contractor shall provide a clean space, separated from the work area, for these activities.
   2. Workers shall remove street clothes in the clean room and put on a respirator and clean protective clothing before entering the work area. Upon exiting the work area, remove gross contamination from clothing before leaving the work area; proceed to the change room and remove clothing except respirators; proceed to the shower; clean the outside of the respirator with soap and water while showering; remove respirator and thoroughly wash. Following showering, proceed directly to the clean room and dress in street clothes. Do not wear disposable clothing outside the decontamination enclosure system.
   3. If data gathered by the Owner or Owner’s Environmental Consultant in areas adjacent to the work areas shows exposure to airborne asbestos or other hazardous materials exceeding Cal-OSHA criteria, that area will become regulated and workers must wear protective clothing and approved respirators and must have a shower facility provided to them.

C. Respirators:
   1. Establish a respiratory protection program as outlined by ANSI and required by Cal-OSHA. Select respirators from those approved by the National Institute for Occupational Safety and Health (NIOSH). Respirators selected must be approved by
the Competent Person. Submit program for review a minimum of five (5) working days prior to the commencement of abatement activities.

2. Provide workers with approved and personally-issued respirators with replaceable filters. Provide sufficient quantity of filters approved by NIOSH for use in asbestos environments so that workers can change filters as required by the manufacturer.

3. At a minimum, provide each employee with the following respiratory protection for each work phase:
   a. Pre-cleaning, containment set-up, and containment removal work: NIOSH-approved, half-face respirators with HEPA cartridges.
   b. Asbestos abatement of thermal systems insulation: full-face powered-air purifying respirators (PAPRs) with HEPA cartridges.
   c. Asbestos abatement of drywall with asbestos containing joint compound, exterior sealants associated with the cooling tower, ACK gasket materials, fiberglass wall panels with associated pin mastics: half-face respirators with HEPA cartridges and organic vapor cartridges (as necessary).

4. At all times, respiratory protection selected shall, at a minimum, meet the requirements of the Table 1 below.

<table>
<thead>
<tr>
<th>Airborne Concentration of Asbestos</th>
<th>Required Respirator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not in excess of 1.0 fl/cc (10 X PEL)</td>
<td>Half-mask air purifying respirator other than a disposable respirator, equipped with high efficiency filters</td>
</tr>
<tr>
<td>Not in excess of 5.0 fl/cc (50 X PEL)</td>
<td>Full facepiece air purifying respirator equipped with high efficiency filters</td>
</tr>
<tr>
<td>Not in excess of 100 fl/cc (1000 X PEL)</td>
<td>Any powered air purifying respirator equipped with high efficiency filters or any supplied air respirator operated in continuous flow mode</td>
</tr>
<tr>
<td>Not in excess of 100 fl/cc (1,000 X PEL)</td>
<td>Full facepiece supplied air respirator operated in pressure demand mode</td>
</tr>
<tr>
<td>Greater than 100 fl/cc or unknown concentration</td>
<td>Full facepiece supplied air respirator operated in pressure demand mode, equipped with an auxiliary positive pressure self-contained breathing apparatus</td>
</tr>
</tbody>
</table>

5. Provide Type C continuous flow or pressure-demand, supplied-air respirators if the average airborne concentration of asbestos exceeds 100 times the permissible exposure limit; i.e., 8-hour time-weighted average (TWA) and ceiling limit. Use the respirators presented in Title 8 CCR 1529 that afford adequate protection at such upper concentrations of airborne asbestos. When Type C Respirators are required provide the following:
   a. The air supply system shall provide Grade D breathing air that conforms to OSHA and ANSI Commodity Specification for Air.
   b. Compressed Air System for Type C Respirators shall be high pressure, with a compressor capable of satisfying the respirator manufacturer's
recommendations. The compressed air system shall have compressor failure alarm, high temperature alarm, and a carbon monoxide alarm. It also shall have suitable in-line air purifying absorbent beds and filters to assure Grade D breathing air.

c. Use of Belt: Type C respirators shall be worn with belt to minimize possibility of dislodging face mask when hose is snagged in the work area.

D. Protective Clothing:
   1. Provide personnel exposed to asbestos fibers with fire retardant disposable protective whole body clothing, head coverings, gloves, and foot coverings. Provide appropriate gloves to protect workers hands from exposure to hazardous materials. Make sleeves secure at the wrists and make foot coverings secure at the ankles with tape. Ensure that all personnel entering and leaving the work area follow this procedure. Suits shall be of adequate size to accommodate the largest employee. Foot covers may be part of the coveralls. Non-disposable footwear shall be left in the work area until it is decontaminated or disposed of at the completion of the job.
   2. Protective clothing will be worn inside the work area after the area passes pre-abatement inspection and shall remain in use until the area passes final clearance inspection.

E. Eye Protection: Provide safety glasses or goggles to personnel removing or handling asbestos-containing materials and waste.

F. Shower Requirements: Contractor shall assure that all employees and visitors use protective equipment and the shower or wash down facility following each entry into the containment area after the start of the asbestos abatement.

G. Emergency Precautions and Procedures:
   1. Establish emergency and fire exits from the work area. Display necessary signage at exits and paths to exits with representative visual aids. A diagram of all emergency and fire exits shall be posted in a conspicuous area proximate to the entrance to each work area.
   2. The Contractor’s supervisor/competent person shall be trained and certified in first aid and CPR, and be prepared to administer first aid to injured personnel after decontamination. Seriously injured personnel shall be treated immediately or evacuated without delay for decontamination. When an injury occurs, the Contractor shall implement fiber reduction techniques until the injured person has been removed from the work area.
   3. In the event of a loss of negative pressure to the work area, work shall stop immediately and entrances to the work area sealed tight. The Contractor shall also institute fiber reduction controls until negative pressure is re-established to acceptable levels.

3.4 ASBESTOS REMOVAL (GROSS REMOVAL TECHNIQUE)

A. The Contractor shall abate all ACMs identified in this specification to the extent required to complete pending equipment replacement projects as specified by the Owner.
B. The Contractor shall continuously apply wetting agent throughout the removal process. The wetting agent shall be applied with a low-pressure fine spray to minimize fiber releases. The materials shall be thoroughly saturated so that there is no detectable fiber release. All ACM shall be immediately packaged in leak-tight containers following removal.

C. Minimize removal activities of ACMs that generate airborne particulate. To the extent feasible, score or cut-out ACMs in sections, wetting along the scoring line continually, and misting the air with an airless sprayer to knock down suspended particulate. After completion of removal work, surfaces from which asbestos has been removed shall be wet cleaned to remove all visible material and residue.

D. Wet clean the exterior surfaces of waste containers in the equipment decontamination enclosure system prior to removal from the work area. Ensure that workers do enter from uncontaminated areas into contaminated areas in the equipment decontamination enclosure system. The Contractor shall transport asbestos-containing waste bags to the waste debris box at designated hours approved by the Owner or Owner’s Environmental Consultant. RACM shall be packaged in a minimum of two (2) 6-mil polyethylene bags. Bags shall be properly labeled for RACM disposal including site-specific generator labels.

E. Non-friable waste shall be packaged in clear, leaktight containers and properly labeled while stored on-site.

F. All drywall debris with ACM joint compound shall be stored in clear, leaktight containers and properly labeled while stored on-site.

G. All other products with asbestos content (<1%) shall be packaged in leaktight containers while stored onsite. No specific labeling is required.

H. Asbestos-containing debris and contaminated water shall be cleaned from the work area at the end of each work shift. The Contractor shall clean the work area using wet methods and HEPA vacuum equipment.

3.5 ASBESTOS REMOVAL (GLOVEBAG TECHNIQUE)

A. Bags commercially manufactured specifically for glovebag enclosure removal of asbestos shall be used. All bags shall be a minimum of 6 mil clear poly, appropriately sized for removal area and task.

B. Maximum temperature of components allowable for glovebag work shall be as specified by glovebag manufacturer. Glovebag procedures shall not be permitted on live steam equipment or any equipment in excess of 150 degrees Fahrenheit.

C. Pre-clean the work area and protect immediate work area by covering floor and nearby equipment with 6 mil poly. Temporarily wrap damage/deteriorated asbestos insulation adjacent to the work with 6 mil poly to prevent further damage or disturbance during removal.

D. Provide two (2) workers for each glovebag operation.
E. Install glovebag around pipe, seal with staples and tape leaving enough sealed space above the pipe to allow access. Secure bag to pipe to support weight of stripped insulation and water (additional support may be provided by a chair or ladder).

F. Insert HEPA vacuum nozzle and flexible tubing or wetting agent sprayer into hole location provided and seal airtight with duct tape.

G. Smoke test the glovebag and repair leaks as required.

H. During removal, periodically use HEPA vacuum to compensate for any leaks and wet the inside surfaces of the bag to control fiber release.

I. Cut the insulation sharply for neat sealing of exposed insulation. Leave 4 inches margin at the bag/seal point.

J. After removal and detail cleaning, wash down all surfaces to below the levels where the bag will be sealed, and saturate the waste.

K. Upon completion of the removal work but prior to commencing with encapsulation, the Owner or Owner's Environmental Consultant reserves the right to conduct visual inspections.

L. Seal all substrate surfaces from which asbestos material was removed with an approved encapsulant.

M. Gather tools in a glove hand and pull the glove inside out. Seal the arm with a minimum of six (6) inches of tape and cut through the middle of the tape. Bend and re-tape the ends. Save the “bagged” tools for the next glovebag operation or clean by placing in a pail of water.

N. Collapse the bag with the HEPA vacuum. With the vacuum still applied, seal the bag just above the glove level. Remove the nozzle and tubing. Place a 6 mil waste bag over the glovebag and carefully remove the glove bag from the component and immediately seal it in a labeled waste bag. Check the component for loose waste and vacuum as required.

O. Seal exposed insulation with fiberglass wettable cloth or other approved material while the insulation is damp, unless other removal is planned.

3.6 EXTERIOR AND ROOFING ASBESTOS REMOVAL (NON-FRIABLE)

A. Establish a regulated area consisting of barrier tape and asbestos warning signs at least 10 feet from the work area. The edge of the roof can be considered one such barrier if sufficient controls have been established to prevent loss of roofing debris from the roof.

B. Provide a decontamination area at the point of entry/exit to the regulated exterior or roof work area.

C. Seal off openings within 50 feet of the work area including ducts, grills, and windows.

D. Utilize fall protection and safety devices at all times during roof work whenever exposed to falls greater than six feet including at perimeter, shafts or skylights.
E. Weather conditions should be dry and wind conditions less than 15 mph for roof and other exterior abatement activities. Establish a waste storage area where sealed bags of roofing materials are stored during removal. Line the storage area with a layer of 6-mil polyethylene sheeting. Dampen the surfaces with a fine spray of amended water before proceeding with removal. Keep ACMs damp throughout the removal process. Cut, peel, and scrape the roofing materials as required to remove the largest pieces possible in layers. Continue the removal until the roof decking is reached. Remove contaminated sleepers, flashing, and counter flashing as applicable.

F. Place all removed asbestos roofing and exterior sealants in waste bags or containers. All waste shall be removed from exterior and roofing regulated work areas by the end of each workday. In no case shall waste disposal containers be dropped or thrown. All ACM waste disposal containers shall be handled in a careful manner to prevent spills.

G. Acceptable clearance criteria for exterior and roofing removal shall be no visible three-dimensional residue at removal locations. The Owner or Owner’s Environmental Consultant reserves the right to conduct visual inspections at the completion of the work.

3.7 REGULATED AREA MONITORING

A. Prior to each work shift and continuously throughout the project, each containment and decontamination enclosure system shall be inspected and repaired as needed.

B. Ambient asbestos fiber levels outside each work area shall not exceed 0.01 f/cc (PCM) or 70 s/mm² (TEM) or background whichever is greater. If the asbestos fiber concentrations outside work areas exceed those levels shown above, then abatement must stop and operations be reviewed and modified until the fiber count can be reduced to within the acceptable limits.

3.8 AIR MONITORING

A. The purpose of any air monitoring that may be conducted by the Owner or Owner’s Environmental Consultant will be to detect possible release of fibers or dusts (asbestos or lead) emanating from the work areas.

B. All PCM air sample analysis shall comply with NIOSH Method 7400. All TEM analysis shall be consistent with modified-AHERA protocols or NIOSH 7402.

C. The Owner or Owner’s Environmental Consultant reserves the right to perform and / or observe final clearance inspection and sampling.

D. The method of analysis for pre-abatement and clearance air samples shall be via Phase Contrast Microscopy (PCM). The method of analysis for in-progress asbestos air samples shall be PCM and TEM at the option of the Owner or Owner’s Environmental Consultant.

E. The Contractor shall be responsible for all personal air sampling. These samples shall be taken each shift and for each distinct crew operation, and shall be used to verify adequacy of fiber control and respiratory protection. Personal breathing zone air sampling shall be in accordance with the Cal-OSHA asbestos standard. A minimum of 25% of the workforce shall be monitored during each shift. All sample results shall be available on-site within 24-
hours of sample collection. If two consecutive shifts of non-compliant or overloaded samples are noted, the contractor shall hire a CAC/CSST at their own expense to assist in compliance with the specifications.

3.9 CLEARANCE INSPECTIONS

A. The Owner or Owner’s Environmental Consultant reserves the right to conduct visual inspections. Contractor shall notify the Owner or Owner’s Environmental Consultant when the decontamination process in each containment area is complete. Evidence of debris will require additional clean up by the Contractor. Contractor shall be responsible for re-cleaning all areas found to be deficient.

B. If the Owner or Owner’s Environmental Consultant determines that the work area is sufficiently clean, the Contractor may proceed. If the Owner or Owner’s Environmental Consultant determines that certain areas require additional cleaning, the Contractor shall re-clean the work area and request a second inspection of the recleaned area. All costs incurred by the Owner or Owner’s Environmental Consultant for inspections required after the second inspection will be charged to the Contractor.

C. Once the initial visual is passed, the Contractor shall remove all but the containment critical barriers.

D. Following the visual inspection, the Contractor shall provide a coating of non-diluted encapsulant in the work area. The Contractor shall allow the encapsulant to dry for the period specified by the manufacturer.

E. Asbestos Clearance Testing: Following encapsulation and drying time, the Contractor shall conduct air clearance sampling. Clearance air sampling shall not take place until all encapsulant is dry. The Owner or Owner’s Environmental Consultant reserves the right to approve the initiation of clearance sampling.

3.10 ASBESTOS CLEARANCE CRITERIA:

A. The clearance level per containment shall be less than 0.01 fibers per cubic centimeter via phase contrast microscopy (PCM) or less than 70 structures per square millimeter via transmission electron microscopy (TEM). Aggressive air sampling may be used for clearance purposes. Multiple samples shall be collected in large containment areas.

B. If air samples do not pass the required clearance criteria, the area shall be recleaned and new samples shall be collected by the Owner or Owner’s Environmental Consultant. The Contractor shall be responsible for all costs associated with re-sampling and re-analyses. This amount will be deducted by the Owner from the Contractor’s final payment.

C. The Owner or Owner’s Environmental Consultant shall notify the Contractor in writing of acceptable asbestos fiber concentrations. The Contractor shall then remove all the remaining barriers in the work area.

3.11 ASBESTOS DISPOSAL
A. It is the responsibility of the Contractor to determine current waste handling, labeling, transportation and disposal regulations for the work site and for each waste disposal landfill. The Contractor must comply fully with these specifications, local, state, and federal regulations and provide documentation of the same.

B. Ensure that polyethylene bags are sealed air-tight. All bags shall be wet cleaned prior to removing them from the equipment decontamination enclosure system.

C. Ensure all disposal containers are properly labeled according to 8 CCR 1529, 5194 (HAZCOM), 49 CFR 171-179 (USDOT), 40 CFR 61 Subpart M (NESHAP), and any local regulations and state regulations as required by this specification.

D. Filter all wastewater to the technically feasible limit, but not more than five (5) microns before disposal. Comply with all current local, state and federal codes relating to waste water release.

E. Asbestos-containing waste that is properly labeled and sealed may be temporarily stored in areas approved by the Owner. Areas must be made secure before storing the waste. Waste is not to remain in temporary storage area for longer than one (1) week before final load-out of materials.

F. All friable asbestos waste shall be double-wrapped prior to transport from the site.

G. All vehicles used to transport hazardous waste must be registered with the Department of Toxic Substances Control and Department of Transportation and maintain proper registration and with vehicle at all times.

H. All vehicles and containers used to transport waste are subject to inspection and approval of Owner prior to departure from site.

I. Contractor shall not throw bags into the truck in a way that may cause the bags to burst open.

J. Contractor shall provide at minimum one (1) day advance notification to the Owner when signatures are required on manifest(s). The Contractor shall ensure that the Hazardous Waste Manifest is correctly filled out. The Contractor shall give the appropriate copies to the Owner and shall also instruct the Owner in writing that they must send the appropriate copy to the Department of Toxic Substances Control.

K. If a debris box is used, the Contractor shall make all necessary arrangement with the Owner including obtaining all appropriate permits.

L. Contractor is responsible for all coordination with the waste disposal site and with the waste hauling company.

M. Debris box shall be constructed with minimum 20-gauge steel with no windows or openings other than the door. Debris box for hazardous waste shall be fully lined with a double layer of polyethylene sheeting and must be locked at all times when unattended. Once the debris box is filled and the manifest is signed, Contractor must transport the debris box off the job site.

N. Disposal shall be in an Owner approved landfill that meets EPA requirements.
ATTACHMENT A
ASBESTOS ABATEMENT WORK PLAN OUTLINE

In accordance with the contract documents, the Contractor is required to prepare a written, site-specific Asbestos Abatement Work Plan, and submit to the Owner for approval prior to start of work. This plan is required for the contractor to meet Cal-OSHA requirements as well as the contract documents, and shall describe work procedures and control methods that will protect the Owner’s facilities and the environment.

I. Location of Work:
The work to be completed under this work plan will be completed at:

(Building name)
(Location within building)

Previous asbestos inspections or surveys have found that ACMs are present at the following locations:

(List all materials and locations to assure the Owner and the Contractor are aware of all hazardous materials locations)

II. Description of Work:
Describe the anticipated work scope

III. Schedule:
Phase/Task                   Anticipated Date(s)
Mobilization  
Set-up of work area(s), containments  
Abatement
Final Cleaning  
Visual Inspection
Final Clearance (visual and air sampling)  
Teardown
Demobilization

IV. Equipment and Materials
List all equipment and materials to be used, such as the following:

HEPA Vacuums                   Negative air filtration units
Scrapers                       Manometers
Power saws                     Shower facilities
Pry bars                       Airless sprayers/compressors
Cutting shears                 Cleaning detergents
Other hand tools               Solvents (must be approved by Owner)
Encapsulants/sealants          Roller/brushes
Gloves                         Disposable coveralls
Respiratory protection         Eye & foot protection
Fall Protection                Scaffolds/Ladders
Gas/Diesel Powered Equipment  

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V. Crew
List all workers and supervisors with emergency contact names and phone numbers.

*Clearly identify the supervisor and competent person who have authority for all safety and health.*

VI. Control Measures and Work Practices

*Describe in a narrative format specific work procedures, exposure/contamination controls, and engineering controls. This description should include, but not be limited to, the following:*

- OSHA Class I, II, III and IV work
- Wet methods
- Negative pressure enclosure
- Glovebag removal
- Respiratory protection
- HEPA vacuums
- Mini-containments
- Solvent removal of mastic
- List other procedures

VII. Respiratory Protection and Protective Clothing/Personal Protective Equipment

*List all respiratory protection including types and manufacturers which are anticipated for this project. Identify the phases of the project for which respirators will be required or likely to be required. List all personal protective equipment anticipated to be used on the project.*

VIII. Decontamination/Hygiene Facilities

*Identify the types and locations of decontamination or hygiene facilities to be used on this project. Specify use of disposable towels, soap, hot and cold water, and other supplies. Specify the required use of the facilities, including use of the facilities prior to eating, drinking, smoking and before leaving the project site. Describe handling or treatment of asbestos-contaminated solid waste and wastewater.*

IX. Air Monitoring Data

*Identify general worker air monitoring protocols to be followed on this project, including worker category classifications, frequency of monitoring, anticipated laboratory to be used for analysis, pump calibration techniques, etc. Identify the competent person responsible for conducting personal air monitoring and proposed consultant if air sampling requirements are not met for two consecutive shifts.*

X. Containment Diagram

*Include a diagram (hand written is acceptable) of the containment(s) showing the containment perimeter in relation to the surrounding areas, locations of negative air machines and exhaust locations, direction of airflow, and decontamination areas.*
XI. Waste

Describe how all waste on this project will be packaged, labeled, stored, transported, manifested and disposed.

XII. Preparation of Asbestos Abatement Work Plan

Date Prepared and Prepared By (signature, name and title)
SECTION 23 00 00
MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 CONDITIONS AND REQUIREMENTS

A. Refer to the Drawings, General Conditions, Supplementary Conditions, and Division 01 General Requirements.

B. This Section 23 00 00, applies specifically to all other Sections of Division 23.

C. Where requirements of this Section exceed those in other contract documents, Contractor shall comply with the requirements of this Section.

1.2 SCOPE OF WORK

A. Provide all labor, apparatus and materials that are required to provide a complete installation as indicated on the drawings and in the specifications, including that reasonably inferred for proper execution of this Division.

B. Provide cutting and patching as required for execution of work performed under this Division and not provided under other sections.

C. Repair or replace any damage to work of this Division, damage caused by leaks or breaks in systems of this Division, and damage caused by work of this Division including that to landscaping, paving or other items which are to remain in use.

D. Valves and trim not specifically indicated but required for proper functioning of equipment shall be furnished and installed by the craft furnishing the equipment.

E. Coordinate all utility requirements for equipment furnished by the mechanical sections of this division. Rough-in required systems and make final connections.

1.3 DEFINITIONS

A. Above Grade: Not buried in ground and not embedded in concrete slab on ground.

B. Below Grade: Buried in ground or embedded in concrete slab on ground.

C. Concealed: Inside building, above grade and located within walls, furred spaces, crawl spaces, attics, above suspended ceilings, etc. In general any item not visible or directly accessible.

D. Connect: Complete hookup of item with required services.
E. Contractor: Mechanical Contractor unless stated otherwise.

F. Exposed: Either visible or subject to mechanical or weather damage, indoors or outdoors, including areas such as mechanical and storage rooms. In general any item that is directly accessible without removing panels, walls, ceilings or other parts of structure.

G. Furnish: Purchase and deliver to job site in new condition.

H. Install: Place, secure and connect as required to make fully operational.

I. Provide: Furnish and install as defined above; perform work.

J. Rough-in: Provide all indicated services in the necessary arrangement for making final connections to fixture or equipment.

K. Indoor: Enclosed within building structure, crawl spaces, etc.

L. Use (verb): Furnish and install as defined above.

M. Outdoor: Outside of building structure.

1.4 ABBREVIATIONS AND SYMBOLS

A. Abbreviations contained in various sections of the specifications and drawings refer to the following organizations, societies, associations standards, publications, terms, etc.:

AABC: Associated Air Balance Council
AMCA: Air Moving and Conditioning Association, Inc.
ANSI: American National Standards Institute, Inc.
ARI: Air-conditioning and Refrigeration Institute
ASHRAE: American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME: American Society of Mechanical Engineers
ASTM: American Society for Testing and Materials
AWS: American Welding Society
AWWA: American Water Works Association
NEBB: National Environmental Balancing Bureau
NEMA: National Electric Manufacturers Association
NFPA: National Fire Protection Association

OSHA: Occupational Safety and Health Act

SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

UL: Underwriters' Laboratories

B. Other abbreviations and symbols are scheduled on the drawings.

1.5 REGULATIONS AND STANDARDS

A. It is the Contractor’s responsibility to install all work to meet or exceed minimum requirements stipulated in current issues of applicable standards, codes, or regulations. Where drawings or specifications prescribe requirements exceeding those minimums, the work shall be installed in accordance with the drawing or specification requirements. Particular attention is directed to the following. This list does not include all standards, codes, and regulations which may be applicable; other Federal, State, and local regulations may apply.

1. Occupational Safety and Health Administration (OSHA).

2. State Fire Marshal and Local Fire Marshal.

3. Local Building, Mechanical, Plumbing, & Fire Codes, all volumes.


5. Factory Mutual Insurers.


7. International Association of Plumbing and Mechanical Officials (IAPMO)


9. Division of State Architects (DSA).

10. Any other applicable Federal, State and local laws and regulations.

Do not construct anything in these drawings and specifications to permit work not conforming to these requirements. The regulations shall govern where they require higher standards or are violated by the drawings and specifications. Consider rulings and interpretations of the enforcing agencies as part of these specifications. Comply
with the drawings and specifications showing work exceeding minimum code requirements.

B. All regulations and standards shall be the latest issued unless the governing authority requires the use of an earlier issue. Provide all work required by the governing authority, even if it is not indicated on drawings or in the specifications, at no additional cost or time to the project.

1.6 DRAWINGS AND SPECIFICATIONS

A. Consider all drawings and all divisions of these specifications as a whole and provide work of this section as shown anywhere therein. Absolute accuracy of the drawings and specifications cannot be guaranteed. While every effort has been made to coordinate the locations of equipment covered under other sections or divisions of these specifications, it is the responsibility of the Contractor to coordinate exact requirements governed by actual job conditions. Check all information and report any discrepancies before submitting bid or fabricating work.

B. Report discrepancies in time to avoid unnecessary work, and make changes as directed by the Architect. Do not make any changes or additions that are subject to additional compensation without written authorization, based upon an agreed price. Any changes made without the above mentioned authorization shall be at Contractor's own risk and expense. Follow manufacturers’ directions where they cover points not specifically indicated; however, if they are in conflict with these drawings and specifications, obtain clarifications from the Architect before starting work.

1.7 ALTERATION PROJECT PROCEDURES

A. Materials: As specified in product Sections; match existing products and work for patching and extending work.

B. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.

C. Remove, cut, and patch work in a manner to minimize damage and to provide a means of restoring products and finishes to original and/or specified condition.

D. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.

E. Where new work abuts or aligns with existing, perform a smooth and even transition. Patched work to match existing adjacent work in texture and appearance.

F. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect/Engineer.
G. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.

H. Finish surfaces as specified in individual product Sections.

1.8 CUTTING AND PATCHING

A. Refer to Division 1 section “Cutting and Patching”.

1.9 START-UP AND COMMISSIONING SERVICES

A. Contractor shall be responsible for proper operation of all systems, minor subsystems, and services provided under this section. He shall coordinate startup and commissioning procedures, meetings, calibration, and system checkout with all subcontractors and trades involved. Any system operational problems shall be diagnosed and all correctional procedures shall be initiated with the various subcontractors as required to bring the system into compliance with the design intent.

B. The contractor shall be responsible for preparing a written commissioning and startup procedure including check off list and report format showing design conditions and blanks for indicating actual operating conditions. The report format shall include each piece of equipment and all items that require adjustment.

C. Personnel performing commissioning and startup services shall be fully qualified, experienced, and normally engaged in this type of work. If the contractor does not have such personnel available from their own company, they shall hire, at their own expense, subcontractors who are qualified personnel.

D. Construction Manager shall regularly communicate with commissioning team through memos and progress reports to apprise them of progress and scheduling changes.

E. Commissioning and startup meetings: Construction manager shall schedule and conduct the meetings with team members in attendance as needed. These will include general, mechanical, controls, electrical contractors and subcontractors as appropriate.

F. Functional performance testing will not begin until startup, pre-functional testing and balancing are completed for given system.

G. The contractor shall designate one field person who has the overall responsibility for startup procedures which includes testing and balancing. He shall directly supervise that startup and commissioning operations and be available for required coordination before, during, and after.

H. Prior to startup, ensure that the systems are ready, including but not limited to the following: Proper equipment rotation; the systems are flushed and are clean; proper wiring; auxiliary
connections; lubrication, venting; controls; all filters and strainers installed; and properly set relief and safety valves.

I. All electrical testing must be complete and test results submitted before equipment startup to avoid power interruptions during mechanical equipment startup and testing.

J. Equipment or systems shall not be started until systems are completed and/or when other continuing work could possibly damage completed systems if they are in operation.

K. Start and operate all systems. Provide the services of factory trained technicians for startup of major equipment and systems including, but not limited to, chillers, air conditioning units variable frequency drives (VFD), temperature controls, pumps, boilers, etc.

L. The contractor shall provide all labor, materials and services necessary for the commissioning, startup and operation of all systems and equipment furnished and installed under this section. Contractor and commissioning team shall make every effort to expedite testing process and minimize unnecessary delays without compromising integrity of procedures.

M. The contractor and factory representative shall check all equipment during the initial startup to ensure correct rotation, proper lubrication, adequate fluids or air flows, non-overloading electrical characteristics, proper alignment, and vibration isolation. Systems shall be checked for air and/or water flows throughout without blockages. Air conditioning units and systems shall be checked for proper damper connections and positions, aligned and adjusted belt drives, proper lubrication, air filters installed, non-excessive electrical characteristics, and minimal vibration. Other miscellaneous equipment shall be started and operated as described above as applicable.

N. During initial operation of the system and unit substantial completion, qualified personnel shall be provided and designated for maintaining the equipment and systems in good running order. Failure of equipment during this period due to lack of proper supervision is the responsibility of the contractor and continued failures shall be grounds for the Owner to provide such services with back charges to the contractor.

O. Check all motor starters and verify that the heater sizing is correct, taking length of electrical feeders into consideration. Record amp readings on all motors.

P. Make sure all control systems are calibrated and functioning properly. Prepare a log to indicate the check, calibration, set point, etc. of each control device.

Q. Functional performance tests verify that components, equipment, systems, and interfaces between systems operate correctly. They include operating modes, interlocks, control sequences, and responses to emergency conditions.

R. Functional performance testing and verification may be achieved by direct manipulation of system inputs (i.e. heating or cooling sensors), manipulation of system inputs by building automation system (i.e. software override of sensor inputs), trend logs of system inputs and
outputs using building automation system, or short term monitoring of system inputs and outputs using stand-alone data loggers.

S. If retesting is necessary because any equipment or system reported to have been successfully started up or pre-functionally tested is found during functional testing to be faulty, the additional cost of retest shall be the responsibility of the contractor.

T. Commissioning and Verification of control system:

1. The control systems shall be completely commissioned to ensure all aspects of the system are operating as intended and at optimum tuning.

2. All wiring connections shall be verified and traced from field device to panel to ensure proper connections.

3. All measured values shall be verified by a hand held calibrated device to validate that value indicated by the control system is in fact the actual measured value.

4. All loops shall be properly tuned to obtain the desired control value. Each loop shall be “upset” and put back in control to demonstrate its ability to stabilize quickly.

5. A final point-by-point report shall be submitted that indicates the date of each verification, the results, and shall be initialed on each page by the person performing the reading.

U. A final and complete commissioning, startup report shall be submitted prior to final acceptance and payment. This report shall be signed by each person doing the commissioning/startup task and by the responsible field person. Report shall include, but not be limited to, date of test; instrument used; date of last calibration; temperatures; set points; rpm; voltage; amperage; pressures; stability; etc.

1.10 DEMONSTRATION AND INSTRUCTIONS

A. Provide operation and maintenance of Products to Owner’s personnel two (2) weeks prior to date of Training.

B. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owners’ personnel in detail to explain all aspects of operation and maintenance.

C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at designated location.

D. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
E. The amount of time required for training on each item of equipment and system is that specified in individual sections, or as noted below:

- HVAC Equipment and Systems: Two sessions at 8 hours each
- Temperature Control System: Two sessions at 8 hours each
- Plumbing System: 4 hours

1.11 TESTING, ADJUSTING, AND BALANCING

A. Mechanical Contractor will appoint and employ services of an independent firm to perform testing, adjusting and balancing.

B. The independent firm hired by the Mechanical Contractor will perform services specified in Section 23 05 93, “Testing, Adjusting and Balancing”.

C. Reports will be submitted by the independent firm to the Architect/Engineer indicating observations and results of tests and indicating compliance or non-compliance with specified requirements and with the requirements of the Contract Documents.

1.12 CLOSEOUT PROCEDURES

A. Refer to Division 1 section “Closeout Procedures”.

B. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect/Engineer’s inspection.

C. Provide submittals to Architect/Engineer that are required by governing or other authorities.

1.13 FINAL CLEANING

A. Refer to Division 1 section “Closeout Procedures”.

B. Execute final cleaning prior to final inspection.

C. Clean interior and exterior of all equipment; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum and clean all dust from air distribution system including ductwork and grilles.

D. Clean equipment and fixtures to a sanitary condition.

E. Replace filters of operating equipment.

F. Clean debris from roofs, gutters, downspouts, and drainage systems.

G. Remove waste and surplus materials, rubbish, and construction facilities from the site.
1.14    PROJECT RECORD DOCUMENTS

A.    Refer to Division 1 section “Project record Documents”.

B.    Maintain on site, one set of the following record documents; record actual revisions to the Work:

2. Specifications.
3. Addenda.
4. Change Orders and other Modifications to the Contract.
5. Reviewed shop drawings, product data, and samples.

C.    Store Record Documents separate from documents used for construction.

D.    Record information concurrent with construction progress.

E.    Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:

1. Manufacturer’s name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and Modifications.

F.    Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:

1. Measured depths of foundations in relation to finish main floor datum.
2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
4. Field changes of dimension and detail.
5. Details not on original Contract Drawings.

G.    Delete Architect/Engineer title block and seal from all documents.

H.    Submit documents to Architect/Engineer.
1.15 OPERATION AND MAINTENANCE DATA

A. Refer to Division 1 section “Operation and Maintenance Data”.

1.16 WARRANTIES

A. Refer to Division 1 section “Operation and Maintenance Data”.

B. Provide duplicate notarized copies.

C. Execute and assemble documents from Subcontractors, suppliers, and manufacturers.

D. Provide Table of Contents and assemble in three (3) D side ring binders with durable plastic cover.

E. Submit prior to final Application for Payment.

F. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1.17 BUILDING CONTROL BOOKS

A. Refer to Division 1 section “Operation and Maintenance Data”.

B. At the time Operation and Maintenance Data are submitted as specified, submit 3 loose, but bundled, sets of Building Control Information on 3 hole punched 8-1/2”X11” paper. The Building Control Information shall be organized as follows:

1. Table of contents with appropriate division tabs.

2. Contractors (Name, Address, Telephone and Contact).

3. Sub-Contractors (Name, Address, Telephone and Contact).

4. Material Suppliers (Name, Address, Telephone and Contact).

5. Warranties (Cards and Information Including Start Date, Duration, Company Name, Address, Telephone and Contact).

1.18 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification Sections.

B. Deliver to Project site and place in location as directed; obtain receipt prior to final payment.
1.19 SITE VISIT
   A. Visit the site before submitting a bid. No extra payment will be made for additional work that would have been made apparent by the site visit.

1.20 OBSERVATION BY ARCHITECT
   A. Work may be observed at any time by the Architect or his representative. Work covered or concealed before being observed and accepted shall be opened and uncovered upon request, and replaced at no additional cost or time to the project.

1.21 INTERRUPTION OF EXISTING SERVICES AND UTILITIES
   A. Coordinate with other Sections and schedule sequence of accomplishing the work covered by this division in such a manner as not to interrupt existing services and utilities at a time that will inconvenience the Owner.

1.22 FEES
   A. Secure and pay fees for permits, licenses, inspections and royalties required for work of this Section.

1.23 OWNER-FURNISHED PRODUCTS
   A. Products furnished to site and paid for by Owner.
   B. Owner's Responsibilities:
      1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
      2. Arrange and pay for product delivery to site.
      3. On delivery, inspect products jointly with Contractor.
      4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
      5. Arrange for manufacturers' warranties, inspections and service.
   C. Contractor's Responsibilities:
      1. Review Owner reviewed shop drawings, product data, and samples.
      2. Receive and unload products at site; inspect for completeness or damage, jointly with Owner.
3. Handle, store, install and finish products.

4. Repair or replace items damaged after receipt.

1.24 SUBMITTAL PROCEDURES

A. Refer to Division 1 section “Submittal Procedures”.

B. General:

1. In addition to the procedures indicated below follow the procedures specified in Division 1 where they exceed the requirements of this section.

2. Provide submittals of material or equipment in accordance with each specification section.

3. Each item submitted shall be labeled or identified the same as on the drawings. (AC1, EF1, TB1.01, etc.)

C. Equipment, materials, and products specifically identified, described, and scheduled on the drawings are the basis of design. The other manufacturers or suppliers which may be named in the specification only indicate the general acceptability of the manufacturer or supplier and are considered alternates. It is the Contractor's responsibility to research, select, and prove, through the submittal process, that the specific model, size, or type of the alternate proposed manufacturer is equal and will perform equal to that which is the basis of the design. Operational characteristics for such items as outlet velocities, power input, sound levels, efficiencies, etc., shall be considered in addition to the overall performance, output, and physical constraints.

D. The Contractor assumes full responsibility that alternative items substituted for the scheduled manufacturer will meet the job requirements and is responsible for the cost of redesign and modifications necessary due to this substitution, for all trades. Revisions or additional work required by any trade due to the use of substitute materials and equipment shall be fully indicated on detailed drawings submitted with the shop drawings and all additional costs shall be accounted for in the final proposed substitution.

E. Mark submittal "Exactly as Specified" or accompanied by a letter from the supplier explaining in detail what differences, if any, exist between the submitted item and the scheduled item. Failure to point out the differences will be considered cause for disapproval. If differences are not indicated and/or not discovered during the submittal review process, the Contractor will still remain responsible for providing equipment and materials that meet the specifications.

F. Acceptable Manufacturers: Subject to compliance with the requirements of the individual specification sections, provide materials and equipment from the indicated manufacturers only. Submittals of material or equipment manufactured by other than those indicated may
be returned, not reviewed. If no manufacturers are indicated, then any product or material which complies with the specification and for the intended application may be submitted.

G. The mechanical and electrical components, structural systems, service clearances, and controls for all equipment are selected and sized, based on the basis of design manufacturer and equipment scheduled. If substitutions and/or equivalent alternate equipment are furnished, it shall be the responsibility of all parties concerned, involved in, and furnishing the substitute and/or equivalent alternate equipment to verify and compare the characteristics (capacity, size, clearance, acoustics, etc.) and requirements of that submitted to that scheduled. If greater capacity or more materials or labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then it shall be the responsibility of the parties involved in providing the substitute and/or equivalent items of equipment to provide all compensation for additional charges made for the proper rough-in, circuitry, support, and connections for the equipment furnished for all trades affected. No additional charges shall be allowed for such revisions.

H. Allow two weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals.

I. The Engineer and/or Architect will review submitted shop drawings and documents for general conformance with the design concept of the project and the information contained in the contract documents. The Engineer's and/or Architect's review is for the convenience of the Owner in following the work and does not relieve the Contractor of the responsibility of deviations from the requirements stated in this specification and contract documents.

J. The Engineer's and/or Architect's review shall not be construed as a complete or detailed check of the work submitted, nor shall it relieve the Manufacturer or Contractor of responsibility for errors or omissions of any sort in the shop drawings and samples, or from the necessity of furnishing any work required by the contract documents. The review of a separate item shall not indicate review of the complete assembly in which it functions. Nothing in the Engineer's and/or Architect's review of the shop drawings and samples shall be considered as authorizing 1) a departure from contract documents and specifications, or 2) additional cost to the owner, or 3) increased time for completion of the work.

K. Submittals are not reviewed for quantities, dimensions, weights, fabrication processes, construction methods, coordination with work of other trades, construction safety practices, service clearance, coil and motor location, location of control and electrical panels, and other layout constraints. These items shall remain the sole responsibility of the contractor.

L. The Engineer and/or Architect will review submittals with reasonable promptness and will return them to the Vendor/Supplier/Manufacturer stamped to indicate the appropriate action taken as follows:

1. No Exceptions Taken.
2. Exceptions Taken As Noted. No resubmittal required.
3. Exceptions As Noted. Resubmit.


M. Markings or comments or the lack thereof shall not be construed as relieving the Vendor/Supplier/Manufacturer/Contractor from complete compliance with the project drawings and specifications.

N. No part of the work shall be started in the shop or in the field until the Engineer and/or Architect have reviewed the shop drawings and samples for that respective portion of the work. Shop drawings and samples shall be submitted for review sufficiently in advance of the scheduled start of the work in the shop or in the field to allow ample time, in consideration of the number and complexity of the drawings in the submittal, for the Engineer and/or Architect to make an orderly review. No extension of time to complete the work will be granted to the Vendor/Supplier/Manufacturer by reason of failure to perform in this respect.

O. Each shop drawing and sample submitted for review shall be accompanied by a letter of transmittal, and shall be identified by the project title, Vendor's/Supplier's/Manufacturer's name, and a reference to the related part of the contract documents.

P. Product Data: For the following:
   1. Transition fittings.
   2. Dielectric fittings.
   3. Mechanical sleeve seals.
   4. Escutcheons.

Q. Welding certificates.

1.25 ESTABLISHED STANDARD MANUFACTURER/OTHER ACCEPTABLE MANUFACTURERS

A. Refer to Division 1 section “Project Requirements and Substitutions”.

1.26 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.
B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

C. Provide interchangeable components of the same manufacturer, for similar components.

1.27 TRANSPORTATION AND HANDLING

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

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

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

1.28 STORAGE AND PROTECTION

A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.

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

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

D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.

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

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

G. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

1.29 SHOP DRAWINGS

A. Refer to “Submittal Procedures” above and Division-1 for additional requirements.

B. Submit information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.
C. Shop Drawings include fabrication and installation drawings and directions, setting diagrams, schedules, patterns, templates and similar drawings, and installation for metal and wood supports and anchorages. Include as a minimum the following information on drawings or diagrams:

1. Dimensions
2. Identification of products and materials included
3. Compliance with specified standards
4. Notation of coordination requirements
5. Allowance for expansion, contraction, and deflection/movement of support structures.

D. Notation of dimensions established by field measurement

E. Clearances for access and service

F. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

G. Upon contractor’s request, engineer can make electronic data files available at contractor’s expense in order to enable contractor to expedite the production of working/coordination/shop drawings for the project. Transfer of the electronic data files to Contractor is for informational purposes only and will only be completed after a waiver is signed by contractor and owner relieving engineer of all liability resulting from use of electronic files and all engineer costs to produce electronic files in a format suitable for distribution are paid by contractor.

1.30 MATERIAL AND EQUIPMENT

A. Place materials and equipment on order in time to avoid job delay or hindrance. Schedule deliveries to coincide, as nearly as possible, with the construction schedule.

B. Use only new, unused materials and equipment unless specifically noted otherwise.

C. All materials and equipment not conforming to the requirements of these specifications will be considered as defective. Items which have been accepted or approved at one time and place, but which subsequently fail to conform to the requirements of these specifications will also be considered as defective. All such defective materials, whether in place or not, will be rejected. Remove such materials and equipment immediately from the site of the work.

D. Prior to ordering materials or starting work, verify all measurements at the site. No extra compensation will be allowed for differences between actual dimensions and the measurements shown on the drawings.
E. Except as specifically noted otherwise, follow the installation and/or maintenance directions provided by the manufacturer for all materials and equipment.

F. For each part of the work furnish all materials and equipment of the same type by the same manufacturer.

1.31 PROTECTION OF BUILDING

A. Protect new and existing building structures and adjacent finished surfaces during construction. Patch, repair, and refinish existing work damaged by work under this Division to match adjacent undisturbed areas. Patching, repair, and refinishing is to be performed by workmen skilled in the Sections involved.

1.32 RECORD DRAWINGS

A. Refer to Division 1 section “Project Record Documentation”.

B. Prepare record documents in accordance with the requirements in Division 1. In addition to the requirements specified in Division 1, indicate the following installed conditions:

1. Indicate actual inverts and horizontal locations of underground piping and conduits.

2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.

3. Accepted substitutions, contract modifications, and actual equipment and materials installed. This includes updating all equipment schedules with actual equipment provided.

4. Indicate duct and pipe routing and locations.

5. Refer to division-1 for additional requirements.

C. Contractor shall maintain a complete set of documents on site that are marked-up during the construction process indicating all changes that have been made. These mark-ups shall be maintained on a regular basis so they are current as the construction is in process and available for inspection by the Architect/Engineer. Markups shall include changes to duct and pipe routing and sizing.

D. Upon completion of the construction, the contractor shall transfer all mark-ups into AutoCAD and update the contract documents into record documents and the shop/coordination drawings into as-built documents.

1. Upon contractor’s request, engineer can make electronic data files available at contractor’s expense in order to enable contractor to expedite the production of record drawings for the project. Transfer of the electronic data files to Contractor is
for informational purposes only and will only be completed after a waiver is signed by contractor and owner relieving engineer of all liability resulting from use of electronic files and all engineer costs to produce electronic files in a format suitable for distribution are paid by contractor.

2. Architect/engineer makes no representations as to the accuracy or completeness of electronic data files. They are provided to the contractor as a start point to upgrade to Record Drawings.

3. The contractor record documents shall be in the same CAD program, version, and operating system as the original Contract Drawings.

4. Delete architect/engineer title block and seal from all documents.

E. Record and as-built document updates shall include schedules where contractor has supplied alternate manufacturers to those scheduled or where submitted performance varies.

F. Contractor shall prepare an electronic CAD file of record and as-built drawings and the drawings shall be updated with the mark-up, RFI and change orders.

G. Provide a minimum of one copy of the markup documents, a hard copy set of prints of the record and as built documents, and one electronic copy (disk) of the CAD files.

1.33 QUALITY ASSURANCE/CONTROL OF INSTALLATION

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

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

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

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

E. Perform work by persons qualified to produce workmanship of specified quality.

F. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.34 FIELD SAMPLES

A. Install field samples at the site as required by individual specifications Sections for review.
B. Acceptable samples represent a quality level for the Work.

C. Where field sample is specified in individual Sections to be removed, clear area after field sample has been accepted by Architect/Engineer.

1.35  MOCK-UPS

A. Tests will be performed under provisions identified in this section.

B. Assemble and erect specified items, with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Where mock-up is specified in individual Sections to be removed, clear area after mock-up has been accepted by Architect/Engineer.

1.36  INSPECTION AND TESTING LABORATORY SERVICES

A. Refer to Division 1 section “Quality Requirements”.

1.37  MANUFACTURERS' FIELD SERVICES AND REPORTS

A. Submit qualifications of observer to Architect/Engineer thirty (30) days in advance of required observations. Observer subject to approval of Architect/Engineer and/or Owner.

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

C. Manufacturer’s Field representative shall report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

D. Submit report in duplicate within five (5) days of observation to Architect/Engineer for review.

1.38  SPECIFIC MANUFACTURER AND MODEL

A. Trade names are used to establish standards. Where more than one name is given, the first listed is the basis of the project design and will be described fully. Other names indicate product lines of generally comparable quality but are subject to the Architect's/Engineer’s direction.
B. Where specifications call for an installation to be made in accordance with manufacturers recommendations, a copy of such recommendations shall at all times be kept in the job superintendent's office, and shall be available to the Owner's representative.

C. Follow manufacturer’s instructions where they cover points not specifically indicated on the drawings and specifications. If they are in conflict with the drawings and specifications obtain clarification from the Architect before starting work.

1.39 NO SPECIFIC MANUFACTURER

A. Where no specific make of material or equipment is mentioned, an appropriate product of approved manufacturer may be used, provided it conforms to the requirements of system.

1.40 U.L. LABEL

A. Furnish UL labeled and listed materials and equipment except when equipment is of a type for which labeling or listing services are not available from UL.

1.41 CURRENT MODELS

A. Materials and equipment shall be new, current models by each manufacturer and shall bear complete identification by the manufacturer. Materials and equipment shall be guaranteed by the manufacturer to equal or exceed specified, submitted and published specifications, such as pressure ratings, capacities, etc.

1.42 SERVICE CAPABILITY

A. Provide materials and equipment of major and reputable manufacturers with ability to render competent and thorough technical services through local organizations, and to expeditiously furnish spare parts.

1.43 FINISHES AND PAINTING

A. Provide all equipment with a factory painted finish. All other painting will be done per the Architect's direction.

B. Touchup scratches in factory finished surfaces to match original. Obtain touch-up paint from the manufacturer of the piece of equipment.

1.44 COORDINATION

A. Coordinate with work performed by other sections/divisions in order to accommodate the requirements of this section and to ensure adequate space and proper location for all necessary work on this project whether or not work is under this section. Provide
coordination drawings, as indicated. Coordination shall be done prior to order or manufacture of any systems or components.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

D. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces.

E. Coordinate work with the Electrical Division. Furnish the Electrical Division with shop drawing information for indicating ratings and control circuits required for the actual equipment furnished. Coordinate voltage, phase, and load requirements, prior to ordering equipment, to insure mechanical and electrical matches. All equipment shall be provided and ordered to suit the power available.

F. Layout support pads, curbs, sleepers, anchor bolts, etc., for all mechanical equipment and materials so as to be in the proper location for the equipment actually ordered. These pads shall be of adequate dimension to provide for proper mounting of equipment isolators and equipment mounting so that anchor bolts meet all seismic criteria. Contractor shall allow for proper service clearances.

G. Provide templates, information, and instructions to other divisions as necessary to properly locate holes and openings to be cut or provided for mechanical work.

H. Layout ducts, piping, and other mechanical systems and confirm all sizes of systems and components to be sure they fit the space available prior to ordering and manufacturing of components. Be certain to allow for proper pipe slopes.

I. Provide proper clearances for access to and service of all equipment and items requiring adjustment including shutoff valves.

J. Coordinate all disciplines to insure maximum point loads that can be attached to structural members are not exceeded. See other sections and structural contract documents for requirements. Provide intermediate supports between existing structural members (Unistrut, angle, etc.) as necessary to not exceed maximum point loads.

K. Lay out trench locations, do all excavation, shoring, laying, backfilling, and compacting for work performed under this division and not provided under other divisions. See other divisions for specification requirements.
1.45 COORDINATION DRAWINGS

A. Prepare and submit, for review, large scale (minimum 1/4" = 1'-0") coordination drawings showing location and elevations of all equipment, ducts, piping, cable trays, conduits, structural, and other items in the area. These shall be fully coordinated with all other trades and Owner supplied items. Check routing and elevations of all piping, ductwork, conduit and equipment before fabricating. Report any conflicts that cannot be solved in the field to the Architect/Engineer. Extra charges shall not be allowed due to lack of coordination prior to, or during, construction. These drawings shall be distributed to, and coordinated with, all other trades that are affected.

1. In addition to plan view, indicate heights to clarify clearances from structure and from other trades. Use partial sections where necessary.

2. Provide proper clearances for access to and service of all equipment and items requiring adjustment including shutoff valves.

3. Coordinate the location of access panels in the hard ceiling areas to insure all equipment and devices have proper access for servicing and adjusting.

4. The coordination drawings shall be reviewed and checked for completeness by the general contractor. Review by the architect and engineer is to assist the contractor and to attempt to point out obvious errors. Responsibility for proper coordination shall remain with the contractor.

B. Differences or disputes concerning coordination, interference, or extent of work between sections shall be decided by general contractor.

C. Extra charges shall not be allowed due to lack of coordination (or lack of coordination drawings) prior to or during construction.

D. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work. Indicate the proposed locations of ductwork, piping, conduit, equipment, and materials. Include the following:

1. Clearances for installing and maintaining insulation, including clearances for servicing and maintaining equipment, and space for equipment disassembly required for periodic maintenance.

2. Clearances for electrical and control components and panels.

3. Equipment connections and support details.

4. Exterior wall and foundation penetrations.

5. Interior floor penetrations.
6. Fire-rated wall and floor penetrations.

7. Sizes and location of required concrete pads and bases.

8. Support, bracing and anchor locations for equipment and conduit.

E. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.

F. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

G. Prepare reflected ceiling plans to coordinate and integrate installations, access panel and door locations, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling-mounted items where ceilings are to be installed.

1.46 STRUCTURAL MODIFICATION

A. Do not cut structural members except with written approval of the Architect and DSA.

1.47 WORKMANSHIP

A. Workmanship shall be first class throughout, performed only by competent and experienced workmen in a manner satisfactory to the Architect. Replace work falling below these standards as directed by the Architect. Constant supervision of the work either by the Contractor or his competent representative shall be maintained. Welding shall be done by certified pipe welders.

1.48 QUIETNESS

A. Quietness during construction is a requirement. Eliminate noise, other than that caused by specific equipment operating at optimum conditions as directed by the Architect.

1.49 GENERAL ELECTRICAL

A. All equipment shall be selected to suit power available; this requirement supersedes other portions of the specifications.

B. All equipment shall conform to the National Electrical Manufacturer’s Association Standards, and shall bear the Underwriter Laboratories label unless such listing is not available.

C. Load and line voltage connections to equipment will be made by the Electrical Division unless specifically noted otherwise. Coordinate work with the Electrical Division. Furnish the Electrical Division with shop drawing information for indicating ratings and control circuits required for the actual equipment furnished.
D. Guard opening giving access to "live" or rotating parts to prevent accidental contact with such parts.

1.50 MANUFACTURER’S INSTRUCTIONS

A. When specified in individual specification Sections, submit manufacturers’ printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.

B. Identify conflicts between manufacturers’ instructions and Contract Documents.

C. Follow Manufacturer’s installation details except as specifically modified on the drawings, and provide any valves or special fittings or other specialty items called for by them as required in order to make the equipment perform as intended.

1.51 MANUFACTURER’S CERTIFICATES

A. When specified in individual specification Sections, submit manufacturers’ certificate to Architect/Engineer for review, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect/Engineer.

1.52 SEISMIC RESTRAINTS

A. General: All equipment, piping, ductwork, and materials shall be fastened to the structure with properly sized and structurally engineered anchors, bolts, and restraints to prevent permanent displacement in any direction caused by lateral motion, overturning, or uplift.

B. Provide specifications of anchor bolt size and loads with installation instructions for each item.

C. All structural steel shall be ASTM A36 (Fy = 36,000 psi). All pipe steel shall be ASTM A501 (Fy = 36,000) or ASTM A53, type E or S, grade B (Fy = 35,000). All tubular steel shall be ASTM A500 grade B (Fy = 46,000 psi). All bolts shall be ASTM A307 or ASTM A325. Other ASTM specified materials to be used in the unit and support shall be submitted for approval. Latest American Institute of Steel Construction (AISC) and American Welding Society (AWS) codes shall apply.

D. All bolts, anchor bolts, expansion bolts, etc., shall be installed with steel washers. All high strength bolting shall be inspected by an independent testing laboratory. All welding shall be by welders holding valid certificates and have current experience in type of welds performed. Certificates shall be those issued by an accepted testing agency.
E. All welding shall be done by E70 series low hydrogen rods. All welding shall be per American Welding Society standards. Vendor may shop weld only the portions of unit and support which is factory preassembled. All field connections shall be bolted. Shop welds shall be shown on shop drawings. All full penetration welds shall be tested and certified by an independent testing laboratory.

F. Expansion Anchors in Hardened Concrete:

1. An expansion anchor is defined as a mechanical fastener designed to expand in a self-drilled or predrilled hole of a specified size, and to engage the sides of the hole in one or more locations to develop shear and/or withdrawal resistance to applied loads without the use of grout, epoxy, or dry pack.


G. All isolators shall be fastened to the structure and to the equipment.

H. The equipment Manufacturer shall furnish the weight of the equipment at each point of support.

I. The SMACNA "Guidelines for Seismic Restraints of mechanical Systems and Plumbing Piping Systems" may be used for reference.

J. Seismic Bracing for Hangers and Duct: All required seismic bracing shall be installed as per the State of California Code of Regulations, Title 24, Division T-22 modified to meet an importance factor (I) of 1.0.

K. Under California Code of Regulations Title 24, Division T-22, seismic restraints may be omitted from the following installation:

1. Gas piping less than 1" inside diameter.

2. Piping in boiler and mechanical equipment rooms less than 1 1/4" inside diameter.

3. All other piping less than 2 1/2" inside diameter.

4. All piping suspended by individual hangers 12" or less in length from the top of pipe to the bottom of the support for the hanger.

5. All rectangular air handling ducts less than 6 square feet in cross sectional area.

6. All round air handling ducts less than 28" in diameter.

7. All ducts suspended by hangers 12" or less in length from the top of the duct to the bottom of the support or the hanger connection point.
The Title 24 Division T-22 allowable omissions do not supersede any requirements indicated in NFPA or required by the Fire Marshal, ASCE Chapter 7, or building official. Contractor shall comply to the most stringent of these requirements.

L. Provide for attachment to portions of the building structure capable of bearing the loads imposed.

M. The Construction Manager shall coordinate the load requirements from all contractors so that no combination of loads exceeds the structural limitations.

N. Install all support systems to comply with the seismic zone 4 requirements of the California Building Code (CBC). Use an importance factor (I) of 1.0.

PART 2 - PRODUCTS (See Subsequent Sections)

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation and Arrangement: Install all mechanical work to permit removal (without damage to other parts) of coils, heat exchange bundles, fan shafts and wheels, filters, belt guards, sheaves and drives, and all other parts requiring periodic replacement or maintenance. Arrange pipes, ducts, raceways and equipment to permit ready access to valves, cocks, traps, starters, motors, and control components. Doors and access panels shall be kept clear.

B. Ductwork: Change the cross-sectional dimensions of ductwork when required to meet job conditions but maintain at least the same equivalent cross-sectional area. Obtain the Architect's/Engineer's approval prior to fabrication of ductwork requiring such changes.

C. Access: Provide access panels in equipment, ducts, as required for inspection and for proper maintenance.

D. Location of pipes, ducts, equipment, fixtures, etc., shall be adjusted to accommodate the work and to avoid interferences anticipated or encountered. Determine the exact route and location of each pipe and duct prior to fabrication.

1. Right-of-Way: Lines which pitch shall have the right-of-way over those which do not pitch. For example, steam, condensate and plumbing drains shall normally have the right-of-way. Lines whose elevations cannot be changed shall have the right-of-way over lines whose elevations can be changed.

2. Offsets, transitions and changes in directions in pipes and ducts shall be made to maintain proper headroom and pitch of sloping lines whether or not indicated on the drawings. Furnish and install all traps, air vents, sanitary vents, etc., required to affect these offsets, transitions and changes in direction.
E. Location of valves, traps, strainers, motors, damper operators, etc., shall be such as to be easily accessible by a person standing on the floor. If any such items are not in the open they shall be accessible through access openings in the building construction. Valves in vertical risers shall be located not over 5 feet above the floor. If circumstances at a particular location make this accessibility difficult or inconvenient, the situation shall be discussed with the Architect before installing apparatus at reduced accessibility locations.

F. Manufacturers' Installation Details: Conform to manufacturer’s instructions. Provide any valves or fittings recommended by manufacturers.

G. Openings in Pipes and Ducts: Keep closed during construction.

H. Ferrous metal work exposed to the weather, other than cast iron, shall be hot dip galvanized.

I. Nameplates: Provide for each fan and pump per the equipment schedules and its associated motor controller (if not in a motor control center); including any special instructions for fan or pump use; laminated black and white plastic with lettering cut through to white background. Submit list to the Architect for prior approval.

J. Items Exposed-to-View Entries, Hallways / Corridor Areas: Obtain acceptance by the Architect of the location of all equipment and materials before installation of work in these areas.

3.2 TESTING

A. Delayed Heating or Cooling Tests: If the work is completed during the heating season, perform final tests of cooling equipment the following summer; if completed during summer, perform test of heating system the following winter.

B. Test Procedures and Reports: The Contractor shall notify the Architect at least 48 hours before each system test, for mechanical work. Qualifications of people running tests should be established in writing. Monitor all tests. A written report shall be prepared by the Contractor and submitted to the Architect, showing the following as a minimum.

1. Who conducted test.

2. Test plan - times, pressures, etc.

3. Test results - times, pressures, a part of system that failed to meet test minimum and why. Corrective action recommended.

C. All Testing will be coordinated with the Commissioning Authority (CxA). For witnessing and testing the contractor shall utilize CxA system readiness and Functional Test Forms. Contractor shall refer to Commissioning Specification sections for further details.”
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. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
7. Grout.
8. Mechanical demolition.
9. Equipment installation requirements common to equipment sections.
10. Painting and finishing.
11. Concrete bases.
12. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspace, and tunnels.
B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:
   2. CPVC: Chlorinated polyvinyl chloride plastic.
   3. PE: Polyethylene plastic.
   4. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:
   1. EPDM: Ethylene-propylene-diene terpolymer rubber.
   2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:
   1. Transition fittings.
   2. Dielectric fittings.
   3. Mechanical sleeve seals.
   4. Escutcheons.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."

2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified at no additional cost to the Owner. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate and provide the access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. Coordinate with construction manager for Access panels, doors and requirements from other trades.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for 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, the manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 22 and Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 15 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 C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements for Joining Plastic Piping:
   1. ABS Piping: ASTM D 2235.
   2. CPVC Piping: ASTM F 493.
   3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
4. PVC to ABS Piping Transition: ASTM D 3138.

I. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.4 TRANSITION FITTINGS

A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

1. Manufacturers:
   b. Dresser Industries, Inc.; DMD Div.
   c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
   d. JCM Industries.
   e. Smith-Blair, Inc.
   f. Viking Johnson.

2. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.


4. Aboveground Pressure Piping: Pipe fitting.

B. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Manufacturers:
   a. Eslon Thermoplastics.

C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Manufacturers:
   a. Thompson Plastics, Inc.

D. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

1. Manufacturers:
   a. NIBCO INC.
   b. NIBCO, Inc.; Chemtrol Div.

E. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.
1. Manufacturers:
   b. Fernco, Inc.
   d. Plastic Oddities, Inc.
2.5 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
   1. Manufacturers:
      a. Capitol Manufacturing Co.
      b. Central Plastics Company.
      c. Eclipse, Inc.
      d. Epco Sales, Inc.
      g. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
   1. Manufacturers:
      a. Capitol Manufacturing Co.
      b. Central Plastics Company.
      c. Epco Sales, Inc.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
   1. Manufacturers:
      a. Advance Products & Systems, Inc.
      b. Calpico, Inc.
      c. Central Plastics Company.
      d. Pipeline Seal and Insulator, Inc.
   2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
   1. Manufacturers:
      a. Calpico, Inc.
b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

1. Manufacturers:
   a. Perfection Corp.
   b. Precision Plumbing Products, Inc.
   c. Sioux Chief Manufacturing Co., Inc.
   d. Victaulic Co. of America.

2.6 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers:
   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Metraflex Co.
   d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

3. Pressure Plates: Stainless steel. Include two for each sealing element.

4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.7 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
2.8 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.
   1. Finish: Polished chrome-plated.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
   1. Finish: Polished chrome-plated.

E. One-Piece, Stamped-Steel Type: With set screw and chrome-plated finish.

F. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw, and chrome-plated finish.

G. One-Piece, Floor-Plate Type: Cast-iron floor plate.

H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.9 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
   2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 MECHANICAL DEMOLITION
A. Refer to Division 1 Section for "Cutting and Patching" and Division 2 Section for "Selective Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed.

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 with same or compatible piping material.

3. **Ducts to Be Removed:** Remove portion of ducts indicated to be removed and plug 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:** Disconnect and cap 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 **PIPING SYSTEMS - COMMON REQUIREMENTS**

A. Install piping according to the following requirements and Division 22 and Division 23 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are accepted on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:
   a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
   b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
   c. Insulated Piping: One-piece, stamped-steel type with spring clips.
   d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
   e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
   f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
   g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type and set screw.
   h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
   i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type with concealed hinge and set screw.
   j. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
   k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with set screw.
   l. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

2. Existing Piping: Use the following:
   a. Chrome-Plated Piping: Split-casting, cast-brass type with chrome-plated finish.
   b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge and spring clips.
   c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and spring clips.

e. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.

f. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and set screw.

g. Bare Piping in Unfinished Service Spaces: Split-casting, cast-brass type with polished chrome-plated finish.

h. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed hinge and set screw or spring clips.

i. Bare Piping in Equipment Rooms: Split-casting, cast-brass type.

j. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with set screw or spring clips.

k. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting, floor-plate type.

M. Sleeves are not required for core-drilled holes.

N. Permanent sleeves are not required for holes formed by removable plain-end sleeves.

O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.
   a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas minimum 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

3. Install sleeves that are large enough to provide 4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
   a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
   b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
   c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to minimum 2 inches above finished floor level. Refer to Division 7 Section “Sheet Metal Flashing and Trim” for flashing.
      (1) Seal space outside of sleeve fittings with grout.
4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.

Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.

2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.

3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

R. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Section "Through-Penetration Firestop Systems" for materials.

T. Verify final equipment locations for roughing-in.

U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
D. **Soldered Joints:** Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. **Brazed Joints:** Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. **Threaded Joints:** Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

   2. **Damaged Threads:** Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. **Welded Joints:** Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. **Flanged Joints:** Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. **Plastic Piping Solvent-Cement Joints:** Clean and dry joining surfaces. Join pipe and fittings according to the following:

   1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.

   2. **ABS Piping:** Join according to ASTM D 2235 and ASTM D 2661 Appendixes.

   3. **CPVC Piping:** Join according to ASTM D 2846/D 2846M Appendix.

   4. **PVC Pressure Piping:** Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.

   5. **PVC Nonpressure Piping:** Join according to ASTM D 2855.

   6. **PVC to ABS Nonpressure Transition Fittings:** Join according to ASTM D 3138 Appendix.

J. **Plastic Pressure Piping Gasketed Joints:** Join according to ASTM D 3139.

K. **Plastic Nonpressure Piping Gasketed Joints:** Join according to ASTM D 3212.

L. **Plain-End Piping Heat-Fusion Joints:** Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
1. Plain-End Pipe and Fittings: Use butt fusion.

2. Plain-End Pipe and Socket Fittings: Use socket fusion.

M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer’s written instructions.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.

2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.


3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.6 PAINTING

A. Painting of mechanical systems, equipment, and components is specified in Division 9 Section, “Painting”.

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 CONCRETE BASES
A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.

2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.

3. Install anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.

4. Place and secure anchorage devices. Use supported equipment manufacturer’s setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

5. Install anchor bolts to elevations required for proper attachment to supported equipment.

6. Install anchor bolts according to anchor-bolt manufacturer’s written instructions.

7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement.

3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1.

3.9 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Refer to Division 6 Section "Rough Carpentry" for wood supports and anchorages information and requirements.

B. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor mechanical materials and equipment.

C. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

D. Attach to substrates as required to support applied loads.
3.10 GROUTING

A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 23 05 00
SECTION 23 05 13

MOTORS

1.0 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 basic requirements for factory-installed and field-installed motors.

B. Related Sections include the following:

1. Division 23 Section "Mechanical Vibration and Seismic Controls" for mounting motors and vibration isolation and seismic-control devices.

2. Division 23 Sections for application of motors and reference to specific motor requirements for motor-driven equipment.

1.3 DEFINITIONS

A. Factory-Installed Motor: A motor installed by motorized-equipment manufacturer as a component of equipment.

B. Field-Installed Motor: A motor installed at Project site and not factory installed as an integral component of motorized equipment.

1.4 SUBMITTALS

A. Product Data for Field-Installed Motors: For each type and size of motor, provide nameplate data and ratings; shipping, installed, and operating weights; mounting arrangements; size, type, and location of winding terminations; conduit entry and ground lug locations; and information on coatings or finishes.

B. Shop Drawings for Field-Installed Motors: Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Include the following:

1. Each installed unit's type and details.

2. Nameplate legends.
3. Diagrams of power and control wiring. Provide schematic wiring diagram for each type of motor and for each control scheme.

C. Coordination Drawings: Floor plans showing dimensioned layout, required working clearances, and required area above and around field-installed motors. Show motor layout, mechanical power transfer link, driven load, and relationship between electrical components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate field measurements.

D. Manufacturer Seismic Qualification Certification: Submit certification that motors, accessories, and components will withstand seismic forces defined in Division 15 Section "Mechanical Vibration and Seismic Controls." Include the following:

1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Motorized Equipment: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Qualification Data: For testing agency.

F. Test Reports: Written reports specified in Parts 2 and 3.

G. Operation and Maintenance Data: For field-installed motors to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

B. Source Limitations: Obtain field-installed motors of a single type through one source from a single manufacturer.

C. Product Options for Field-Installed Motors: Drawings indicate size, profiles, and dimensional requirements of motors and are based on the specific system indicated.
D. 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.

E. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices. Provide motors that are:

1. Compatible with the following:
   a. Magnetic controllers.
   b. Multispeed controllers.
   c. Reduced-voltage controllers.

2. Designed and labeled for use with variable frequency controllers, and suitable for use throughout speed range without overheating.

3. Matched to torque and horsepower requirements of the load.

4. Matched to ratings and characteristics of supply circuit and required control sequence.

2.0 PRODUCTS

2.1 MOTOR REQUIREMENTS

A. Motor requirements apply to factory-installed and field-installed motors except as follows:

1. Different ratings, performance, or characteristics for a motor are specified in another Section.

2. Manufacturer for a factory-installed motor requires ratings, performance, or characteristics, other than those specified in this Section, to meet performance specified.

2.2 MOTOR CHARACTERISTICS

A. Motors 1/2 HP and Larger: Three phase except where scheduled otherwise.

B. Frequency Rating: 60 Hz.
C. Voltage Rating: NEMA standard voltage selected to operate on nominal circuit voltage to which motor is connected.

D. Service Factor: 1.15 for open drip-proof motors; 1.15 for totally enclosed motors.

E. Duty: Continuous duty at ambient temperature of 105 deg F and at altitude of 3300 feet above sea level.

F. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

G. Enclosure: Open drip-proof or totally enclosed fan cooled if indicated on drawings.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Premium efficiency.

C. Stator: Copper windings, unless otherwise indicated.

1. Multispeed motors shall have separate winding for each speed.

D. Rotor: Squirrel cage, unless otherwise indicated.

E. Bearings: Double-shielded, pre-lubricated ball bearings suitable for radial and thrust loading.

F. Temperature Rise: Match insulation rating, unless otherwise indicated.

G. Insulation: Class F, unless otherwise indicated.

H. Code Letter Designation:

1. Motors 10 HP and Larger: NEMA starting Code F or G.

2. Motors Smaller Than 10 HP: Manufacturer's standard starting characteristic.

I. Enclosure: Cast iron for motors 5 hp and larger; rolled steel for motors smaller than 5 hp.

1. Finish: Gray enamel or red enamel.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS
A. Motors Used with Reduced-Inrush Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers (inverter duty): Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
   1. Designed with critical vibration frequencies outside operating range of controller output.
   2. Temperature Rise: Matched to rating for Class B insulation.
   3. Insulation: Class H.
   4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

C. Rugged-Duty Motors: Totally enclosed, with 1.25 minimum service factor, greased bearings, integral condensate drains, and capped relief vents. Windings insulated with non-hygroscopic material.
   1. Finish: Chemical-resistant paint over corrosion-resistant primer.

D. Source Quality Control: Perform the following tests on each motor according to NEMA MG 1:
   1. Measure winding resistance.
   2. Read no-load current and speed at rated voltage and frequency.
   3. Measure locked rotor current at rated frequency.
   4. Perform high-potential test.

3.0 EXECUTION

3.1 EXAMINATION

A. Examine areas to receive field-installed motors for compliance with requirements, installation tolerances, and other conditions affecting performance.

B. Examine roughing-in of conduit systems to verify actual locations of conduit connections before motor installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 MOTOR INSTALLATION

A. Anchor each motor assembly to base, adjustable rails, or other support, arranged and sized according to manufacturer's written instructions. Attach by bolting. Level and align with load transfer link.

B. Install motors on concrete bases complying with the Architectural and Structural Contract documents.

C. Comply with mounting and anchoring requirements specified in Division 15 Section "Mechanical Vibration and Seismic Controls."

D. Motors installed outdoors shall be totally enclosed, fan cooled.

3.3 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:
   1. Run each motor with its controller. Demonstrate correct rotation, alignment, and speed at motor design load.
   2. Test interlocks and control features for proper operation.
   3. Verify that current in each phase is within nameplate rating.

B. Testing: Engage a qualified testing agency to perform the following field quality-control testing:
   1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.15.1. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Manufacturer's Field Service: Engage a factory-authorized service representative to perform the following:
   1. Inspect field-assembled components, equipment installation, and piping and electrical connections for compliance with requirements.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
   3. Verify bearing lubrication.
   4. Verify proper motor rotation.
5. Test Reports: Prepare a written report to record the following:
   a. Test procedures used.
   b. Test results that comply with requirements.
   c. Test results that do not comply with requirements and corrective action taken to achieve compliance.

3.4 ADJUSTING
   A. Align motors, bases, shafts, pulleys and belts. Tension belts according to manufacturer's written instructions.

3.5 CLEANING
   A. After completing equipment installation, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.
   B. Clean motors, on completion of installation, according to manufacturer's written instructions.

END OF SECTION
SECTION 23 05 19

METERS AND GAUGES

1.0 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 meters and gauges for mechanical systems and water meters installed outside the building.

B. Related Sections include the following:

1. Mechanical equipment Sections that specify meters and gauges as part of factory-fabricated equipment.

1.3 SUBMITTALS

A. Product Data: Include scale range, ratings, and calibrated performance curves for each meter, gauge, fitting, specialty, and accessory specified.

B. Shop Drawings: Include schedule indicating manufacturer's number, scale range, fittings, and location for each meter and gauge.

C. Product Certificates: Signed by manufacturers of meters and gauges certifying accuracies under specified operating conditions and compliance with specified requirements.

D. Shop Drawings: For brackets for duct-mounting thermometers.

2.0 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Direct-Mounting, Filled-System Dial Thermometers:

b. Dresser Industries, Inc.; Instrument Div.; Weksler Instruments Operating Unit.

c. Marsh Bellofram.

d. Trerice: H. O. Trerice Co.

e. Weiss Instruments, Inc.

2. Pressure Gauges:

a. AMETEK, Inc.; U.S. Gauge Div.


c. Dresser Industries, Inc.; Instrument Div.; Weksler Instruments Operating Unit.

d. Ernst Gauge Co.

e. Marsh Bellofram.

f. Noshok, Inc.

g. Trerice: H. O. Trerice Co.

h. Weiss Instruments, Inc.

i. WIKA Instruments Corp.

j. Winter's Thermogauges, Inc.

3. Test Plugs:


b. MG Piping Products Co.

c. National Meter.

d. Peterson Equipment Co., Inc.
2.2 THERMOMETERS, GENERAL

A. Scale Range: Temperature ranges for services listed are as follows:
   1. Heating Hot Water: 30 to 240 deg F, with 2-degree scale divisions.
   2. Chilled Water: 0 to 100 deg F, with 2-degree scale divisions.

B. Accuracy: Plus or minus 1 percent of range span or plus or minus one scale division to maximum of 1.5 percent of range span.

2.3 DIRECT-MOUNTING, FILLED-SYSTEM DIAL THERMOMETERS

A. Description: Vapor-actuated, universal-angle dial type.

B. Case: Drawn steel or cast aluminum, with 4-1/2-inch diameter, glass lens.

C. Adjustable Joint: Finish to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.

D. Thermal Bulb: Copper with phosphor-bronze bourdon pressure tube.

E. Movement: Brass, precision geared.

F. Scale: Progressive, satin-faced nonreflective aluminum with permanently etched markings.

G. Stem: Copper-plated steel, aluminum, or brass for separable socket; of length to suit installation.

2.4 SEPARABLE SOCKETS

A. Description: Fitting with protective socket for installation in threaded pipe fitting to hold fixed thermometer stem.
   1. Material: Brass, for use in copper piping.

4. Insertion Length: To extend to center of pipe.

5. Cap: Threaded, with chain permanently fastened to socket.

6. Heat-Transfer Fluid: Oil or graphite.

2.5 THERMOMETER WELLS

A. Description: Fitting with protective well for installation in threaded pipe fitting to hold test thermometer.

1. Material: Brass, for use in copper piping.


4. Insertion Length: To extend to center of pipe.

5. Cap: Threaded, with chain permanently fastened to socket.

6. Heat-Transfer Fluid: Oil or graphite.

2.6 PRESSURE GAUGES

A. Description: ASME B40.1, phosphor-bronze bourdon-tube type with bottom connection; dry type, unless liquid-filled-case type is indicated.

B. Case: Drawn steel, brass, or aluminum with 4-1/2-inch diameter, glass lens.

C. Connector: Brass, NPS 1/4.

D. Scale: White-coated aluminum with permanently etched markings.

E. Accuracy: Grade A, plus or minus 1 percent of middle 50 percent of scale.

F. Range: Comply with the following:

1. Vacuum: 30 inches Hg of vacuum to 15 psig of pressure.

2. Fluids under Pressure: Two times the operating pressure.
2.7 PRESSURE-GAUGE FITTINGS

A. Valves: NPS 1/4 brass or stainless-steel needle type.

B. Syphons: NPS 1/4 coil of brass tubing with threaded ends.

C. Snubbers: ASME B40.5, NPS 1/4 brass bushing with corrosion-resistant porous-metal disc of material suitable for system fluid and working pressure.

2.8 TEST PLUGS

A. Description: Nickel-plated, brass-body test plug in NPS 1/2 fitting.

B. Body: Length as required to extend beyond insulation.

C. Pressure Rating: 500 psig minimum.

D. Core Insert: Self-sealing valve, suitable for inserting 1/8-inch OD probe from dial-type thermometer or pressure gauge.

E. Core Material for Oil, and Gas: 20 to 200 deg F, chlorosulfonated polyethylene synthetic rubber.

F. Core Material for Air and Water: Minus 30 to plus 275 deg F, ethylene-propylene-diene terpolymer rubber.

G. Test-Plug Cap: Gasketed and threaded cap, with retention chain or strap.

H. Test Kit: Pressure gauge and adapter with probe, two bimetal dial thermometers, and carrying case.

1. Pressure Gauge and Thermometer Ranges: Approximately two times the system’s operating conditions.

3.0 EXECUTION

3.1 METER AND GAUGE INSTALLATION, GENERAL

A. Install meters, gauges, and accessories according to manufacturer's written instructions for applications where used.

3.2 THERMOMETER INSTALLATION

A. Install thermometers and adjust vertical and tilted positions.
3.3 PRESSURE-GAUGE INSTALLATION

A. Install pressure gauges in piping tees with pressure-gauge valve located on pipe at most readable position.

B. Install dry-type pressure gauges in the following locations:
   1. Discharge of each pressure-reducing valve.
   2. Building water-service entrance.

C. Install liquid-filled-type pressure gauges at suction and discharge of each pump.

D. Install pressure-gauge needle valve and snubber in piping to pressure gauges.

END OF SECTION
SECTION 23 05 23

VALVES

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 general-duty valves:

1. Bronze angle valves.
2. Cast-iron angle valves.
3. Copper-alloy ball valves.
4. Ferrous-alloy ball valves.
5. Ferrous-alloy butterfly valves.
6. High-pressure butterfly valves.
7. Bronze check valves.
8. Gray-iron swing check valves.
10. Spring-loaded, lift-disc check valves.
12. Cast-iron gate valves.
15. Cast-iron plug valves.
17. Chainwheel actuators.

B. Related Sections include the following:

1. Division 23 piping Sections for general-duty and specialty valves for site construction piping.

2. Division 23 Section "Mechanical Identification" for valve tags and charts.

3. Division 23 Section "HVAC Instrumentation and Controls" for control valves and actuators.

4. Division 23 piping Sections for specialty valves applicable to those Sections only.

1.3 DEFINITIONS

A. The following are standard abbreviations for valves:

1. CWP: Cold working pressure.

2. EPDM: Ethylene-propylene-diene terpolymer rubber.

3. NBR: Acrylonitrile-butadiene rubber.

4. PTFE: Polytetrafluoroethylene plastic.

5. SWP: Steam working pressure.

6. TFE: Tetrafluoroethylene plastic.

1.4 SUBMITTALS

A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

1.5 QUALITY ASSURANCE

A. ASME Compliance: ASME B31.1 for power piping valves and ASME B31.9 for building services piping valves.

1. Exceptions: Domestic hot- and cold-water, sanitary waste, and storm drainage piping valves unless referenced.
B. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, grooves, and weld ends.
   3. Set angle, gate, and globe valves closed to prevent rattling.
   4. Set ball and plug valves open to minimize exposure of functional surfaces.
   5. Set butterfly valves closed or slightly open.
   6. Block check valves in either closed or open position.

B. Use the following precautions during storage:
   1. Maintain valve end protection.
   2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use hand-wheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for 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, the manufacturers specified.
   2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.
2.2 VALVES, GENERAL

A. Refer to Part 3 "Valve Applications" Article for applications of valves.

B. Bronze Valves: NPS 2 (DN 50) and smaller with threaded ends, unless otherwise indicated.

C. Ferrous Valves: NPS 2-1/2 (DN 65) and larger with flanged ends, unless otherwise indicated.

D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

E. Valve Sizes: Same as upstream pipe, unless otherwise indicated.

F. Valve Actuators:

1. Chainwheel: For attachment to valves, of size and mounting height, as indicated in the "Valve Installation" Article in Part 3.

2. Gear Drive: For quarter-turn valves NPS 8 (DN 200) and larger.

3. Handwheel: For valves other than quarter-turn types.

4. Lever Handle: For quarter-turn valves NPS 6 (DN 150) and smaller, except plug valves.

5. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 10 plug valves, for each size square plug head.

G. Extended Valve Stems: On insulated valves.


I. Valve Grooved Ends: AWWA C606.

1. Solder Joint: With sockets according to ASME B16.18.
   a. Caution: Use solder with melting point below 840 deg F (454 deg C) for angle, check, gate, and globe valves; below 421 deg F (216 deg C) for ball valves.

2. Threaded: With threads according to ASME B1.20.1.

J. Valve Bypass and Drain Connections: MSS SP-45.

2.3 BRONZE ANGLE VALVES

A. Manufacturers:

1. Type 1, Bronze Angle Valves with Metal Disc:
2. Type 2, Bronze Angle Valves with Nonmetallic Disc:
   a. American Valve, Inc.
   b. Cincinnati Valve Co.
   c. Crane Co.; Crane Valve Group; Crane Valves.
   d. Crane Co.; Crane Valve Group; Jenkins Valves.
   e. Crane Co.; Crane Valve Group; Stockham Div.
   f. Grinnell Corporation.
   g. Hammond Valve.
   h. NIBCO INC.
   i. Powell, Wm. Co.

3. Type 3, Bronze Angle Valves with Metal Disc and Renewable Seat:
   a. Cincinnati Valve Co.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Div.
   e. Grinnell Corporation.
   f. Milwaukee Valve Company.
   g. NIBCO INC.

B. Bronze Angle Valves, General: MSS SP-80, with ferrous-alloy handwheel.

C. Type 1, Class 125, Bronze Angle Valves: Bronze body with bronze disc and union-ring bonnet.

D. Type 1, Class 150, Bronze Angle Valves: Bronze body with bronze disc and union-ring bonnet.

E. Type 1, Class 200, Bronze Angle Valves: Bronze body with bronze disc and union-ring bonnet.

F. Type 2, Class 125, Bronze Angle Valves: Bronze body with PTFE disc and union-ring bonnet.

G. Type 2, Class 150, Bronze Angle Valves: Bronze body with PTFE disc and union-ring bonnet.

H. Type 2, Class 200, Bronze Angle Valves: Bronze body with PTFE disc and union-ring bonnet.

I. Type 3, Class 125, Bronze Angle Valves: Bronze body with bronze disc and renewable seat, include union-ring bonnet.

J. Type 3, Class 150, Bronze Angle Valves: Bronze body with bronze disc and renewable seat, include union-ring bonnet.
K. Type 3, Class 200, Bronze Angle Valves: Bronze body with bronze disc and renewable seat, include union-ring bonnet.

2.4 CAST-IRON ANGLE VALVES

A. Manufacturers:

1. Type II, Cast-Iron Angle Valves with Metal Seats:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Jenkins Valves.
   c. Crane Co.; Crane Valve Group; Stockham Div.
   d. NIBCO INC.

B. Cast-Iron Angle Valves, General: MSS SP-85, Type II.

C. Class 125, Cast-Iron Angle Valves: Bronze mounted with gray-iron body and bronze seats.

D. Class 250, Cast-Iron Angle Valves: Bronze mounted with gray-iron body and bronze seats.

2.5 COPPER-ALLOY BALL VALVES

A. Manufacturers:

1. One-Piece, Copper-Alloy Ball Valves:
   a. American Valve, Inc.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Div.
   e. DynaQuip Controls.
   f. Grinnell Corporation.
   g. Jamesbury, Inc.
   h. Kitz Corporation of America.
   i. Legend Valve & Fitting, Inc.
   j. NIBCO INC.
   k. Watts Industries, Inc.; Water Products Div.

2. Two-Piece, Copper-Alloy Ball Valves:
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Div.
   e. DynaQuip Controls.
   f. Flow-Tek, Inc.
   g. Grinnell Corporation.
   h. Hammond Valve.
i. Honeywell Braukmann.

j. Jamesbury, Inc.

k. Jomar International, LTD.

l. Kitz Corporation of America.

m. Legend Valve & Fitting, Inc.

n. Milwaukee Valve Company.

o. Nexus Valve Specialties.

p. NIBCO INC.

q. R & M Energy Systems (Borger, TX).

r. Red-White Valve Corp.

s. Richards Industries; Marwin Ball Valves.


3. Three-Piece, Copper-Alloy Ball Valves:
   b. DynaQuip Controls.
   c. Grinnell Corporation.
   d. Hammond Valve.
   e. Jamesbury, Inc.
   f. Kitz Corporation of America.
   g. NIBCO INC.
   h. PBM, Inc.
   i. Red-White Valve Corp.
   j. Worcester Controls.

4. Safety-Exhaust, Copper-Alloy Ball Valves:
   b. DynaQuip Controls.
   c. Grinnell Corporation.
   d. Hammond Valve.
   e. Jamesbury, Inc.
   f. Milwaukee Valve Company.
   g. NIBCO INC.

B. Copper-Alloy Ball Valves, General: MSS SP-110.

C. One-Piece, Copper-Alloy Ball Valves: Brass or bronze body with chrome-plated bronze ball, PTFE seats, and 400-psig (2760-kPa) minimum CWP rating.

D. Two-Piece, Copper-Alloy Ball Valves: Forged-brass body with full-port, chrome-plated bronze ball; PTFE seats; and 600-psig (4140-kPa) minimum CWP rating and blowout-proof stem.

E. Three-Piece, Copper-Alloy Ball Valves: Forged-brass body with full-port, chrome-plated bronze ball; PTFE seats; and 600-psig (4140-kPa) minimum CWP rating and blowout-proof stem.
F. Safety-Exhaust, Copper-Alloy Ball Valves: Two-piece bronze body with exhaust vent opening, chrome-plated ball with vent, blowout-proof stem, locking handle, and working pressure rating of 400-psig (2760-kPa) CWP.

2.6 FERROUS-ALLOY BALL VALVES

A. Manufacturers:
   1. American Valve, Inc.
   3. Cooper Cameron Corp.; Cooper Cameron Valves Div.
   4. Crane Co.; Crane Valve Group; Stockham Div.
   5. Flow-Tek, Inc.
   6. Foster Valve Co.
   8. Jamesbury, Inc.
   10. Kitz Corporation of America.
   11. KTM Products, Inc.
   14. NIBCO INC.
   15. PBM, Inc.
   16. Richards Industries; Marwin Ball Valves.
   17. Worcester Controls.

B. Ferrous-Alloy Ball Valves, General: MSS SP-72, with flanged ends.

C. Ferrous-Alloy Ball Valves: Class 150, full port.

D. Ferrous-Alloy Ball Valves: Class 300, full port.
2.7 BRONZE CHECK VALVES

A. Manufacturers:

1. Type 1, Bronze, Horizontal Lift Check Valves with Metal Disc:
   a. Cincinnati Valve Co.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Stockham Div.
   d. Red-White Valve Corp.
   e. Walworth Co.

2. Type 2, Bronze, Horizontal Lift Check Valves with Nonmetallic Disc:
   a. Cincinnati Valve Co.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Div.
   e. Walworth Co.

3. Type 1, Bronze, Vertical Lift Check Valves with Metal Disc:
   a. Cincinnati Valve Co.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Red-White Valve Corp.

4. Type 2, Bronze, Vertical Lift Check Valves with Nonmetallic Disc:
   a. Grinnell Corporation.
   b. Kitz Corporation of America.
   c. Milwaukee Valve Company.

5. Type 3, Bronze, Swing Check Valves with Metal Disc:
   a. American Valve, Inc.
   b. Cincinnati Valve Co.
   c. Crane Co.; Crane Valve Group; Crane Valves.
   d. Crane Co.; Crane Valve Group; Jenkins Valves.
   e. Crane Co.; Crane Valve Group; Stockham Div.
   f. Grinnell Corporation.
   g. Hammond Valve.
   h. Kitz Corporation of America.
   i. Legend Valve & Fitting, Inc.
   j. Milwaukee Valve Company.
   k. NIBCO INC.
   l. Powell, Wm. Co.
   m. Red-White Valve Corp.
   n. Walworth Co.
   o. Watts Industries, Inc.; Water Products Div.
6. Type 4, Bronze, Swing Check Valves with Nonmetallic Disc:
   a. Cincinnati Valve Co.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Div.
   e. Grinnell Corporation.
   f. Hammond Valve.
   g. McWane, Inc.; Kennedy Valve Div.
   h. Milwaukee Valve Company.
   i. NIBCO INC.
   j. Red-White Valve Corp.
   k. Walworth Co.
   l. Watts Industries, Inc.; Water Products Div.

B. Bronze Check Valves, General: MSS SP-80.

C. Type 1, Class 125, Bronze, Horizontal Lift Check Valves: Bronze body with bronze disc and seat.

D. Type 1, Class 125, Bronze, Vertical Lift Check Valves: Bronze body with bronze disc and seat.

E. Type 1, Class 150, Bronze, Horizontal Lift Check Valves: Bronze body with bronze disc and seat.

F. Type 1, Class 150, Bronze, Vertical Lift Check Valves: Bronze body with bronze disc and seat.

G. Type 1, Class 200, Bronze, Horizontal Lift Check Valves: Bronze body with bronze disc and seat.

H. Type 1, Class 200, Bronze, Vertical Lift Check Valves: Bronze body with bronze disc and seat.

I. Type 2, Class 125, Bronze, Horizontal Lift Check Valves: Bronze body with nonmetallic disc and bronze seat.

J. Type 2, Class 125, Bronze, Vertical Lift Check Valves: Bronze body with nonmetallic disc and bronze seat.

K. Type 2, Class 150, Bronze, Horizontal Lift Check Valves: Bronze body with nonmetallic disc and bronze seat.

L. Type 2, Class 150, Bronze, Vertical Lift Check Valves: Bronze body with nonmetallic disc and bronze seat.

M. Type 2, Class 200, Bronze, Horizontal Lift Check Valves: Bronze body with nonmetallic disc and bronze seat.
N. Type 2, Class 200, Bronze, Vertical Lift Check Valves: Bronze body with nonmetallic disc and bronze seat.

O. Type 3, Class 125, Bronze, Swing Check Valves: Bronze body with bronze disc and seat.

P. Type 3, Class 150, Bronze, Swing Check Valves: Bronze body with bronze disc and seat.

Q. Type 3, Class 200, Bronze, Swing Check Valves: Bronze body with bronze disc and seat.

R. Type 4, Class 125, Bronze, Swing Check Valves: Bronze body with nonmetallic disc and bronze seat.

S. Type 4, Class 150, Bronze, Swing Check Valves: Bronze body with nonmetallic disc and bronze seat.

T. Type 4, Class 200, Bronze, Swing Check Valves: Bronze body with nonmetallic disc and bronze seat.

2.8 GRAY-IRON SWING CHECK VALVES

A. Manufacturers:

1. Type I, Gray-Iron Swing Check Valves with Metal Seats:
   a. Cincinnati Valve Co.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Div.
   e. Flomatic Valves.
   f. Grinnell Corporation.
   g. Hammond Valve.
   h. Kitz Corporation of America.
   i. Legend Valve & Fitting, Inc.
   j. Milwaukee Valve Company.
   k. Mueller Co.
   l. NIBCO INC.
   m. Powell, Wm. Co.
   n. Red-White Valve Corp.
   o. Walworth Co.

2. Type II, Gray-Iron Swing Check Valves with Composition to Metal Seats:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Stockham Div.
   c. Mueller Co.
3. Grooved-End, Ductile-Iron Swing Check Valves:
   a. Grinnell Corporation.
   b. Mueller Co.
   c. Victaulic Co. of America.


C. Type I, Class 125, gray-iron, swing check valves with metal seats.

D. Type I, Class 250, gray-iron, swing check valves with metal seats.

E. Type II, Class 125, gray-iron, swing check valves with composition to metal seats.

F. Type II, Class 250, gray-iron, swing check valves with composition to metal seats.

G. 175-psig (1207-kPa) CWP Rating, Grooved-End, Swing Check Valves: Ductile-iron body with grooved or shouldered ends.

H. 300-psig (2070-kPa) CWP Rating, Grooved-End, Swing Check Valves: Ductile-iron body with grooved or shouldered ends.

2.9 BRONZE GATE VALVES

A. Manufacturers:

1. Type 1, Bronze, Nonrising-Stem Gate Valves:
   a. American Valve, Inc.
   b. Cincinnati Valve Co.
   c. Crane Co.; Crane Valve Group; Crane Valves.
   d. Crane Co.; Crane Valve Group; Jenkins Valves.
   e. Crane Co.; Crane Valve Group; Stockham Div.
   f. Grinnell Corporation.
   g. Hammond Valve.
   h. Kitz Corporation of America.
   i. Legend Valve & Fitting, Inc.
   j. Milwaukee Valve Company.
   k. NIBCO INC.
   l. Powell, Wm. Co.
   m. Red-White Valve Corp.
   n. Walworth Co.
   o. Watts Industries, Inc.; Water Products Div.

2. Type 2, Bronze, Rising-Stem, Solid-Wedge Gate Valves:
   a. American Valve, Inc.
   b. Cincinnati Valve Co.
   c. Crane Co.; Crane Valve Group; Crane Valves.
d. Crane Co.; Crane Valve Group; Jenkins Valves.
e. Crane Co.; Crane Valve Group; Stockham Div.
f. Grinnell Corporation.
g. Hammond Valve.
h. Kitz Corporation of America.
i. Milwaukee Valve Company.
j. NIBCO INC.
k. Powell, Wm. Co.
l. Red-White Valve Corp.
m. Walworth Co.

3. Type 3, Bronze, Rising-Stem, Split-Wedge Gate Valves:
   a. Cincinnati Valve Co.
   b. Crane Co.; Crane Valve Group; Jenkins Valves.
   c. Grinnell Corporation.
   d. NIBCO INC.

B. Bronze Gate Valves, General: MSS SP-80, with ferrous-alloy handwheel.

C. Type 1, Class 125, Bronze Gate Valves: Bronze body with nonrising stem and bronze solid wedge and union-ring bonnet.

D. Type 1, Class 150, Bronze Gate Valves: Bronze body with nonrising stem and bronze solid wedge and union-ring bonnet.

E. Type 1, Class 200, Bronze Gate Valves: Bronze body with nonrising stem and bronze solid wedge and union-ring bonnet.

F. Type 2, Class 125, Bronze Gate Valves: Bronze body with rising stem and bronze solid wedge and union-ring bonnet.

G. Type 2, Class 150, Bronze Gate Valves: Bronze body with rising stem and bronze solid wedge and union-ring bonnet.

H. Type 2, Class 200, Bronze Gate Valves: Bronze body with rising stem and bronze solid wedge and union-ring bonnet.

I. Type 3, Class 125, Bronze Gate Valves: Bronze body with rising stem and bronze split wedge and union-ring bonnet.

J. Type 3, Class 150, Bronze Gate Valves: Bronze body with rising stem and bronze split wedge and union-ring bonnet.

K. Type 3, Class 200, Bronze Gate Valves: Bronze body with rising stem and bronze split wedge and union-ring bonnet.
2.10 CAST-IRON GATE VALVES

A. Manufacturers:

1. Type I, Cast-Iron, Nonrising-Stem Gate Valves:
   a. Cincinnati Valve Co.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Div.
   e. Grinnell Corporation.
   f. Hammond Valve.
   g. Kitz Corporation of America.
   h. Legend Valve & Fitting, Inc.
   i. Milwaukee Valve Company.
   j. NIBCO INC.
   k. Powell, Wm. Co.
   l. Red-White Valve Corp.
   m. Walworth Co.

2. Type I, Cast-Iron, Rising-Stem Gate Valves:
   a. Cincinnati Valve Co.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Div.
   e. Grinnell Corporation.
   f. Hammond Valve.
   g. Kitz Corporation of America.
   h. Legend Valve & Fitting, Inc.
   i. Milwaukee Valve Company.
   j. NIBCO INC.
   k. Powell, Wm. Co.
   l. Red-White Valve Corp.
   m. Walworth Co.

B. Cast-Iron Gate Valves, General: MSS SP-70, Type I.

C. Class 125, NRS, Bronze-Mounted, Cast-Iron Gate Valves: Cast-iron body with bronze trim, nonrising stem, and solid-wedge disc.

D. Class 125, OS&Y, Bronze-Mounted, Cast-Iron Gate Valves: Cast-iron body with bronze trim, rising stem, and solid-wedge disc.

E. Class 125, NRS, All-Iron, Cast-Iron Gate Valves: Cast-iron body with cast-iron trim, nonrising stem, and solid-wedge disc.
F. Class 125, OS&Y, All-Iron, Cast-Iron Gate Valves: Cast-iron body with cast-iron trim, rising stem, and solid-wedge disc.

G. Class 250, NRS, Bronze-Mounted, Cast-Iron Gate Valves: Cast-iron body with bronze trim, nonrising stem, and solid-wedge disc.

H. Class 250, OS&Y, Bronze-Mounted, Cast-Iron Gate Valves: Cast-iron body with bronze trim, rising stem, and solid-wedge disc.

I. Class 250, NRS, All-Iron, Cast-Iron Gate Valves: Cast-iron body with cast-iron trim, nonrising stem, and solid-wedge disc.

J. Class 250, OS&Y, All-Iron, Cast-Iron Gate Valves: Cast-iron body with cast-iron trim, rising stem, and solid-wedge disc.

2.11 BRONZE GLOBE VALVES

A. Manufacturers:

1. Type 1, Bronze Globe Valves with Metal Disc:
   a. Cincinnati Valve Co.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Div.
   e. Grinnell Corporation.
   f. Hammond Valve.
   g. Kitz Corporation of America.
   h. Legend Valve & Fitting, Inc.
   i. Milwaukee Valve Company.
   j. NIBCO INC.
   k. Powell, Wm. Co.
   l. Red-White Valve Corp.
   m. Walworth Co.

2. Type 2, Bronze Globe Valves with Nonmetallic Disc:
   a. Cincinnati Valve Co.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Div.
   e. Grinnell Corporation.
   f. Hammond Valve.
   g. Kitz Corporation of America.
   h. McWane, Inc.; Kennedy Valve Div.
   i. Milwaukee Valve Company.
   j. NIBCO INC.
k. Powell, Wm. Co.
l. Red-White Valve Corp.
m. Walworth Co.

3. Type 3, Bronze Globe Valves with Renewable Seat and Metal Disc:
   a. Cincinnati Valve Co.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Div.
   e. Grinnell Corporation.
   f. Hammond Valve.
   g. Milwaukee Valve Company.
   h. NIBCO INC.
   i. Walworth Co.

B. Bronze Globe Valves, General: MSS SP-80, with ferrous-alloy handwheel.

C. Type 1, Class 125, Bronze Globe Valves: Bronze body with bronze disc and union-ring bonnet.

D. Type 1, Class 150, Bronze Globe Valves: Bronze body with bronze disc and union-ring bonnet.

E. Type 1, Class 200, Bronze Globe Valves: Bronze body with bronze disc and union-ring bonnet.

F. Type 2, Class 125, Bronze Globe Valves: Bronze body with PTFE disc and union-ring bonnet.

G. Type 2, Class 150, Bronze Globe Valves: Bronze body with PTFE disc and union-ring bonnet.

H. Type 2, Class 200, Bronze Globe Valves: Bronze body with PTFE disc and union-ring bonnet.

I. Type 3, Class 125, Bronze Globe Valves: Bronze body with bronze disc and renewable seat, include union-ring bonnet.

J. Type 3, Class 150, Bronze Globe Valves: Bronze body with bronze disc and renewable seat, include union-ring bonnet.

K. Type 3, Class 200, Bronze Globe Valves: Bronze body with bronze disc and renewable seat, include union-ring bonnet.

2.12 CAST-IRON GLOBE VALVES

A. Manufacturers:

   1. Type I, Cast-Iron Globe Valves with Metal Seats:
      a. Cincinnati Valve Co.
      b. Crane Co.; Crane Valve Group; Crane Valves.
      c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Div.

e. Grinnell Corporation.

f. Hammond Valve.

g. Kitz Corporation of America.

h. Milwaukee Valve Company.

i. NIBCO INC.

j. Powell, Wm. Co.

k. Red-White Valve Corp.

l. Walworth Co.


C. Type I, Class 125, Cast-Iron Globe Valves: Gray-iron body with bronze seats.

D. Type I, Class 250, Cast-Iron Globe Valves: Gray-iron body with bronze seats.

2.13 CAST-IRON PLUG VALVES

A. Manufacturers:

1. Nonlubricated-Type, Cast-Iron Plug Valves:

   a. General Signal; DeZurik Unit.

   b. Grinnell Corporation.


   e. Wheatley Gaso, Inc.

   f. Xomox Corporation.

B. Cast-Iron Plug Valves, General: MSS SP-78.

C. Class 125 or 150, lubricated-type, cast-iron plug valves.

D. Class 250 or 300, lubricated-type, cast-iron plug valves.

E. Class 125 or 150, nonlubricated-type, cast-iron plug valves.

F. Class 250, nonlubricated-type, cast-iron plug valves.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

D. Examine threads on valve and mating pipe for form and cleanliness.

E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

F. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE APPLICATIONS

A. Refer to piping Sections for specific valve applications. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butterfly, or gate valves.
2. Throttling Service: Angle, ball, butterfly, or globe valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.

C. Domestic Water Piping: Use the following types of valves:

1. Angle Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 125, bronze.
2. Angle Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, cast iron.
3. Ball Valves, NPS 2 (DN 50) and Smaller: One-piece, 400-psig (2760-kPa) CWP rating, copper alloy.
4. Ball Valves, NPS 2-1/2 (DN 65) and Larger: Class 150, ferrous alloy.
5. Swing Check Valves, NPS 2 (DN 50) and Smaller: Type 4, Class 125, bronze.
6. Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, gray iron.
7. Grooved-End, Ductile-Iron, Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: 175-psig (1207-kPa) CWP rating.

8. Gate Valves, NPS 2 (DN 50) and Smaller: Type 1, Class 125, bronze.

9. Gate Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, bronze-mounted cast iron.

10. Globe Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 125, bronze.

11. Globe Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, bronze-mounted cast iron.

12. Plug Valves, NPS 2 (DN 50) and Larger: Class 125, nonlubricated-type, cast iron.

D. Sanitary Waste and Storm Drainage Piping: Use the following types of valves:

1. Ball Valves, NPS 2 (DN 50) and Smaller: One-piece, 400-psig (2760-kPa) CWP rating, copper alloy.

2. Ball Valves, NPS 2-1/2 (DN 65) and Larger: Class 150, ferrous alloy.

3. Swing Check Valves, NPS 2 (DN 50) and Smaller: Type 3, Class 125, bronze.

4. Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, gray iron.

5. Grooved-End, Ductile-Iron, Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: 175-psig (1207-kPa) minimum CWP rating.

6. Gate Valves, NPS 2 (DN 50) and Smaller: Type 1, Class 125, bronze.

7. Gate Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, bronze-mounted cast iron.

8. Globe Valves, NPS 2 (DN 50) and Smaller: Type 1, Class 125, bronze.

9. Globe Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, cast iron.

10. Plug Valves, NPS 2 (DN 50) and Larger: Class 125 or 150, nonlubricated-type, cast iron.

E. Select valves, except wafer and flangeless types, with the following end connections:

1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Solder-joint or threaded ends.

2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends.

3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.
4. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.

5. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends.

6. For Steel Piping, NPS 5 (DN 125) and Larger: Flanged ends.

7. For Grooved-End, Copper Tubing and Steel Piping: Valve ends may be grooved. Do not use for steam or steam condensate piping.

3.3 VALVE INSTALLATION

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

C. Locate valves for easy access and provide separate support where necessary.

D. Install valves in horizontal piping with stem at or above center of pipe.

E. Install valves in position to allow full stem movement.

F. Install check valves for proper direction of flow and as follows:
   1. Swing Check Valves: In horizontal position with hinge pin level.
   2. Dual-Plate Check Valves: In horizontal or vertical position, between flanges.
   3. Lift Check Valves: With stem upright and plumb.

3.04 JOINT CONSTRUCTION

A. Refer to Division 23 Section 23 05 00 "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.5 ADJUSTING

A. 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.
SECTION 23 05 29
HANGERS AND SUPPORTS

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 hangers and supports for mechanical system piping and equipment.

B. Related Sections include the following:

1. Division 23 Section "Mechanical Vibration and Seismic Controls" for vibration isolation and seismic restraint devices.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for the Valve and Fittings Industry.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 SUBMITTALS

A. Product Data: For each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated.

B. Shop Drawings: Signed and sealed by a qualified professional engineer for multiple piping supports and trapeze hangers. Include design calculations and indicate size and characteristics of components and fabrication details.

C. Welding Certificates: Copies of certificates for welding procedures and operators.

D. All attachments to building structure shall be made in accordance with the Owners structural engineers requirements and weight limitations.

E. Submit shop drawings and calculations for review and approval by Owners structural engineer before installation.
1.5 QUALITY ASSURANCE

A. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pipe Hangers:
   a. B-Line Systems, Inc.
   b. Carpenter & Patterson, Inc.
   c. Grinnell Corp.
   d. Michigan Hanger Co., Inc.
   e. National Pipe Hanger Corp.
   f. Piping Technology & Products, Inc.

2. Channel Support Systems:
   a. B-Line Systems, Inc.
   b. Grinnell Corp.; Power-Strut Unit.
   c. GS Metals Corp.
   e. National Pipe Hanger Corp.
   f. Unistrut Corp.

3. Thermal-Hanger Shield Inserts:
   a. Carpenter & Patterson, Inc.
   b. Michigan Hanger Co., Inc.
   c. Pipe Shields, Inc.
   e. Rilco Manufacturing Co., Inc.

4. Powder-Actuated Fastener Systems:
   a. Gunnebo Fastening Corp.
   b. Hilti, Inc.
   c. ITW Ramset/Red Head.
   d. Masterset Fastening Systems, Inc.
2.2 MANUFACTURED UNITS

A. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components. Refer to "Hanger and Support Applications" Article in Part 3 for where to use specific hanger and support types.

1. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.

2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

B. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.

1. Coatings: Manufacturer’s standard finish, unless bare metal surfaces are indicated.

2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

C. Thermal-Hanger Shield Inserts: 100-psi minimum compressive-strength insulation, encased in sheet metal shield.

1. Material for Cold Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate with vapor barrier.

2. Material for Cold Piping: ASTM C 552, Type I cellular glass with vapor barrier.


4. Material for Hot Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate.

5. Material for Hot Piping: ASTM C 552, Type I cellular glass.


7. For Trapeze or Clamped System: Insert and shield cover entire circumference of pipe.

8. For Clevis or Band Hanger: Insert and shield cover lower 180 degrees of pipe.

9. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.
2.3 MISCELLANEOUS MATERIALS

A. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

B. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.

C. Grout: ASTM C 1107, Grade B, factory-mixed and -packaged, nonshrink and nonmetallic, dry, hydraulic-cement grout.
   1. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
   3. Design Mix: 5000-psi, 28-day compressive strength.
   4. Refer to Division 3 Section “Cast-in-Place Concrete” for additional information and requirements.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger requirements are specified in Sections specifying equipment and systems.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.

C. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification 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 120 to 450 deg F pipes, NPS 4 to NPS 16, 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 24, 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 2.

10. Split Pipe-Ring with or without Turnbuckle-Adjustment 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 pipe, 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.

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 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 20, 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.

D. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.

2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

E. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification 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.

F. Building Attachments: Unless otherwise indicated and except as specified in piping system Specification 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 where allowed by seismic codes.

3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles where allowed by seismic codes.

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 where allowed by structural codes.

8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams where allowed by structural codes.

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 head room is limited.

G. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification 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 by manufacturer to prevent crushing insulation.

3. Thermal-Hanger Shield Inserts: For supporting insulated pipe, 360-degree insert of high-density, 100-psi minimum compressive-strength, water-repellent-treated calcium silicate or cellular-glass pipe insulation, same thickness as adjoining insulation with vapor barrier and encased in 360-degree sheet metal shield.
H. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification 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 absorb 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 absorb 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 absorb 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.

3.2 HANGER AND SUPPORT INSTALLATION

A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems.

1. Field assemble and install according to manufacturer's written instructions.
C. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.

2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.

D. Install building attachments within concrete slabs or attach to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, 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.

E. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer’s written instructions.

F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

G. 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.

H. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

I. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.

J. Insulated Piping: Comply with the following:

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 according to ASME B31.9.

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 arc of 180 degrees.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:
   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   b. NPS 4: 12 inches long and 0.06 inch thick.
   c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
   d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
   e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood inserts.

6. Insert Material: Length at least as long as protective shield.

7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor.

3.4 METAL FABRICATION

A. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes 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 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 contours of welded surfaces match adjacent contours.
3.5 ADJUSTING

A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

A. Touching Up: 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. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 9 Section "Painting."

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 23 05 29
SECTION 23 05 33
MECHANICAL VIBRATION AND SEISMIC CONTROLS

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. Elastomeric isolation pads and mounts.
2. Restrained elastomeric isolation mounts.
3. Freestanding and restrained spring isolators.
4. Housed spring mounts.
5. Elastomeric hangers.
7. Spring hangers with vertical-limit stops.
8. Thrust limits.
9. Pipe riser resilient supports.
10. Resilient pipe guides.
11. Freestanding and restrained air spring isolators.
12. Restrained vibration isolation roof-curb rails.
15. Steel and inertia, vibration isolation equipment bases.

1.3 DEFINITIONS
A. $A_v$: Effective peak velocity related acceleration coefficient.

B. OSHPD: Office of Statewide Health Planning & Development for the State of California. OSHPD assigns a unique anchorage pre approval "R" number to each seismic restraint it tests. The number describes a specific device applied as tested.

1.4 PERFORMANCE REQUIREMENTS

A. All mechanical equipment shall be braced or anchored to resist horizontal force acting in any direction using the following criteria:

1. The total design lateral seismic force shall be determined from Section 1632A.2, California Building Code (CBC) 1998. Forces shall be applied in the horizontal directions, which result in the most critical loading for design.

2. The value of $\text{Ap}$ (Component Application Factor) of Section 1632A.2 shall be selected from Table 16A-0, CBC 1998. The value of $\text{Pp}$ (Seismic Importance Factor) and $\text{Ca}$ (Seismic Coefficient) shall be selected from Table 16A-K and 16A-Q, CBC 1998, respectively.

B. Effective peak velocity related acceleration coefficient, $A_v$: Per 1998 UBC, Chapter 16.

1.5 SUBMITTALS

A. Product Data: Include load deflection curves for each vibration isolation device.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Include the following:

1. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.

2. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system has been examined for excessive stress and that none will exist.

3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.

4. Seismic-Restraint Details: Detail fabrication and attachment of seismic restraints and snubbers. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.
5. Submittals for Interlocking Snubbers: Include load deflection curves up to 1/2-inch deflection in x, y, and z planes.

C. Welding certificates.

D. Manufacturer Seismic Qualification Certification: Submit certification that all specified equipment will withstand seismic forces identified in "Performance Requirements" Article above. Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculations.
   a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
   b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.6 QUALITY ASSURANCE

A. Seismic-restraint devices shall have horizontal and vertical load testing and analysis performed according to OSHPD and shall bear anchorage pre-approval "R" number, from OSHPD or another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If pre-approved 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. Testing and calculations must include both shear and tensile loads and 1 test or analysis at 45 degrees to the weakest mode.

B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into base.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.
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. Seismic Snubber Units: Furnish replacement neoprene inserts for all snubbers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following
   requirements apply for 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, the manufacturers specified.

   2. Manufacturers: Subject to compliance with requirements, provide products by the
      manufacturers specified.

2.2 VIBRATION ISOLATORS

A. Manufacturers:

   1. Amber/Booth Company, Inc.
   2. California Dynamics Corp.
   4. Mason Industries, Inc.
   5. Vibration Isolation Co., Inc.
   6. Vibrex

B. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in
   single or multiple layers, molded with a nonslip pattern and galvanized steel baseplates of
   sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match
   requirements of supported equipment.

   2. Durometer Rating: 60.
C. Elastomeric Mounts: Double-deflection type, with molded, oil-resistant rubber or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.

1. Durometer Rating: 60.

D. Restrained Elastomeric Mounts: All-directional elastomeric mountings with seismic restraint.

1. Materials: Cast-ductile-iron housing containing two separate and opposing, molded, bridge-bearing neoprene elements that prevent central threaded sleeve and attachment bolt from contacting the casting during normal operation.

2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge bearing neoprene as defined by AASHTO.

E. Spring Isolators: Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

2. Minimum Additional Travel: 50 percent of the required deflection at rated load.

3. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.

4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 100 psig.

6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

F. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.

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 the rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

G. Housed Spring Mounts: Housed spring isolator with integral seismic snubbers.
1. Housing: Ductile-iron or steel housing to provide all-directional seismic restraint.
2. Base: Factory drilled for bolting to structure.
3. Snubbers: Vertically adjustable to allow a maximum of 1/4-inch travel before contacting a resilient collar.

H. Elastomeric Hangers: Double-deflection type, with molded, oil-resistant rubber or neoprene isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.

I. 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 the 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.

J. Spring Hangers with Vertical-Limit Stop: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with a vertical-limit stop.
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 the 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.

7. **Adjustable Vertical Stop**: Steel washer with neoprene washer "up-stop" on lower threaded rod.

K. **Thrust Limits**: Combination coil spring and elastomeric insert with spring and insert in compression and with a load stop. Include rod and angle-iron brackets for attaching to equipment.

1. **Frame**: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular 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 the 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.

7. **Coil Spring**: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

L. **Pipe Riser Resilient Support**: All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch thick, 60-durometer neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig and for equal resistance in all directions.

M. **Resilient Pipe Guides**: Telescopic arrangement of 2 steel tubes separated by a minimum of 1/2-inch thick, 60-durometer neoprene. Factory set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.3 **SEISMIC-RESTRAINT DEVICES**
A. Manufacturers:

1. Amber/Booth Company, Inc.
2. California Dynamics Corp.
4. Mason Industries, Inc.
5. Unistrut Diversified Products Co.; Wayne Manufacturing Division.
6. Vibration Isolation Co., Inc.
7. Vibrex.

B. Resilient Isolation Washers and Bushings: 1-piece, molded, bridge-bearing neoprene complying with AASHTO M 251 and having a durometer of 40, plus or minus 5, with a flat washer face.

C. Seismic 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: 1-piece, molded, bridge-bearing neoprene complying with AASHTO M 251 and having a durometer of 60, plus or minus 5.

D. Restraining Cables: Galvanized steel aircraft cables with end connections made of steel assemblies that swivel to final installation angle and utilize two clamping bolts for cable engagement.

E. Anchor Bolts: Seismic-rated, drill-in, and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488/E 488M.

2.4 VIBRATION ISOLATION EQUIPMENT BASES

A. Manufacturers:

1. Amber/Booth Company, Inc.
2. California Dynamics Corp.
4. Mason Industries, Inc.
5. Vibration Isolation Co., Inc.
6. Vibrex.

B. Steel Base: Factory-fabricated, welded, structural-steel bases and rails.
   1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails. Include supports for suction and discharge elbows for pumps.
   2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
   3. Support Brackets: Factory-welded steel angles on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

   1. Design Requirements: Lowest possible mounting height with not less than 1-inch (25-mm) clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails. Include supports for suction and discharge elbows for pumps.
   2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
   3. Support Brackets: Factory-welded steel angles on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
   4. Fabrication: Fabricate steel templates to hold equipment anchor-bolt sleeves and anchors in place during placement of concrete. Obtain anchor-bolt templates from supported equipment manufacturer.

2.5 FACTORY FINISHES

A. 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 electrogalvanized. Hot-dip galvanize metal components for exterior use.
   3. Baked enamel for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements, 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 INSTALLATION

A. Install roof curbs, equipment supports, and roof penetrations.

B. Install thrust limits at centerline of thrust, symmetrical on either side of equipment.

C. Install seismic snubbers on isolated equipment. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.

D. Install restraining cables at each trapeze and individual pipe hanger. At trapeze anchor locations, shackle piping to trapeze. Install cables so they do not bend across sharp edges of adjacent equipment or building structure.

E. Install steel angles or channel, sized to prevent buckling, clamped with ductile-iron clamps to hanger rods for trapeze and individual pipe hangers. At trapeze anchor locations, shackle piping to trapeze. Requirements apply equally to hanging equipment. Do not weld angles to rods.

F. Install resilient bolt isolation washers on equipment anchor bolts.

3.3 EQUIPMENT BASES

A. Concrete Bases: Anchor equipment to concrete base according to supported equipment manufacturer's written instructions for seismic codes at Project site.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.

2. Place and secure anchorage devices. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
3. Install anchor bolts to elevations required for proper attachment to supported equipment.

4. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.4 FIELD QUALITY CONTROL

A. Testing: Engage a qualified testing agency to perform the following field quality-control testing:

1. Isolator seismic-restraint clearance.

2. Isolator deflection.

3. Snubber minimum clearances.


5. Air-Mounting System Operational Test: Test the compressed-air leveling system. Remove malfunctioning units, replace with new units, and retest.

6. Test and adjust air-mounting system controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 ADJUSTING

A. Adjust isolators after piping systems have been filled and equipment 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. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop.

D. Adjust air spring leveling mechanism.

E. Adjust active height of spring isolators.

F. Adjust snubbers according to manufacturer's written recommendations.

G. Adjust seismic restraints to permit free movement of equipment within normal mode of operation.

H. Torque anchor bolts according to equipment manufacturer's written recommendations to resist seismic forces.
3.6 CLEANING

A. After completing equipment installation, inspect vibration isolation and seismic-control devices. Remove paint splatters and other spots, dirt, and debris.

END OF SECTION 23 05 33

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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 mechanical identification materials and their installation:

1. Equipment nameplates.
2. Equipment markers.
3. Equipment signs.
4. Access panel and door markers.
5. Pipe markers.
6. Duct markers.
7. Stencils.
8. Valve tags.
10. Warning tags.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Valve numbering scheme.

D. Valve Schedules: For each piping system. Furnish extra copies (in addition to mounted copies) to include in maintenance manuals.
1.4 QUALITY ASSURANCE


1.5 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION DEVICES

A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.

1. Data:
   a. Manufacturer, product name, model number, and serial number.
   b. Capacity, operating and power characteristics, and essential data.
   c. Labels of tested compliances.

2. Location: Accessible and visible.

3. Fasteners: As required to mount on equipment. No adhesive will be acceptable as a method of permanent fastener for equipment labels.

B. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.

1. Terminology: Match schedules as closely as possible.

2. Data:
   a. Name and plan number.
   b. Equipment service.
   c. Design capacity.
   d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.

3. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.
C. Equipment Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.

1. Data: Instructions for operation of equipment and for safety procedures.
2. Engraving: Manufacturer's standard letter style, of sizes and with terms to match equipment identification.
3. Thickness: 1/16 inch for units up to 20 sq. in. or 8 inches in length, and 1/8 inch (3.2 mm) for larger units.
4. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

D. Access Panel and Door Markers: 1/16-inch- (1.6-mm-) thick, engraved laminated plastic, with abbreviated terms and numbers corresponding to identification. Provide 1/8-inch center hole for attachment.


2.2 PIPING IDENTIFICATION DEVICES

A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.

1. Colors: Comply with ASME A13.1, unless otherwise indicated.
2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
3. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers extending 360 degrees around pipe at each location.
4. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.

B. Pretensioned Pipe Markers: Precoiled semirigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.

C. Shaped Pipe Markers: Preformed semirigid plastic formed to partially cover circumference of pipe and to attach to pipe with mechanical fasteners that do not penetrate insulation vapor barrier.

E. Plastic Tape: Continuously printed, vinyl tape at least 3 mils thick with pressure-sensitive, permanent-type, self-adhesive back.
   2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2 inches minimum.

2.3 DUCT IDENTIFICATION DEVICES

A. Duct Markers: Engraved, color-coded laminated plastic. Include direction and quantity of airflow and duct service (such as supply, return, and exhaust). Include contact-type, permanent adhesive.

2.4 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches for ducts; and minimum letter height of 3/4 inch for access panel and door markers, equipment markers, equipment signs, and similar operational instructions.
   1. Stencil Material: Aluminum or Brass.
   2. Stencil Paint: Exterior, gloss, acrylic enamel black, unless otherwise indicated. Paint may be in pressurized spray-can form.
   3. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1, unless otherwise indicated.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers, with numbering scheme approved by Architect. Provide 5/32-inch hole for fastener.
   1. Material: 0.032-inch-thick brass or aluminum.
   2. Material: 0.0375-inch-(1-mm-) thick stainless steel.
   3. Material: 3/32-inch-(2.4-mm-) thick laminated plastic with 2 black surfaces and white inner layer.
   4. Valve-Tag Fasteners: Brass wire-link or beaded chain.
2.6 VALVE SCHEDULES

A. Valve Schedules: For each piping system, on standard-size 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-Schedule Frames: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Include mounting screws.
2. Frame: Extruded aluminum.
3. Glazing: ASTM C 1036, Type I, Class 1, Glazing Quality B, 2.5-mm, single-thickness glass.

2.7 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags; of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches minimum.
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 APPLICATIONS, GENERAL

A. Products specified are for applications referenced in other Division 15 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.2 EQUIPMENT IDENTIFICATION

A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:

1. Fuel-burning units, including boilers, furnaces, heaters, stills, and absorption units.
2. Pumps, compressors, chillers, condensers, and similar motor-driven units.
3. Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and similar equipment.

4. Fans, blowers, primary balancing dampers, and mixing boxes.

5. Packaged HVAC central-station and zone-type units. Provide identification label on each door to indicate service section, i.e. supply fan, return/exhaust fan, filters, electrical, controls, cooling coils, heating/reheat coil, humidifier and similar items.

6. Expansion tanks, air separators and similar equipment.

B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.

1. Letter Size: Minimum ¼ inch for name of units if viewing distance is less than 24 inches, ½ 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.

2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.

3. Locate markers where accessible and visible. Include markers for the following general categories of equipment:
   a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
   b. Fire department hose valves and hose stations.
   c. Meters, gages, thermometers, and similar units.
   d. Fuel-burning units, including boilers, furnaces, heaters, stills, and absorption units.
   e. Pumps, compressors, chillers, condensers, and similar motor-driven units.
   f. Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and similar equipment.
   g. Fans, blowers, primary balancing dampers, and mixing boxes.
   h. Packaged HVAC central-station and zone-type units.
   i. Tanks and pressure vessels.
   j. Strainers, filters, humidifiers, water-treatment systems, and similar equipment.

C. Stenciled Equipment Marker Option: Stenciled markers may be provided instead of laminated-plastic equipment markers, at Installer’s option, if lettering larger than 1 inch high is needed for proper identification because of distance from normal location of required identification.

D. Install equipment signs with screws or permanent adhesive on or near each major item of mechanical equipment. Locate signs where accessible and visible.

1. Identify mechanical equipment with equipment markers in the following color codes:
a. Green: For cooling equipment and components.
b. Yellow: For heating equipment and components.
c. Green and Yellow: For combination cooling and heating equipment and components.
d. Brown: For energy-reclamation equipment and components.

2. Letter Size: Minimum ¼ inch for name of units if viewing distance is less than 24 inches, ½ 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.

3. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.

4. Include signs for the following general categories of equipment:
   a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
   b. Fuel-burning units, including boilers, furnaces, heaters, stills, and absorption units.
   c. Pumps, compressors, chillers, condensers, and similar motor-driven units.
   d. Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and similar equipment.
   e. Fans, blowers, primary balancing dampers, and mixing boxes.
   f. Packaged HVAC central-station and zone-type units.
   g. Tanks and pressure vessels.
   h. Strainers, filters, humidifiers, water-treatment systems, and similar equipment.

E. Stenciled Equipment Sign Option: Stenciled signs may be provided instead of laminated-plastic equipment signs, at Installer's option, if lettering larger than 1 inch high is needed for proper identification because of distance from normal location of required identification.

F. Install access panel markers with screws on equipment access panels.

3.3 PIPING IDENTIFICATION

A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.

1. Pipes with OD, Including Insulation, Less Than 6 Inches: Pretensioned pipe markers. Use size to ensure a tight fit.

2. Pipes with OD, Including Insulation, Less Than 6 Inches: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 1-1/2 inches wide, lapped at least 1-1/2 inches at both ends of pipe marker, and covering full circumference of pipe.

3. Pipes with OD, Including Insulation, 6 Inches and Larger: Shaped pipe markers. Use size to match pipe and secure with fasteners.
4. Pipes with OD, Including Insulation, 6 Inches and Larger: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 1-1/2 inches wide, lapped at least 3 inches at both ends of pipe marker, and covering full circumference of pipe.

B. Stenciled Pipe Marker Option: Stenciled markers may be provided instead of manufactured pipe markers, at Installer's option. Install stenciled pipe markers complying with ASME A13.1 on each piping system.

1. Identification Paint: Use for contrasting background.

C. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior non-concealed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and nonaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

3.4 DUCT IDENTIFICATION

A. Install duct markers with permanent adhesive on air ducts in the following color codes:

1. Green: For cold-air supply ducts.
2. Yellow: For hot-air supply ducts.
3. Blue: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
4. ASME A13.1 Colors and Designs: For hazardous material exhaust.
5. Letter Size: Minimum 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 letter-
ing for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

B. Stenciled Duct Marker Option: Stenciled markers, showing service and direction of flow, may be provided instead of laminated-plastic duct markers, at Installer's option, if lettering larger than 1 inch high is needed for proper identification because of distance from normal location of required identification.

C. Locate markers 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; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar rough-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:

1. Valve-Tag Size and Shape:
   d. Gas: 1-1/2 inches, round.
   e. Steam: 1-1/2 inches, round.

2. Valve-Tag Color:
   a. Cold Water: Green.
   b. Hot Water: Yellow.
   c. Fire Protection: Red.
   d. Gas: Yellow.

3. Letter Color:
   d. Gas: White.

3.6 VALVE-SCHEDULE INSTALLATION

A. Mount valve schedule on wall in accessible location in each major equipment room.

3.7 WARNING-TAG INSTALLATION
A. Write required message on, and attach warning tags to, equipment and other items where re-
dquired.

3.8 ADJUSTING

A. Relocate mechanical identification materials and devices that have become visually blocked by
other work.

3.9 CLEANING

A. Clean faces of mechanical identification devices and glass frames of valve schedules.

END OF SECTION 23 05 53
PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:

1. Balancing airflow including submains, branches, and terminals, to indicated quantities according to specified tolerances.
2. Adjusting total HVAC systems to provide indicated quantities.
4. Setting quantitative performance of HVAC equipment.
5. Verifying that automatic control devices are functioning properly.
7. Reporting results of activities and procedures specified in this Section.

1.2 DEFINITIONS

C. CTI: Cooling Tower Institute.
E. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.3 SUBMITTALS

B. Certified Testing, Adjusting, and Balancing Reports: Prepared on approved forms certified by the testing, adjusting, and balancing Agent.
1.4 QUALITY ASSURANCE

A. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by AABC or NEBB.

B. Certification of Testing, Adjusting, and Balancing Reports: Certify testing, adjusting, and balancing field data reports. This certification includes the following:
   1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.
   2. Certify that testing, adjusting, and balancing team complied with approved testing, adjusting, and balancing plan and procedures specified and referenced in this Specification.


D. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification" as appropriate.

E. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by the instrument manufacturer.

1.5 PROJECT CONDITIONS

A. Full Owner Occupancy: The Owner will occupy the site and existing building during the entire testing, adjusting, and balancing period. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

1.6 COORDINATION

A. Coordinate efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.

B. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.7 WARRANTY
A. National Project Performance Guarantee: For AABC certified agents, provide a guarantee on AABC’S "National Standards" forms stating that AABC will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:

1. The certified Agent has tested and balanced systems according to the Contract Documents.
2. Systems are balanced to optimum performance capabilities within design and installation limits.

B. Special Guarantee: For NEBB certified agents, provide a guarantee on NEBB forms stating that NEBB will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:

1. The certified Agent has tested and balanced systems according to the Contract Documents.
2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to construction, examine the Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.

1. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine Project Record Documents described in Division 1 Section "Project Record Documentation."

D. Examine equipment performance data, including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create
undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA’s "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with design data and installed conditions.

E. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.

F. Examine system and equipment test reports.

G. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, flow-control devices and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

H. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

I. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes and mixing boxes, to verify that they are accessible and their controls are connected and functioning.

K. Examine plenum ceilings, utilized for supply air, to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.

L. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

M. Examine equipment for installation and for properly operating safety interlocks and controls.

N. Examine automatic temperature system components to verify the following:

1. Dampers and other controlled devices operate by the intended controller.

2. Dampers and valves are in the position indicated by the controller.

3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.

4. Automatic modulating and shutoff dampers are properly connected.
5. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.

6. Sensors are located to sense only intended conditions.

7. Sequence of operation for control modes is according to the Contract Documents.

8. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.

9. Interlocked systems are operating.

10. Changeover from heating to cooling mode occurs according to design values.

O. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.2 PREPARATION

A. Prepare a testing, adjusting, and balancing plan that includes strategies and step-by-step procedures. The contractor shall submit a copy of project specific testing, adjusting, and balancing plan to Commissioning Authority (CxA) for review prior to commencing the work at site. The plan shall include all necessary single line diagrams and design data templates ready for execution. The CxA shall review the plan for completeness, acceptable standards and conformance to design requirements.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.

2. Automatic temperature-control systems are operational.

3. Equipment and duct access doors are securely closed.

4. Balance, smoke, and fire dampers are open.

5. Isolating and balancing dampers are open and control dampers are operational.

6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.

7. Windows and doors can be closed so design conditions for system operations can be met.

3.3 TESTING AND BALANCING PROCEDURES
A. Perform testing and balancing procedures on each system according to procedures contained in AABC national standards or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.

C. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.
3.4 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans: Plus 5 to plus 10 percent.

2. Air Outlets and Inlets: Plus 5 to minus 5 percent.

3.5 REPORTS

A. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

B. Preliminary Report: Contractor shall provide preliminary report with hand-written values and notes to Commissioning Authority (CxA) at the immediate conclusion of site work for review. Typing, binding, or formatting the Preliminary Report is not necessary before submitting for Commissioning Authority review. Report must have readable values and notes, including all testing condition data.

C. Final Report: Typewritten, or computer printout in letter-quality font, on standard bond paper, bound in three-ring, loose-leaf binder, and tabulated and divided into sections by tested and balanced systems.

1. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing agent.

2. Include a list of instruments used for procedures, along with proof of calibration.

3. Final Report Contents: In addition to certified field report data, include the following:
   a. Fan curves.
   b. Manufacturers' test data.
   c. Field quality-control test reports prepared by system and equipment installers.
   d. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.

4. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:
   a. Title page.
   b. Name and address of testing, adjusting, and balancing Agent.
   c. Project name.
   d. Project location.
   e. Architect's name and address.
   f. Engineer's name and address.
g. Contractor's name and address.

h. Report date.

i. Signature of testing, adjusting, and balancing Agent who certifies the report.

j. Summary of contents, including the following:
   1) Design versus final performance.
   2) Notable characteristics of systems.
   3) Description of system operation sequence if it varies from the Contract Documents.

k. Nomenclature sheets for each item of equipment.

l. Data for terminal units, including manufacturer, type size, and fittings.

m. Notes to explain why certain final data in the body of reports vary from design values.

n. Test conditions for fan performance forms, including the following:
   1) Settings for outside-, return-, and exhaust-air dampers.
   2) Conditions of filters.
   3) Fan drive settings, including settings and percentage of maximum pitch diameter.
   4) Inlet vane settings for variable-air-volume systems.
   5) Settings for supply-air, static-pressure controller.
   6) Other system operating conditions that affect performance.

5. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present with single-line diagrams and include the following:
   a. Quantities of outside, supply, return, and exhaust airflows.
   b. Duct, outlet, and inlet sizes.
   c. Terminal units.
   d. Balancing stations.

3.6 ADDITIONAL TESTS

A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial testing, adjusting, and balancing procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

END OF SECTION 23 05 93
SECTION 23 07 00
PIPE INSULATION

1.0 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 preformed, rigid and flexible pipe insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

1.3 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for the following:
   1. Application of protective shields, saddles, and inserts at pipe hangers for each type of insulation and hanger.
   2. Attachment and covering of heat trace inside insulation.
   3. Insulation application at pipe expansion joints for each type of insulation.
   4. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
   5. Removable insulation at piping specialties and equipment connections.
   6. Application of field-applied jackets.

C. 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.

D. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.
1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.

2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate clearance requirements with piping Installer for insulation application.

1.7 SCHEDULING

A. Schedule insulation application after testing piping systems and, where required, after installing and testing heat-trace tape. Insulation application may begin on segments of piping that have satisfactory test results.

2.0 PRODUCTS

2.1 MANUFACTURERS

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. Mineral-Fiber Insulation:
a. CertainTeed Manson.
b. Knauf FiberGlass GmbH.
c. Owens-Corning Fiberglas Corp.
d. Schuller International, Inc.

2. Cellular-Glass Insulation:
   a. Pittsburgh-Corning Corp.

2.2 INSULATION MATERIALS

A. Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:

1. Preformed Pipe Insulation: Comply with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retarder jacket.

2. Blanket Insulation: Comply with ASTM C 553, Type II, without facing.

3. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:
   a. Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass-fiber insulation.
   b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.

4. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.


B. Cellular-Glass Insulation: Inorganic, foamed or cellulated glass, annealed, rigid, hermetically sealed cells, incombustible.
1. Preformed Pipe Insulation, without Jacket: Comply with ASTM C 552, Type II, Class 1.

2. Preformed Pipe Insulation, with Jacket: Comply with ASTM C 552, Type II, Class 2.

C. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.

2.3 FIELD-APPLIED JACKETS

A. General: ASTM C 921, Type 1, unless otherwise indicated.

B. Aluminum Jacket: Aluminum roll stock, ready for shop or field cutting and forming to indicated sizes. Comply with ASTM B 209 (ASTM B 209M), 3003 alloy, H-14 temper.
   1. Finish and Thickness: Smooth finish, 0.010 inch thick.
   2. Finish and Thickness: Corrugated finish, 0.010 inch thick.
   4. Elbows: Preformed, 45- and 90-degree, short- and long-radius elbows; same material, finish, and thickness as jacket.

2.4 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd.
   1. Tape Width: 4 inches.

B. Bands: 3/4 inch wide, in one of the following materials compatible with jacket:
   1. Stainless Steel: ASTM A 666, Type 304; 0.020 inch thick.
   2. Galvanized Steel: 0.005 inch thick.
   3. Aluminum: 0.007 inch thick.
   4. Brass: 0.010 inch thick.
   5. Nickel-Copper Alloy: 0.005 inch thick.

C. Wire: 0.080-inch, nickel-copper alloy; 0.062-inch, soft-annealed, stainless steel; or 0.062-inch, soft-annealed, galvanized steel.
D. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

3.0 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

3.3 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer’s written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply insulation with longitudinal seams at the bottom of horizontal pipe runs.

E. Apply 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. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

H. Keep insulation materials dry during application and finishing.

I. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
J. Apply insulation with the least number of joints practical.

K. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.

L. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, and other projections with vapor-retarder mastic.

   1. Apply insulation continuously through hangers and around anchor attachments.

   2. For insulation application where vapor retarders are indicated, extend insulation on anchor legs at least 12 inches (300 mm) from point of attachment to pipe and taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

   3. Install insert materials and apply insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer.

   4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, and shield.

M. Insulation Terminations: For insulation application where vapor retarders are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

N. Apply adhesives and mastics at the manufacturer's recommended coverage rate.

O. Apply insulation with integral jackets as follows:

   1. Pull jacket tight and smooth.

   2. Circumferential Joints: Cover with 3-inch wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches o.c.

   3. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches. Apply 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 4 inches o.c.

      a. Exception: Do not staple longitudinal laps on insulation with vapor retarder.
4. **Vapor-Retarder Mastics:** Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.

5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic.

**P. Roof Penetrations:** Apply insulation for interior applications to a point even with top of roof flashing.

1. Seal penetrations with vapor-retarder mastic.

2. Apply insulation for exterior applications tightly joined to interior insulation ends.

3. Extend metal jacket of exterior insulation outside roof flashing at least 2 inches below top of roof flashing.

4. Seal metal jacket to roof flashing with vapor-retarder mastic.

**Q. Exterior Wall Penetrations:** For penetrations of below-grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor-retarder mastic.

### 3.4 MINERAL-FIBER INSULATION APPLICATION

**A. Apply insulation to straight pipes and tubes as follows:**

1. Secure each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.

2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic. Apply vapor retarder to ends of insulation at intervals of 15 to 20 feet to form a vapor retarder between pipe insulation segments.

3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches o.c.

4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

**B. Apply insulation to flanges as follows:**

1. Apply preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the 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. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch, and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.

2. When premolded insulation elbows and fittings are not available, apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.

3. Cover fittings with standard PVC fitting covers.

4. Cover fittings with heavy PVC fitting covers. Overlap PVC covers on pipe insulation jackets at least 1 inch at each end. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

D. Apply insulation to valves and specialties as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.

2. When premolded insulation sections are not available, apply glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to stainer basket without disturbing insulation.

3. Apply insulation to flanges as specified for flange insulation application.

5. Use preformed heavy PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer’s attachments and accessories. Seal seams with tape and vapor-retarder mastic.

6. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.5 CELLULAR-GLASS INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of insulation to pipe with wire, tape, or bands without deforming insulation materials.

2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic.

3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches o.c.

4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the 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 the same thickness as pipe insulation.

4. Apply canvas jacket material with manufacturer’s recommended adhesive, overlapping seams at least 1 inch, and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer’s written instructions.
2. When premolded sections of insulation are not available, apply mitered sections of cellular-glass insulation. Secure insulation materials with wire, tape, or bands.

3. Cover fittings with standard PVC fitting covers.

4. Cover fittings with heavy PVC fitting covers. Overlap PVC covers on pipe insulation jackets at least 1 inch at each end. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

D. Apply insulation to valves and specialties as follows:

1. Apply premolded segments of cellular-glass insulation or glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to stainer basket without disturbing insulation.

2. Apply insulation to flanges as specified for flange insulation application.


4. Use preformed heavy PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

5. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.6 FIELD-APPLIED JACKET APPLICATION

A. Apply metal jacket 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.

3.7 FINISHES

A. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

3.8 PIPING SYSTEM APPLICATIONS
A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:

1. Flexible connectors.
2. Vibration-control devices.
3. Fire-suppression piping.
4. Drainage piping located in crawl spaces, unless otherwise indicated.
5. Below-grade piping, unless otherwise indicated.
6. Chrome-plated pipes and fittings, unless potential for personnel injury.
7. Air chambers, unions, strainers, check valves, plug valves, and flow regulators.

3.9 FIELD QUALITY CONTROL

A. Inspection: Owner will engage a qualified inspection agency to perform the following field quality-control inspections, after installing insulation materials, jackets, and finishes, to determine compliance with requirements.

B. Inspection: Engage a qualified inspection agency to perform the following field quality-control inspections, after installing insulation materials, jackets, and finishes, to determine compliance with requirements.

C. Inspection: Perform the following field quality-control inspections, after installing insulation materials, jackets, and finishes, to determine compliance with requirements:

1. Inspect fittings and valves randomly selected by Architect.
2. Remove fitting covers from 20 elbows or 1 percent of elbows, whichever is less, for various pipe sizes.
3. Remove fitting covers from 20 valves or 1 percent of valves, whichever is less, for various pipe sizes.

D. Insulation applications will be considered defective if sample inspection reveals noncompliance with requirements. Remove defective Work and replace with new materials according to these Specifications.

E. Reinstall insulation and covers on fittings and valves uncovered for inspection according to these Specifications.
3.10 EXTERIOR INSULATION APPLICATION SCHEDULE

A. This application schedule is for aboveground insulation outside the building. Loose-fill insulation, for below ground piping, is specified in architectural and civil piping distribution Sections.

B. Service: Combination chilled water supply and return and heating hot water supply and return.

1. Operating Temperature: 35 to 220 deg F.

2. Insulation Material: Mineral fiber, cellular glass, with jacket.

3. Insulation Thickness: Apply the following insulation thicknesses:

   a. Steel, Copper Pipe, 1/2 inch to 12 inch: 1-1/2 inch thick.


5. Vapor Retarder Required: Yes.

END OF SECTION
SECTION 23 09 23
DIRECT DIGITAL CONTROL SYSTEM FOR HVAC

PART 1: GENERAL

1.1 WORK INCLUDED

A. Furnish a native BACnet Energy Management System (EMS) as specified herein. The operator’s workstation, all building controllers, application controllers, and all input/output devices shall communicate using the protocols and network standards as defined by ANSI/ASHRAE Standard 135-2008, BACnet. In other words, all workstations and controllers, including unitary controllers, shall be native BACnet devices. No gateways shall be used for communication to controllers installed under this section. Gateways may be used for communication to existing systems or to systems installed under other sections.

B. The native BACnet EMS shall be as specified herein and consist of a high-speed, peer-to-peer local area network of DDC controllers connected to a dedicated Server PC and other client workstation PC’s and Lap Top computers as specified. All HVAC and/or Electrical system points monitored and controlled by the EMS, including the building floor plans as well as all control devices, will be depicted by point-and-click graphics.

C. Provide all necessary BACnet-compliant hardware and software to meet the system’s functional specifications. Provide Protocol Implementation Conformance Statement (PICS) for Windows-based control software and every controller in system, including unitary controllers. All controller devices must be BTL tested and listed by the official BACnet Testing Laboratory, having the BTL approval mark issued.

D. All devices in this new project facility location shall be accessible from a single graphical user interface.

E. Prepare individual hardware layouts, interconnection drawings, and software configuration from project design data.

F. Design, provide, and install all equipment cabinets, panels, data communication network cables needed, and all associated hardware.

G. Furnish and install the required software to produce a complete and operational native BACnet EMS as specified herein.

H. Provide complete manufacturer’s specifications for all items that are supplied. Include vendor name of every item supplied.

I. Provide supervisory specialists, including a dedicated project manager, and technicians throughout the duration of the project to assist in all phases of EMS system installation, startup, and commissioning.

J. Provide a comprehensive operator and technician training program as described herein.
K. Provide as-built documentation, operator’s terminal software, diagrams, and all other associated project operational documentation (such as technical manuals) on approved media, the sum total of which accurately represents the final system.

1.2 SYSTEM DESCRIPTION

A. A distributed logic control system complete with all software and hardware functions shall be provided and installed. System shall be completely based on ANSI/ASHRAE Standard 135-2008, BACnet and achieved listing under the BACnet Testing Laboratories BACnet - Advanced Workstation Software (B-AWS). This system is to control all mechanical equipment, including all unitary equipment such as heat pumps, fan-coils, AC units, etc., and all air handlers, boilers, cooling towers, and any other listed equipment using native BACnet-compliant components. Non-BACnet-compliant or proprietary equipment or systems (including gateways) shall not be acceptable and are specifically prohibited.

B. Operator’s workstation software shall be 64-bit operating system running Windows 7, Windows 8, Windows 8.1, Windows Server 2012 or SQL Server 2008 R2 as the computer operating system. The Energy Management System (EMS) application program shall be written to communicate specifically utilizing BACnet protocols. Software functions delivered on this project shall include password protection, scheduling (including optimum start), alarming, logging of historical data, full graphics including animation, after-hours billing program, demand limiting, and a full suite of field engineering tools including graphical programming and applications. Systems using operating systems other than that described above are strictly prohibited. All software required to program EMS application specific controllers and all field level devices and controllers will be left with the owner. All software passwords required to program and make future changes to the system will also become the property of the owner. All software required to make any program changes anywhere in the system, along with scheduling and trending applications, will be left with the owner. All software passwords required to program and make future changes to schedules, trends and related program changes will also become the property of the owner. All software required for all field engineering tools including graphical programming and applications will be left with the owner. All software passwords required to program and make future changes to field engineering tools, including graphical programming and applications will be left with the owner.

C. Building controllers shall include complete energy management software, including scheduling building control strategies with optimum start and logging routines. All energy management software and firmware shall be resident in field hardware and shall not be dependent on the operator’s terminal. Operator’s terminal software is to be used for access to field-based energy management functions only. Provide zone-by-zone direct digital logic control of space temperature, scheduling, runtime accumulation, equipment alarm reporting, and override timers for after-hours usage.

D. Room sensors shall be architecturally pleasing, sense temperature and allow tenant to override system (as indicated on plan documents).

E. All application controllers for every terminal unit (HP, UV, etc.), air handler, all central
plant equipment, and any other piece of controlled equipment shall be fully programmable. Application controllers shall be mounted next to controlled equipment and communicate with building controller through BACnet LAN.

F. System Architecture

a. **EMS** Contractor shall utilize Owner’s IT WAN for connection from BACnet Server to all Building Control Modules (BCM’s) furnished and installed as part of this project. Connection shall be by way of BACnet/IP as defined in Addendum A (Annex J) of the ANSI/ASHRAE Standard for BACnet. Connection between all Integration Level Global Controllers, the BACnet Server and any client work stations (PC’s or Lap Tops) shall be high-speed, peer-to-peer Ethernet as per Standard IEEE802.3. Owner shall furnish and maintain IT WAN infrastructure.

b. **EMS** Contractor shall provide and install a dedicated MS/TP LAN extending from all Global Controller’s to distributed field level controller BACnet devices.

c. Distributed field level controllers are responsible for directly controlling and monitoring HVAC and Electrical system points throughout the facility.

d. The BACnet Server hosts system configurations, programming databases and stores all trendlog data. The Server maintains all backup files for system configuration and programming located on Global Controller’s and field level controllers and is capable of directly uploading or downloading information from the controllers.

e. An operator’s workstation and/or any designated portable operator’s terminal (if specified) shall be used as a graphical user interface to provide system supervision, management report generation and alarm annunciation.

1.3 APPROVED MANUFACTURERS

A. Approved Control Manufacturers:

a. Alerton (Basis of Design) – Ascent Compass. Contact Katrina Hearn at Syserco: 510.498.1418 or e-mail: k.hearn@syserco.com for further bid coordination.

b. Schneider Electric – TAC I/A (BACnet).

c. Siemens – Apogee (BACnet).

d. No Equals.

B. Owner and Owner’s Representative reserves the right to approve and/or deny qualification status of all potential bidders based upon references and compliance with Specifications and Contract Documents.

1.4 QUALITY ASSURANCE

A. The Contractor shall be regularly engaged in the manufacturing, installation and maintenance of EMS systems and shall have demonstrated technical expertise and experience in the manufacture, installation and maintenance of EMS systems similar in
size and complexity to this project.

B. The EMS system shall be designed, installed, commissioned, and serviced by manufacturer-authorized and trained personnel. System provider shall have an in-place support facility within 50 miles of the site with technical staff, spare parts inventory and necessary test and diagnostic equipment.

C. To provide the level of support and response required by the Owner, the Energy Management System Contractor shall have a fully staffed service department with the following minimum personnel and service offerings:
   a. Minimum of 1 (one) Dedicated Support Technician located at a fixed location with access to a network for remote access to the site.
   b. Minimum of 1 (one) Dedicated Service Dispatcher to route calls and prioritize service response.
   c. Minimum of 5 (five) Dedicated Field Service Technicians. To ensure that there are personnel available to respond to service requests in a timely manner, these technicians are to be dedicated to service and not used on construction projects.
   d. Maintain a 24/7 Service Call Center staffed by live operators enabling immediate response to Owner’s critical emergency EMS concerns.

D. The EMS Contractor shall provide an on-site, experienced project manager for this work who is responsible for direct supervision of the installation, start up and commissioning of the EMS system.

E. EMS Contractor shall have a proven record of successful native BACnet installations and maintenance of equivalent native BACnet systems for a minimum period of 5 years utilizing the same native BACnet manufacturer’s product line that the Contractor proposes to use on this project.

F. Materials and equipment shall be manufacturer’s latest standard design that complies with the specification requirements.

G. All BAS peer-to-peer network controllers, central system controllers and local user displays shall be UL Listed under Standard UL 916, category PAZX.

H. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.

1.5 REFERENCE STANDARDS

A. The latest edition of the following standards and codes in effect and amended as of supplier's proposal date, and any applicable subsections thereof, shall govern design and selection of equipment and material supplied:

1. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).


Canada and the US.


6. FCC Part 15, Subpart J, Class A.


8. UL-864 UUKL listing for Smoke Controls for any equipment used in smoke control sequences.

B. City, county, state, and federal regulations and codes in effect as of contract date.

C. Except as otherwise indicated, the system supplier shall secure and pay for all permits, inspections, and certifications required for his work, and arrange for necessary approvals by the governing authorities.

1.6 SUBMITTALS

A. Drawings

1. The system supplier shall submit engineered drawings, control sequence, and bill of materials for approval.

2. Drawings shall be submitted in the following standard sizes: 11” x 17” (ANSI B).

3. Eight (8) complete sets (copies) of submittal drawings shall be provided.

4. Drawings shall be available on CD-ROM.

B. System Documentation

Include the following in submittal package:

1. System configuration diagrams in simplified block format.

2. All input/output object listings and an alarm point summary listing.

3. Electrical drawings that show all system internal and external connection points, terminal block layouts, and terminal identification.


5. Manufacturer's instructions and drawings for installation, maintenance, and operation of all purchased items.

6. Overall system operation and maintenance instructions—including preventive maintenance and troubleshooting instructions.

7. For all system elements—operator’s workstation(s), building controller(s), application controllers, routers, and repeaters—provide BACnet Protocol Implementation Conformance Statements (PICS) as per ANSI/ASHRAE Standard 135-2001.
8. Provide complete description and documentation of any proprietary (non-BACnet) services and/or objects used in the system.

9. A list of all functions available and a sample of function block programming that shall be part of delivered system.

1.7 WARRANTY
A. Warranty shall cover all costs for parts, labor, associated travel, and expenses for a period of one (1) year from completion of system acceptance.

B. Hardware and software personnel supporting this warranty agreement shall provide on-site or off-site service in a timely manner after failure notification to the vendor.

C. This warranty shall apply equally to both hardware and software.

1.8 RELATED WORK IN OTHER SECTIONS
A. Refer to Division 0 and Division 1 for related contractual requirements.

B. Refer to Section 23 00 00 for General Mechanical Provisions.

C. Refer to Section 26 00 00 for General Electrical Provisions.

PART 2: PRODUCTS

2.1 ADVANCED WORKSTATION
A. General structure of workstation interaction shall be a standard client/server relationship. Server shall be used to archive data and store system database for the BACnet network as specified in these contract document Specifications and project Plan Drawings. Thick and Web Clients shall access server for all archived data. Server shall support a minimum of 20 simultaneous clients.

B. BACnet Conformance

1. Operator workstation shall be approved by the BTL as meeting the BACnet Advanced Workstation (AWS) requirements.

2. Please refer to Section 22.2, BACnet Functional Groups, in the BACnet standard, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

3. Standard BACnet object types accessed by the workstation shall include as a minimum: Analog Value, Analog Input, Analog Output, Binary Value, Binary Input, Binary Output, Calendar, Device, Event Enrollment, File, Notification Class, Program, and Schedule object types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the
submittal data. All necessary tools shall be supplied for working with proprietary information.

4. The AWS shall comply with Annex J of the BACnet specification for IP connections. Must support remote connection to server using a thick client application. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the LAN. Must support interoperability on wide area networks (WANS) and campus area networks (CANs). Workstation shall support Foreign Device Registration to allow temporary workstation connection to IP network.

C. Data Displays

1. Data displays shall render all data associated with project as called out on drawings and/or object type list supplied. Graphic files shall be created using digital, full color photographs of system installation, AutoCAD or Visio drawing files of field installation drawings and wiring diagrams from as-built drawings.

2. Data displays shall render all data using iconic graphic representations of all mechanical equipment. System shall be capable of displaying graphic file, text, and dynamic object data together on each display and shall include animation. Information shall be labeled with descriptors and shall be shown with the appropriate engineering units. All information on any display shall be dynamically updated without any action by the user.

3. Data display frame shall allow user to change all field-resident AWS functions associated with the project, such as setpoints, weekly schedules, exception schedules, etc., from any screen, no matter if that screen shows all text or a complete graphic display. This shall be done without any reference to object addresses or other numeric/mnemonic indications.

4. Analog objects shall be displayed with operator modifiable units. Analog input objects may also be displayed as individual graphic items on the display screen as an overlay to the system graphic.

5. All displays and programming shall be generated and customized by the local EMS Contractor. Systems requiring factory development of graphics or programming of DDC logic are specifically prohibited.

6. AWS shall be supplied with a library of standard graphics, which may be used unaltered or modified by the operator. AWS shall include a library of equipment graphic components to assemble custom graphics. Systems that do not allow customization or creation of new graphic objects by the operator (or with third-party software) shall not be allowed.

7. Data display frame shall include customizable and persistent tree navigation for building, equipment and system diagnostic centric display organization.

8. Each display may be protected from viewing unless operator credentials have the appropriate access level. An access level may be assigned to each display.
and system object. The menu label shall not appear on the graphic if the operator does not have the appropriate security level.

9. Data displays shall have the ability to link to content outside of the BAS system. Such content shall include but is not limited to: Launching external files in their native applications (for example, a Microsoft Word document) and launching a Web browser resolving to a specified Web address.

10. Data displays shall support:
   a. Graphic items with custom geometry that offer both color gradient shading and variable opacity in scale to system variables and range set points.
   b. Clear and custom geometry navigation buttons to provide intuitive navigation.
   c. Graphic files in jpg, png, and .gif file types.
   d. Viewing of 1,024 system data points in a single screen.

11. All graphical user interface screens developed for Thick or Web Client devices on this project shall be seamlessly integrated to the existing Alerton Ascent Compass Server PC. Graphical user interface screens for this project requiring software enabling/support beyond Alerton Ascent Compass are specifically prohibited.

12. EMS Contractor shall be solely responsible for seamlessly integrating all graphical user interface screens developed for Thick or Web Client devices on this project with the existing Alerton Ascent Compass Server PC.

D. Password Protection

1. Provide security system that prevents unauthorized use unless operator is logged on. Access shall be limited to operator’s assigned functions when user is logged on. This includes displays as outlined above.

2. AWS shall provide security for a minimum of 200 users. Each user shall have an individual User ID, User Name, and Password. Entries are alphanumeric characters only and are case sensitive (except for User ID). User ID shall be 0–8 characters, User Name shall be 0–29 characters, and Password shall be 4–8 characters long.

3. Each user shall be allowed individual assignment of only those control functions, menu items, and user specific system start display, as well restricted access to discrete BACnet devices to which that user requires access.

4. All passwords, user names, and access assignments shall be adjustable online at the operator’s terminal.

5. Users shall also have a set access level, which defines access to displays and
individual objects the user may control. System shall include 10 separate and distinct access levels for assignment to users.

6. System shall include an Auto Logout Feature that shall automatically logout user when there has been no keyboard or mouse activity for a set period of time. Time period shall be adjustable by system administrator. Auto Logout may be enabled and disabled by system administrator. Operator terminal shall display message on screen that user is logged out after Auto Logout occurs.

7. The system shall permit the assignment of an effective date range, as well as an effective time of day, that the User IDs are permitted to authenticate.

E. Operator Activity Log

1. Operator Activity Log that tracks all operator changes and activities shall be included with AWS. System shall track what is changed in the system, who performed this change, date and time of system activity, and value of the change before and after operator activity. Operator shall be able to display all activity, sort the changes by user and also by operation. Operator shall be able to print the Operator Activity log display.

2. Log shall be gathered and archived to hard drive on AWS as needed. Operator shall be able to export data for display and sorting in a spreadsheet.

F. Scheduling

1. AWS and Web Client shall show all information in easy-to-read daily format including calendar of this month and next. All schedules shall show actual ON/OFF times for day based on scheduling priority. Priority for scheduling shall be events, holidays and daily, with events being the highest.

2. Holiday and special event schedules shall display data in calendar format. Operator shall be able to schedule holidays and special events directly from these calendars.

3. Operator shall be able to change all information for a given weekly or exception schedule if logged on with the appropriate access privileges.

4. AWS shall include a Schedule Wizard for set up of schedules. Wizard shall walk user through all steps necessary for schedule generation. Wizard shall have its own pull-down selection for startup or may be started by right-clicking on value displayed on graphic and then selecting Schedule.

5. Scheduling shall include optimum start based on outside air temperature, current heating/cooling setpoints, indoor temperature and history of previous starts. Each and every individual zone shall have optimum start time independently calculated based on all parameters listed. User shall input schedules to set time that occupied setpoint is to be attained. Optimum start feature shall calculate the startup time needed to match zone temperature to setpoint. User shall be able to set a limit for the maximum startup time allowed.
6. Schedule list shall show all schedules currently defined. This list shall include all standard, holiday and event schedules. In addition, user shall be able to select a list that shows all scheduled points and zones.

7. Display of all three schedules must show all ON times for standard, holiday and event schedules in different colors on a given day. In addition, OFF times for each must also be shown in additional colors. User shall be able to select from standard calendar what days are to be scheduled and same display shall show all points and zones affected. User shall be able to set time for one day and select all days of the week that shall be affected as a recurrence of that same schedule for that given day.

8. Any displayed data that is changeable by the operator may be selected using the right mouse button and the schedule shall then be selectable on the screen. Selection of the schedule using this method shall allow the viewing of the assigned schedule allow the point to be scheduled.

9. Schedule editor shall support Drag-n-drop events and holidays onto the schedule calendar.

10. Schedule editor shall support Drag-n-drop events default to a 2hr period; which can then be adjusted by the user.

12. Schedule editor shall support Drag-n-drop holidays are defaulted for OFF all day and can be edited for multiple-day holidays.

13. Schedule editor shall support the View of affected zones when adding or editing timed events of a schedule.

G. Alarm Indication and Handling

1. AWS shall provide visual, printed, and email means of alarm indication. Printout of alarms shall be sent to the assigned terminal and port. Alarm notification can be filtered based on the User ID’s authorization level.

2. Web client shall display a persistent alarm state for the system regardless of the data view including points in alarm but not acknowledged, and points that have gone into alarm and returned to normal without being acknowledged.

3. Alarm History shall provide log of alarm messages. Alarm log shall be archived to the hard disk of the AWS. Each entry shall include a description of the event-initiating object generating the alarm. Description shall be an alarm message of at least 256 characters in length. Entry shall include time and date of alarm occurrence, time and date of object state return to normal, time and date of alarm acknowledgment, and identification of operator acknowledging alarm.

4. Alarm messages shall be in user-definable text (English or other specified language) and shall be delivered either to the operator’s terminal, client or through remote communication using email (Authenticated SMTP supported).
5. AWS shall include an Alarm Wizard for set up of alarms. Wizard shall walk user through all steps necessary for alarm generation. Wizard shall have its own pull-down selection for startup or may be started by right-clicking on value displayed on graphic and then selecting alarm setup.

6. AWS shall support color-coded indication of current alarms as follows:
   a) Red indicator shows number of active alarms that have not been acknowledged.
   b) Yellow indicator shows number of alarms that are still active but have been acknowledged.
   c) Blue indicator shows number of alarms that have returned to normal but have not been acknowledged.
   d) Color-coded indicators, when selected by the user, navigate to a pre-filtered view of Alarm History.
   e) Alarm history can be filtered by color-coded indicator states.

8. Alarm annunciation includes navigation link to a user selected display or URL.

9. User can silence audible annunciation for the current session.

10. User can disable auto-refresh of alarm annunciation for current session.

11. Any displayed data that is changeable by the operator may be selected using the right mouse button and the alarm shall then be selectable on the screen. Selection of the alarm using this method shall allow the viewing of the alarm history or allow the creation of a new alarm.

H. Trendlog Information

1. AWS shall periodically gather historically recorded data stored in the building controllers and store the information in the system database. Stored records shall be appended with new sample data, allowing records to be accumulated. Systems that write over stored records shall not be allowed unless limited file size is specified. System database shall be capable of storing up to 50 million records before needing to archive data. Samples may be viewed at the web client. Operator shall be able to view all trended records, both stored and archived. All trendlog records shall be displayed in standard engineering units.

2. AWS shall be capable of trending on an interval determined by a polling rate, or change-of-value.

3. AWS shall be able to change Trendlog setup information. This includes the information to be logged as well as the interval at which it is to be logged. All operations shall be password protected. Viewing may be accessed directly from any and all graphics on which a trended object is displayed.
4. AWS shall include a Trendlog Wizard for setup of logs. Wizard shall walk user through all necessary steps. Wizard shall have its own pull-down selection for startup, or may be started by right-clicking on value displayed on graphic, and then selecting Trendlogs from the displayed menu.

5. AWS shall be capable of using Microsoft SQL as the system database.

6. Any displayed data that is changeable by the operator may be selected using the right mouse button and the trendlog shall then be selectable on the screen. Selection of the trendlog using this method shall allow the viewing of the trendlog view.

7. Trendlog viewer shall provide:
   a) Software that is capable of graphing the trend logged object data shall be included.
   b) Access and ability to create, edit and view are restricted to users by user account credentials
   c) Specific and repeatable URL defines the trendlog(s) that comprise the view
   d) Call out of trendlog value at intersection of trend line and mouse-over vertical axis.
   e) Trend log and companion logs can be configured to display on one of two independent vertical scales.
   f) Click zoom for control of data set viewed along either graph axis
   g) User specifiable start and end dates as well as a fast scroll features that that supports click zoom of macro scale view of the data for quickly finding data set based on visual signature.
   h) User export of the viewed data set to MS Excel.
   i) Web browser based help
   j) Optional min/max ranges (Upper Control Limits, Lower Control Limits) for each value.

I. Energy Log Information – As Scheduled

1. AWS shall be capable of periodically gathering energy log data stored in the field equipment and archive the information. Archive files shall be appended with new data, allowing data to be accumulated. Systems that write over archived data shall not be allowed unless limited file size is specified. Display all energy log information in standard engineering units.

2. All data shall be stored in database file format for direct use by third-party programs. Operation of system shall stay completely online during all graphing
3. AWS Operator shall be able to change the energy log setup information as well. This includes the meters to be logged, meter pulse value, and the type of energy units to be logged. All meters monitored by the system may be logged. System shall support using flow and temperature sensors for BTU monitoring.

4. AWS shall display archived data in tabular format form for both consumption and peak values. Data shall be shown in hourly, daily, weekly, monthly and yearly formats. In each format, the user shall be able to select a specific period of data to view.

J. Demand Limiting – As Scheduled

1. AWS shall include demand limiting program that includes two types of load shedding. One type of load shedding shall shed/restore equipment in binary fashion based on energy usage when compared to shed and restore settings. The other type of shedding shall adjust operator selected control setpoints in an analog fashion based on energy usage when compared to shed and restore settings. Shedding may be implemented independently on each and every zone or piece of equipment connected to system.

2. Binary shedding shall include minimum of five (5) priority levels of equipment shedding. All loads in a given priority level shall be shed before any loads in a higher priority level are shed. Load shedding within a given priority level shall include two methods. In one, the loads shall be shed/restored in a “first off-first on” mode, and in the other the loads are just shed/restored in a “first off-last on” (linear) fashion.

3. Analog shed program shall generate a ramp that is independently used by each individual zone or individual control algorithm to raise the appropriate cooling setting and lower appropriate heating setting to reduce energy usage.

4. AWS shall be able to display the status of each and every load shed program. Status of each load assigned to an individual shed program shall be displayed along with English description of each load.

K. Tenant Activity – As Scheduled

1. AWS shall include program that monitors after-hours overrides by tenants, logs that data, and generates a bill based on usage and rate charged for each tenant space. Tenant Activity program shall be able to assign multiple zones, from a list of every zone connected to system, to a particular tenant. Every zone is monitored for after-hour override usage and that data logged in AWS. Operator may then generate a bill based on the usage for each tenant and the rate charged for any overtime use.

2. Configuration shall include entry of the following information for use in logging and billing:
a. Tenant’s contact name and address

b. One or multiple tenant zones that make up a total tenant space, including a separate billing rate for each separate zone

c. Minimum and maximum values an event duration and event limit

d. Property management information

e. Overall billing rate

f. Seasonal adjustments or surcharge to billing rate

g. Billing notification type such including, but not limited to printer, file and email

h. Billing form template

3. Logging shall include recording the following information for each and every tenant event:

a. Zone description

b. Time the event begins

c. Total override time

d. Limits shall be applied to override time

4. A tenant bill shall be generated for a specific period using all the entered configuration data and the logged data. User with appropriate security level shall be able to view and override billing information. User shall be able to select a billing period to view and be able to delete events from billing and edit a selected tenant activity event’s override time.

L. Reports

1. AWS shall be capable of periodically producing reports of trendlogs, alarm history, tenant activities, device summary, energy logs, and override points. The frequency, content, and delivery are to be user adjustable.

2. All reports shall be capable of being delivered in multiple formats including text- and comma-separated value (CSV) files. The files can be printed, emailed, or saved to a folder, either on the server hard drive or on any network drive location.

M. Configuration/Setup

1. Provide means for operator to display and change system configuration. This shall include, but not be limited to, system time, day of the week, date of daylight savings set forward/set back, printer termination, port addresses, modem port and speed, etc. Items shall be modified using understandable
N. Field Engineering Tools

1. AWS shall include field engineering tools for programming all controllers supplied. All controllers shall be programmed using graphical tools that allow the user to connect function blocks on screen that provide sequencing of all control logic. Function blocks shall be represented by graphical displays that are easily identified and distinct from other types of blocks. Graphical programming that uses simple rectangles and squares is not acceptable.

2. User shall be able to select a graphical function block from menu and place on screen. Provide zoom in and zoom out capabilities. Function blocks shall be downloaded to controller without any reentry of data.

3. Programming tools shall include a real-time operation mode. Function blocks shall display real-time data and be animated to show status of data inputs and outputs when in real-time operation. Animation shall show change of status on logic devices and countdown of timer devices in graphical format.

4. Field engineering tools shall also include a database manager of applications that include logic files for controllers and associated graphics. Operator shall be able to select unit type, input/output configuration and other items that define unit to be controlled. Supply minimum of 250 applications as part of workstation software.

5. Field engineering tool shall include Device Manager for detection of devices connected anywhere on the BACnet network by scanning of the entire network. This function shall display device instance, network identification, model number, and description of connected devices. It shall record and display software file loaded into each controller. A copy of each file shall be stored on the computer’s hard drive. If needed, this file shall be downloaded to the appropriate controller using the mouse.

6. AWS automatically notify the user when a device that is not in the database is added to the network.

7. AWS shall include backup/restore function that will back up entire system to selected medium and then restore system from that media. The system shall be capable of creating a backup for the purpose of instantiating a new client PC.

8. The system shall provide a means to scan, detect, interrogate, and edit third-party BACnet devices and BACnet objects within those devices.

O. Workstation Hardware – As Scheduled

1. Provide operator’s workstation(s) at location(s) noted on the plans.

2. AWS Server
   a. 64-bit OS.

c. 2 GHz (or better), one or more dual-core or quad-core processors.

d. 8 GB RAM or higher.

e. 3 GB of hard drive space required for base installation without application data.

f. Network interface card (10/100/1000 Mbps).

P. Software

1. At the conclusion of project, contractor shall leave with owner a CD ROM that includes the complete software operation system and project graphics, setpoints, system parameters, etc. This backup shall allow the owner how to completely restore the system in the case of a computer malfunction.

Q. WEB Client

1. BAS supplier shall provide an HTML5 based browser access to the AWS as part of standard installation. User must be able to access all displays of real-time data that are part of the AWS using a standard Web browser. Web browser shall tie into the network through owner-supplied Ethernet network connection. The AWS must be able to support 20 concurrent web client users at a minimum.

2. Browser shall be standard version of Microsoft Internet Explorer v10.0 or later, Firefox v19.0 or later and Chrome v24.0 or later. No special vendor-supplied software shall be needed on computers running browser. Data shall be displayed in real-time and update automatically without user interaction.

3. Web pages shall be automatically generated using HTML 5 from the data display files that reside on the AWS. Any system that requires use of an HTML editor for generation of Web pages shall not be considered.

4. Access through web client or thick client shall utilize the same hierarchical security scheme as the AWS. User shall be asked to log on once the client makes connection to the AWS. Once the user logs in, any and all changes that are made shall be tracked by the AWS. The user shall be able to change only those items he or she has authority to change. A user activity report shall show any and all activity of the users who have logged in to the system, regardless of whether those changes were made using a web client, thick client or through the AWS.

2.2 Control Programming Software

A. All DDC programming throughout the EMS network shall adhere to the following standards:

1. Programming on all controllers must be completely operator definable and modifiable and must use a single common programming language for all
control devices. Use of pre-canned, factory burned-in DDC programming on controllers is not acceptable and is grounds for rejection of EMS system.

2 Programming shall be developed in an object-oriented graphical programming environment. Line by line code programming is specifically prohibited and is not acceptable.

3 Programming must accommodate all written sequences of operations.

4 Programming shall be modifiable from any server PC, operator console PC and/or portable laptop PC workstation without requiring the burning of new chips or having to directly access the local controller. Software shall accommodate the downloading of programming via established network Ethernet or modem connections.

5 Programming must support the use of virtual software points in the same manner as all physical points are supported.

6 All programming points, virtual or real, for any specific device in the entire EMS network shall be accessible to all other network devices at any given time, regardless of physical location.

7 All programming shall adhere to the BACnet protocols for Standard Command Priorities.

8 Programming software must include a pre-developed cohesive PID (proportional-integral-derivative) algorithm whereby a user can adjust gain and anti-windup coefficients accordingly to effectively accomplish advanced sequence of operation requirements.

2.3 BUILDING (GLOBAL) CONTROLLER
A. General Requirements

1. BACnet Conformance
   a. Building Controller shall be approved by the BTL as meeting the BACnet Building Controller requirements.

   b. Please refer to section 22.2, BACnet Functional Groups, in the BACnet standard, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

2. Building controller shall be of scalable design such that the number of trunks and protocols may be selected to fit the specific requirements of a given project.

3. The controller shall be capable of panel-mounted on DIN rail and/or mounting screws.
4. The controller shall be capable of providing global control strategies for the system based on information from any objects in the system, regardless if the object is directly monitored by the building controller module or by another controller.

5. The controller shall be capable of running up to six independent control strategies simultaneously. The modification of one control strategy does not interrupt the function or runtime others.

6. The software program implementing the DDC strategies shall be completely flexible and user-definable. All software tools necessary for programming shall be provided as part of project software. Any systems utilizing factory pre-programmed global strategies that cannot be modified by field personnel on-site, using a WAN or downloaded through remote communications are not acceptable. Changing global strategies using firmware changes is also unacceptable.

7. Programming shall be object-oriented using control function blocks, and support DDC functions. All flowcharts shall be generated and automatically downloaded to controller. Programming tool shall be supplied and be resident on workstation. The same tool shall be used for all controllers.

8. Programming tool shall provide means to graphically view inputs and outputs to each program block in real-time as program is executing. This function may be performed using the operator’s workstation or field computer.

9. Controller shall have 6000 Analog Values and 6000 Binary Values

10. Controller IP configuration can be done via a direct USB connect with a operator’s workstation or field computer.

11. Controller shall have at a minimum a Quad Core 996Ghz processor to ensure fast processing speeds.

12. Global control algorithms and automated control functions shall execute using a 64-bit processor.

13. Controller shall have a minimum of 1 GB of DDR3 SDRAM on a 533Mhz bus to ensure high speed data recording, large data storage capacity and reliability.

14. Controller shall support two on-board EIA-485 ports capable of supporting various EIA-485 protocols including but not limited to BACnet MS/TP and Modbus.
   a. Ports are capable of supporting various EIA-485 protocols including but not limited to BACnet MS/TP and Modbus.

15. Controller shall support two gigabit speed Ethernet (10/100/1000) ports.
   a. Ports are capable of supporting various Ethernet protocols including but not limited to BACnet IP, FOX, and Modbus.
16. All ports shall be capable of having protocol(s) assigned to utilize the port's physical connection.

17. The controller shall have at a minimum four onboard inputs, two universal inputs and two binary inputs.

18. Schedules
   a. Building controller modules shall provide normal seven-day scheduling, holiday scheduling and event scheduling.
   b. Each building controller shall support a minimum of 480 BACnet Schedule Objects and 480 BACnet Calendar Objects.

19. Logging Capabilities
   a. Each building controller shall log as minimum 1920 objects at 15 min intervals. Any object in the system (real or calculated) may be logged. Sample time interval shall be adjustable at the operator's workstation.
   b. Logs may be viewed both on-site or off-site using WAN or remote communication.
   c. Building controller shall periodically upload trended data to networked operator's workstation for long-term archiving if desired.
   d. Archived data stored in database format shall be available for use in third-party spreadsheet or database programs.

20. Alarm Generation
   a. Alarms may be generated within the system for any object change of value or state (either real or calculated). This includes things such as analog object value changes, binary object state changes, and various controller communication failures.
   b. Each alarm may be dialed out as noted elsewhere.
   c. Alarm log shall be provided for alarm viewing. Log may be viewed on-site at the operator's terminal or off-site using remote communications.
   d. Controller must be able to handle up to 1920 alarm setups stored as BACnet event enrollment objects, with system destination and actions individually configurable.

21. Demand Limiting
   a. Demand limiting of energy shall be a built-in, user-configurable function. Each controller module shall support shedding of up to 1200 loads using a minimum of two types of shed programs.
   b. Load shedding programs in building controller modules shall operate as
defined in section 2.1.J of this specification.

22. Tenant Activity Logging
   a. Tenant Activity logging shall be supported by building controller module. Each independent module shall support a minimum of 480 zones.
   b. Tenant Activity logging shall function as defined in section 2.1.K of this specification.

B. BACnet MS/TP
   1. BACnet MS/TP LAN must be software-configurable from 9.6 to 115.4Kbps
      a. Each BACnet MS/TP LAN shall support 64 BACnet devices at a minimum
      b. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

C. BACnet IP
   1. The building controller shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the LAN.
   2. Must support interoperability on WANs and CANs and function as a BACnet Broadcast Management Device (BBMD).
   3. Each controller shall support at a minimum 128 BBMD entries
   4. BBMD management architecture shall support 3000 subnets at a minimum
   5. Shall support BACnet Network Address Translation
   5. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

D. Expansion ports
   1. Controller shall support two expansion ports.
      a. Combining the two on-board EIA-458 ports with fully loaded expansion ports the controller shall support 6 EIA-485 trunks simultaneously
   2. Expansion cards that mate to the expansion ports shall include:
      b. Dual port EIA-485 card
      c. LON network card
E. Niagara framework

1. Controller shall utilize the Tridium Niagara Framework
   a. Niagara Framework shall be version 3.8 or newer
   b. All Niagara licensing shall be stored on a removable MicroSD card for fast in
      field replacement of controller
   c. The controller shall be programmable via Niagara Workplace programming
      tool
   d. The controller shall be programmable via an Niagara embedded Workplace
      programming tool

F. Power Supply

1. Input for power shall accept between 17–30VAC, 47–63Hz.
2. Optional rechargeable battery for shutdown of controller including storage of all
   data in flash memory
2. On-board capacitor will ensure continuous operation of real-time clocks for
   minimum of 14 days.

G. Controller shall be in compliance with the following

1. UL 916 for open energy management
2. FCC Class B
3. ROHS
4. IEC 60703
5. C-Tick Listed

H. Controller shall operate in the following environmental conditions:

1. -4 to 149 °F (-20 to 65 °C) without optional battery, or 32 to 122 °F (0 to 50 °C)
   with optional battery
2. 0 to 95% RH, non-condensing.

2.4 ADVANCED APPLICATION CONTROLLERS

A. Provide one or more native BACnet advanced application controllers for HVAC
   equipment requiring DDC standalone control independent of building control module
   operation. All controllers shall interface to building controller through either MS/TP
   LAN using BACnet protocol, or Ethernet LAN using BACnet over Ethernet or BACnet
   TCP/IP. No gateways shall be used. Controllers shall include input, output and self-
   contained logic program as needed for complete control of units. Controllers shall be
   fully programmable using graphical programming blocks. Programming tool shall be
resident on operator workstation and be the same tool as used for the building controller. No auxiliary or non-BACnet controllers shall be used.

B. BACnet Conformance

a. Application controllers shall be approved by the BTL as meeting the BACnet Advanced Application Controller requirements.

b. Please refer to section 22.2, BACnet Functional Groups, in the BACnet standard, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

c. Standard BACnet object types supported shall include, as a minimum, Analog Input, Analog Output, Analog Value, Binary Input, Binary Output, Binary Value, Multi-state Values, Device, File, and Program object types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

C. Application controllers shall include universal inputs with 12-bit resolution that accept 3K and 10K thermistors, 0–10VDC, Platinum 1000 Ohm RTD, 0–5VDC, 4–20mA and dry contact signals. Any input on a controller may be either analog or digital with a minimum of three (3) inputs that accept pulses. Controller shall also include support and modifiable programming for interface to intelligent room sensor with digital display. Controller shall include binary and analog outputs on board. Analog outputs with 12-bit resolution shall support either 0–10VDC or 0–20mA. Binary outputs shall have LED indication of status. Software shall include scaling features for analog outputs. Application controller shall include 20VDC voltage supply for use as power supply to external sensors.

a. All outputs must have on-board Hand-Off-Auto (HOA) switches and a status indicator light. HOA switch position shall be monitored. Each analog output shall include a potentiometer for manually adjusting the output when the HOA switch is in the Hand position. The position of each and every HOA switch shall be available system wide as a BACnet object property.

D. All program sequences shall be stored on board application controller in EEPROM. No batteries shall be needed to retain logic program. All program sequences shall be executed by controller up to 20 times per second (minimum of 10 times per second) and capable of multiple PID loops for control of multiple devices. All calculations shall be completed using floating-point math and system shall support display of all information in floating-point nomenclature at operator’s terminal.

a. The following control blocks shall be supported:

i. Natural Log
ii. Exponential

iii. Log base 10

iv. X to the power of Y

v. Nth square root of X

vi. 5th Order Polynomial Equations

vii. Astronomical Clock (sunrise/sunset calculation)

viii. Time-based schedules

E. Programming of application controller shall be completely modifiable in the field over installed BACnet LANs or remotely using modem interface. Operator shall program logic sequences by graphically moving function blocks on screen and tying blocks together on screen. Application controller shall be programmed using programming tools as described in operator’s terminal section.

F. Application controller shall include support for intelligent room sensor (see Section 2.9.B.) Display on intelligent room sensor shall be programmable at application controller and include an operating mode and a field service mode. All button functions and display data shall be programmable to show specific controller data in each mode, based on which button is pressed on the sensor. See sequence of operation for specific display requirements at intelligent room sensor.

G. Schedules

   a. The controller shall support a minimum of three (3) BACnet Schedule Objects and have a real-time clock on board with battery backup to maintain time through a power loss.

H. Logging Capabilities

   a. Controller shall support a minimum of 50 trendlogs. Any object in the controller (real or calculated) may be logged. Sample time interval shall be adjustable at the operator’s workstation.

   b. Controller shall periodically upload trended data to system server for long-term archiving if desired. Archived data stored in (MS Jet Database or SQL) database form and shall be available for use in third-party spreadsheet or database programs.

I. Alarm Generation

   a. Alarms may be generated within the controller for any object change of value or state (either real or calculated). This includes things such as analog object value changes, and binary object state changes.

   b. Alarm log shall be provided for alarm viewing. Log may be viewed on-site at the
operator’s terminal or off-site using remote communications.

c. Controller must be able to handle up to 25 alarm setups stored as BACnet event enrollment objects, with system destination and actions individually configurable.

J. The controller processor shall be a 32-bit processor.

K. The packaging of the controller shall provide operable doors to cover the terminals once installation is complete. The housing of the controller shall provide for DIN rail mounting and also fully enclose circuit board.

2.5 APPLICATION SPECIFIC CONTROLLERS

A. Provide one (1) native BACnet application controller for each piece of unitary mechanical equipment that adequately covers all objects listed in object list for unit. All controllers shall interface to building controller through MS/TP LAN using BACnet protocol. No gateways shall be used. Controllers shall include input, output and self-contained logic program as needed for complete control of unit.

B. BACnet Conformance

a. Application controllers shall, as a minimum, support MS/TP BACnet LAN types. They shall communicate directly using this BACnet LAN at 9.6, 19.2, 38.4 and 76.8 Kbps, as a native BACnet device. Application controllers shall be approved by the BTL as meeting the BACnet Application Specific Controller requirements and support all BACnet services necessary to provide the following BACnet functional groups:

   i. Files Functional Group

   ii. Reinitialize Functional Group

   iii. Device Communications Functional Group

b. Please refer to Section 22.2, BACnet Functional Groups in the BACnet standard, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

c. Standard BACnet object types supported shall include, as a minimum, Analog Input, Analog Output, Analog Value, Binary Input, Binary Output, Binary Value, Device, File, and Program Object Types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

C. Application controllers shall include universal inputs with 10-bit resolution that can accept 3K and 10K thermistors, 0–5VDC, 4–20mA, dry contact signals and a minimum of
three (3) pulse inputs. Any input on controller may be either analog or digital. Controller shall also include support and modifiable programming for interface to intelligent room sensor. Controller shall include binary outputs on board with analog outputs as needed.

D. All program sequences shall be stored on board controller in EEPROM. No batteries shall be needed to retain logic program. All program sequences shall be executed by controller 10 times per second and shall be capable of multiple PID loops for control of multiple devices. Programming of application controller shall be completely modifiable in the field over installed BACnet LANs or remotely through modem interface. Operator shall program logic sequences by graphically moving function blocks on screen and tying blocks together on screen. Application controller shall be programmed using same programming tools as building controller and as described in operator workstation section. All programming tools shall be provided and installed as part of system.

E. Application controller shall include support for intelligent room sensor (see Section 2.9.B.) Display on room sensor shall be programmable at controller and include an operating mode and a field service mode. All button functions and display data shall be programmable to show specific controller data in each mode based on which button is pressed on the sensor. See sequence of operation for specific display requirements at intelligent room sensor.

2.6 Electronic Actuators and Valves

A. Quality Assurance for Actuators and Valves

1. UL Listed Standard 873 and C.S.A. Class 4813 02 certified.

2. NEMA 2 rated enclosures for inside mounting, provide with weather shield for outside mounting.

3. Five-year manufacturer’s warranty. Two-year unconditional and three-year product defect from date of installation.

B. Execution Details for Actuators and Valves

1. VAV box damper and reheat valve actuation in addition to Fan Coil primary valve actuation shall be floating type or analog (2–10 VDC, 4–20 mA).

2. Primary valve control on Air Handling Units shall be analog (2–10 VDC, 4–20 mA).

C. Actuators for damper and control valves 0.5–6 inches shall be electric unless otherwise specified, provide actuators as follows:

1. UL Listed Standard 873 and Canadian Standards Association Class 481302 shall certify actuators.

2. NEMA 2 rated actuator enclosures for inside mounting. Use additional weather shield to protect actuator when mounted outside.

3. Five-year manufacturer’s warranty. Two-year unconditional and three-year product defect from date of installation.
product defect from date of installation.

4. Mechanical spring shall be provided when specified. Capacitors or other non-mechanical forms of fail-safe are not acceptable.

5. Position indicator device shall be installed and made visible to the exposed side of the actuator. For damper short shaft mounting, a separate indicator shall be provided to the exposed side of the actuator.

6. Overload Protection: Actuators shall provide protection against actuator burnout by using an internal current limiting circuit or digital motor rotation sensing circuit. Circuit shall insure that actuators cannot burn out due to stalled damper or mechanical and electrical paralleling. End switches to deactivate the actuator at the end of rotation are acceptable only for butterfly valve actuators.

7. A pushbutton gearbox release shall be provided for all non-spring actuators.

8. Modulating actuators shall be 24 VAC and consume 10 VA power or less.

9. Conduit connectors are required when specified and when code requires it.

D. Damper Actuators

1. Economizer actuators shall utilize analog control 2–10 VDC; floating control is not acceptable.

2. Electric damper actuators (including VAV box actuators) shall be direct shaft-mounted and use a V-bolt and toothed V-clamp causing a cold weld effect for positive gripping. Single bolt or set-screw type fasteners are not acceptable.

3. One (1) electronic actuator shall be direct shaft-mounted per damper section. No connecting rods or jackshafts shall be needed. Small outside air and return air economizer dampers may be mechanically linked together if one (1) actuator has sufficient torque to drive both and damper drive shafts are both horizontal installed.

4. Multi-section dampers with electric actuators shall be arranged so that each damper section operates individually. One (1) electronic actuator shall be direct shaft-mounted per damper section. (See below execution section for more installation details.)

E. Valve Actuators 0.5–6 inches

1. All zone service actuators shall be non-spring return unless otherwise specified.

2. The valve actuator shall be capable of providing the minimum torque required for proper valve close-off for the required application.

3. All control valves actuators shall have an attached 3-foot cable for easy installation to a junction box.
4. Override handle and gearbox release shall be provided for all non-spring return valve actuators.

F. Control Valves 0.5–6 inches

1. The BAS contractor shall furnish all specified motorized control valves and actuators. BAS contractor shall furnish all control wiring to actuators. The plumbing contractor shall install all valves. Equal percentage control characteristic shall be provided for all water coil control valves. Linear valve characteristic is acceptable for 3-way valves that are 2.5 inches and above.

2. Characterized control valves shall be used for hydronic heating or cooling applications and small to medium AHU water-coil applications to 100GPM. Actuators are non-spring return for terminal unit coil control unless otherwise noted. If the coil is exposed to the outside air stream, see plans for spring return requirement.
   a. Leakage is 0% (zero percent), close-off is 200psi, maximum differential is 30psi; rangeability is 500:1.
   b. Valves 0.5–2 inches shall be nickel-plated forged brass body, NPT screw type connections.
   c. Valves 0.5–1.25 inches shall be rated for ANSI Class 600 working pressure. Valves 1.5 and 2 inches shall be rated for ANSI Class 400 working pressure.
   d. The operating temperature range shall be 0–250 degrees F.
   e. Stainless steel ball and stem shall be furnished on all modulating valves.
   f. Seats shall be fiberglass reinforced Teflon.
   g. Two-way and three-way valves shall have an equal percentage control port. Full stem rotation is required for maximum flow to insure stable BTU control of the coil.
   h. Three-way valve shall be applicable for both mixing and diverting.
   i. The characterizing disc is made of TEFZEL and shall be keyed and held secure by a retaining ring.
   j. The valves shall have a blow-out proof stem design.
   k. The stem packing shall consist of two (2) lubricated O-rings designed for on-off or modulating service and require no maintenance.
   l. The valves shall have an ISO type, 4-bolt flange for mounting actuator in any orientation parallel or perpendicular to the pipe.
   m. A non-metallic thermal isolation adapter shall separate valve flange from actuator.
n. One (1) fastening screw shall secure the direct coupling of the thermal isolation adapter between the actuator and the valve. This will prevent all lateral or rotational forces from affecting the stem and its packing O-rings.

2. Globe valves 0.5–2 inches shall be used for steam control or water flow applications.
   a. Valves shall be bronze body, NPT screw type, and shall be rated for ANSI Class 250 working pressure.
   b. Valves 0.5 inches (DN15) through 2 inches (DN50) with spring return actuators shall close off against 50 psi pressure differential with Class III leakage (0.1%).
   c. The operating temperature range shall be 20–280 degrees F.
   d. Spring loaded TFE packing shall protect against leakage at the stem.
   e. Two-way valves shall have an equal percentage control port.
   f. Three-way valves shall have a linear control and bypass port.
   g. Mixing and diverting valves must be installed specific to the valve design.

3. Globe Valves 2.5–6 inches
   a. Valves 2.5 inches (DN65) through 6 inches (DN50) shall be iron body, 125 lb. flanged with Class III (0.1%) close-off leakage at 50 psi differential.
   b. Valves with spring return actuators shall close off against 50 psi pressure differential with Class III leakage (0.1%).
   c. Flow type for two-way valves shall be equal percentage. Flow type for three-way valves shall be linear.
   d. Mixing and diverting valves must be installed specific to the valve design.

H. Butterfly valves
   1. Butterfly valves shall be sized for modulating service at 60–70 degree stem rotation. Isolation valves shall be line-size. Design velocity shall be less than 12 feet per second when used with standard EPDM seats.
      a. Body is cast iron.
      b. Disc is aluminum bronze standard.
      c. Seat is EPDM standard.
      d. Body Pressure is 200 psi, -30–275 degrees F.
      e. Flange is ANSI 125/250.
f. Media Temperature Range is -22–240 degree F.

g. Maximum Differential Pressure is 200 psi for 2- to 6- inch size.

I. Butterfly Valve Industrial Actuators

1. Actuators shall be approved under Canadian Standards Association or other Nationally Recognized Testing Laboratory to UL standards. CSA Class 4813 02 or equal. Enclosure shall be NEMA 4 (weatherproof) enclosure and will have an industrial quality coating.

   a. Actuator shall have a motor rated for continuous duty. The motor shall be fractional horsepower; permanent split capacitor type designed to operate on a 120 VAC, 1pH, 60 Hz supply. Two (2) adjustable cam-actuated end travel limit switches shall be provided to control direction of travel. A self-resetting thermal switch shall be imbedded in the motor for overload protection.

   b. Reduction gearing shall be designed to withstand the actual motor stall torque. Gears shall be hardened alloy steel, permanently lubricated. A self-locking gear assembly or a brake shall be supplied.

   c. Actuator shall have a 6-foot wiring harness provided for ease in field wiring (above 1500 in-lbs). Two (2) adjustable SPDT cam-actuated auxiliary switches, rated at 250 VAC shall be provided for indication of open and closed position. Actuator shall have heater and thermostat to minimize condensation within the actuator housing.

   d. Actuator shall be equipped with a hand wheel for manual override to permit operation of the valve in the event of electrical power failure or system malfunction. Hand wheel must be permanently attached to the actuator and when in manual operation electrical power to the actuator will be permanently interrupted. The hand wheel will not rotate while the actuator is electrically driven.

   e. The actuator shall be analog, floating, or two position as called out in the control sequence of operation. All Analog valves shall be positive positioning, and respond to a 2–10 VDC, 4-20 mA, or adjustable signal as required. Analog actuators shall have a digital control card allowing any voltage input for control and any DC voltage feedback signal for position indication.

2. Performance Verification Test

   a. Control loops shall cause productive actuation with each movement of the actuator and actuators shall modulate at a rate that is stable and responsive. Actuator movement shall not occur before the effects of previous movement have affected the sensor.

   b. Actuator shall have capability of signaling a trouble alarm when the actuator
Stop-Go Ratio exceeds 30%.

3. Actuator mounting for damper and valve arrangements shall comply with the following:

   a. Damper actuators: Shall not be installed in the air stream.

   b. A weather shield shall be used if actuators are located outside. For damper actuators, use clear plastic enclosure.

   c. Damper or valve actuator ambient temperature shall not exceed 122 degrees F through any combination of medium temperature or surrounding air. Appropriate air gaps, thermal isolation washers or spacers, standoff legs, or insulation shall be provided as necessary.

   d. Actuator cords or conduit shall incorporate a drip leg if condensation is possible. Water shall not be allowed to contact actuator or internal parts. Location of conduits in temperatures dropping below dew point shall be avoided to prevent water from condensing in conduit and running into actuator.

   e. Damper mounting arrangements shall comply to the following:

      i. The ventilation subcontractor shall furnish and install damper channel supports and sheet metal collars.

      ii. No jack shafting of damper sections shall be allowed.

      iii. Multi-section dampers shall be arranged so that each damper section operates individually. One (1) electronic actuator shall be direct shaft mounted per section.

   f. Size damper sections based on actuator manufacturer’s specific recommendations for face velocity, differential pressure and damper type. In general:

      i. Damper section shall not exceed 24 ft-sq. with face velocity >1500 FPM.

      ii. Damper section shall not exceed 18 ft-sq. with face velocity > 2500 FPM.

      iii. Damper section shall not exceed 13 ft-sq. with face velocity > 3000 FPM.

   g. Multiple section dampers of two or more shall be arranged to allow actuators to be direct shaft mounted on the outside of the duct.

   h. Multiple section dampers of three or more sections wide shall be arranged with a 3-sided vertical channel (8 inches wide by 6 inches deep) within the duct or fan housing and between adjacent damper sections. Vertical channel shall be anchored at the top and bottom to the fan housing or building structure for support. The sides of each damper frame shall be connected to the channels. Holes in the channel shall allow damper drive
blade shafts to pass through channel for direct shaft-mounting of actuators. Open side of channel shall be faced downstream of the airflow, except for exhaust air dampers.

i. Multiple section dampers to be mounted flush within a wall or housing opening shall receive either vertical channel supports as described above or sheet metal standout collars. Sheet metal collars (12-inch minimum) shall bring each damper section out of the wall to allow direct shaft-mounting of the actuator on the side of the collar.

4. Valve Sizing for Water Coil

   a. On/Off control valves shall be line-size.

   b. Modulating control valve body size may be reduced, at most, two (2) pipe sizes from the line size or not less than half the pipe size. The BAS contractor shall size all water coil control valves for the application as follows:

      i. Booster-heat valves shall be sized not to exceed 4–9psi differential pressure. Size valve for 50% valve authority. Valve design pressure drop is equal to the sum of coil drop plus the balance valve drop.

      ii. Primary valves shall be sized not to exceed 5–15psi differential pressure. Size valve for 50% valve authority. Valve design pressure drop is equal to the sum of coil drop plus the balance valve drop.

      iii. Butterfly valves shall be sized for modulating service at 60–70 degree rotation. Design velocity shall be 12 feet per second or less when used with standard EPDM seats.

   c. Valve mounting arrangements shall comply with the following:

      i. Unions shall be provided on all ports of two-way and three-way valves.

      ii. Install three-way equal percentage characterized control valves in a mixing configuration with the “A” port piped to the coil.

      iii. Install 2.5 inches and above, three-way globe valves, as manufactured for mixing or diverting service to the coil.

2.7 ENCLOSURES

   A. All controllers, power supplies and relays shall be mounted in enclosures.

   B. Enclosures may be NEMA 1 when located in a clean, dry, indoor environment. Indoor enclosures shall be NEMA 12 when installed in other than a clean environment. Outdoor enclosures must be either NEMA 3R or NEMA 4.

   C. All temperature control panels shall be fabricated in a UL-listed panel shop. Field assembled temperature control panels are not allowed.
PART 3: EXECUTION

3.1 EXAMINATION
A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this section may properly commence.

B. Notify the owner’s representative in writing of conditions detrimental to the proper and timely completion of the work.

C. Do not begin work until all unsatisfactory conditions are resolved.

3.2 INSTALLATION (GENERAL)
A. Install in accordance with manufacturer's instructions.

B. Provide all miscellaneous devices, hardware, software, interconnections, installation, and programming required to ensure a complete operating system in accordance with the sequences of operation and point schedules.

3.3 LOCATION AND INSTALLATION OF COMPONENTS
A. Locate and install components for easy accessibility; in general, mount 48 inches above floor with minimum three (3) feet of clear access space in front of units. Obtain approval on locations from owner’s representative prior to installation.

B. All instruments, switches, transmitters, etc., shall be suitably wired and mounted to protect them from vibration, moisture, and high or low temperatures.

C. Identify all equipment and panels. Provide permanently mounted tags for all panels.

D. Provide stainless steel or brass thermowells suitable for respective application and for installation under other sections, and sized to suit pipe diameter without restricting flow.

3.4 INTERLOCKING AND CONTROL WIRING
A. Provide all interlock and control wiring associated with the EMS system. All wiring shall be installed neatly and professionally, in accordance with all national, state and local electrical codes.

B. Provide wiring as required by functions as specified and as recommended by equipment manufacturers, to serve specified control functions. Provide shielded low capacitance wire for all communications trunks.

C. Control wiring shall not be installed in power circuit raceways. Magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required. Coordinate location and arrangement of all control equipment with the owner's representative prior to rough-in.

D. Provide auxiliary pilot duty relays on motor starters as required for control function.
E. Provide power for all control components from nearest electrical control panel or as indicated on the electrical drawings; coordinate with electrical contractor.

F. All control wiring in mechanical, electrical, telephone and boiler rooms to be installed in raceways. Exposed control wiring shall also be installed in raceways. All other control wiring to be installed without conduit neatly and inconspicuously per local code requirements.

3.5 DDC OBJECT TYPE SUMMARY

A. Provide all database generation.

B. Displays

1. System displays shall show all analog and binary object types within the system. They shall be logically laid out for easy use by the owner. Provide outside air temperature indication on all system displays associated with economizer cycles.

C. Run Time Totalization

1. At a minimum, run time totalization shall be incorporated for each monitored supply fan, return fan, exhaust fan, hot water and chilled water pumps. Warning limits for each point shall be entered for alarm and or maintenance purposes.

D. Trendlog

1. All binary and analog object types (including zones) shall have the capability to be automatically trended.

E. Alarm

1. All analog inputs (High/Low Limits) and selected binary input alarm points shall be prioritized and routed (locally or remotely) with alarm message per owner's requirements.

F. Database Save

1. Provide backup database for all standalone application controllers on disk.

3.6 FIELD SERVICES

A. Prepare and start logic control system under provisions of this section.

B. Start up and commission systems. Allow sufficient time for startup and commissioning prior to placing control systems in permanent operation.

C. Provide the capability for off-site monitoring at control contractor's local or main office. At a minimum, off-site facility shall be capable of system diagnostics and software download. Owner shall provide phone line for this service for one (1) year or as specified.

D. Provide owner's representative with spare parts list. Identify equipment critical to
maintaining the integrity of the operating system.

3.7 TRAINING
A. Provide application engineer to instruct owner in operation of systems and equipment.

B. Provide system operator’s training to include (but not be limited to) such items as the following: modification of data displays, alarm and status descriptors, requesting data, execution of commands and request of logs. Provide this training to a minimum of three persons.

C. Provide on-site training above as required, up to 16 hours as part of this contract.

3.8 DEMONSTRATION
A. Demonstrate complete operating system to owner’s representative.

B. Provide certificate stating that control system has been tested and adjusted for proper operation.

END OF SECTION 23 09 23
SECTION 23 21 13
HYDRONIC PIPING

1.0 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 piping, special duty valves, and hydronic specialties for hot water heating, chilled water cooling, makeup water for these systems; blowdown drain lines; and condensate drain piping.

1.3 SUBMITTALS
A. Product Data: For each type of special-duty valve indicated. Include flow and pressure drop curves based on manufacturer's testing for diverting fittings, calibrated balancing valves, and automatic flow-control valves.
B. Shop Drawings: Detail fabrication of pipe anchors, hangers, special pipe support assemblies, alignment guides, expansion joints and loops, and their attachment to the building structure. Detail location of anchors, alignment guides, and expansion joints and loops.
C. Welding Certificates: Copies of certificates for welding procedures and personnel.
D. Field Test Reports: Written reports of tests specified in Part 3 of this Section. Include the following:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Failed test results and corrective action taken to achieve requirements.
E. Maintenance Data: For hydronic specialties and special-duty valves to include in maintenance manuals specified in Division 1.
F. Water Analysis: Submit a copy of the water analysis to illustrate water quality available at Project site.
1.4 QUALITY ASSURANCE

A. Welding: Qualify processes and operators according to the ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. 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 the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

1.5 COORDINATION

A. Coordinate layout and installation of hydronic piping and suspension system components with other construction, including HVAC equipment.

B. Coordinate pipe sleeve installations for foundation wall penetrations.

C. Coordinate piping installation with roof curbs, equipment supports, and roof penetrations.

D. Coordinate pipe fitting pressure classes with products specified in related Sections.

E. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into base. Concrete, reinforcement, and formwork requirements are specified in Division 3 Sections.

F. Coordinate installation of pipe sleeves for penetrations through exterior walls and floor assemblies.

1.6 EXTRA MATERIALS

A. Water Treatment Chemicals: Furnish sufficient chemicals for initial system startup and for preventive maintenance for one year from date of Substantial Completion.

2.0 PRODUCTS

2.1 MANUFACTURERS

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. Calibrated Balancing Valves:
   a. Armstrong Pumps, Inc.

c. Gerand Engineering Company.

d. Griswold Controls.

e. ITT Bell & Gossett; ITT Fluid Technology Corp.

f. Taco, Inc.

2. Pressure-Reducing Valves:

a. Amtrol, Inc.

b. Armstrong Pumps, Inc.

c. Conbraco Industries, Inc.

d. ITT Bell & Gossett; ITT Fluid Technology Corp.

e. Spence Engineering Company, Inc.


3. Safety Valves:

a. Amtrol, Inc.

b. Armstrong Pumps, Inc.

c. Conbraco Industries, Inc.

d. ITT McDonnell & Miller Div.; ITT Fluid Technology Corp.

e. Kunkle Valve Division.

f. Spence Engineering Company, Inc.

4. Automatic Flow-Control Valves:


b. Griswold Controls.

5. Expansion Tanks:

a. Amtrol, Inc.
b. Armstrong Pumps, Inc.
c. ITT Bell & Gossett; ITT Fluid Technology Corp.
d. Taco, Inc.
e. Wessels.

6. Air Separators and Air Purgers:
   a. Amtrol, Inc.
   b. Armstrong Pumps, Inc.
   c. ITT Bell & Gossett; ITT Fluid Technology Corp.
   d. Taco, Inc.

2.2 PIPING MATERIALS
   A. General: Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.3 STEEL PIPE AND FITTINGS
   A. Steel Pipe, NPS 2 and Smaller: ASTM A 53, Type S (seamless) or Type F (furnace-butt welded), Grade A, Schedule 40, black steel, plain ends.
   B. Steel Pipe, NPS 2-1/2 through NPS 12: ASTM A 53, Type E (electric-resistance welded), Grade A, Schedule 40, black steel, plain ends.
   C. Cast-Iron Threaded Fittings: ASME B16.4; Class 250.
   E. Malleable-Iron Unions: ASME B16.39; Class 300.
   F. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Class 250; raised ground face, and bolt holes spot faced.
   G. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.
   H. 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.

I. Flexible Connectors: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket; 150-psig minimum working pressure and 250 deg F maximum operating temperature. Connectors shall have flanged or threaded-end connections to match equipment connected and shall be capable of 3/4-inch misalignment.

J. Spherical, Rubber, Flexible Connectors: Fiber-reinforced rubber body with steel flanges drilled to align with Classes 150 and 300 steel flanges; operating temperatures up to 250 deg F and pressures up to 150 psig.

K. Welding Materials: Comply with Section II, Part C, of the ASME Boiler and Pressure Vessel Code for welding materials appropriate for wall thickness and for chemical analysis of pipe being welded.

L. Gasket Material: Thickness, material, and type suitable for fluid to be handled; and design temperatures and pressures.

2.4 ALTERNATE PIPING MATERIALS

A. Provide deduct pricing in bid for use of grooved pipe, fittings, and valves in lieu of welded steel. Base bid shall include welded steel pipe, fittings, and valves per specifications.

B. Grooved Mechanical-Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; Grade 32510 malleable iron; ASTM A 53, Type F, E, or S, Grade B fabricated steel fittings with grooves or shoulders designed to accept grooved end couplings. Manufactured by Grinnel Corporation, Victaulic Company of America, Central Grooved Piping Products, or approved equal.

C. Grooved Mechanical-Joint 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. Manufactured by Grinnel Corporation, Victaulic Company of America, Central Grooved Piping Products, or approved equal.

2.5 VALVES

A. Gate, globe, check, ball, and butterfly valves are specified in Division 23 Section "Valves."

B. Refer to Part 3 "Valve Applications" Article for applications of each valve.
C. Calibrated Balancing Valves, NPS 2 and Smaller: Bronze body, ball type, 200-psig working pressure, 250 deg F maximum operating temperature, and having threaded ends. Valves shall have calibrated orifice or venturi, connections for portable differential pressure meter with integral seals, and be equipped with a memory stop to retain set position.

D. Calibrated Balancing Valves, NPS 2-1/2 and Larger: Cast-iron or steel body, ball type, 200-psig working pressure, 250 deg F maximum operating temperature, and having flanged or grooved connections. Valves shall have calibrated orifice or venturi, connections for portable differential pressure meter with integral seals, and be equipped with a memory stop to retain set position.

E. Pressure-Reducing Valves: Diaphragm-operated, bronze or brass body with low inlet pressure check valve, inlet strainer removable without system shutdown, and noncorrosive valve seat and stem. Select valve size, capacity, and operating pressure to suit system. Valve shall be factory set at operating pressure and have capability for field adjustment.

F. Safety Valves: Diaphragm-operated, bronze or brass body with brass and rubber, wetted, internal working parts; shall suit system pressure and heat capacity and shall comply with the ASME Boiler and Pressure Vessel Code, Section IV.

G. Automatic Flow-Control Valves: Gray-iron body, factory set to maintain constant flow with plus or minus 5 percent over system pressure fluctuations, and equipped with a readout kit including flow meter, probes, hoses, flow charts, and carrying case. Each valve shall have an identification tag attached by chain, and be factory marked with the zone identification, valve number, and flow rate. Valve shall be line size and one of the following designs:

1. Gray-iron or brass body, designed for 175 psig at 200 deg F with stainless-steel piston and spring.

2. Brass or ferrous-metal body, designed for 300 psig at 250 deg F with corrosion-resistant, tamperproof, self-cleaning, piston-spring assembly easily removable for inspection or replacement.

3. Combination assemblies, including bronze ball valve and brass alloy control valve, with stainless-steel piston and spring, fitted with pressure and temperature test valves, and designed for 300 psig at 250 deg F.

2.6 HYDRONIC SPECIALTIES

A. Manual Air Vent: Bronze body and nonferrous internal parts; 150-psig working pressure; 225 deg F operating temperature; manually operated with screwdriver or thumbscrew; with NPS 1/8 discharge connection and NPS 1/2 inlet connection.
B.  Automatic Air Vent: Designed to vent automatically with float principle; bronze body and nonferrous internal parts; 150-psig working pressure; 240 deg F operating temperature; with NPS 1/4 discharge connection and NPS 1/2 inlet connection. Provide a ball valve in the pipe upstream of the automatic air vent to facilitate isolation and/or replacement of the air vent.

C.  Expansion Tanks: Welded carbon steel, rated for 125-psig working pressure and 375 deg F maximum operating temperature. Separate air charge from system water to maintain design expansion capacity by a flexible bladder securely sealed into tank. Include drain fitting and taps for pressure gage and air-charging fitting. Support vertical tanks with steel legs or base; support horizontal tanks with steel saddles. Factory fabricate and test tank with taps and supports installed and labeled according to the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

D.  Tangential-Type Air Separators: Welded black steel; ASME constructed and labeled for 125-psig minimum working pressure and 375 deg F maximum operating temperature; perforated stainless-steel air collector tube designed to direct released air into expansion tank; tangential inlet and outlet connections; threaded connections for NPS 2 and smaller; flanged connections for NPS 2-1/2 and larger; threaded blowdown connection. Provide units in sizes for full-system flow capacity.

E.  Bypass Chemical Feeder: Griswold, or equal, with welded steel construction; 125-psig working pressure; 5-gal. capacity; with fill funnel and inlet, outlet, and drain valves. Provide with optional valve package.

1.  Chemicals: Specially formulated, based on analysis of makeup water, to prevent accumulation of scale and corrosion in piping and connected equipment.

F.  Flexible Connectors: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket; 150-psig minimum working pressure and 250 deg F maximum operating temperature. Connectors shall have flanged- or threaded-end connections to match equipment connected and shall be capable of 3/4-inch misalignment.

G.  Spherical, Rubber, Flexible Connectors: Fiber-reinforced rubber body with steel flanges drilled to align with Classes 150 and 300 steel flanges; operating temperatures up to 250 deg F and pressures up to 150 psig.
3.0 EXECUTION

3.1 PIPING APPLICATIONS

A. Hot and Chilled Water, NPS 2 and Smaller: Aboveground, use Type L drawn-temper copper tubing with soldered joints or Schedule 40 steel pipe with threaded joints. Provide deduct pricing for use of grooved piping per 2.05 above. Base bid shall included welded pipe, fittings, and valves.

B. Hot and Chilled Water, NPS 2-1/2 and Larger: Schedule 40 steel pipe with welded and flanged joints. Provide deduct pricing for use of grooved piping per 2.05 above. Base bid shall included welded pipe, fittings, and valves.

C. Condensate and Other Drain Lines: Type L drawn-temper copper tubing with soldered joints.

3.2 VALVE APPLICATIONS

A. General-Duty Valve Applications: Unless otherwise indicated, use the following valve types:

1. Shutoff Duty: Gate, ball, and butterfly valves.


B. Install shutoff duty valves at each branch connection to supply mains, at supply connection to each piece of equipment, unless only one piece of equipment is connected in the branch line. Install throttling duty valves at each branch connection to return mains, at return connections to each piece of equipment, and elsewhere as indicated on the drawings.

D. Install check valves at each pump discharge and elsewhere as required to control flow direction.

E. Install safety valves on hot-water generators, where indicated on the drawings and elsewhere as required by the ASME Boiler and Pressure Vessel Code. Install safety-valve discharge piping, without valves, to floor. Comply with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, for installation requirements.

F. Install pressure-reducing valves on hot-water generators and elsewhere as required to regulate system pressure and as indicated on the drawings.

3.3 PIPING INSTALLATIONS
A. Refer to Division 23 Section "Basic Mechanical Materials and Methods" for basic piping installation requirements.

B. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

C. 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.

D. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

E. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

F. Install strainers on supply side of each pressure-reducing 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. G. Anchor piping for proper direction of expansion and contraction.

3.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor devices are specified in Division 23 Section "Hangers and Supports." Comply with requirements below for maximum spacing of supports.

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.

2. Spring hangers to support vertical runs.

3. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

C. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 2½: Maximum span, 10 feet; minimum rod size, 3/8 inch.

2. NPS 4: Maximum span, 10 feet; minimum rod size, 1/2 inch.

3.5 PIPE JOINT CONSTRUCTION

A. Refer to Division 23 Section 23 05 00 "Basic Mechanical Materials and Methods" for joint construction requirements for soldered and brazed joints in copper tubing; and threaded, welded, and flanged joints in steel piping.
3.6 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping and elsewhere as required for system air venting.

B. Install automatic air vents only at high points of system piping and elsewhere as required for system air venting.

C. Install dip-tube fittings in boiler outlet. Install piping to expansion tank with a 2 percent upward slope toward tank. Connect boiler-outlet piping.

D. Install bypass chemical feeders in each hydronic system where indicated, in upright position with top of funnel not more than 48 inches above floor. Install feeder in bypass line, off main, using globe valves on each side of feeder and in the main between bypass connections. Pipe valved drain to nearest equipment drain.

E. Install expansion tanks as indicated on the drawings. Vent and purge air from hydronic system, and ensure tank is properly charged with air to suit system design requirements.

3.7 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 system with clean water. Clean strainers.

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. Alternate liquids that are safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release trapped air. Use drains installed at low points for complete draining of liquid.

3. Check expansion tanks to determine that they are not air bound and that system is full of water.

4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the design 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 either 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A of ASME B31.9, "Building Services Piping."

5. After hydrostatic test pressure has been applied for at least 10 minutes, 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.

3.8 ADJUSTING

A. Mark calibrated nameplates of pump discharge valves after hydronic system balancing has been completed, to permanently indicate final balanced position.

B. Perform these adjustments before operating the system:

1. Open valves to fully open position. Close coil bypass valves.

2. Check pump for proper direction of rotation.

3. Set automatic fill valves for required system pressure.

4. Check 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. Check operation of automatic bypass valves.

7. Check and set operating temperatures of boilers and chillers to design requirements.

8. Lubricate motors and bearings.
3.9 CLEANING

A.Flush hydronic piping systems with clean water. Remove and clean or replace strainer screens. After cleaning and flushing hydronic piping systems, but before balancing, remove disposable fine-mesh strainers in pump suction diffusers.

END OF SECTION 23 21 13

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SECTION 23 21 23
HYDRONIC PUMPS

1.0 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 categories of hydronic pumps for hydronic systems: End-suction pumps.

1.3 SUBMITTALS

A. Product Data: Include certified performance curves and rated capacities; shipping, installed, and operating weights; 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.

1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.

C. Maintenance Data: For pumps to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. UL Compliance: Fabricate and label pumps to comply with UL 778, "Motor-Operated Water Pumps," for construction requirements.

B. Product Options: Drawings indicate size, profiles, connections, and dimensional requirements of pumps and are based on the specific types and models indicated. Other manufacturers' pumps with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

C. Regulatory Requirements: Fabricate and test steam condensate pumps to comply with HI 1.1-1.5, "Centrifugal Pumps for Nomenclature, Definitions, Application and Operation," and HI 1.6, "Centrifugal Pump Tests."
D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

1.5 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.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

1.7 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 for each pump.

2.0 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Close-Coupled, End-Suction Pumps:
   a. Bell & Gossett ITT; Div. of ITT Fluid Technology Corp.
   b. Armstrong Pumps, Inc.
   c. Goulds Pump, Inc.
d. PACO Pumps.  
e. Taco; Fabricated Products Div.

2. Flexible-Coupled, End-Suction Pumps:  
   a. Bell & Gossett ITT; Div. of ITT Fluid Technology Corp.  
   b. Goulds Pumps, Inc.  
   c. PACO Pumps.  
   d. Taco; Fabricated Products Div.

2.2 GENERAL PUMP REQUIREMENTS

   A. Pump Units: Factory assembled and tested.  
   B. Motors: Include built-in, thermal-overload protection and grease-lubricated ball bearings. Select each motor to be nonoverloading over full range of pump performance curve.  
   C. Motors Indicated to Be Energy Efficient: Motors shall be premium efficiency and totally enclosed fan cooled type for all locations.

2.3 FLEXIBLE-COUPLED, END-SUCTION PUMPS

   A. Description: Base-mounted, centrifugal, flexible-coupled, end-suction, single-stage, bronze-fitted, back-pull-out, radially split case design; rated for 175-psig minimum working pressure and a continuous water temperature of 225 deg F.  
   1. Casing: Cast iron, with flanged piping connections, drain plug at low point of volute, threaded gage tappings at inlet and outlet connections, and integral feet or other means on volute to support weight of casing and attached piping. Casing shall allow removal and replacement of impeller without disconnecting piping.  
   2. Impeller: ASTM B 584, cast bronze, statically and dynamically balanced, closed, overhung, single suction, keyed to shaft, and secured by locking cap screw.  
   3. Wear Rings: Replaceable, bronze casing ring.  
   4. Shaft and Sleeve: Stainless steel shaft with bronze sleeve.  
   5. Seals: Mechanical, with carbon-steel rotating ring, stainless-steel spring, ceramic seat, and flexible bellows and gasket.
6. Coupling: Flexible-spacer type, capable of absorbing torsional vibration and shaft misalignment; with flange and sleeve section that can be disassembled and removed without removing pump or motor.

7. Coupling Guard: Steel, removable, and attached to mounting frame.


9. Motor: Secured to mounting frame, with adjustable alignment.

2.4 IN-LINE, CENTRIFUGAL PUMP

A. Pumps shall be close-coupled, single stage design, bronze fitted with standard mechanical seals.

B. Pump internals shall be capable of being serviced without disturbing piping connections.

C. Impeller shall be hydraulically and dynamically balanced and shall be keyed to the shaft and secured by a suitable locking capscrew.

2.6 PUMP SPECIALTY FITTINGS

A. Suction Diffuser: Angle or straight pattern, 175-psig pressure rating, cast-iron body and end cap, pump-inlet fitting; with bronze startup and stainless-steel strainers; full length stainless-steel straightening vanes; pressure gauge tap; drain plug; and factory- or field-fabricated support.

B. Triple-Duty Valve: Non slam drip-tight check valve, positive shut-off valve, calibrated system balance valve; angle or straight pattern, 175-psig pressure rating, cast-iron body, pump-discharge fitting; with drain plug and bronze-fitted shutoff, balancing, and check valve features.

3.0 EXECUTION

3.1 EXAMINATION

A. Examine equipment foundations and anchor-bolt locations for compliance with requirements for installation.

1. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.

2. Examine foundations for suitable conditions where pumps are to be installed.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PUMP INSTALLATION

A. Install pumps according to manufacturer's written instructions.
   1. Install pumps according to HI 1.1-1.5, "Centrifugal Pumps for Nomenclature, Definitions, Application and Operation."

B. Install pumps to provide access for periodic maintenance, including removing motors, impellers, couplings, and accessories.

C. Support pumps and piping separately so piping is not supported by pumps.

D. Set base-mounted pumps on concrete foundation. Disconnect coupling halves before setting. Do not reconnect couplings until alignment operations have been completed.
   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.

3.3 ALIGNMENT

A. Align pump and motor shafts and piping connections after setting them on foundations, after grout has been set and foundation bolts have been tightened, and after 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.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 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 the 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 suction diffuser and shutoff valve on suction side of base-mounted pumps.

F. Install triple-duty valve on discharge side of pumps.

G. Install flexible connectors on suction and discharge sides of pumps between pump casing and valves.

H. Install pressure gages on pump suction and discharge. Install at integral pressure-gage tappings where provided.

I. Install temperature and pressure-gage connector plugs in suction and discharge piping around each pump.

J. Install electrical connections for power, controls, and devices.

K. Electrical power and control wiring and connections are specified in Division 26 Sections.

L. Ground equipment.
   1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 COMMISSIONING

A. Verify that pumps are installed and connected according to the Contract Documents.

B. Verify that electrical wiring installation complies with manufacturer's written instructions and the Contract Documents.

C. Perform the following preventive maintenance operations and checks before starting:
   1. Lubricate bearings.
   2. Remove grease-lubricated bearing covers, flush bearings with kerosene, and clean thoroughly. Fill with new lubricant according to manufacturer's written instructions.
   3. Disconnect coupling and check motor for proper rotation that matches direction marked on pump casing.
4. Verify that pumps are free to rotate by hand and that pumps for handling hot liquids are free to rotate with pumps hot and cold. Do not operate pumps if they are bound or drag, until cause of trouble is determined and corrected.

5. Check suction piping connections for tightness to avoid drawing air into pumps.

6. Clean strainers.

7. Verify that pump controls are correct for required application.

D. Starting procedure for pumps with shutoff power not exceeding safe motor power is as follows:

1. Prime pumps by opening suction valves and closing drains, and prepare pumps for operation.

2. Start motors.

3. Open discharge valves slowly.

4. Observe leakage from stuffing boxes and adjust sealing liquid valve for proper flow to ensure lubrication of packing. Let packing "run in" before reducing leakage through stuffing boxes; then tighten glands.

5. Check general mechanical operation of pumps and motors.

E. When pumps are to be started against closed check valves with discharge shutoff valves open, steps are the same, except open discharge valves before starting motors.

F. Refer to Division 23 Section "Testing, Adjusting, and Balancing" for detailed requirements for testing, adjusting, and balancing hydronic systems.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner’s maintenance personnel to adjust, operate, and maintain hydronic pumps as specified below:

1. Train Owner’s maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining pumps.

2. Review data in maintenance manuals. Refer to Division 1.

3. Schedule training with Owner, through Architect, with at least seven days’ advance notice.

END OF SECTION 23 21 23
SECTION 23 25 00
WATER TREATMENT

1.0 GENERAL

1.1 CONDITIONS AND REQUIREMENTS
A. Refer to the General Requirements Section 23 00 00 and Division 1.

1.2 SCOPE OF WORK
A. Provide all equipment, apparatus, materials and supervision necessary to fit and apply chemical treatments to the existing and new water systems prior to start up of the mechanical systems involved.

B. Provide a water management program for a period of one (1) year from the date of start up.

C. Refer to other sections of Division 23 for mechanical equipment and piping systems.

D. Required electrical power supplies provided under Division 26 - Electrical.

1.3 QUALITY ASSURANCE
A. Qualifications of Supplier:
   1. Work required under this section shall be done by a single firm (for undivided responsibility). The Manufacturer of the water treatment formulations shall supply all equipment and testing apparatus as specified for these systems. Supplier shall be ISO 9002 certified and have an EPA certified laboratory for support.

   2. The water treatment chemical and service supplier shall be a recognized specialist, active in the field of industrial water treatment, whose major business is in the field of water treatment, and who shall have a regional water and deposit analysis laboratory and service department with full time service personnel located within the trading area of the job site.

   3. The indoctrination and water management program shall be conducted by a qualified full time local representative.

1.4 SUBMITTALS
A. Refer to Section 23 00 00 for submittal procedures.
B. Alternates: Any substitutions or deviations from the specified supplier must be approved by the design engineer.

C. Shop Drawings: Submit shop drawings on complete systems describing equipment, apparatus, material, and application of treatment. Include wiring diagrams for electrically operated apparatus or equipment.

D. Operation and Maintenance Data: Submit on system and components at time of equipment shipment.

E. Chemicals: Submit product data bulletins along with MSDS on each chemical.

1.5 GUARANTEE

A. All work and material provided hereunder shall be guaranteed for a period of one (1) year from the date of project acceptance. Individual component warranties are described under equipment/apparatus.

2.0 PRODUCTS

2.1 EXTRA STOCK

A. Chemicals/Test Kits

1. Provide a supply of treatment chemicals sufficient for start up with a minimum of 15 gallons of each different chemical in liquid form. All chemicals shall be in 5 gallon containers for roof delivery and application to double containment tanks.

2. Provide complete supply of chemicals for all systems for a period of one (1) year from acceptance date of equipment.

3. Provide facility with a permanent set of all testing apparatus necessary to monitor each system including a pH test kit and a Myron-L Model 532MI specific conductance meter.

4. Provide facility with supply of all necessary reagents for each test for a period of one (1) year from acceptance date of equipment.

2.2 SERVICE AND PRODUCTS

A. Suppliers:

1. Treatment equipment, apparatus, materials and services to be provided by Garratt-Callahan Company at (415)697-5811 or Aqua Treat Chemical at (415)593-2100.
2.3 CLEANOUT COMPOUNDS
   A. Existing and New Equipment and Piping System Hot Water:
      1. Provide Garratt-Callahan GC248-L performulated alkaline type.

2.4 CLOSED LOOPS
   A. Equipment/Apparatus
      1. Provide Garratt-Callahan Model 5018 - 5 gallon bypass feeder. One permanently installed for each separate closed loop.
      2. Provide Garratt-Callahan Model 7101-DR test kit in portable case.
   B. Chemicals
      1. Provide Garratt-Callahan Formula 12-L nitrate-borate scale and corrosion inhibitor with biocide for antifoulant capabilities.

3.0 EXECUTION
3.1 PREPARATION
   A. Coordination:
      1. Examine the existing equipment and piping system as well as the drawings and installation of each system to be treated; note extend, materials, etc. Coordinate location and installation of treatment system connections and apparatus with the installer of the systems being treated.
      2. Prepare to supply all material and labor requisite to timely execution of this work. All cleanouts shall be done at time of initial water charge.
      3. Insure that all piping systems affected have been flushed and cleaned as specified.

3.2 CLEANOUT - CLOSED LOOPS
   A. Systems
      1. Products specified in part 2 above and execution as specified below shall be applied to each of the following (Single circuit) systems:
         a. Main hot loop
   B. Execution
1. Check with all regulating agencies for any discharge restrictions.
   a. Add 3 gallons of formula 248-L into the system per 1000 gallons of system water.
   b. Circulate for a period of at least 72 hours.
   c. Every 8 hours rapidly blow down boiler, evaporator, and system low points for 3 minutes.
   d. Drain and flush system. Rapid draining from lowest point in system is necessary to remove debris.
   e. Continue to flush system until TDS of effluent is equal to TDS of influent. Effluent should be clear at end of process.
   f. Initiate automatic feeding of inhibitors and biocides immediately following flush.

3.3 EQUIPMENT START UP

A. Execution:

1. Contractor shall read start up and calibration sections of each separate equipment manual to successfully operate all systems to specifications. Prime all metering pumps and place in service.

END OF SECTION 23 25 00
SECTION 23 29 23
VARIABLE-FREQUENCY DRIVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes solid-state, PWM, VFDs for speed control of three-phase, squirrel-cage induction motors.

B. Related Sections include the following:
   1. Division 26 Section "Electrical Power Monitoring and Control" for monitoring and control of motor circuits.
   2. Division 26 Section "Transient-Voltage Suppression for Low-Voltage Electrical Power Circuits" for low-voltage power, control, and communication surge suppressors.

1.3 DEFINITIONS

A. BMS: Building management system.

B. IGBT: Integrated gate bipolar transistor.

C. LAN: Local area network.

D. PID: Control action, proportional plus integral plus derivative.

E. PWM: Pulse-width modulated.

F. VFD: Variable frequency drive.

1.4 SUBMITTALS

A. Product Data: For each type of VFD. Include dimensions, mounting arrangements, location for conduit entries, shipping and operating weights, and manufacturer’s technical data on features, performance, electrical ratings, characteristics, and finishes.
B. Shop Drawings: For each VFD.

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:

   a. Each installed unit's type and details.
   b. Nameplate legends.
   c. Short-circuit current rating of integrated unit.
   d. Listed and labeled for series rating of overcurrent protective devices in combination controllers by an NRTL acceptable to authorities having jurisdiction.
   e. Features, characteristics, ratings, and factory settings of each motor-control center unit.

2. Wiring Diagrams: Power, signal, and control wiring for VFDs. Provide schematic wiring diagram for each type of VFD.

C. Coordination Drawings: Floor plans, drawn to scale, showing dimensioned layout, required working clearances, and required area above and around VFDs where pipe and ducts are prohibited. Show VFD layout and relationships between electrical components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate field measurements.

D. Manufacturer Seismic Qualification Certification: Submit certification that VFDs, accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

   a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
   b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For VFDs, all installed devices, and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Routine maintenance requirements for VFDs and all installed components.
2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

G. Load-Current and Overload-Relay Heater List: Compile after motors have been installed and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.

H. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed and arrange to demonstrate that dip switch settings for motor running overload protection suit actual motor to be protected.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 100 miles of Project site, a service center capable of providing training, parts, and emergency maintenance and repairs.

B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

C. Source Limitations: Obtain VFDs of a single type through one source from a single manufacturer.

D. 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.

E. Comply with NFPA 70.

F. Product Selection for Restricted Space: Drawings indicate maximum dimensions for VFDs, minimum clearances between VFDs, and adjacent surfaces and other items. Comply with indicated maximum dimensions and clearances.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver VFDs in shipping splits of lengths that can be moved past obstructions in delivery path as indicated.

B. Store VFDs indoors in clean, dry space with uniform temperature to prevent condensation. Protect VFDs from exposure to dirt, fumes, water, corrosive substances, and physical damage.
C. If stored in areas subject to weather, cover VFDs to protect them from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside controllers; install electric heating of sufficient wattage to prevent condensation.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation, capable of driving full load without derating, under the following conditions, unless otherwise indicated:

1. Ambient Temperature: 0 to 40 deg C.
2. Humidity: Less than 90 percent (noncondensing).
3. Altitude: Not exceeding 3300 feet.

B. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify the district no fewer than three weeks in advance of proposed interruption of electrical service.
2. Indicate method of providing temporary electrical service.
3. Do not proceed with interruption of electrical service district’s written permission.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for VFDs, including clearances between VFDs, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.8 COORDINATION

A. Coordinate layout and installation of VFDs with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete."

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

D. Coordinate features of VFDs, installed units, and accessory devices with pilot devices and control circuits to which they connect.

E. Coordinate features, accessories, and functions of each VFD and each installed unit with ratings and characteristics of supply circuit, motor, required control sequence, and duty cycle of motor and load.
1.9 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. Spare Fuses: Furnish one spare for every five installed, but no fewer than one set of each type and rating.
2. Indicating Lights: Two of each type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

2. Baldor Electric Company (Graham).
5. General Electric Company; GE Industrial Systems.
7. Siemens Energy and Automation; Industrial Products Division.
8. Square D.

2.2 VARIABLE FREQUENCY DRIVES

A. Description: NEMA ICS 2, IGBT, PWM, VFD; listed and labeled as a complete unit and arranged to provide variable speed of an NEMA MG 1, Design B, 3-phase induction motor by adjusting output voltage and frequency.

1. Provide unit suitable for operation of premium-efficiency motor as defined by NEMA MG 1.

B. Design and Rating: Match load type such as fans, blowers, and pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.

C. Output Rating: 3-phase; 6 to [60 Hz, with voltage proportional to frequency throughout voltage range] [66 Hz, with torque constant as speed changes] [120 Hz, with horsepower constant throughout speed range].
D. Unit Operating Requirements:

1. Input ac voltage tolerance of 10 percent.
2. Input frequency tolerance of 50/60 Hz, plus or minus 6 percent.
3. Minimum Efficiency: 96 percent at 60 Hz, full load.
5. Overload Capability: 1.1 times the base load current for 60 seconds; 2.0 times the base load current for 3 seconds.
6. Starting Torque: 100 percent of rated torque or as indicated.
7. Speed Regulation: Plus or minus 1 percent.

E. Isolated control interface to allow controller to follow control signal over an 11:1 speed range.

1. Electrical Signal: 4 to 20 mA at 24 V.
2. Pneumatic Signal: 3 to 15 psig (20 to 104 kPa).

F. Internal Adjustability Capabilities:

1. Minimum Speed: 5 to 25 percent of maximum rpm.
2. Maximum Speed: 80 to 100 percent of maximum rpm.
3. Acceleration: 2 to a minimum of 22 seconds.
4. Deceleration: 2 to a minimum of 22 seconds.
5. Current Limit: 50 to a minimum of 110 percent of maximum rating.

G. Self-Protection and Reliability Features:

1. Input transient protection by means of surge suppressors.
2. Under- and overvoltage trips; inverter overtemperature, overload, and overcurrent trips.
5. Instantaneous line-to-line and line-to-ground overcurrent trips.
7. Reverse-phase protection.
8. Short-circuit protection.

H. Multiple-Motor Capability: Controller suitable for service to multiple motors and having a separate overload relay and protection for each controlled motor. Overload relay shall shut off controller and motors served by it when overload relay is tripped.

I. Automatic Reset/Restart: Attempts three restarts after controller fault or on return of power after an interruption and before shutting down for manual reset or fault correction. Bidirectional autospeed search shall be capable of starting into rotating loads spinning in either direction and returning motor to set speed in proper direction, without damage to controller, motor, or load.
J. Power-Interruption Protection: To prevent motor from re-energizing after a power interruption until motor has stopped.

K. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.

L. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.

M. Status Lights: Door-mounted LED indicators shall indicate the following conditions:
   1. Power on.
   2. Run.
   3. Overvoltage.
   4. Line fault.
   5. Overcurrent.


O. Indicating Devices: Meters or digital readout devices and selector switch, mounted flush in controller door and connected to indicate the following controller parameters:
   1. Output frequency (Hz).
   5. Motor torque (percent).
   6. Fault or alarming status (code).
   7. PID feedback signal (percent).
   8. DC-link voltage (VDC).
   9. Set-point frequency (Hz).
  10. Motor output voltage (V).

P. Control Signal Interface:
   1. Electric Input Signal Interface: A minimum of 2 analog inputs (0 to 10 V or 0/4-20 mA) and 6 programmable digital inputs.
   2. Pneumatic Input Signal Interface: 3 to 15 psig.
   3. Remote Signal Inputs: Capability to accept any of the following speed-setting input signals from the BMS or other control systems:
      a. 0 to 10-V dc.
      b. 0-20 or 4-20 mA.
      c. Potentiometer using up/down digital inputs.
      d. Fixed frequencies using digital inputs.
e. RS485.

f. Keypad display for local hand operation.

4. Output Signal Interface:

a. A minimum of 1 analog output signal (0/4-20 mA), which can be programmed to any of the following:

1) Output frequency (Hz).
2) Output current (load).
3) DC-link voltage (VDC).
4) Motor torque (percent).
5) Motor speed (rpm).
6) Set-point frequency (Hz).

5. Remote Indication Interface: A minimum of 2 dry circuit relay outputs (120-V ac, 1 A) for remote indication of the following:

a. Motor running.
b. Set-point speed reached.
c. Fault and warning indication (overtemperature or overcurrent).
d. PID high- or low-speed limits reached.

Q. Communications: Provide an RS485 interface allowing VFD to be used with an external system within a multidrop LAN configuration. Interface shall allow all parameter settings of VFD to be programmed via BMS control. Provide capability for VFD to retain these settings within the nonvolatile memory.

R. Manual Bypass: Magnetic contactor arranged to safely transfer motor between controller output and bypass controller circuit when motor is at zero speed. Controller-off-bypass selector switch sets mode, and indicator lights give indication of mode selected. Unit shall be capable of stable operation (starting, stopping, and running), with motor completely disconnected from controller (no load).

S. Bypass Controller: NEMA ICS 2, full-voltage, nonreversing enclosed controller with across-the-line starting capability in manual-bypass mode. Provide motor overload protection under both modes of operation with control logic that allows common start-stop capability in either mode.

T. Integral Disconnecting Means: [NEMA AB 1, instantaneous-trip circuit breaker] [NEMA AB 1, molded-case switch] [NEMA KS 1, nonfusible switch] [NEMA KS 1, fusible switch] with lockable handle.

U. Isolating Switch: Non-load-break switch arranged to isolate VFD and permit safe troubleshooting and testing, both energized and de-energized, while motor is operating in bypass mode.

V. Remote Indicating Circuit Terminals: Mode selection, controller status, and controller fault.
2.3 ENCLOSURES
   A. Provide NEMA 1 enclosures for indoor installation and NEMA 3R for installations exposed to
      the weather.

2.4 ACCESSORIES
   A. Devices shall be factory installed in controller enclosure, unless otherwise indicated.
   C. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factory-
      applied hasp arranged so padlock can be used to lock push button in depressed position with
      control circuit open.
   D. Control Relays: Auxiliary and adjustable time-delay relays.
   E. Standard Displays:
      1. Output frequency (Hz).
      2. Set-point frequency (Hz).
      4. DC-link voltage (VDC).
      5. Motor torque (percent).
      7. Motor output voltage (V).
   F. Historical Logging Information and Displays:
      1. Real-time clock with current time and date.
      2. Running log of total power versus time.
      3. Total run time.
      4. Fault log, maintaining last four faults with time and date stamp for each.
   G. Current-Sensing, Phase-Failure Relays for Bypass Controller: Solid-state sensing circuit with
      isolated output contacts for hard-wired connection; arranged to operate on phase failure, phase
      reversal, current unbalance of from 30 to 40 percent, or loss of supply voltage; with
      adjustable response delay.

2.5 FACTORY FINISHES
   A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested VFDs before
      shipping.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, surfaces, and substrates to receive VFDs for compliance with requirements, installation tolerances, and other conditions affecting performance.

B. Examine roughing-in for conduit systems to verify actual locations of conduit connections before VFD installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Select features of each VFD to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; and duty cycle of motor, controller, and load.

B. Select horsepower rating of controllers to suit motor controlled.

3.3 INSTALLATION

A. Anchor each VFD assembly to steel-channel sills arranged and sized according to manufacturer's written instructions. Attach by bolting. Level and grout sills flush with mounting surface.

B. Comply with mounting and anchoring requirements specified in Division 26 Section "Hangers and Supports for Electrical Systems."

C. Controller Fuses: Install fuses in each fusible switch. Comply with requirements in Division 26 Section "Fuses."

3.4 IDENTIFICATION

A. Identify VFDs, components, and control wiring according to Division 26 Section "Identification for Electrical Systems."

B. Operating Instructions: Frame printed operating instructions for VFDs, including control sequences and emergency procedures. Fabricate frame of finished metal, and cover instructions with clear acrylic plastic. Mount on front of VFD units.

3.5 CONTROL WIRING INSTALLATION

A. Install wiring between VFDs and remote devices according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
B. Bundle, train, and support wiring in enclosures.

C. Connect hand-off-automatic switch and other automatic-control devices where applicable.
   1. Connect selector switches to bypass only manual- and automatic-control devices that have no safety functions when switch is in hand position.
   2. Connect selector switches with control circuit in both hand and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.6 CONNECTIONS
   A. Conduit installation requirements are specified in other Division 26 Sections. Drawings indicate general arrangement of conduit, fittings, and specialties.
   B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

3.7 FIELD QUALITY CONTROL
   A. Prepare for acceptance tests as follows:
      1. Test insulation resistance for each enclosed controller element, bus, component, connecting supply, feeder, and control circuit.
      2. Test continuity of each circuit.
   B. Manufacturer's Field Service: Engage a factory-authorized service representative to perform the following:
      1. Inspect controllers, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
      2. Assist in field testing of equipment including pretesting and adjusting of solid-state controllers.
   C. Perform the following field tests and inspections and prepare test reports:
      1. Perform each electrical test and visual and mechanical inspection, except optional tests, stated in NETA ATS. Certify compliance with test parameters.
      2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.8 ADJUSTING
   A. Set field-adjustable switches and circuit-breaker trip ranges.
3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner’s maintenance personnel to adjust, operate, and maintain variable frequency drives. Refer to Division 01 Section “Demonstration and Training.”

END OF SECTION 26 29 23
SECTION 23 31 13

METAL DUCTS

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 01330 Submittal Procedures.

1.2 SUMMARY

A. This Section includes metal ducts for supply, return, outside, and exhaust air-distribution systems in pressure classes from minus 2- to plus 10-inch wg. Metal ducts include the following:
   1. Rectangular ducts and fittings.
   2. Single-wall, round and flat-oval spiral-seam ducts and formed fittings.
   3. Double-wall, round and flat-oval spiral-seam ducts and formed fittings.
   4. Duct liner.

B. Related Sections include the following:
   1. Division 23 Section 23 33 00 "Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.
   2. Division 23 Section "Duct Insulation" for duct insulation.

1.3 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select size and type of air-moving and distribution equipment and other air system components. Changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

1.4 SUBMITTALS

A. Shop Drawings: Drawn to 1/4 inch equals 1 foot scale. Show fabrication and installation details for metal ducts.
1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.

2. Duct layout indicating sizes and pressure classes.

3. Elevations of top and bottom of ducts.

4. Dimensions of main duct runs from building grid lines.

5. Fittings.

6. Reinforcement and spacing.

7. Seam and joint construction.

8. Penetrations through fire-rated and other partitions.

9. Equipment installation based on equipment being used on Project.

10. Duct accessories, including access doors and panels.

11. Hangers and supports, including methods for duct and building attachment, vibration isolation, and seismic restraints.

B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Ceiling suspension assembly members.

2. Other systems installed in same space as ducts.

3. Ceiling- and wall-mounting access doors and panels required to provide access to dampers and other operating devices.

4. Ceiling-mounting items, including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

1.5 QUALITY ASSURANCE

A. NFPA Compliance:

1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."

2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

C. All ductwork shall be cleaned and wiped down before delivery to job site. Ends of duct shall be sealed to prevent any dust and debris from getting in. Seals shall be removed after rigging into place for installation and downstream ends shall be kept sealed at all times. Upon attachment to diffuser and grille, provide visqueen over diffuser and grille.

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. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 (Z275) coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

C. Stainless Steel: ASTM A 480/A 480M, Type 304, and having a No. 2D finish for concealed ducts and No. 4 for exposed ducts.


E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 DUCT LINER

A. Fibrous-Glass Liner: Comply with NFPA 90A or NFPA 90B and with NAIMA AH124.
1. Manufacturers:
   a. CertainTeed Corp.; Insulation Group.
   c. Knauf Fiber Glass GmbH.
   d. Owens Corning.

2. Materials: ASTM C 1071; surfaces exposed to airstream shall be coated to prevent erosion of glass fibers.
   a. Thickness: Minimum 1 inch, or thicker where specifically noted in Contract Documents.
   b. Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature for indoor use and 0.158 at 75 deg F mean temperature for outdoor use.
   c. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
   d. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
   e. Mechanical Fasteners: Galvanized steel suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in duct.
      1) Tensile Strength: Indefinitely sustain a 50-lb tensile, dead-load test perpendicular to duct wall.
      2) Fastener Pin Length: As required for thickness of insulation and without projecting more than 1/8 inch into airstream.
      3) Adhesive for Attaching Mechanical Fasteners: Comply with fire-hazard classification of duct liner system.

B. Flexible Elastomeric Duct Liner: Comply with NFPA 90A or NFPA 90B.

1. Manufacturers:
   a. Armstrong World Industries, Inc.

   a. Thickness: Minimum 1 inch.
   b. Thermal Conductivity (k-Value): 0.24 at 75 deg F mean temperature for indoor use and 0.158 at 75 deg F mean temperature for outdoor use.
   c. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM C 411.
   d. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

2.4 SEALANT MATERIALS

A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.

C. Tape Sealing System: Woven-fiber tape impregnated with gypsum mineral compound and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.

D. Water-Based Joint and Seam Sealant: Flexible, adhesive sealant, resistant to UV light when cured, UL 723 listed, and complying with NFPA requirements for Class 1 ducts.

E. Solvent-Based Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant formulated with a minimum of 75 percent solids.

F. Flanged Joint Mastic: One-part, acid-curing, silicone, elastomeric joint sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

G. Flange Gaskets: Butyl rubber or EPDM polymer with polyisobutylene plasticizer.

2.5 HANGERS AND SUPPORTS

A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. All attachments to building structure shall be made in accordance with the Structural Engineers requirements and weight limitations.

2. Submit shop drawings and calculations for review and approval by Mechanical & Structural engineer before installation.

B. Hanger Materials: Galvanized sheet steel or threaded steel rod.

1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

2. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for steel sheet width and thickness and for steel rod diameters.

3. Galvanized-steel straps attached to aluminum ducts shall have contact surfaces painted with zinc-chromate primer.

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.

2.6 RECTANGULAR DUCT FABRICATION

A. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.

1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.

2. Deflection: Duct systems shall not exceed deflection limits according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.

1. Manufacturers:
   a. Ductmate Industries, Inc.
   b. Nexus Inc.
   c. Ward Industries, Inc.

C. Formed-On Flanges: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details.

1. Manufacturers:
   a. Ductmate Industries, Inc.
   b. Lockformer.

2. Duct Size: Maximum 30 inches wide and up to 2-inch wg pressure class.

3. Longitudinal Seams: Pittsburgh lock sealed with noncuring polymer sealant.

D. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of nonbraced panel area unless ducts are lined.

2.7 APPLICATION OF LINER IN RECTANGULAR DUCTS

A. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.

B. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.

C. Butt transverse joints without gaps and coat joint with adhesive.
D. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.

E. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.

F. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.

G. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

H. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or “Z” profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

1. Fan discharges.
2. Intervals of lined duct preceding unlined duct.
3. Upstream edges of transverse joints in ducts where air velocities are greater than 2500 fpm or where indicated.

I. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.

1. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.

J. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.8 ROUND AND FLAT-OVAL DUCT AND FITTING FABRICATION

A. Diameter as applied to flat-oval ducts in this Article is the diameter of a round duct with a circumference equal to the perimeter of a given size of flat-oval duct.

B. Round, Longitudinal- and Spiral Lock-Seam Ducts: Fabricate supply ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

C. Flat-Oval, Longitudinal- and Spiral Lock-Seam Ducts: Fabricate supply ducts according to SMACNA’s “HVAC Duct Construction Standards--Metal and Flexible.” Fabricate ducts larger than 72 inches in diameter with butt-welded longitudinal seams.
1. **Manufacturers:**
   b. SEMCO Incorporated.

D. **Duct Joints:**

1. Ducts up to 20 Inches in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.

2. Ducts 21 to 72 Inches in Diameter: Three-piece, gasketed, flanged joint consisting of two internal flanges with sealant and one external closure band with gasket.

3. Ducts Larger Than 72 Inches in Diameter: Companion angle flanged joints per SMACNA "HVAC Duct Construction Standards--Metal and Flexible," Figure 3-2.

4. Round Ducts: Prefabricated connection system consisting of double-lipped, EPDM rubber gasket. Manufacture ducts according to connection system manufacturer's tolerances.
   a. **Manufacturers:**
      1) Lindab Inc.

5. Flat-Oval Ducts: Prefabricated connection system consisting of two flanges and one synthetic rubber gasket.
   a. **Manufacturers:**
      1) Ductmate Industries, Inc.
      3) SEMCO Incorporated.

E. **90-Degree Tees and Laterals and Conical Tees:** Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," with metal thicknesses specified for longitudinal-seam straight ducts.

F. **Diverging-Flow Fittings:** Fabricate with reduced entrance to branch taps and with no excess material projecting from fitting onto branch tap entrance.

G. Fabricate elbows using die-formed, gored, pleated, or mitered construction. Pleated elbows not allowed. Bend radius of die-formed and gored, and pleated elbows shall be 1-1/2 times duct diameter. Unless elbow construction type is indicated, fabricate elbows as follows:

1. **Mitered-Elbow Radius and Number of Pieces:** Welded construction complying with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.

2. **Round Mitered Elbows:** Welded construction with the following metal thickness for pressure classes from minus 2- to plus 2-inch wg:
   a. Ducts 3 to 36 Inches in Diameter: 0.034 inch.
   b. Ducts 37 to 50 Inches in Diameter: 0.040 inch.
c. Ducts 52 to 60 Inches in Diameter: 0.052 inch.
d. Ducts 62 to 84 Inches in Diameter: 0.064 inch.

3. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from 2- to 10-inch wg:
a. Ducts 3 to 26 Inches in Diameter: 0.034 inch.
b. Ducts 27 to 50 Inches in Diameter: 0.040 inch.
c. Ducts 52 to 60 Inches in Diameter: 0.052 inch.
d. Ducts 62 to 84 Inches in Diameter: 0.064 inch.

4. Flat-Oval Mitered Elbows: Welded construction with same metal thickness as longitudinal-seam flat-oval duct.

5. 90-Degree, 2-Piece, Mitered Elbows: Use only for supply systems or for material-handling Class A or B exhaust systems and only where space restrictions do not permit using radius elbows. Fabricate with single-thickness turning vanes.

6. Round Elbows 8 Inches and Less in Diameter: Fabricate die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.

7. Round Elbows 9 through 14 Inches in Diameter: Fabricate gored or pleated elbows for 30, 45, 60, and 90 degrees unless space restrictions require mitered elbows. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.

8. Round Elbows Larger Than 14 Inches in Diameter and All Flat-Oval Elbows: Fabricate gored elbows unless space restrictions require mitered elbows.

9. Die-Formed Elbows for Sizes through 8 Inches in Diameter and All Pressures 0.040 inch thick with 2-piece welded construction.

10. Round Gored-Elbow Metal Thickness: Same as non-elbow fittings specified above.

11. Flat-Oval Elbow Metal Thickness: Same as longitudinal-seam flat-oval duct specified above.

PART 3 - EXECUTION

3.1 DUCT APPLICATIONS

A. Static-Pressure Classes: Unless otherwise indicated, construct ducts according to the following:

1. Supply Ducts: 3-inch wg.
2. Supply Ducts (before Air Terminal Units): 3-inch wg.


5. Return Ducts (Negative Pressure): 2-inch wg.


B. All ducts shall be galvanized steel except as follows:

1. Range Hood Exhaust Ducts: Comply with NFPA 96.
   a. Concealed: Galvanized steel sheet of at least 0.055 inch thickness.
   b. Exposed: Type 304, stainless steel of at least 0.044 inch thickness with finish to match kitchen equipment and range hood.
   c. Weld seams and joints.

3.2 DUCT INSTALLATION

A. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.

B. Install round and flat-oval ducts in lengths not less than 12 feet unless interrupted by fittings.

C. Install ducts with fewest possible joints.

D. Install fabricated fittings for changes in directions, size, and shape and for connections.

E. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches, with a minimum of 3 screws in each coupling.

F. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.

J. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.
K. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws.

L. Electrical Equipment Spaces: Route ducts to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

M. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2 inches.

N. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated combination fire/smoke dampers, sleeves, and firestopping sealant. Fire and smoke dampers are specified in Division 23 Section 23 33 00 "Duct Accessories." Firestopping materials and installation methods are specified in Division 7 Section "Through-Penetration Firestop Systems."

O. Install ducts with hangers and braces designed to withstand, without damage to equipment, seismic force required by applicable building codes. Refer to SMACNA’s "Seismic Restraint Manual: Guidelines for Mechanical Systems" and NUSIG.

P. Protect all ductwork and duct interiors shall be clean and free from foreign materials until building is enclosed. Refer sections 3.07 and 3.08 for duct cleaning requirements.

Q. Paint interiors of metal ducts, that do not have duct liner, for 24 inches upstream of registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 9 painting Sections.

3.3 SEAM AND JOINT SEALING

A. Seal duct seams and joints according to SMACNA’s "HVAC Duct Construction Standards--Metal and Flexible" for duct pressure class indicated.

1. For pressure classes lower than 2-inch wg, seal transverse joints.

B. Seal ducts before external insulation is applied.

3.4 HANGING AND SUPPORTING

A. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.

B. Support vertical ducts at maximum intervals of 16 feet and at each floor.

C. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.
3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors according to Division 23 Section "Duct Accessories."

B. Comply with SMACNA’s "HVAC Duct Construction Standards--Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 CLEANING NEW SYSTEMS

A. Mark position of dampers and air-directional mechanical devices before cleaning, and perform cleaning before air balancing.

B. Use service openings, as required, for physical and mechanical entry and for inspection.
   1. Create other openings to comply with duct standards.
   2. Disconnect flexible ducts as needed for cleaning and inspection.
   3. Remove and reinstall ceiling sections to gain access during the cleaning process.

C. Vent vacuuming system to the outside. Include filtration to contain debris removed from HVAC systems, and locate exhaust down wind and away from air intakes and other points of entry into building.

D. Clean the following metal duct systems by removing surface contaminants and deposits:
   1. Air outlets and inlets registers, grilles, and diffusers.
   2. Supply, return, and exhaust fans including fan housings, plenums, except ceiling supply and return plenums, scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
   3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, filters and filter sections, and condensate collectors and drains.
   5. Return-air ducts, dampers, and actuators except in ceiling plenums and mechanical equipment rooms.
   7. All ductwork shall be cleaned and wiped down before delivery to job site. Ends of duct shall be sealed to prevent any dust and debris from getting in. Seals shall be removed.
after rigging into place for installation and downstream ends shall be kept sealed at all times. Upon attachment to diffuser grille, provide visqueen over diffuser and grille.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.

2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.

3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.

4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet.

5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.

F. Cleanliness Verification:

1. Visually inspect metal ducts for contaminants.

2. Where contaminants are discovered, re-clean and reinspect ducts.

3.7 CLEANING EXISTING SYSTEMS

A. Use service openings, as required, for physical and mechanical entry and for inspection.

1. Use existing service openings where possible.

2. Create other openings to comply with duct standards.

3. Disconnect flexible ducts as needed for cleaning and inspection.

4. Reseal rigid fiberglass duct systems according to NAIMA recommended practices.

5. Remove and reinstall ceiling sections to gain access during the cleaning process.

B. Mark position of dampers and air-directional mechanical devices before cleaning, and restore to their marked position on completion.

C. Particulate Collection and Odor Control:
1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron size or larger particles.

2. When venting vacuuming system to the outside, use filtration to contain debris removed from HVAC system, and locate exhaust down wind and away from air intakes and other points of entry into building.

D. Clean the following metal duct systems by removing surface contaminants and deposits:

1. Air outlets and inlets registers, grilles, and diffusers.

2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.

3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.


5. Return-air ducts, dampers, and actuators except in ceiling plenums and mechanical equipment rooms.


7. Dedicated exhaust and ventilation components and makeup air systems.

8. All ductwork shall be cleaned and wiped down before delivery to job site. Ends of duct shall be sealed to prevent any dust and debris from getting in. Seals shall be removed after rigging into place for installation and down stream ends shall be kept sealed at all times. Upon attachment to diffuser grille, provide visqueen over diffuser and grille.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.

2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.

3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.

4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.

6. Provide operative drainage system for washdown procedures.

7. Biocidal Agents and Coatings: Apply biocidal agents if fungus is present. Apply biocidal agents according to manufacturer's written instructions after removal of surface deposits and debris.

F. Cleanliness Verification:

1. Verify cleanliness after mechanical cleaning and before application of treatment, including biocidal agents and protective coatings.

2. Visually inspect metal ducts for contaminants.

3. Where contaminants are discovered, re-clean and reinspect ducts.

G. Gravimetric Analysis: At discretion and expense of Owner, sections of metal duct system, chosen randomly by Owner, may be tested for cleanliness according to NADCA vacuum test gravimetric analysis.

1. If analysis determines that levels of debris are equal to or lower than suitable levels, system shall have passed cleanliness verification.

2. If analysis determines that levels of debris exceed suitable levels, system cleanliness verification will have failed and metal duct system shall be re-cleaned and re-verified.

H. Verification of Coil Cleaning: Cleaning must restore coil pressure drop to within 10 percent of pressure drop measured when coil was first installed. If original pressure drop is not known, coil will be considered clean only if it is free of foreign matter and chemical residue, based on thorough visual inspection.

3.8 FIELD QUALITY CONTROL

A. Field Quality Control for the sub-contractor: The sub-contractor shall provide copies of all test results and reports to Commissioning Authority for review.

END OF SECTION 23 31 13
SECTION 23 33 00

DUCT ACCESSORIES

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. Backdraft dampers.
2. Volume dampers.
3. Motorized control dampers.
4. Fire dampers.
5. Ceiling fire dampers.
7. Combination fire and smoke dampers.
8. Duct silencers.
10. Duct-mounting access doors.
11. Flexible connectors.
12. Flexible ducts.
13. Duct accessory hardware.

B. Related Sections include the following:

1. Division 23 Section "23 09 00 – Automatic Temperature Controls" for electric and pneumatic damper actuators.
1.3 SUBMITTALS

A. Product Data: For the following:

1. Backdraft dampers.
2. Volume dampers.
3. Motorized control dampers.
4. Fire dampers.
5. Ceiling fire dampers.
7. Combination fire and smoke dampers.
8. Duct silencers.
10. Duct-mounting access doors.
11. Flexible connectors.
12. Flexible ducts.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Special fittings.
3. Motorized-control damper installations.
4. Fire-damper, smoke-damper, and combination fire- and smoke-damper installations, including sleeves and duct-mounting access doors.


C. Coordination Drawings: Reflected ceiling plans, drawn to scale and coordinating penetrations and ceiling-mounting items. Show ceiling-mounting access panels and access doors required for access to duct accessories.
1.4 QUALITY ASSURANCE

1.5 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. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SHEET METAL MATERIALS
   A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.

   B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G60 (Z180) or G90 (Z275) coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

   C. Stainless Steel: ASTM A 480/A 480M.


   F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

   G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 BACKDRAFT DAMPERS
A. Manufacturers:

1. Air Balance, Inc.
2. American Warming and Ventilating.
3. Duro Dyne Corp.
5. Penn Ventilation Company, Inc.
6. Prefco Products, Inc.
7. Ruskin Company.

B. Description: Multiple-blade, parallel action gravity balanced, counter-balanced dampers where noted in Contract Documents, with center-pivoted blades of maximum 6-inch width, with sealed edges, assembled in rattle-free manner with 90-degree stop, steel ball bearings, and axles; adjustment device to permit setting for varying differential static pressure.

C. Frame: 0.125-inch thick extruded aluminum, with welded corners and mounting flange.

D. Blades: 0.070-inch thick, extruded aluminum.

E. Blade Seals: Vinyl.

F. Blade Axles: Nonferrous or Galvanized steel.

G. Tie Bars and Brackets: Aluminum.

H. Return Spring: Adjustable tension.

2.4 VOLUME DAMPERS

A. Manufacturers:

1. Air Balance, Inc.
2. American Warming and Ventilating.
3. Flexmaster U.S.A., Inc.
5. Nailor Industries Inc.
7. Ruskin Company.

B. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

1. Pressure Classes of 3-Inch wg or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.

C. Standard Volume Dampers: Multiple or single-blade, opposed-blade design for multiple blades, standard leakage rating, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
2. Roll-Formed Steel Blades: 0.064-inch thick, galvanized sheet steel.
4. Bearings: Oil-impregnated bronze or Molded synthetic.
5. Tie Bars and Brackets: Galvanized steel.

D. Low-Leakage Volume Dampers: Multiple or single-blade, opposed-blade design for multiple blades, low-leakage rating, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
2. Roll-Formed Steel Blades: 0.064-inch thick, galvanized sheet steel.
4. Bearings: Oil-impregnated bronze, molded synthetic or stainless-steel sleeve thrust or ball.
7. Tie Bars and Brackets: Galvanized steel.

E. Jackshaft: 1-inch diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.

F. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.5 MOTORIZED CONTROL DAMPERS

A. Manufacturers:

1. Air Balance, Inc.
2. American Warming and Ventilating.
3. Duro Dyne Corp.
6. Nailor Industries Inc.
7. Penn Ventilation Company, Inc.
8. Ruskin Company.

B. General Description: AMCA-rated, opposed-blade design; minimum of 0.125-inch thick, extruded aluminum hat channel frames with holes for duct mounting; minimum of 0.070-inch thick, airfoil shape extruded aluminum damper blades with maximum blade width of 8 inches.

1. Secure blades to 1/2-inch diameter, zinc-plated axles using zinc-plated hardware, with nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.

2. Operating Temperature Range: From minus 40 to plus 200 deg F.

3. Provide opposed-blade design with replaceable rubber seals, rated for leakage at less than 10 cfm per sq. ft. of damper area, at differential pressure of 4-inch wg when damper is being held by torque of 50 in. x lbf; when tested according to AMCA 500D.

2.6 FIRE DAMPERS

A. Manufacturers:

1. Air Balance, Inc.
2. Greenheck.
4. Nailor Industries Inc.
5. Penn Ventilation Company, Inc.
6. Prefco Products, Inc.
7. Ruskin Company.

B. Fire dampers shall be labeled according to UL 555.

C. Fire Rating: 1-1/2 or 3 hours as required for opening conditions.

D. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch thick galvanized steel; with mitered and interlocking corners.

E. Mounting Sleeve: Factory galvanized sheet steel.
   1. Minimum Thickness: 0.052 or 0.138 inch thick of length to suit application.
   2. Exceptions: Omit sleeve where damper frame width permits direct attachment of perimeter mounting angles on each side of wall or floor, and thickness of damper frame complies with sleeve requirements.

F. Mounting Orientation: Vertical or horizontal as indicated.

G. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

H. Fusible Links: Replaceable, 165 deg F rated.

2.7 CEILING FIRE DAMPERS

A. Manufacturers:
   1. Air Balance, Inc.
   2. Greenheck.
   4. Nailor Industries Inc.
   5. Penn Ventilation Company, Inc.
   6. Pottorff Company, Inc.
7. Prefco Products, Inc.

8. Ruskin Company.

B. General Description: Labeled according to UL 555C; comply with construction details for
tested floor- and roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory."

C. Fire Rating: 1-1/2 or 3 hours as required for opening conditions.

D. Frame: Galvanized sheet steel, round or rectangular, style to suit ceiling construction.

E. Blades: Galvanized sheet steel with refractory insulation.

F. Fusible Links: Replaceable, 165 deg F rated.

2.8 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible"
for vanes and vane runners. Vane runners shall automatically align vanes.

B. Manufactured Turning Vanes: Fabricate 1-1/2-inch wide, double-vane, curved blades of
galvanized sheet steel set 3/4 inch o.c.; support with bars perpendicular to blades set 2 inches
o.c.; and set into vane runners suitable for duct mounting.

1. Manufacturers:
   a. Ductmate Industries, Inc.
   b. Duro Dyne Corp.
   c. METALAIRE, Inc.
   d. Ward Industries, Inc.

C. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces
and fibrous-glass fill.

2.9 DUCT-MOUNTING ACCESS DOORS

A. General Description: Fabricate doors airtight and suitable for duct pressure class.

B. Door: Double wall, duct mounting, and rectangular; fabricated of galvanized sheet metal with
insulation fill and thickness as indicated for duct pressure class. Include vision panel where
indicated. Include 1-by-1-inch butt or piano hinge and cam latches.

1. Manufacturers:
   a. American Warming and Ventilating.
   b. Ductmate Industries, Inc.
   c. Flexmaster U.S.A., Inc.
   d. Greenheck.
f. Nailor Industries Inc.
g. Ventfabrics, Inc.
h. Ward Industries, Inc.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

3. Provide number of hinges and locks as follows:
   a. Less Than 12 Inches Square: Secure with two sash locks.
   b. Up to 18 Inches Square: Two hinges and two sash locks.
   c. Up to 24 by 48 Inches: Three hinges and two compression latches.
   d. Sizes 24 by 48 Inches and Larger: One additional hinge.

C. Pressure Relief Access Door: Double wall and duct mounting; fabricated of galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. Include vision panel where indicated, latches, and retaining chain.

1. Manufacturers:
   a. American Warming and Ventilating.
   b. Ductmate Industries, Inc.
   c. Greenheck.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

E. Insulation: 1-inch thick, fibrous-glass or polystyrene-foam board.

2.10 FLEXIBLE CONNECTORS

A. Manufacturers:
   1. Duro Dyne Corp.
   2. Ventfabrics, Inc.
   3. Ward Industries, Inc.

B. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

C. Metal-Edged Connectors: Factory fabricated with a fabric strip 5-3/4 inches wide attached to two strips of 2-3/4-inch wide, 0.028-inch thick, galvanized sheet steel or 0.032-inch thick aluminum sheets. Select metal compatible with ducts.

   1. Minimum Weight: 26 oz./sq. yd.
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.

3. Service Temperature: Minus 40 to plus 200 deg F.

E. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd.

2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.

3. Service Temperature: Minus 50 to plus 250 deg F.


1. Minimum Weight: 16 oz./sq. yd.

2. Tensile Strength: 285 lbf/inch in the warp and 185 lbf/inch in the filling.

3. Service Temperature: Minus 67 to plus 500 deg F.


1. Minimum Weight: 14 oz./sq. yd.

2. Tensile Strength: 450 lbf/inch in the warp and 340 lbf/inch in the filling.

3. Service Temperature: Minus 67 to plus 500 deg F.

2.11 FLEXIBLE DUCTS

A. Manufacturers:

1. Ductmate Industries, Inc.

2. Flexmaster U.S.A., Inc.

3. Hart & Cooley, Inc.


5. Flexible Technologies, Automation Industries, Inc.

B. Insulated-Duct Connectors: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor barrier film. Meet NFPA Standards 90A and 90B.
1. Pressure Rating: 6 inch wg positive and 1.0 inch wg negative.


3. Temperature Range: Minus 20 to plus 175 deg F.

4. Thermal Conductance: 0.23 BTU/hr/sq. ft./deg F.


### OCTAVE BAND

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<th>CENTER FREQ.</th>
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C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 through 20 inches to suit duct size.

2.12 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
C. Install backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

D. Install volume dampers in ducts with liner; avoid damage to and erosion of duct liner.

E. Provide balancing dampers at points on supply, return, and exhaust systems where branches lead from larger ducts as required for air balancing. Install at a minimum of two duct widths from branch takeoff.

F. Provide test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire and smoke dampers, with fusible links, according to manufacturer’s UL-approved written instructions.

H. Install duct silencers rigidly to ducts. For silencers before and after elbows, install silencer baffles parallel to the plane of the elbow.

I. Install duct access doors to allow for inspecting, adjusting, and maintaining accessories and terminal units as follows:

   1. On both sides of duct coils.
   2. On both sides of air measuring stations.
   3. Downstream from volume dampers and equipment.
   4. Adjacent to fire or smoke dampers, providing access to reset or reinstall fusible links.
   5. To interior of ducts for cleaning; before and after each change in direction, at maximum 50-foot spacing.
   6. On sides of ducts where adequate clearance is available.

J. Install the following sizes for duct-mounting, rectangular access doors:

   1. One-Hand or Inspection Access: 8 by 5 inches.
   2. Two-Hand Access: 12 by 6 inches.

K. Install the following sizes for duct-mounting, round access doors:
1. One-Hand or Inspection Access: 8 inches in diameter.
3. Head and Hand Access: 12 inches in diameter.

L. Install the following sizes for duct-mounting, pressure relief access doors:
   1. One-Hand or Inspection Access: 5 inches in diameter.

M. Label access doors according to Division 23 05 53 Section "Mechanical Identification." Access to fired and fire smoke dampers shall be permanently labeled with letters not less than ½ inch in height reading “Smoke Damper” or “Fire Damper” per UMC.

N. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators.

O. For fans developing static pressures of 5-inch wg and higher, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

P. Connect terminal units and VAV boxes to supply ducts with minimum 36 inches of straight duct.

Q. Connect diffusers or light troffer boots to low-pressure ducts with maximum 72-inch lengths of flexible duct clamped or strapped in place.

R. Connect flexible ducts to metal ducts with sheet metal collars secured with screws and UL 181 FX tape.

S. Install duct test holes where indicated and required for testing and balancing purposes. Provide plugs for all test hole locations.

3.2 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Adjust fire and smoke dampers for proper action.
C. Final positioning of manual-volume dampers is specified in Division 23 Section 23 05 93 "Testing, Adjusting, and Balancing."

END OF SECTION 23 33 00
PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes factory-fabricated air-filter devices and media used to remove particulate matter from air for HVAC applications.

1.2 SUBMITTALS

A. Product Data: Include dimensions; required clearances and access; rated flow capacity, including initial and final pressure drop at rated airflow; efficiency and test method; fire classification; furnished specialties; and accessories for each unit indicated.

B. Shop Drawings: Include plans, elevations, sections, and details to illustrate component assemblies and attachments.

1. Show filter rack assembly, dimensions, materials, and methods of assembly of components.

2. Include Setting Drawings, templates, and requirements for installing anchor bolts and anchorages.


C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. 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.

B. Comply with NFPA 90A and NFPA 90B.

C. ASHRAE Compliance: Comply with provisions of ASHRAE 52.1 for method of testing and rating air-filter units.

D. Comply with ARI 850.
E. Electronic Air Cleaners and Electrical 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 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Farr Co.
2. AAF International.
3. Airguard Industries, Inc.
4. Columbus Industries, Inc.
5. Flanders Filters, Inc.
6. International Air Filter, Inc.

C. Disposable Panel Filters: Factory-fabricated, viscous-coated, flat-panel type, disposable air filters with holding frames.

1. Media: Interlaced glass fibers sprayed with nonflammable adhesive.
2. Frame: Cardboard frame with perforated metal retainer.
3. Duct-Mounting Frames: Welded, galvanized steel with gaskets and fasteners and suitable for bolting together into built-up filter banks.

D. Extended-Surface, Disposable Panel Filters: Factory-fabricated, dry, extended-surface filters with holding frames.

1. Media: Fibrous material formed into deep-V-shaped pleats and held by self-supporting wire grid.
3. Duct-Mounting Frames: Welded, galvanized steel with gaskets and fasteners and suitable for bolting together into built-up filter banks.

PART 3 - EXECUTION
3.1 INSTALLATION

A. Position each filter unit with clearance for normal service and maintenance. Anchor filter holding frames to substrate.

B. Install filters in position to prevent passage of unfiltered air.

C. Coordinate filter installations with duct and air-handling unit installations.

D. Electrical wiring and connections are specified in Division 26 Sections.

END OF SECTION 23 41 00

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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-wall vents.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Type B and BW vents.
2. Special gas vents.
4. Guy wires and connectors.

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 QUALITY ASSURANCE

A. Source Limitations: Obtain listed system components through one source from a single manufacturer.

B. Certified Sizing Calculations: Manufacturer shall certify venting system sizing calculations.
1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of venting system that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, structural failures caused by expansion and contraction.

B. Warranty Period: 1 year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 LISTED TYPE B AND BW VENTS

A. Manufacturers:

1. American Metal Products; MASCO Corporation.

2. FAMCO.

3. Hart & Cooley, Inc.

4. Heat-Fab Inc.

5. Industrial Chimney Company.

6. LSP Products Group, Inc.

7. Metal-Fab, Inc.

8. ProTech Systems Inc.

10. Selkirk Inc.; Selkirk Metalbestos and Air Mate.


12. Tru-Flex Metal Hose Corp.

B. Description: Double-wall metal vents tested according to UL 441 and rated for 480 deg F (248 deg C) continuously for Type B, or 550 deg F (288 deg C) continuously for Type BW; with neutral or negative flue pressure complying with NFPA 211 and suitable for certified gas-fired appliances.

C. Construction: Inner shell and outer jacket separated by at least a 1/2-inch airspace.

D. Inner Shell: ASTM A 666, Type 430 stainless steel.

E. Outer Jacket: Aluminized 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 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.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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. Connect base section to foundation using anchor lugs of size and number recommended by manufacturer.

F. Join sections with acid-resistant joint cement to provide continuous joint and smooth interior finish.

G. Erect stacks plumb to finished tolerance of no more than 1 inch (25 mm) out of plumb from top to bottom.

3.3 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. Clean breechings internally, during and after installation, to remove dust and debris. Clean external surfaces to remove welding slag and mill film. Grind welds smooth and apply touchup finish to match factory or shop finish.

C. 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 00

HEATING BOILERS

1.0  GENERAL

1.1  RELATED DOCUMENTS

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

1.2  SUMMARY

A. This Section includes packaged, factory-fabricated and -assembled, gas-fired, fire-tube condensing boilers, trim and accessories for generating hot water.

1.3  SUBMITTALS

A. Product Data: Include performance data, operating characteristics, furnished specialties and accessories.

1. Prior to flue vent installation, engineered calculations and drawings must be submitted to Architect/Engineer to thoroughly demonstrate that size and configuration conform to recommended size, length and footprint for each submitted boiler.

B. Efficiency Curves: At a minimum, submit efficiency curves for 100%, 50%, and 5% input firing rates at incoming water temperatures ranging from 60°F to 160°F.

C. Pressure Drop Curve: Submit pressure drop curve for flows ranging from 0 GPM to maximum value of boiler.

1. If submitted material is different from that of the design basis, boiler manufacture shall incur all costs associated with reselection of necessary pumps. Possible differences include, but are not limited to, the pump type, pump pad size, electrical characteristics and piping changes.

D. Shop Drawings: For boilers, boiler trim and accessories, include:

1. Plans, elevations, sections, details and attachments to other work

2. Wiring Diagrams for power, signal and control wiring

E. Source Quality Control Test Reports: Reports shall be included in submittals.
F. Field Quality Control Test Reports: Reports shall be included in submittals.

G. Operation and Maintenance Data: Data to be included in boiler emergency, operation and maintenance manuals.

H. Warranty: Standard warranty specified in this Section.

I. Other Informational Submittals
   1. ASME Stamp Certification and Report: Submit "$A," "$S," or "$PP" stamp certificate of authorization, as required by authorities having jurisdiction, and document hydrostatic testing of piping external to boiler.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices and Accessories: Boilers must be listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. I=B=R Performance Compliance: Condensing boilers must be rated in accordance with applicable federal testing methods and verified by AHRI as capable of achieving the energy efficiency and performance ratings as tested within prescribed tolerances.

C. ASME Compliance: Condensing boilers must be constructed in accordance with ASME Boiler and Pressure Vessel Code, Section IV “Heating Boilers”.

D. ASHRAE/IESNA 90.1 Compliance: Boilers shall have minimum efficiency according to "Gas and Oil Fired Boilers - Minimum Efficiency Requirements."


F. UL Compliance. Boilers must be tested for compliance with UL 795, "Commercial-Industrial Gas Heating Equipment." Boilers shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

G. NOx Emission Standards. When installed and operated in accordance with manufacturer’s instructions, condensing boilers shall comply with the NOx emission standards outlined in South Coast Air Quality Management District (SCAQMD), Rule 1146.2; and the Texas Commission on Environmental Quality (TCEQ), Title 30, Chapter 117, Rule 117.465.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement and formwork requirements are specified in Division 03.
1.6 WARRANTY

A. Standard Warranty: Boilers shall include manufacturer's standard form in which manufacturer agrees to repair or replace components of boilers that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Fire-Tube Condensing Boilers

a. The pressure vessel/heat exchanger shall carry a 10-year from shipment, prorated, limited warranty against any failure due to condensate corrosion, thermal stress, mechanical defects or workmanship.

b. Manufacturer labeled control panels are conditionally warranted against failure for (2) two years from shipment.

c. All other components, with the exception of the igniter and flame detector, are conditionally guaranteed against any failure for 18 months from shipment.

2.0 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but is not limited to, the following:

1. Raypak
2. Laars
3. Camus
4. Approved equal.

2.2 CONSTRUCTION

A. The boiler shall be rated at the input and output shown on the schedule. The unit shall be design certified to comply with the current edition of the Harmonized ANSI Z21.13 / CSA 4.9 Standard for Gas-Fired Low Pressure Steam and Hot Water Boilers, and shall be design certified for both indoor and outdoor use. The unit shall be designed and constructed in accordance with the ASME Boiler & Pressure Vessel Code, Section IV requirements for 160 psi working pressure, and shall bear the ASME “H” Stamp. The unit shall be constructed to comply with the efficiency requirements of the latest edition of ASHRAE Standard 90.1 The standard unit shall meet the requirements of the

B. The water tube heat exchanger shall be a straight tube design with ten 7/8” inner diameter integral finned copper tubes. The tubes shall be rolled directly into glass-lined cast iron headers, rated for 160 psi working pressure. The heat exchanger shall be a low water volume design. All gaskets shall be non-metallic, outside the jacket, and separated from the combustion chamber by at least 3.5” to eliminate deterioration from heat. Headers shall have covers permitting visual inspection and cleaning of all internal surfaces. The heat exchanger shall have a ten year warranty.

C. The piping side header shall have removable flanges, and the boiler design shall permit removal of the complete heat exchanger for service from either the front or top, to facilitate maintenance.

D. The boiler shall come complete with a volute-mounted pump sized to provide the correct boiler flow rate, for the boiler and 30 feet of full-sized piping. Each unit shall have a pump time delay. The pump time delay shall be adjustable from 20 seconds to 10 minutes for continued pump circulation after the call for heat has been satisfied, to remove residual heat from the unit’s combustion chamber.

E. The units shall use a proved hot surface ignition with a 15 second pre-purge cycle to clean out the combustion chamber. Upon a call for heat, if a flame is not detected, the ignition module shall lock-out and shall require manual reset. If there is a loss of flame signal during a call for heat, the ignition control shall attempt one re-ignition cycle before locking out. The control circuit shall be 24V. Unit shall be 120V, single phase, less than 12 Amps.

F. Burners shall be multi-port design, and shall be constructed of high temperature stainless steel. The burners shall be designed to mix air and gas, and burn cleanly with NOx emissions not exceeding 10ppm. Burners shall be in easily-removable burner tray assemblies with no more than 4 burners per tray.

G. The combustion chamber shall be lined with lightweight, ceramic fiberboard insulation to retain heat, and shall be approved for service temperatures of not less than 2000°F. The outer jacket shall be a unitized shell finished with acrylic thermo-set paint baked at not less than 325°F. The frame shall be constructed of galvanized steel for strength and protection. Chamber shall include a sight glass for viewing flame.

H. Boilers shall have a forced draft design and shall meet a minimum 85% steady state combustion efficiency. The unit shall be designed for vertical venting with standard B-vent as a fan-assisted Category I appliance, and for horizontal venting as a Category III appliance and shall not require an external draft hood. The unit shall accept ducted combustion air, or shall be able to pull combustion air from the boiler room. Vent and
ducted combustion air shall each be able to be piped to either the top or the back of the unit, in any combination. Changing from top-to-back or from back-to-top piping orientation shall be easily accomplished in the field.

I. Temperature control shall be an electronic PID temperature control with LCD and touchpad and shall control the boiler stage firing. The boiler shall have connections for an external staging control, and a selector switch to enable the user to choose between the boiler’s staging control or a field-supplied staging control, without bypassing any of the boiler’s safety controls. The boiler display shall have diagnostic lights which include power on, call for heat, pump on, stage 1, stage 2, stage 3, stage 4, and service. The boiler display shall be visible without the removal of any jacket panels or control panels. Additional diagnostic lights for service (low water flow, blocked flue, low air flow — blower 1, and low air flow — blower 2 (if applicable)) shall be easily accessed in the control panel. Dry alarm contacts for ignition failure shall be included. Models 500 and 750 shall be two-stage firing, model 1000 shall be three-stage firing, and models 1500 and 2000 shall be four-stage firing.

J. The unit shall have multiple gas trains, such that each gas train shall have a maximum input of 399,000 BTU/hr. Each gas train shall have a gas shutoff valve and main gas valve with built-in redundant valve seats and gas regulator. Unions shall be used before and after each main gas valve, to permit easy removal of the each gas valve, gas train and burner tray assembly from the front of the unit.

K. The boiler shall be provided with an integral, washable combustion air filter. The air filter shall provide 83% arrestence to protect the burners and blowers from debris. The air filter shall be constructed of open-cell polyurethane foam.

L. The boiler shall include as standard equipment the following controls and trim:

1. ASME 160 psi working pressure heat exchanger
2. ASME “H” stamp
3. Flanged water connections
4. Glass-lined cast iron headers
5. External header gaskets
6. 75 psi ASME rated pressure relief valve
7. Flow switch
8. Temperature and pressure gauge
Multiple operating gas valve/pressure regulators
Manual “A” gas valve
Intake air filter
Multiple, removable burner trays
Stainless steel burners
Built-in draft fan(s) for Category I or III venting
Air pressure switch
Burner site glass
24V control system
115/24VAC 75VA power from class 2 transformer
Manual reset high limit
Automatic reset high limit
Electronic PID staging control with LCD and touchpad
PC board for electrical connections
External controller connections with selector switch
Hot surface ignition
On/Off toggle switch
Pump time delay
Diagnostic lights

2.3 CONTROLS

M. The boiler control system shall be segregated into three components: “C-More” Control Panel, Power Box and Input/Output Connection Box. The entire system shall be Underwriters Laboratories recognized.

N. The control panel shall consist of six individual circuit boards using state-of-the-art surface-mount technology in a single enclosure. These circuit boards shall include:
1. A display board incorporating LED display to indicate temperature and a vacuum fluorescent display module for all message enunciation

2. A CPU board housing all control functions

3. An electric low-water cutoff board with test and manual reset functions

4. A power supply board

5. An ignition /stepper board incorporating flame safeguard control

6. A connector board

Each board shall be individually field replaceable.

O. The combustion safeguard/flame monitoring system shall use spark ignition and a rectification-type flame sensor.

P. The control panel hardware shall support both RS-232 and RS-485 remote communications.

Q. The controls shall annunciate boiler and sensor status and include extensive self-diagnostic capabilities that incorporate a minimum of eight separate status messages and 34 separate fault messages.

R. The control panel shall incorporate three self-governing features designed to enhance operation in modes where it receives an external control signal by eliminating nuisance faults due to over-temperature, improper external signal or loss of external signal. These features include:

1. Set point High Limit: Set point high limit allows for a selectable maximum boiler outlet temperature and acts as temperature limiting governor. Set point limit is based on a PID function that automatically limits firing rate to maintain outlet temperature within a 0 to 10 degree selectable band from the desired maximum boiler outlet temperature.

2. Set point Low Limit: Set point low limit allows for a selectable minimum operating temperature.

3. Failsafe Mode: Failsafe mode allows the boiler to switch its mode to operate from an internal set point if its external control signal is lost, rather than shut off. This is a selectable mode, enabling the control can to shut off the unit upon loss of external signal, if so desired.

S. The boiler control system shall incorporate the following additional features for enhanced external system interface:
1. System start temperature feature
2. Pump delay timer
3. Auxiliary start delay timer
4. Auxiliary temperature sensor
5. Analog output feature to enable simple monitoring of temperature setpoint, outlet temperature or fire rate
6. Remote interlock circuit
7. Delayed interlock circuit
8. Fault relay for remote fault alarm

T. Each boiler shall include an electric, single-seated combination safety shutoff valve/regulator with proof of closure switch in its gas train. Each boiler shall incorporate dual over-temperature protection with manual reset, in accordance with ASME Section IV and CSD-1.

U. Boiler Management System (BMS): The Boiler Manufacturer shall supply as part of the boiler package a completely integrated Boiler Management System Programmer to control all operation and energy input of the multiple boiler heating plant. The Boiler Management System shall be comprised of a microprocessor based control utilizing the MODBUS protocol to communicate with the Boilers via the RS-485 port. The BMS controller shall have the ability to operate up to 32 boilers per BMS panel.

The controller shall have the ability to vary the firing rate and energy input of each individual boiler throughout its full modulating range to maximize the condensing capability and thermal efficiency output of the entire heating plant. The BMS shall control the boiler outlet header temperature within +29°F. The controller shall be a PID type controller and uses Ramp Up/Ramp Down control algorithm for accurate temperature control with excellent variable load response. The BMS controller shall provide contact closure for auxiliary equipment such as system pumps and combustion air inlet dampers based upon outdoor air temperature.

When set on Internal Setpoint Mode, temperature control setpoint on the BMS shall be fully field adjustable from 50°F to 190°F in operation. When set on Indoor/Outdoor Reset Mode, the BMS will operate on an adjustable inverse ratio in response to outdoor temperature to control the main header temperature. Reset ratio shall be fully field adjustable from 0.3 to 3.0 in operation. When set on 4ma to 20ma Temperature Control Mode, the BMS will operate the plant to vary header temperature setpoint linearly as an externally applied 4-20 ma signal is supplied.
When set on MODBUS Temperature Control Mode, the BMS will operate the plant to vary header temperature setpoint as an external communication utilizing the MODBUS protocol is supplied via the RS-232 port. The BMS controller shall have a vacuum fluorescent display for monitoring of all sensors and interlocks. Non-volatile memory backup of all control parameters shall be internally provided as standard. The controller will automatically balance the sequence of operating time on each boiler by a first-on first-off mode and provide for setback and remote alarm contacts. Connection between central BMS system and individual boilers shall be twisted pair low voltage wiring, with the boilers ‘daisy-chained’ for ease of installation.

2.4 ELECTRICAL POWER

A. Controllers, Electrical Devices and Wiring: Electrical devices and connections are specified in Division 16 sections.

B. Single-Point Field Power Connection: Factory-installed and factory-wired switches, motor controllers, transformers and other electrical devices shall provide a single-point field power connection to the boiler.

C. Electrical Characteristics:
   1. Voltage: 120 V
   2. Phase: Single
   3. Frequency: 60 Hz
   4. Full-Load Current: 12 Amps

2.5 VENTING

A. The exhaust vent must be UL Listed for use with Category III and IV appliances and compatible with operating temperatures up to 480°F, positive pressure, condensing flue gas service. UL-listed vents of Al 29-4C stainless steel must be used with boilers.

B. The minimum exhaust vent duct size for each boiler is six-inch diameter.

C. Combustion-Air Intake: Boilers shall be capable of drawing combustion air from the outdoors via a metal or PVC duct connected between the boiler and the outdoors.

D. The minimum sealed combustion air duct size for each boiler is six-inch diameter.

E. Common Vent and Common Combustion Air must be an available option for boiler installation. Consult manufacturer for common vent and combustion air sizing.

F. Follow guidelines specified in manufacturer’s venting guide.
2.6 SOURCE QUALITY CONTROL

A. 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 testing.

B. Test and inspect factory-assembled boilers, before shipping, according to ASME Boiler and Pressure Vessel Code.

1. If boilers are not factory assembled and fire-tested, the local vendor is responsible for all field assembly and testing.

C. Allow Owner access to source quality-control testing of boilers. Notify Architect fourteen days in advance of testing.

3.0 EXECUTION

3.1 EXAMINATION

A. Before boiler installation, examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations. Examine 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 bases. Concrete materials and installation requirements are specified in Division 03.

B. Install gas-fired boilers according to NFPA 54.

C. Assemble and install boiler trim.

D. Install electrical devices furnished with boiler but not specified to be factory mounted.

E. Install control wiring to field-mounted electrical devices.

3.3 CONNECTIONS
A. Piping installation requirements are specified in other Division 15 sections. Drawings indicate general arrangement of piping, fittings and specialties.

B. Install piping adjacent to boiler to permit service and maintenance.

C. 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.

D. Connect gas piping to boiler gas-train inlet with unions. Piping shall be at least full size of gas train connection. Provide a reducer if required.

E. Connect hot-water piping to supply and return boiler tappings with shutoff valve and union or flange at each connection.

F. Install piping from safety relief valves to nearest floor drain.

G. Boiler Venting

1. Install flue venting kit and combustion-air intake.

2. Connect venting full size to boiler connections.

H. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

I. Connect wiring according to Division 26 Section 26 05 23 “Conductors and Cables” for low-voltage wiring.

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. Installation and Startup Test: Perform installation and startup checks according to manufacturer's written instructions.

2. Leak Test: Perform 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. Controls and Safeties: Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
   a. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level and water temperature.
   b. 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 2 months of date of Substantial Completion, provide on-site assistance 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

The boiler manufacturer is expected to provide partial load thermal efficiency curves. These thermal efficiency curves must include at least three separate curves at various BTU input levels. If these curves are not available, it is the responsibility of the boiler manufacturer to complete the following 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 to comply.

3. Perform field performance tests to determine capacity and efficiency of boilers.
   a. Test for full capacity.
   b. 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.


END OF SECTION 23 52 00

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PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Packaged, water-cooled, multiple-compressor chillers.

1.2 PERFORMANCE REQUIREMENTS
A. Seismic Performance: Chillers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
B. Condenser-Fluid Temperature Performance:
   1. Startup Condenser-Fluid Temperature: Chiller shall be capable of starting with an entering condenser-fluid temperature of 40 deg F (4 deg C) and providing stable operation until the system temperature is elevated to the minimum operating entering condenser-fluid temperature.
   2. Minimum Operating Condenser-Fluid Temperature: Chiller shall be capable of continuous operation over the entire capacity range indicated with an entering condenser-fluid temperature of 55 deg F (13 deg C).
   3. Make factory modifications to standard chiller design if necessary to comply with performance indicated.
C. Site Altitude: Chiller shall be suitable for altitude in which installed without affecting performance indicated. Make adjustments to affected chiller components to account for site altitude.

1.3 SUBMITTALS
A. Product Data: For each type of product indicated. Include refrigerant, rated capacities, operating characteristics, furnished specialties, and accessories.
B. LEED Submittal:
1. Product Data for Credit EA 4: Documentation required by Credit EA 4 indicating that equipment and refrigerants comply.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

D. Certificates: For certification required in "Quality Assurance" Article.

E. Seismic Qualification Certificates: For chillers, accessories, and components, from manufacturer.

F. Startup service reports.

G. Operation and maintenance data.

H. Warranty.

1.4 QUALITY ASSURANCE

A. ARI Certification: Certify chiller according to ARI 550 and ARI 590 certification program(s).

B. ARI Rating: Rate chiller performance according to requirements in ARI 550/590.

C. ASHRAE Compliance:

   1. ASHRAE 15 for safety code for mechanical refrigeration.
   2. ASHRAE 147 for refrigerant leaks, recovery, and handling and storage requirements.

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004

E. ASME Compliance: Fabricate and label chiller to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, and include an ASME U-stamp and nameplate certifying compliance.

F. Comply with NFPA 70.

G. Comply with requirements of UL and UL Canada and include label by a qualified testing agency showing compliance.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of chillers that fail in materials or workmanship within specified warranty period.

   1. Extended warranties include, but are not limited to, the following:

      a. Complete chiller including refrigerant and oil charge.
b. Complete compressor and drive assembly including refrigerant and oil charge.
c. Refrigerant and oil charge.
d. Parts and labor.
e. Loss of refrigerant charge for any reason.

2. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PACKAGED, WATER-COOLED, MULTIPLE-COMPRESSOR CHILLERS

A. 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:

1. Trane
2. Carrier
3. York
4. Approved Equal

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Trane
2. Carrier
3. York
4. Approved Equal

C. Description: Factory-assembled and run-tested chiller with compressor, compressor motor, compressor motor controller, lubrication system, evaporator, condenser, controls, interconnecting unit piping and wiring, and indicated accessories.

1. Disassemble chiller into major assemblies as required by the installation after factory testing and before packaging for shipment.

D. Fabricate chiller mounting base with reinforcement strong enough to resist chiller movement during a seismic event when chiller is anchored to field support structure.

E. Compressor:

1. Description: Positive displacement, hermetically sealed.
2. Casing: Cast iron, precision machined for minimum clearance about periphery of rotors.
3. Rotors: Manufacturer's standard one-, two-, or three-rotor design.
4. Drive Coupling: For chillers with open drives, provide flexible disc with all-metal construction and no wearing parts to ensure long life without the need for lubrication.
5. Seals: Seal drive assembly to prevent refrigerant leakage.
F. Compressor Motors:
   1. Hermetically sealed and cooled by refrigerant suction gas.
   2. High-torque, induction type with inherent thermal-overload protection on each phase.

G. Vibration Balance: Balance chiller compressor and drive assembly to provide a precision balance that is free of noticeable vibration over the entire operating range.
   1. Overspeed Test: 25 percent above design operating speed.

H. Service: Easily accessible for inspection and service.
   1. Compressor's internal components shall be accessible without having to remove compressor-drive assembly from chiller.
   2. Provide lifting lugs or eyebolts attached to casing.

I. Capacity Control: Modulating slide-valve assembly or port unloaders combined with a variable frequency controller, if applicable, and hot-gas bypass, if necessary, to achieve performance indicated.
   1. Maintain stable operation throughout range of operation. Configure to achieve most energy-efficient operation possible.
   2. Operating Range: From 100 to 20 (or lower) percent of design capacity.
   3. Condenser-Fluid Unloading Requirements over Operating Range: Constant-design entering condenser-fluid temperature.

J. Oil Lubrication System: Consisting of pump if required, filtration, heater, cooler, factory-wired power connection, and controls.
   1. Provide lubrication to bearings, gears, and other rotating surfaces at all operating, startup, shutdown, and standby conditions including power failure.
   2. Thermostatically controlled oil heater properly sized to remove refrigerant from oil.
   3. Oil filter shall be the easily replaceable cartridge type, minimum 0.5-micron efficiency, with means of positive isolation while servicing.
   4. Water-cooled oil cooler.
   5. Factory-installed and pressure-tested piping with isolation valves and accessories.
   6. Oil compatible with refrigerant and chiller components.
   7. Positive visual indication of oil level.

K. Vibration Control:
   1. Vibration Balance: Balance chiller compressor and drive assembly to provide a precision balance that is free of noticeable vibration over the entire operating range.
      a. Overspeed Test: 25 percent above design operating speed.
   2. Isolation: Mount individual compressors on vibration isolators.
L. Refrigerant Circuit:

1. Refrigerant: Type as indicated on Drawings.
2. Refrigerant Type: R-134a, R-410a or R-407c. Classified as Safety Group A1 according to ASHRAE 34.
3. Refrigerant Compatibility: Chiller parts exposed to refrigerants shall be fully compatible with refrigerants, and pressure components shall be rated for refrigerant pressures.
4. Refrigerant Circuit: Each shall include a thermal- or electronic-expansion valve, refrigerant charging connections, a hot-gas muffler, compressor suction and discharge shutoff valves, a liquid-line shutoff valve, a replaceable-core filter-dryer, a sight glass with moisture indicator, a liquid-line solenoid valve, and an insulated suction line.
5. Pressure Relief Device:
   a. Comply with requirements in ASHRAE 15 and in applicable portions of ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
   b. ASME-rated, spring-loaded pressure relief valve; single- or multiple-reseating type.
6. Refrigerant Isolation: Factory install positive shutoff isolation valves in the compressor discharge line to the condenser and the refrigerant liquid-line leaving the condenser to allow for isolation and storage of full refrigerant charge in the chiller condenser shell.
7. Refrigerant Flow Control: Manufacturer’s standard refrigerant flow-control device satisfying performance requirements indicated.
8. Refrigeration Transfer: Provide service valves and other factory-installed accessories required to facilitate transfer of refrigerant from chiller to a remote refrigerant storage and recycling system. Comply with requirements in ASHRAE 15 and ASHRAE 147.

A. Evaporator:

1. Description: Shell-and-tube design.
   a. Direct-expansion (DX) type with fluid flowing through the shell, and refrigerant flowing through the tubes within the shell.
   b. Flooded type with fluid flowing through tubes and refrigerant flowing around tubes within the shell.
2. Code Compliance: Tested and stamped according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
4. Shell Heads: Removable carbon-steel heads with multipass baffles, and located at each end of the tube bundle.
5. Fluid Nozzles: Terminated with mechanical-coupling or flanged end connections for connection to field piping.
6. Tube Construction: Individually replaceable copper tubes with enhanced fin design, expanded into tube sheets.

B. Condenser:

1. Shell and Tube:
a. Description: Shell-and-tube design with refrigerant flowing through shell, and fluid flowing through tubes within shell.
b. Provides positive subcooling of liquid refrigerant.
c. Code Compliance: Tested and stamped according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
e. Water Boxes: Removable, of carbon-steel construction, located at each end of the tube bundle with fluid nozzles terminated with mechanical-coupling end connections for connection to field piping.
f. Tube Construction: Individually replaceable copper tubes with enhanced fin design, expanded into tube sheets.
g. Provide each condenser with a pressure relief device, purge cock, and liquid-line shutoff valve.

C. Electrical Power:

1. Factory installed and wired, and functionally tested at factory before shipment.
2. Single-point, field-power connection to circuit breaker. Minimum withstand rating shall be as required by electrical power distribution system, but not less than 42,000 A.
   a. Provide branch power circuit to each motor, electric heater, dedicated electrical load, and controls with disconnect switch or circuit breaker.
   b. NEMA- and ICS 2-rated motor controller for auxiliary motors, hand-off-auto switch, and overcurrent protection for each motor. Provide variable frequency controller for each variable-speed motor furnished.
   c. Control-circuit transformer with primary and secondary side fuses.
3. Terminal blocks with numbered and color-coded wiring to match wiring diagram. Spare wiring terminal block for connection to external controls or equipment.
4. Factory-installed wiring outside of enclosures shall be in metal raceway except make connections to each motor and heater with not more than a 24-inch (610-mm) length of liquidtight conduit.
5. Factory install and wire capacitor bank for the purpose of power factor correction to 0.95 at all operating conditions.
   a. If capacitors are mounted in a dedicated enclosure, use same NEMA enclosure type as motor controller. Provide enclosure with service entrance knockouts and bushings for conduit.
   b. Capacitors shall be non-PCB dielectric fluid, metallized electrode design, low loss with low-temperature rise. The kVAR ratings shall be indicated and shall not exceed the maximum limitations set by NFPA 70. Provide individual cells as required.
   c. Provide each cell with current-limiting replaceable fuses and carbon-film discharge resistors to reduce residual voltage to less than 50 V within 1 minute after de-energizing.
   d. Provide a ground terminal and a terminal block or individual connectors for phase connection.
D. Motor Controller:

1. Enclosure: Factory installed, unit mounted, with hinged full-front access door.
2. Control Circuit: Obtained from integral control power transformer with a control power source of enough capacity to operate connected control devices.
3. Overload Relay: Shall be sized according to UL 1995 or shall be an integral component of chiller control microprocessor.
5. Star-Delta, Reduced-Voltage Controller: NEMA ICS 2, closed transition.
6. Autotransformer Reduced-Voltage Controller: NEMA ICS 2, closed transition; include isolation switch and current-limiting fuses.
   a. Surge suppressor in solid-state power circuits providing three-phase protection against damage from supply voltage surges 10 percent or more above nominal line voltage.
   b. Visual indication of motor and control status, including the following conditions:
      1) Controller on.
      2) Overload trip.
      3) Loss of phase.
      4) Starter fault.
8. Accessories: Devices shall be factory installed in controller enclosure unless otherwise indicated.
   a. Externally Operated Disconnect: Circuit breaker. Minimum withstand rating shall be as required by electrical power distribution system, but not less than 42,000A.
   c. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factory-applied hasp arranged so padlock can be used to lock push button in depressed position with control circuit open.
   d. Control Relays: Time-delay relays.
   e. Elapsed-Time Meters: Numerical readout in hours on face of enclosure.
   f. Number-of-Starts Counter: Numerical readout on face of enclosure.
   g. Meters: Panel type, 2-1/2 inches (64 mm) with 120-degree (minimum) scale and 2 percent accuracy. Where indicated, provide transfer device with an off position. Meters shall indicate the following:
      1) Ammeter: Output current for each phase, with current sensors rated to suit application.
      2) Voltmeter: Output voltage for each phase.
      3) Frequency Meter: Output frequency.
      4) Real-time clock with current time and date.
      5) Total run time.
h. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:

1) Selectable, digital display of the following:
   a) Phase Currents, Each Phase: Plus or minus 1 percent.
   b) Phase-to-Phase Voltages, Three Phase: Plus or minus 1 percent.
   c) Phase-to-Neutral Voltages, Three Phase: Plus or minus 1 percent.
   d) Three-Phase Real Power: Plus or minus 2 percent.
   e) Three-Phase Reactive Power: Plus or minus 2 percent.
   f) Power Factor: Plus or minus 2 percent.
   g) Frequency: Plus or minus 0.5 percent.
   h) Integrated Demand with Demand Interval Selectable from 5 to 60 Minutes: Plus or minus 2 percent.
   i) Accumulated energy, in megawatt hours (joules), plus or minus 2 percent; stored values unaffected by power outages for up to 72 hours.

2) Mounting: Display and control unit flush or semirecessed in instrument compartment door.

i. Phase-Failure, Phase-Reversal, and Undervoltage Relays: Solid-state sensing circuit with adjustable undervoltage setting and isolated output contacts for hardwired connection.

j. Power Protection: Chiller shall shut down within six cycles of power interruption.

E. Variable Frequency Controller:

1. Motor controller shall be factory mounted and wired on the chiller to provide a single-point, field-power termination to the chiller and its auxiliaries.
2. Description: NEMA ICS 2; listed and labeled as a complete unit and arranged to provide variable speed by adjusting output voltage and frequency.
3. Enclosure: Unit mounted, NEMA 250, Type 1 with hinged full-front access door with lock and key.
4. Integral Disconnecting Means: NEMA AB 1, instantaneous-trip circuit breaker with lockable handle. Minimum withstand rating shall be as required by electrical power distribution system, but not less than 42,000A.
5. Technology: Pulse width modulated (PWM) output suitable for constant or variable torque loads.
6. Output Rating: Three phase; with voltage proportional to frequency throughout voltage range.
7. Operating Requirements:
   a. Input AC Voltage Tolerance: 460-V ac, plus/minus 10 percent.
   b. Input frequency tolerance of 60 Hz, plus or minus 2 Hz.
   c. Capable of driving full load, without derating, under the following conditions:
      1) Ambient Temperature: 0 to 40 deg C.
2) Relative Humidity: Up to 90 percent (noncondensing).
3) Altitude: 3300 feet (1005 m).

d. Minimum Efficiency: 96 percent at 60 Hz, full load.
e. Minimum Displacement Primary-Side Power Factor: 98 percent.
f. Overload Capability: 1.05 times the full-load current for 7 seconds.
g. Starting Torque: As required by compressor-drive assembly.
h. Speed Regulation: Plus or minus 1 percent.
i. Isolated control interface to allow controller to follow control signal over a 10:1 speed range.
j. To avoid equipment resonant vibrations, provide critical speed lockout circuitry to allow bands of operating frequency at which controller shall not operate continuously.
k. Capable of being restarted into a motor coasting in either the forward or reverse direction without tripping.

8. Internal Adjustability Capabilities:
   a. Minimum Output Frequency: 6 Hz.
   b. Maximum Output Frequency: 60 Hz.
   c. Acceleration: 2 seconds to 60 seconds.
   d. Deceleration: Zero seconds to 60 seconds.
   e. Current Limit: 30 to a minimum of 100 percent of maximum rating.

9. Self-Protection and Reliability Features: Subjecting the controller to any of the following conditions shall not result in component failure or the need for replacement:
   a. Overtemperature.
   b. Short circuit at controller output.
   c. Ground fault at controller output. Variable frequency controller shall be able to start a grounded motor.
   d. Open circuit at controller output.
   e. Input undervoltage.
   f. Input overvoltage.
   g. Loss of input-phase.
   h. Reverse phase.
   i. AC line switching transients.
   j. Instantaneous overload, line to line or line to ground.
   k. Sustained overload exceeding 100 percent of controller rated current.
   l. Starting a rotating motor.

10. Motor Protection: Controller shall protect motor against overvoltage and undervoltage, phase loss, reverse phase, overcurrent, overtemperature, and ground fault.

11. Automatic Reset and Restart: Capable of three restarts after controller fault or on return of power after an interruption and before shutting down for manual reset or fault correction. Controller shall be capable of automatic restart on phase-loss, and overvoltage and undervoltage trips.
12. Visual Indication: On face of controller enclosure or chiller control enclosure; indicating the following conditions:

   a. Power on.
   b. Run.
   c. Overvoltage.
   d. Line fault.
   e. Overcurrent.
   f. External fault.
   g. Motor speed (percent).
   h. Fault or alarm status (code).
   i. Motor output voltage.
   j. Input kilovolt amperes.
   k. Total power factor.
   l. Input kilowatts.
   m. Input kilowatt-hours.
   n. Three-phase input voltage.
   o. Three-phase output voltage.
   p. Three-phase input current.
   q. Three-phase output current.
   r. Output frequency (Hertz).
   s. Elapsed operating time (hours).
   t. Diagnostic and service parameters.

13. Operator Interface: At controller or chiller control panel; with start-stop and auto-manual selector with manual-speed-control potentiometer.

14. Harmonic Distortion Filter: Factory mounted and wired to limit total voltage and current distortion to 5 percent.

F. Controls:

1. Standalone and microprocessor based with all memory stored in nonvolatile memory so that reprogramming is not required on loss of electrical power.
2. Enclosure: Unit mounted, NEMA 250, Type 4, hinged or lockable; factory wired with a single-point, field-power connection and a separate control circuit.
3. Operator Interface: Multiple-character digital or graphic display with dynamic update of information and with keypad or touch-sensitive display located on front of control enclosure. In either imperial or metric units, display the following information:

   a. Date and time.
   b. Operating or alarm status.
   c. Fault history with not less than last 10 faults displayed.
   d. Set points of controllable parameters.
   e. Trend data.
   f. Operating hours.
   g. Number of chiller starts.
   h. Outdoor-air temperature or space temperature if required for chilled-water reset.
i. Temperature and pressure of operating set points.

j. Entering- and leaving-fluid temperatures of evaporator and condenser.

k. Difference in fluid temperatures of evaporator and condenser.

l. Fluid flow of evaporator and condenser.

m. Fluid pressure drop of evaporator and condenser.

n. Refrigerant pressures in evaporator and condenser.

o. Refrigerant saturation temperature in evaporator and condenser.

p. Pump status.

q. Antirecycling timer status.

r. Percent of maximum motor amperage.

s. Current-limit set point.

t. Compressor bearing temperature.

u. Motor bearing temperature.

v. Motor winding temperature.

w. Oil temperature.

x. Oil discharge pressure.

y. Phase current.

z. Percent of motor rated load amperes.

aa. Phase voltage.

bb. Demand power (kilowatts).

cc. Energy use (kilowatt-hours).

dd. Power factor.

4. Control Functions:

a. Manual or automatic startup and shutdown time schedule.

b. Entering and leaving chilled-water temperatures, control set points, and motor load limits. Evaporator fluid temperature shall be reset based on return-water and/or outdoor-air temperature.

c. Current limit and demand limit.

d. Condenser-fluid temperature.

e. External chiller emergency stop.

f. Antirecycling timer.

g. Variable evaporator flow.

h. Thermal storage.

i. Heat reclaim.

5. Manually Reset Safety Controls: The following conditions shall shut down chiller and require manual reset:

a. Low evaporator pressure or temperature; high condenser pressure.

b. Low evaporator fluid temperature.

c. Low oil differential pressure.

d. High or low oil pressure.

e. High oil temperature.

f. High compressor-discharge temperature.

g. Loss of condenser-fluid flow.
h. Loss of evaporator-fluid flow.

i. Motor overcurrent.

j. Motor overvoltage.

k. Motor undervoltage.

l. Motor phase reversal.

m. Motor phase failure.

n. Sensor- or detection-circuit fault.

o. Processor communication loss.

p. Motor controller fault.

q. Extended compressor surge.

6. Trending: Capability to trend analog data of up to five parameters simultaneously over an adjustable period and frequency of polling.

7. Security Access: Provide electronic security access to controls through identification and password with at least three levels of access: view only; view and operate; and view, operate, and service.

8. Control Authority: At least four conditions: Off, local manual control at chiller, local automatic control at chiller, and automatic control through a remote source.

9. Communication Port: RS-232 port or equivalent connection capable of connecting a printer.

10. BAS Interface: Factory-installed hardware and software to enable the BAS to monitor, control, and display chiller status and alarms.

   a. Hardwired Points:

      1) Monitoring: On-off status, common trouble alarm, electrical power demand (kilowatts), electrical power consumption (kilowatt-hours).

      2) Control: On-off operation, chilled-water discharge temperature set-point adjustment.

   b. ASHRAE 135 BACnet communication interface with the BAS shall enable the BAS operator to remotely control and monitor the chiller from an operator workstation. Control features and monitoring points displayed locally at chiller control panel shall be available through the BAS.

G. Insulation:

1. Material: Closed-cell, flexible elastomeric, thermal insulation complying with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

2. Thickness: minimum 3/4 inch (19 mm).

3. Adhesive: As recommended by insulation manufacturer and applied to 100 percent of insulation contact surface. Seal seams and joints.

4. Factory-applied insulation over cold surfaces of chiller capable of forming condensation. Components shall include, but not be limited to, evaporator shell and end tube sheets, evaporator water boxes including nozzles, refrigerant suction pipe from evaporator to compressor, cold surfaces of compressor, refrigerant-cooled motor, and auxiliary piping.
a. Before insulating steel surfaces, prepare surfaces for paint, and prime and paint as indicated for other painted components. Do not insulate unpainted steel surfaces.

b. Seal seams and joints to provide a vapor barrier.

c. After adhesive has fully cured, paint exposed surfaces of insulation to match other painted parts.

H. Finish:

1. Paint chiller, using manufacturer's standard procedures, except comply with the following minimum requirements:

   a. Provide at least one coat of primer with a total dry film thickness of at least 2 mils (0.05 mm).
   b. Provide at least two coats of [alkyd-modified, vinyl enamel, epoxy or polyurethane finish with a total dry film thickness of at least 4 mils (0.10 mm).
   c. Paint surfaces that are to be insulated before applying the insulation.
   d. Paint installed insulation to match adjacent uninsulated surfaces.
   e. Color of finish coat to be manufacturer's standard.

2. Provide Owner with quart container of paint used in application of topcoat to use in touchup applications after Project Closeout.

I. Accessories:

1. Flow Switches:

   a. If required and not factory installed, chiller manufacturer shall furnish a switch for each evaporator and condenser and verify field-mounting location before installation.
   b. Paddle Flow Switches:

      1) Vane operated to actuate a double-pole, double-throw switch with one pole field wired to the chiller control panel and the other pole field wired to the BAS.
      2) Contacts: Platinum alloy, silver alloy, or gold-plated switch contacts with a rating of 10 A at 120-V ac.
      3) Pressure rating equal to pressure rating of heat exchanger.
      4) Construct body and wetted parts of Type 316 stainless steel.
      5) House switch in a NEMA 250, Type 4 enclosure constructed of die-cast aluminum.
      6) Vane length to suit installation.

   c. Pressure Differential Switches:

      1) Construction: Wetted parts of body and trim constructed of Type 316 stainless steel.
2) Performance: Switch shall withstand, without damage, the full-pressure rating of the heat exchanger applied to either port and exhibit zero set-point shift due to variation in working pressure.

3) Set Point: Screw type, field adjustable.

4) Electrical Connections: Internally mounted screw-type terminal blocks.

5) Switch Enclosure: NEMA 250, Type 4.

6) Switch Action: Double-pole, double-throw switch with one pole field wired to the chiller control panel and the other pole field wired to the BAS.

2. Vibration Isolation:
   a. Chiller manufacturer shall furnish vibration isolation for each chiller.
   b. Neoprene Pad:
      1) Two layers of 0.375-inch- (10-mm-) thick, ribbed- or waffle-pattern neoprene pads separated by a 16-gage, stainless-steel plate.
      2) Fabricate pads from 40- to 50-durometer neoprene.
      3) Provide stainless-steel square bearing plate to load the pad uniformly between 20 and 40 psig (138 and 276 kPa) with a 0.12- to 0.16-inch (3- to 4-mm) deflection.
   c. Spring Isolator:
      1) Stable in operation and designed for not less than 30 percent reserve deflection beyond actual operating conditions. Isolators shall be designed such that the Kx/Ky ratio shall be 1.0 or more for stability.
      2) Provide PVC or neoprene-coated springs and hot-dip, galvanized-steel components. Aluminum components shall be etched and painted. Nuts, bolts, and washers shall be zinc electroplated.
      3) Isolators shall be adjustable and with an open spring, having one or more coil springs attached to a top compression plate and a baseplate. An elastomeric pad with a minimum thickness of 0.25 inch (6 mm) shall be bonded to the baseplate.
      4) Spring assembly shall be removable and shall fit within a welded steel enclosure consisting of a top plate and rigid lower housing, which serves as a blocking device during installation. Isolated restraining bolts shall not be engaged during normal operation and shall connect the top plate and lower housing to prevent the isolated equipment from rising when drained of fluid.
      5) Isolators shall be selected for a nominal 2-inch (50-mm) deflection.

J. Capacities and Characteristics:

1. Capacity: Nominal 160-tons (Premium Efficiency)
3. Full-Load Efficiency (Power Input/Cooling Output): 0.629 kW/ton.
4. Part-Load Efficiency (IPLV): 0.490 kW/ton.
5. Part-Load Efficiency (NPLV): 0.484 kW/ton.
6. Evaporator:
   b. Fluid Type: Water.
   c. Design Fluid Flow Rate: 425 GPM.
   d. Minimum Fluid Flow Rate: 174 GPM.
   e. Maximum Fluid Flow Rate: 638 GPM
   f. Entering-Fluid Temperature: 55 deg F.
   g. Leaving-Fluid Temperature: 45 deg F.
   i. Fouling Factor: 0.0001 sq. ft. x h x deg F/Btu (0.000018 sq. m x deg C/W).

7. Condenser:
   a. Pressure Rating: 150 psi
   b. Fluid Type: Water.
   c. Design Fluid Flow Rate: 497 GPM.
   d. Minimum Fluid Flow Rate: 247 GPM.
   e. Maximum Fluid Flow Rate: 755 GPM
   f. Entering-Fluid Temperature: 85 deg F.
   g. Leaving-Fluid Temperature: 95 deg F.
   h. Fluid Pressure Drop: 18.3 ft. H2O (design), 40.2 ft. H2O (@ maximum flow rate).
   i. Fouling Factor: 0.00025 sq. ft. x h x deg F/Btu (0.000044 sq. m x deg C/W).

8. Compressor:
   b. Locked-Rotor Amperes: 212.

9. Chiller Electrical Requirements:
   a. Power Input: 111.7 kW
   b. Minimum Circuit Ampacity: 194A.
   c. Maximum Overcurrent Protection Device: 250A.
   d. Volts: 480V.
   e. Phase: Three.
   f. Hertz: 60.

10. Noise Rating: 79 sound power level when measured according to ARI 575. Provide factory-installed sound treatment if necessary to achieve the performance indicated.

2.2 SOURCE QUALITY CONTROL

A. Perform functional tests of chillers before shipping.

B. Factory run test each air-cooled chiller with water flowing through evaporator.
C. Factory test and inspect evaporator and condenser according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

D. For chillers located indoors, rate sound power level according to ARI 575.

E. For chillers located outdoors, rate sound power level according to ARI 370.

PART 3 - EXECUTION

3.1 CHILLER INSTALLATION

A. Install chillers on support structure indicated.

B. Equipment Mounting: Install chiller using elastomeric pads for protection and isolation. Comply with requirements for vibration isolation devices specified in Division 23 Section "Mechanical Vibration and Seismic Controls."

C. Maintain manufacturer's recommended clearances for service and maintenance.

D. Charge chiller with refrigerant and fill with oil if not factory installed.

E. Install separate devices furnished by manufacturer and not factory installed.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Division 23 Section "Hydronic Piping". Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to chiller to allow service and maintenance.

C. Evaporator Fluid Connections: Connect to evaporator inlet with shutoff valve, strainer, flexible connector, thermometer, and plugged tee with pressure gage. Connect to evaporator outlet with shutoff valve, balancing valve, flexible connector, flow switch, thermometer, plugged tee with shutoff valve and pressure gage, flow meter, and drain connection with valve. Make connections to chiller with a flange.

D. Condenser Fluid Connections: Connect to condenser inlet with shutoff valve, strainer, flexible connector, thermometer, and plugged tee with pressure gage. Connect to condenser outlet with shutoff valve, balancing valve, flexible connector, flow switch, thermometer, plugged tee with shutoff valve and pressure gage, flow meter, and drain connection with valve. Make connections to chiller with a flange.

E. Refrigerant Pressure Relief Device Connections: For chillers installed indoors, extend vent piping to the outdoors without valves or restrictions. Comply with ASHRAE 15. Connect vent to chiller pressure relief device with flexible connector and dirt leg with drain valve.
F. Connect each chiller drain connection with a union and drain pipe, and extend pipe, full size of connection, to floor drain. Provide a shutoff valve at each connection.

3.3 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. Verify that refrigerant charge is sufficient and chiller has been leak tested.
3. Verify that pumps are installed and functional.
4. Verify that thermometers and gages are installed.
5. Operate chiller for run-in period.
6. Check bearing lubrication and oil levels.
7. For chillers installed indoors, verify that refrigerant pressure relief device is vented outdoors.
8. Verify proper motor rotation.
9. Verify static deflection of vibration isolators, including deflection during chiller startup and shutdown.
12. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

B. Inspect field-assembled components, equipment installation, and piping and electrical connections for proper assembly, installation, and connection.

C. Prepare test and inspection startup reports.

END OF SECTION 23 64 26
SECTION 23 65 00
COOLING TOWERS

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Open-circuit, induced-draft, counterflow cooling towers.

1.2 PERFORMANCE REQUIREMENTS
A. Seismic Performance: Cooling towers shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
   1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.3 SUBMITTALS
A. Product Data: For each type of product indicated. Include rated capacities, pressure drop, fan performance data, rating curves with selected points indicated, furnished specialties, and accessories.
B. Shop Drawings: Complete set of manufacturer's prints of cooling tower assemblies, control panels, sections and elevations, and unit isolation.
C. Certificates: For certification required in "Quality Assurance" Article.
D. Seismic Qualification Certificates: For cooling towers, accessories, and components, from manufacturers.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
E. Source quality-control reports.
F. Field quality-control reports.
G. Startup service reports.
H. Operation and maintenance data.
I. Warranty.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
C. ASME Compliance: Fabricate and label heat-exchanger coils to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
D. CTI Certification: Cooling tower thermal performance according to CTI STD 201, "Certification Standard for Commercial Water-Cooling Towers Thermal Performance."
E. FMG approval and listing in the latest edition of FMG’s "Approval Guide."

1.5 WARRANTY

A. The manufacturer’s standard equipment warranty shall be for a period of not less than one year from date of startup or eighteen months from date of shipment, whichever occurs first. In addition, the manufacturer shall warrant the rotating mechanical equipment, including fans, fan motors, fan shafts, bearings, sheaves and associated supports for not less than five (5) years from date of shipment.

PART 2 - PRODUCTS

2.1 OPEN-CIRCUIT, INDUCED-DRAFT, COUNTERFLOW COOLING TOWERS

A. 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:

1. Baltimore Aircoil Co., VTO Series
2. Approved Equal
B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Baltimore Aircoil Co.
2. Delta Cooling Towers, Inc.
3. Evapco Inc.

C. Fabricate cooling tower mounting base with reinforcement strong enough to resist cooling tower movement during a seismic event when cooling tower is anchored to field support structure.

D. Cooling tower designed to resist wind load of 30 lbf/sq. ft. (1.44 kPa).

E. Structure:

1. The cooling tower shall be constructed of heavy-gauge steel utilizing double-brake flanges for maximum strength and rigidity and reliable sealing of watertight joints. The fill shall be removable from the basin section to facilitate shipping and handling. The fan(s) and fan drive system, including the fan motor, shall be factory mounted and aligned and located in the dry entering airstream to ensure reliable operation and ease of maintenance.

F. Cold Water Basin:

1. The cold water basin shall be provided with large area lift out strainers with perforated openings sized smaller than the water distribution system nozzles and an anti-vortexing device to prevent air entrainment. The strainer and anti-vortexing device shall be constructed of the same material as the basin to prevent dissimilar metal corrosion. Standard basin accessories shall include a corrosion resistant make-up valve with large diameter polystyrene filled plastic float for easy adjustment of the operating water level. Circular access doors shall be provided for easy access to the make-up water assembly and suction strainer for routine maintenance.

G. Basin Water Level Control:

1. The cooling tower manufacturer shall provide an electric water level control (EWLC) system. The system shall consist of water level sensing and control units in quantities and locations as indicated on the drawings. Each water level sensing and control unit shall consist of the following:
   a. NEMA 4 enclosure with gasketed access cover; solid state controls including all necessary relays and contacts to achieve the specified sequence of operation; stainless steel water level sensing electrodes with brass holder; Schedule 40 PVC standpipe assembly with vent holes, and all necessary stainless steel mounting hardware.
   b. Provide PVC union directly below the control enclosure to facilitate the removal and access of electrodes and control enclosure. The number and position of water level sensing electrodes shall be provided to sense the following: high water level,
low water level, high water alarm level, low water alarm, and heater safety cutout.

H. Electric Basin Heater:

2. Heater Control Panel: Mounted on the side of each cooling tower cell.
3. Enclosure: NEMA 250, Type 4X.
4. Magnetic contactors controlled by a temperature sensor/controller shall maintain collection basin water-temperature set point. Water-level probe shall monitor cooling tower water level and de-energize the heater when the water reaches low-level set point.
5. Control-circuit transformer with primary and secondary side fuses.
6. Terminal blocks with numbered and color-coded wiring to match wiring diagram.
7. Single-point, field-power connection to a circuit breaker and heater branch circuiting complying with NFPA 70.
8. Factory Wiring Method: Metal raceway for factory-installed wiring outside of enclosures, except make connections to each electric basin heater with liquidtight conduit.

I. Water Distribution Piping:

1. Water shall be distributed evenly over the fill by a water distribution system consisting of a header and spray branches of Schedule 40 PVC pipe with large orifice, non-clog plastic distribution nozzles. The branches and spray nozzles shall be held in place by snap-in rubber grommets, allowing quick removal of individual nozzles or complete branches for cleaning or flushing.

J. Fill:

1. The fill shall be formed from self-extinguishing (per UL94 HB and UL94 V-0 testing) polyvinyl chloride (PVC) having a flame spread rating of 5 per ASTM E84 and shall be impervious to rot, decay, and fungus or biological attack. The fill shall be manufactured and performance tested by the cooling tower manufacturer to assure single source responsibility and control of the final product.

K. Removable Drift Eliminator:

1. Eliminators shall be constructed of specially formulated PVC and be removable in easily handled sections. They shall have a minimum of three changes in air direction.

L. Fan(s): Balanced at the factory after assembly.

1. Fan(s) shall be dynamically balanced, forwardly curved, centrifugal type selected to provide optimum thermal performance with minimal sound levels. Fan housings shall have curved inlet rings for efficient air entry and four-sided rectangular discharge cowls.
shall extend into the basin to increase fan efficiency and prevent water from splashing into the fans.

M.  Bearings:

1.  Fan(s) and shaft(s) shall be supported by heavy-duty, self-aligning, relubricatable bearings with cast iron housings, designed for a minimum L10 life of 40,000 hours (280,000 Hr. Avg. Life).

N.  Fan Drive:

1.  The fan(s) shall be driven by matched V-belts with taper lock sheaves designed for not less than 150% of the motor nameplate horsepower. Motor shall be located on a heavy-duty motor base, adjustable by a single threaded bolt-and-nut arrangement. Removable steel screens or panels shall protect the fan drive and all moving parts.

O.  Fan Motor:

1.  Fan motor(s) shall be totally enclosed air over (TEFL), reversible, squirrel cage, ball bearing type designed specifically for cooling tower service. The motor shall be furnished with special moisture protection on windings, shafts and bearings and labeled appropriately for cooling tower duty.

P.  Fan Discharge Stack:  Material shall match casing, manufacturer's standard design.


2.  The unit shall be equipped with a tapered hood lined with sound absorbing fiberglass acoustical baffles to reduce sound levels from the top of the unit

Q.  Vibration Cut-out Switch:

1.  Provide mechanical local reset vibration switch. The mechanical vibration cut out switch will be guaranteed to trip at a point so as not to cause damage to the cooling tower. To ensure this, the trip point will be a frequency range of 0 to 3,600 RPM and a trip point of 0.2 to 2.0 g’s.

R.  Gear-Drive, Oil-Level Switch:  Low-oil-level warning switch[ for connection to a BMS].

1.  Switch shall, on reaching a low-oil-level set point recommended by cooling tower manufacturer, signal an alarm through the BMS.

S.  Controls:

1.  A variable frequency drive (VFD) shall be provided for each fan motor. The supplier of the VFD shall be the manufacturer of the evaporative cooling equipment. The VFD shall have a 3-contactor bypass, 3% input line reactor, a removable keypad, an RS232
terminal for PC connection, and a circuit breaker disconnect. Fuse protection will not be accepted. Control voltage shall be 24V to minimize the size of the enclosure. VFD shall be provided in a NEMA (1)(3R)(12) enclosure. The VFD shall be compatible with a BACnet Building Automation System.

T. Control Package: Factory installed and wired, and functionally tested at factory before shipment.

1. NEMA 250, Type 3R enclosure with removable internally mount back plate.
2. Control-circuit transformer with primary and secondary side fuses.
3. Terminal blocks with numbered and color-coded wiring to match wiring diagram. Spare wiring terminal block for connection to external controls or equipment.
4. Microprocessor-based controller for automatic control of fan based on cooling tower leaving-water temperature with control features to improve operating efficiency based on outdoor ambient wet-bulb temperature by using adaptive logic.
5. Fan motor sequencer for multiple-cell and two-speed applications with automatic lead stage rotation.
7. Electric basin heaters with temperature control and low-water-level safety switch for each cell, complying with requirements in "Electric Basin Heater" Paragraph.
8. Vibration switch for each fan, complying with requirement in "Vibration Switch" Paragraph.
9. Oil-level switch for each fan with a gear drive, complying with requirement in "Gear-Drive, Oil-Level Switch" Paragraph.
10. Single-point, field-power connection to a nonfused disconnect switch.

a. Branch power circuit to each motor and electric basin heater and to controls with a disconnect switch or circuit breaker.
b. NEMA-rated motor controller, hand-off-auto switch, and overcurrent protection for each motor. Provide variable frequency controller with manual bypass and line reactors for each variable-speed motor indicated.

11. Factory-installed wiring outside of enclosures shall be in metal raceway, except make connections to each motor and electric basin heater with liquidtight conduit.
12. Visual indication of status and alarm with momentary test push button for each motor.
13. Audible alarm and silence switch.
14. Visual indication of elapsed run time, graduated in hours for each motor.
15. Cooling tower shall have hardware to enable BMS to remotely monitor and display the following:

a. Operational status of each motor.
b. Position of dampers.
c. Cooling tower leaving-fluid temperature.
d. Fan vibration alarm.
e. Oil-level alarm.
f. Collection basin high and low water-level alarms.

U. Capacities and Characteristics:

1. Number of Cells: 1.
2. Air-Inlet Arrangement: All sides.
3. Water Flow/Cell: 498 GPM
4. Water Pressure Drop: 9.34 psi
5. Entering-Water Temperature: 95 deg F.
6. Leaving-Water Temperature: 85 deg F.
7. Entering-Air Wet-Bulb Temperature: 69 deg F.
8. Fan Drive: Belt.
9. Fan Motor:
   a. Type: Variable speed.
   b. Horsepower/Cell: 15 HP.
   c. Full-Load Ampacity: 21.0A.
   d. Minimum Circuit Ampacity: 26.3A.
   e. Maximum Overcurrent Protection Device: 30 A.
   f. Electrical Characteristics: 460V ac, 3 phase, 60 Hz.
10. Sound Pressure Level: 80 dB @ 5ft; 64 dB @ 50ft.
11. Basin Heater:
   b. Outdoor Ambient Temperature: 0 deg F (-17.8 deg C).
   c. Capacity: 3 kW.
   d. Electrical Characteristics: 460V ac, 3 phase, 60 Hz.

2.2 SOURCE QUALITY CONTROL

A. Verification of Performance: Test and certify cooling tower performance according to CTI STD 201, "Certification Standard for Commercial Water-Cooling Towers Thermal Performance."

B. Factory pressure test heat exchangers after fabrication and prove to be free of leaks.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cooling towers on support structure indicated.
B. Equipment Mounting: Install cooling tower using restrained spring isolators. Comply with requirements for vibration isolation devices specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

1. Minimum Deflection: 2 inches (50 mm)
2. Provide stainless-steel plate to equally distribute weight over elastomeric pad.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

C. Install anchor bolts to elevations required for proper attachment to supported equipment.

D. Maintain manufacturer's recommended clearances for service and maintenance.

E. Loose Components: Install electrical components, devices, and accessories that are not factory mounted.

3.2 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 cooling towers to allow service and maintenance.

C. Install flexible pipe connectors at pipe connections of cooling towers mounted on vibration isolators.

D. Provide drain piping with valve at cooling tower drain connections and at low points in piping.

E. Connect cooling tower overflows and drains, and piping drains to sanitary sewage system.

F. Domestic Water Piping: Comply with applicable requirements in Division 22 Section "Domestic Water Piping." Connect to water-level control with shutoff valve and union, flange, or mechanical coupling at each connection.

G. Supply and Return Piping: Comply with applicable requirements in Division 23 Section "Hydronic Piping." Connect to entering cooling tower connections with shutoff valve, balancing valve, thermometer, plugged tee with pressure gage, flow meter, and drain connection with valve. Connect to leaving cooling tower connection with shutoff valve. Make connections to cooling tower with a flange.

H. Equalizer Piping: Piping requirements to match supply and return piping. Connect an equalizer pipe, full size of cooling tower connection, between tower cells. Connect to cooling tower with shutoff valve.
3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections: Comply with ASME PTC 23, "ASME Performance Test Codes - Code on Atmospheric Water Cooling Equipment"

C. Cooling towers will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Inspect field-assembled components, equipment installation, and piping and electrical connections for proper assemblies, installations, and connections.

C. Obtain performance data from manufacturer.

1. Complete installation and startup checks according to manufacturer’s written instructions and perform the following:

   a. Clean entire unit including basins.
   b. Verify that accessories are properly installed.
   c. Verify clearances for airflow and for cooling tower servicing.
   d. Check for vibration isolation and structural support.
   e. Lubricate bearings.
   f. Verify fan rotation for correct direction and for vibration or binding and correct problems.
   g. Adjust belts to proper alignment and tension.
   h. Verify proper oil level in gear-drive housing. Fill with oil to proper level.
   i. Operate variable-speed fans through entire operating range and check for harmonic vibration imbalance. Set motor controller to skip speeds resulting in abnormal vibration.
   j. Check vibration switch setting. Verify operation.
   k. Verify water level in tower basin. Fill to proper startup level. Check makeup water-level control and valve.
   l. Verify operation of basin heater and control.
   m. Verify that cooling tower air discharge is not recirculating air into tower or HVAC air intakes. Recommend corrective action.
n. Replace defective and malfunctioning units.

D. Start cooling tower and associated water pumps. Follow manufacturer's written starting procedures.

E. Prepare a written startup report that records the results of tests and inspections.

3.5 ADJUSTING

A. Set and balance water flow to each tower inlet.

B. Adjust water-level control for proper operating level.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner’s maintenance personnel to adjust, operate, and maintain cooling towers.

END OF SECTION 236500
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Variable-air-volume, single-zone air-handling units.
   2. Variable-air-volume, multi-zone air-handling units.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Casing panels shall be self-supporting and capable of withstanding 133 percent of internal static pressures indicated, without panel joints exceeding a deflection of L/200 where "L" is the unsupported span length within completed casings.

B. Seismic Performance: Air-handling units shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.4 ACTION SUBMITTALS

A. Product Data: For each air-handling unit indicated.
   1. Unit dimensions and weight.
   2. Cabinet material, metal thickness, finishes, insulation, and accessories.
   3. Fans:
      a. Certified fan-performance curves with system operating conditions indicated.
      b. Certified fan-sound power ratings.
      c. Fan construction and accessories.
      d. Motor ratings, electrical characteristics, and motor accessories.
4. Certified coil-performance ratings with system operating conditions indicated.
5. Dampers, including housings, linkages, and operators.
6. Filters with performance characteristics.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Mechanical-room layout and relationships between components and adjacent structural and mechanical elements.
   2. Support location, type, and weight.
   3. Field measurements.

B. Seismic Qualification Certificates: For air-handling units, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Source quality-control reports.

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air-handling units to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Filters: One set for each air-handling unit.
   2. Gaskets: One set for each access door.
   3. Fan Belts: One set for each air-handling unit fan.
1.8 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of air-handling units and components.

C. ARI Certification: Air-handling units and their components shall be factory tested according to ARI 430, "Central-Station Air-Handling Units," and shall be listed and labeled by ARI.

D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."


F. Comply with NFPA 70.

1.9 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

B. Coordinate sizes and locations of structural-steel support members, if any, with actual equipment provided.

1.10 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set for each air-handling unit.
2. Gaskets: One set for each access door.
3. Fan Belts: One set for each air-handling unit fan.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Where the submitted manufacturer is not the scheduled manufacturer it is considered an alternate and shall meet the Submittal requirements in Section 230500.

1. Carrier.
2. McQuay International
3. Trane.

2.2 UNIT CASINGS

A. Construction:

1. Unit Construction: All unit panels shall be 2" solid, double-wall construction to facilitate cleaning of unit interior. Unit panels shall be provided with a mid-span, no-through-metal, internal thermal break. Casing thermal performance shall be such that under 55°F supply air temperature and design conditions on the exterior of the unit of 81°F dry bulb and 73°F wet bulb, condensation shall not form on the casing exterior. All interior indoor AHU panels will be made of galvanized steel.

2. Casing Deflection: The casing shall not exceed 0.0042 inch deflection per inch of panel span at 1.00 times design static pressure. Maximum design static shall not exceed +8 inches w.g. in all positive pressure sections and -8 inches w.g. in all negative pressure sections.

3. Floor Construction: The unit floor shall be of sufficient strength to support a 300.0 lb load during maintenance activities and shall deflect no more than 0.0042 inch per inch of panel span.

B. Insulation:

1. Panel insulation shall provide a minimum thermal resistance (R) value of 13 ft²·h·°F/Btu throughout the entire unit. Insulation shall completely fill the panel cavities in all directions so that no voids exist and settling of insulation is prevented. Panel insulation shall comply with NFPA 90A.

C. Access Door Construction:

1. Access doors shall be 2" double wall construction. Interior and exterior door panels shall be of the same construction as the interior and exterior wall panels respectively. All doors shall be provided with a thermal break construction of door panel and door frame. Gasketing shall be provided around the full perimeter of the doors to prevent air leakage. Surface mounted handles shall be provided to allow quick access to the interior of the functional section and to prevent through cabinet penetrations that could likely weaken the casing leakage and thermal performance. Handle hardware shall be designed to prevent unintended closure. Access doors shall be hinged and removable for quick easy access. 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. Door handle hardware shall be adjustable and visually indicate locking position of door latch external to the section. Door hinges shall be galvanized.
2. All doors shall be a minimum of 60" high when sufficient height is available or the maximum height allowed by the unit height.

3. Door handles shall be provided for each latching point of the door necessary to maintain the specified air leakage integrity of the unit. Optionally for indoor AHUs and as standard on outdoor AHUs, outward swing doors are provided with a single handle linked to multiple latching points. An optional shatterproof window shall be provided in access doors where indicated on the plans. Window shall either be single pane, or thermal dual pane, as defined on schedule. Window shall be capable of withstanding unit operating pressures and shall be safe for viewing UV-C lamps. Refer to Product Data for specific information on which sections are supplied with an access door, the door location, a single handle and a window.

D. Condensate Drain Pans:

1. In sections provided with a drain pan, the drain pan shall be designed in accordance with ASHRAE 62.1. To address indoor air quality (IAQ) the drain pan shall be sloped in two planes promoting positive drainage to eliminate stagnant water conditions. Drain pan shall be insulated, and of double wall construction. The outlet shall be the lowest point on the pan, and shall be of sufficient diameter to preclude drain pan overflow under normally expected operating conditions. All drain pans connections shall have a threaded connection, extending a minimum of 2-1/2" beyond the unit base, and shall be made from the same material as the drain pan. Drain pan located under a cooling coil shall be of sufficient size to collect all condensate produced from the coil.

2.3 FAN, DRIVE, AND MOTOR SECTION

A. FC Fan Section:

1. The fan type shall be provided as required for stable operation and optimum energy efficiency. The fan shall be a double-width, double-inlet, multiblade-type, forward-curved (FC) fan. The fan shall be equipped with self-aligning, antifriction bearings with an L-50 life of 200,000 hours as calculated per ANSI/AFBMA Standard 9. For any bearing requiring relubrication, the grease line shall be extended to the fan support bracket on the drive side. The fan shall be statically and dynamically balanced at the factory as a complete fan assembly (fan wheel, motor, drive, and belts). The fan shaft shall not exceed 75 percent of its first critical speed at any cataloged speed. Fan wheels shall be keyed to the fan shaft to prevent slipping. The fan shafts shall be solid steel. The fan section shall be provided with an access door on the drive side of the fan. Fan performance shall be certified as complying with AHRI Standard 430.

2. Fans that are selected with inverter balancing shall first be dynamically balanced at design RPM. The fans then will be checked in the factory from 25% to 100% of design RPM to insure they are operating within vibration tolerance specifications, and that there are no resonant frequency issues throughout this operating range. Inverter balancing that requires lockout frequencies inputted into a variable frequency drive to
in order to bypass resonant frequencies shall not be acceptable. If supplied in this manner by the unit manufacturer, the contractor will be responsible for rebalancing in the field after unit installation. Fans selected with inverter balancing shall have a maintenance free, circumferential conductive micro fiber shaft grounding ring installed on the fan motor to discharge shaft currents to ground.

B. Motor Frame:

1. The motor shall be mounted integral to the isolated fan assembly and furnished by the unit manufacturer. The motor is mounted inside the unit casing on an adjustable base to permit adjustment of drive belt tension (not applicable for direct drive plenum fans). The motor shall meet or exceed all NEMA Standards Publication MG 1 requirements and comply with NEMA Premium efficiency levels when applicable except for fractional horsepower motors which are not covered by the NEMA classification. The motor shall be T-frame, squirrel cage with size, type, and electrical characteristics as shown on the equipment schedule.

C. Internal Vibration Isolation:

1. The fan and motor assembly (on sizes 10 to 120) shall be internally isolated from the unit casing with 2-inch (50.8 mm) deflection spring isolators, furnished and installed by the unit manufacturer. The isolation system shall be designed to resist loads produced by external forces, such as earthquakes, and conform to the current IBC seismic requirements.

2. Starter/VFD shall be mounted externally in a NEMA Type 1 enclosure on the supply fan section. An external disconnect shall be mounted through-the-door to the starter/VFD to disconnect full power from starter/VFD.

D. Variable Frequency Drive:

1. A combination Variable Frequency Drive (VFD) / disconnect shall be provided when variable air volume control is required for fan operation. Whether for single fan, dual fan, or fan array applications, a single VFD shall be provide to ensure proper operation and to optimize operating life. Each VFD / disconnect shall be properly sized, factory mounted in a full metal enclosure, wired to the fan motor, and commissioned to facilitate temporary heating, cooling, ventilation, and/or timely completion of the project. VFD / disconnects shall include a circuit breaker disconnect with a through-the-door interlocking handle and shall be lockable. The VFD package shall also include:

   a. Electronic manual speed control
   b. Hand-Off-Auto (H-O-A) selector switch
   c. Inlet fuses to provide maximum protection against inlet short circuit
   d. Current limited stall prevention
   e. Auto restart after momentary power loss
   f. Speed search for starting into rotating motor
   g. Anti-windmill w/DC injection before start
h. Phase-to-phase short circuit protection  
i. Ground fault protection

2. Units with factory-mounted controls shall include power wiring from the VFD panel to the control system transformers, binary output on/off wiring, analog output-speed-signal wiring, and all interfacing wiring between the VFD and the direct digital controller.

3. The VFD shall be UL508C listed and CSA certified and conform to applicable NEMA, ICS, NFPA, & IEC standards.

2.4 COIL SECTION

A. The coil section shall be provided complete with coil and coil holding frame. The coils shall be installed such that headers and return bends are enclosed by unit casings. If two or more cooling coils are stacked in the unit, an intermediate drain pan shall be installed between each coil and be of the same material as the primary drain pan. Like the primary drain pan, 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 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. Intermediate drain pan shall include downspouts to direct condensate to the primary drain pan. 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. Casing penetrations supplied for hydronic drain and vents. Piping contractor shall provide extended piping.

B. Water Coils:

1. The coils shall have aluminum fins and seamless copper tubes. Copper fins may be applied to coils with 5/8-inch tubes. Fins shall have collars drawn, belled, and firmly bonded to tubes by mechanical expansion of the tubes. The coil casing may be galvanized or stainless steel. Refer to the Product Data section of the submittal for the coil casing material. The coils shall be proof-tested to 300 psig and leak-tested under water to 200 psig. Coils containing water or ethylene glycol are certified in accordance with the AHRI Forced-Circulation Air-Cooling and Air-Heating Coils Certification Program which is based on AHRI Standard 410 within the Range of Standard Rating Conditions listed in Table 1 of the Standard. Certified units may be found in the AHRI Directory at www.ahridirectory.org. Propylene glycol and calcium chloride, or mixtures thereof, are outside the scope of AHRI Standard 410 and, therefore, do not require AHRI 410 rating or certification.

2. Coil connections are constructed of cast iron with female connections, steel block with female connections or steel pipe with male connections.

3. Tubes are 1/2" [13mm] OD 0.016" [0.406mm] thick copper.
2.5 AIR FILTRATION SECTION

A. General Requirements for Air Filtration Section:

1. Comply with NFPA 90A.
2. Provide minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
3. Provide filter holding frames arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.
4. A section shall be provided to support the filter rack as indicated throughout the unit. Refer to Product Data and As-Built sections of the submittal for specific locations within each unit.

B. Primary Filters:

1. 2 inch pleated media filters made with 100% synthetic fibers that are continuously laminated to a supported steel wire grid with water repellent adhesive shall be provided. Filters shall be capable of operating up to 625 fpm face velocity without loss of filter efficiency and holding capacity. The filters shall have a MERV 13 rating.

2.6 CAPACITIES AND CHARACTERISTICS

A. Supply Fan:

1. Drive: Belt.
2. Type: Forward-Curved
4. Airflow: 16,400 CFM
5. Total Static Pressure: 4.416 in. H2O
6. External Static Pressure: 2.75 in. H2O.
7. Design Motor Speed: 890 RPM max (variable speed fan)
8. Design Outlet Velocity: 2360 FPM.
9. Motor Size: 25 HP.
10. Motor Speed: 1800 RPM.
11. Electrical Characteristics:
   a. Volts: 460
   b. Phase: 3.
   c. Hertz: 60.
   d. Full-Load Amperes: 34.
   e. Minimum Circuit Ampacity: 42.5.

B. Chilled-Water Cooling Coil:
1. Sensible Heat-Transfer Rate: 685 MBh
2. Total Heat-Transfer Rate: 780 MBh.
3. Entering-Air, Dry-Bulb Temperature: 90.0 deg F.
4. Entering-Air, Wet-Bulb Temperature: 67.5 deg F.
5. Leaving-Air, Dry-Bulb Temperature: 52.0 deg F.
6. Leaving-Air, Wet-Bulb Temperature: 51.7 deg F.
7. Face Area: 29.9 sq.ft.
8. Maximum Face Velocity: 550 FPM.
9. Maximum Air-Side, Static-Pressure Drop: 0.932 in. H2O.
10. Tube Material: Copper.
11. Tube Thickness: 0.16 in.
12. Tube Diameter: 1/2 in.
15. Number of Rows: 8.
16. Water:
   a. Water Flow: 155 GPM
   b. Maximum Water Pressure Drop: 10.5 ft. H2O.
   c. Entering-Water Temperature: 45 deg F.
   d. Leaving-Water Temperature: 55 deg F.
   e. Tube Velocity: 3.25 FPM.

C. Filters:

1. Type: Pleated media
2. Filter Area: 30.4 sq.ft.
3. Thickness or Depth: 2 in.
5. Design Face Velocity: 539 FPM.

2.7 SOURCE QUALITY CONTROL

A. Fan Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Fans shall bear AMCA-certified sound ratings seal.

B. Fan Performance Rating: Factory test fan performance for airflow, pressure, power, air density, rotation speed, and efficiency. Rate performance according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating."

C. Water Coils: Factory tested to 300 psig (2070 kPa) according to ARI 410 and ASHRAE 33.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine casing insulation materials and filter media before air-handling unit installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for steam, hydronic, and condensate drainage piping systems and electrical services to verify actual locations of connections before installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Equipment Mounting: Install air-handling unit without external vibration isolation devices, but shall be structurally anchored and seismically braced to comply with California Building and Mechanical Code requirements. Unit shall come with fan and factory-mounted with spring isolators.

B. Arrange installation of units to provide access space around air-handling units for service and maintenance.

C. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with new, clean filters.

D. Install filter-gage, static-pressure taps upstream and downstream of filters. Mount filter gages on outside of filter housing or filter plenum in accessible position. Provide filter gages on filter banks, installed with separate static-pressure taps upstream and downstream of filters.

3.3 CONNECTIONS

A. Comply with requirements for piping specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to air-handling unit to allow service and maintenance.

C. Connect condensate drain pans using NPS 1-1/4 (DN 32), ASTM B 88, Type M (ASTM B 88M, Type C) copper tubing. Extend to nearest equipment or floor drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.
D. Chilled-Water Piping: Comply with applicable requirements in Division 23 Section "Hydronic Piping." Install shutoff valve and union or flange at each coil supply connection. Install balancing valve and union or flange at each coil return connection.

E. Connect duct to air-handling units with flexible connections. Comply with requirements in Division 23 Section "Duct Accessories."

3.4 FIELD QUALITY CONTROL

A. Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.
   1. Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:
   1. Leak Test: After installation, fill water coils with water, and test coils and connections for leaks.
   2. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Air-handling unit or components will be considered defective if unit or components do not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 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. Verify that shipping, blocking, and bracing are removed.
   3. Verify that unit is secure on mountings and supporting devices and that connections to piping, ducts, and electrical systems are complete. Verify that proper thermal-overload protection is installed in motors, controllers, and switches.
   4. Verify proper motor rotation direction, free fan wheel rotation, and smooth bearing operations. Reconnect fan drive system, align belts, and install belt guards.
5. Verify that bearings, pulleys, belts, and other moving parts are lubricated with factory-recommended lubricants.
6. Verify that zone dampers fully open and close for each zone.
7. Verify that face-and-bypass dampers provide full face flow.
8. Verify that outdoor- and return-air mixing dampers open and close, and maintain minimum outdoor-air setting.
10. Verify that proper thermal-overload protection is installed for electric coils.
11. Install new, clean filters.
12. Verify that manual and automatic volume control and fire and smoke dampers in connected duct systems are in fully open position.

B. Starting procedures for air-handling units include the following:

1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated rpm. Replace fan and motor pulleys as required to achieve design conditions.
2. Measure and record motor electrical values for voltage and amperage.
3. Manually operate dampers from fully closed to fully open position and record fan performance.

3.6 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for air-handling system testing, adjusting, and balancing.

3.7 CLEANING

A. After completing system installation and testing, adjusting, and balancing air-handling unit and air-distribution systems and after completing startup service, clean air-handling units internally to remove foreign material and construction dirt and dust. Clean fan wheels, cabinets, dampers, coils, and filter housings, and install new, clean filters.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train owner's maintenance personnel to adjust, operate, and maintain air-handling units.

END OF SECTION 23 73 13
## Electrical Specifications

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SECTION 26 00 00

ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 CONDITIONS AND REQUIREMENTS

A. Refer to Division 0, the General Conditions, Supplementary Conditions and Division I - General Requirements, and the drawings. The Contractor, shall read the conditions and be responsible for, and governed by, all requirements thereunder. This Condition applies to all Sections of Specification Division 26.

1.2 REGULATIONS

A. The Contractor shall give required notices to the building inspectors, the Engineer and the Owner and comply with laws, ordinances, rules and regulations applicable to the work and safety. Authorities include, but are not limited to:

1. The latest revision of the State of California Electrical Code.
2. The applicable Rules and Regulations of the National Fire Protection Association.
4. Underwriters Laboratories.
5. Any other applicable Federal, State, County or City Codes or Regulations, including O.S.H.A.

B. Nothing in these Drawings or Specifications shall be construed to permit work not conforming to the above Regulations and Codes.

1.3 DRAWINGS AND SPECIFICATIONS

A. Drawings are diagrammatic and indicate the general arrangement of equipment and wiring. Exact requirements shall be governed by the engineer, structural and mechanical conditions of the job. Consult other drawings in preparation of the bid. As-built record drawings

B. Extra lengths of wiring or pull boxes or junction boxes, etc., necessitated by the existing conditions shall be included in the bid. Report any apparent discrepancies before submitting bid.

C. Right is reserved by the Engineer to make changes of up to ten feet in location of any outlet or equipment prior to roughing-in without increasing contract cost.

1.4 EXAMINATION OF SITE
A. The Contractor shall examine the site and the existing conditions and make allowances for them in preparing his proposal. In the event of discrepancies between existing conditions and the Drawings, the Contractor shall report such discrepancies prior to bid and bid the conditions necessary to complete the job and to provide a fully operable and acceptable systems.

B. Extra charges will not be allowed for work that must be provided when it was apparent from a pre-bid inspection of the premises, even though the work is not shown on the drawings or called for in the Specification.

1.5 RECORD DRAWINGS AND SYSTEM OPERATION AND MAINTENANCE

A. Refer to Division 1 Sections “Closeout Procedures”, “Operation and Maintenance Data”, “Project Record Documentation” and “Demonstration and Training”.

1.6 SHOP DRAWING AND MATERIAL LIST

A. Refer to Division 1 Sections “Submitall Procedures”.

1.7 OPERATING AND MAINTENANCE MANUALS

A. Refer to Division 1 Sections “Operation and Maintenance Data”.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Receive, store and handle materials in a manner to prevent damage. Costs of damage shall be borne by the Contractor.

B. Protect equipment from weather (rain, sunshine, winds), water vapors, theft, and vehicular traffic.

PART 2 - PRODUCTS

2.1 MATERIAL APPROVAL

A. The design, manufacture and testing of electrical equipment and materials shall conform to or exceed latest applicable NEMA, IEEE, ANSI, and U.L. Standards.

B. Materials shall be new and bear Underwriters Laboratories (UL) label or other accepted testing laboratory certification. Materials that are not labeled by U.L. shall be tested and approved by an independent testing laboratory or a governmental agency acceptable to the Engineer, Owner and code enforcing authority.

PART 3 - EXECUTION
3.1 WORKMANSHIP AND CONTRACTOR'S QUALIFICATIONS

A. Installation of parts and connection of parts into systems shall be completed by skilled electrical journeymen. Material assemblies and installation work shall meet applicable code requirements, be securely fastened to structure, attractive in appearance and safe to operate. Provide code required clearance about electrical equipment. Assembly work or installations that are improper, unsafe or unattractive shall be removed and replaced with satisfactory work at no additional cost to the Owner.

B. Provide an on site foreman or superintendent in charge of this work at all times.

3.2 COORDINATION

A. Coordinate work with other trades to avoid conflict and to provide correct rough-in and connection for equipment furnished by other trades. Inform other trades Sub-contractors of the required access to, and clearances around, electrical equipment to maintain serviceability and code compliance.

B. Verify equipment dimensions and requirements. Check actual job conditions before installing work. Report necessary changes in design to the Engineer in time to prevent needless work. Changes, or additions subject to additional compensation, which are made without written authorization and an agreed price, shall be at Contractor's risk and expense.

3.3 MANUFACTURER'S INSTRUCTIONS

A. Where the specifications call for an installation to be made in accordance with Manufacturer's recommendations, a copy of such recommendations shall at all times be kept in the job superintendent's office and shall be available to the Engineer and Owner's representative.

B. Follow manufacturer's instructions where they cover points not specifically indicated on drawings and specifications. If instructions are in conflict with the drawings and specifications, obtain clarification from the Engineer before starting work.

3.4 QUALITY ASSURANCE

A. Provide a Quality Assurance program. These specifications set forth the minimum acceptable requirements. The specifications do not prohibit the Contractor from executing other Quality Assurance measures which can improve the operating facility, improve the construction schedule, and conserve energy within the scope of this project.

B. The Contractor shall insure that workmen's practices, materials employed, equipment and methods of installation conform to accepted construction and engineering practices, and that each piece of equipment can satisfactorily perform its functional operation.

3.5 CLOSING IN UNINSPECTED WORK
A. The Contractor shall not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested and/or approved. Field observations made by the engineer do not waive the inspections required by the contract documents.

B. Should a portion of the work be enclosed or covered up prior to inspection and testing, the contractor shall uncover the work at his own expense, and after it has been tested, inspected and approved, make repairs with such materials as may be necessary to restore the uncovered work to its intended condition.

3.6 PRELIMINARY OPERATION

A. Should the Owner request that a portion of the plant, apparatus or equipment be operated prior to final completion and acceptance of the work, the Contractor shall consent, and such operation shall be under the supervision and direction of the Contractor, but expense thereof shall be paid by the Owner, separate and distinct from money paid on account of the Contract. Such preliminary operation and payment thereof shall not be construed as an acceptance of that portion of the work in this Contract.

3.7 ACCEPTANCE DEMONSTRATION

A. Refer to Division 1 Section “Demonstration and Training”.

B. The system demonstrations shall be made by this Contractor in the presence of the Engineer and the manufacturer’s representative.

C. Demonstrate the function (in the structure) of each system and indicate its relationship to the single line diagrams and drawings.

D. Demonstrate by "start-stop operation", the controls, how to reset protective devices, how to replace fuses and what to do in case of emergency.

E. Demonstrate how maintenance and spare parts manuals are related to the equipment and systems installed.

3.8 TESTS

A. Where the Contract Documents, laws, ordinances or any public authority requires any work to be tested specifically or reviewed by another authority, the Contractor shall give the Engineer/Owner timely notice of readiness therefor. The Contractor shall give the Engineer/Owner the test results for review. If any work to be tested is covered up without written approval or consent of the Engineer, it must, if directed by the Engineer, be uncovered for examination at the Contractor's expense.

B. Any work which fails to meet the requirements of any test or any work which does not meet the requirements of the Contract Documents shall be considered defective and may be
rejected. Rejected work shall be corrected promptly by the Contractor or removed from the site.

C. Provide written test reports for each test to the Engineer for review.

END OF SECTION 26 00 00

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SECTION 26 05 00

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 0 General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Supporting devices for electrical components.
2. Cutting and patching for electrical construction.
3. Touchup painting.

1.3 COORDINATION

A. Coordinate conduits, cable pathways, chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure to maintain existing components and operations to facilitate the electrical installations.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment, anchorage and logistics with the ongoing campus and building operations.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch diameter slotted holes at a maximum of 2 inches o.c., in webs.

1. Channel Thickness: Selected to suit structural loading.
2. Fittings and Accessories: Products of the same manufacturer as channel supports.

D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers and J-hooks.
E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
F. Expansion Anchors: Carbon-steel wedge or sleeve type.
G. Toggle Bolts: All-steel springhead type.

2.2 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.
B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.
B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
C. Equipment: Install to facilitate operation service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations or existing conditions.
D. Right of Way: Give to raceways and piping systems installation.
E. Coordination: Coordinate with work existing conditions, ongoing campus and building operation, other trades, especially other utilities routes and clearances required to properly provide work.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials, U-channel system components.
B. Dry Locations: Steel materials.
C. Support Clamps for PVC Raceways: Click-type clamp system.
D. Selection of Supports: Comply with manufacturer's written instructions.

3.3 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.
B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze or bracket-type hangers.

D. Size supports for multiple raceway installations, so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

F. Install 1/4-inch diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Simultaneously install vertical conductor supports with conductors.

J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceways with an approved fastener not more than 24-inches from the box.

K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

1. Wood: Fasten with wood screws, screw-type nails or lag bolts.
2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
3. New Concrete: Concrete inserts with machine screws and bolts.
4. Existing Concrete: Expansion bolts.
5. Steel: Welded threaded studs or spring-tension clamps on steel.
a. Field Welding: Comply with AWS D1.1.

6. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
7. Light Steel: Sheet-metal screws.
8. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 FIRESTOPPING

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly.

3.5 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new firestopping where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.6 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:

1. Supporting devices for electrical components.
2. Electrical demolition.
3. Cutting and patching for electrical construction.
4. Touchup painting.

3.8 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touchup paint.

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer’s written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

B. Remove and replace with new items damaged beyond repair or refinishings.

3.9 CLEANING AND PROTECTION
A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations, and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of completion.

END OF SECTION 26 05 00
SECTION 26 05 23

CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 0 General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field Quality-Control Test Reports: From a qualified testing and inspecting agency engaged by Contractor.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the International Electrical Testing Association and that is acceptable to authorities having jurisdiction.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2. General Cable Corporation.
3. Okonite Wire & Cable Company.
B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

C. Conductor Material: Copper complying with NEMA WC 5; stranded conductor.

D. Conductor Insulation Types: Type THHN-THWN complying with NEMA WC 5.

2.3 CONNECTORS AND SPLICES

A. Manufacturers:
   1. AFC Cable Systems, Inc.
   2. AMP Incorporated/Tyco International.
   3. Hubbell/Anderson.
   4. O-Z/Gedney; EGS Electrical Group LLC.
   5. 3M Company; Electrical Products Division.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Concrete and Below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.

D. Exposed Branch Circuits: Type THHN-THWN, single conductors in raceway.

E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

F. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.

3.2 INSTALLATION

A. All 120V power conductors and cables shall be installed in raceways.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Seal around conduits penetrating fire-rated elements to maintain fire rating integrity.

E. Low voltage open cable installed above accessible ceiling space shall be supported by metallic J-hooks. No stapling is allowed. Staples used shall be removed and cable conductivity shall be tested by contractor at contractor’s cost.

3.3 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

B. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.4 FIELD QUALITY CONTROL

A. Testing: Engage a qualified testing agency to perform the following field quality-control testing:

1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

B. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION 26 05 23

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SECTION 26 05 26

GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 0 General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.3 SUBMITTALS

A. Product Data: For the following:
   1. Fittings.

B. Field Test Reports: Submit written test reports to include the following:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.
   1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
   1. Comply with UL 467.

PART 2 - PRODUCTS
2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Grounding Conductors, Cables, Connectors, and Rods:
   a. Apache Grounding/Erico Inc.
   b. Chance/Hubbell.
   c. Copperweld Corp.
   e. Framatome Connectors/Burndy Electrical.
   f. Galvan Industries, Inc.
   g. Ideal Industries, Inc.
   h. ILSCO.
   i. Kearney/Cooper Power Systems.
   j. Korns: C. C. Korns Co.; Division of Robroy Industries.
   k. O-Z/Gedney Co.; a business of the EGS Electrical Group.
   l. Raco, Inc.; Division of Hubbell.
   m. Superior Grounding Systems, Inc.
   n. Thomas & Betts, Electrical.

2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 26 Section "Conductors and Cables."

B. Equipment Grounding Conductors: Insulated with green-colored insulation.

C. Grounding Electrode Conductors: Stranded cable.

D. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

E. Bare Copper Conductors: Comply with the following:


F. Copper Bonding Conductors: As follows:

1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch in diameter.
2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

G. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.
PART 3 - EXECUTION

3.1 APPLICATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

B. In raceways, use insulated equipment grounding conductors.

C. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
   1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated on the drawings.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and branch circuits.

C. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

D. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 6 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, MDF/IDF, wiring closet, and central equipment location.
   1. Service and Central Equipment Locations, MDF/IDF, and Wiring Closets: Terminate grounding conductor on a ¼” thick x 2” x12” grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

3.4 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

C. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

D. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

E. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
SECTION 26 05 33

RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 0 General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. IMC: Intermediate metal conduit.

D. LFMC: Liquidtight flexible metal conduit.

E. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For conduit, fittings, surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.5 QUALITY ASSURANCE

A. 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.

B. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with existing conditions and work of other trades.

PART 2 - PRODUCTS
2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for 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, the manufacturers specified.

2.2 METAL CONDUIT AND TUBING

A. Available Manufacturers:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Anamet Electrical, Inc.; Anaconda Metal Hose.
4. Electri-Flex Co.
5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
6. LTV Steel Tubular Products Company.
7. Manhattan/CDT/Cole-Flex.
8. O-Z Gedney; Unit of General Signal.
9. Wheatland Tube Co.

B. Rigid Steel Conduit: ANSI C80.1.

C. IMC: ANSI C80.6.

D. EMT and Fittings: ANSI C80.3.

1. Fittings: Compression type.

E. FMC: Aluminum.

F. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

A. Available Manufacturers:

2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corp.
4. Cantex Inc.
5. Carlon.
8. ElecSYS, Inc.
9. Electri-Flex Co.
10. Lamson & Sessions; Carlon Electrical Products.
11. Manhattan/CDT/Cole-Flex.
12. RACO; Division of Hubbell, Inc.

B. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.

C. RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

2.4 METAL WIREWAYS

A. Available Manufacturers:
   1. Hoffman.
   2. Square D.

B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 1.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

E. Wireway Covers: Screw-cover type.

F. Finish: Manufacturer’s standard enamel finish.

2.5 SURFACE RACEWAYS

A. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC compound with matte texture and manufacturer’s standard color - color to match adjacent finish colors.

   1. Manufacturers:
      b. Wiremold Company (The); Electrical Sales Division.

B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.6 BOXES, ENCLOSURES, AND CABINETS

A. Available Manufacturers:
   1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
   2. Emerson/General Signal; Appleton Electric Company.
3. Erickson Electrical Equipment Co.
6. O-Z/Gedney; Unit of General Signal.
7. RACO; Division of Hubbell, Inc.
10. Spring City Electrical Manufacturing Co.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.

D. Floor Boxes: Cast metal, fully adjustable, rectangular. Walker Omni box, RFB 4 or equal as indicated.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

G. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.7 FACTORY FINISHES

A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors:

1. Exposed: Rigid steel or IMC.
2. Concealed: Rigid steel or IMC.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R.

B. Indoors:

1. Exposed: EMT.
2. Concealed: EMT.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
4. Damp or Wet Locations: Rigid steel conduit.
5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:

   a. Damp or Wet Locations: NEMA 250, Type 4.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

   1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

B. Complete raceway installation before starting conductor installation.

C. Support raceways as specified in Division 26 Section "Basic Electrical Materials and Methods."

D. Install temporary closures to prevent foreign matter from entering raceways.

E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.

F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

   1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
H. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches of concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
2. Space raceways laterally to prevent voids in concrete.
3. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
4. Change from rigid nonmetallic conduit to rigid steel conduit or IMC before rising above the floor.

I. Raceways below Slabs: Install in base rock below slab where practical and leave at least 2 inches of base rock cover.

J. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

1. Run parallel or banked raceways together on common supports.
2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

K. Join raceways with fittings designed and approved for that purpose and make joints tight.

1. Use insulating bushings to protect conductors.

L. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 18 inches of slack at each end of pull wire.

N. Telephone and Signal System Raceways, 2 Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

O. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6
inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

P. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semi recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.

Q. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.

R. Set floor boxes level and flush with finished floor surface.

S. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

B. Remove and replace with new any item damaged beyond repair or refinishing.

3.4 CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION 26 05 33
SECTION 26 05 53

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 0 General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and authorities having jurisdiction.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Schedule of Nomenclature: An index of electrical equipment and system components used in identification signs and labels.

PART 2 - PRODUCTS

2.1 RACEWAY AND CABLE LABELS

A. Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

1. Color: Black letters on orange field.
2. Legend: Indicates voltage and service.

B. Adhesive Labels: Preprinted, flexible, self-adhesive vinyl with legend overlaminated with a clear, weather- and chemical-resistant coating.

C. Pretensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the line it identifies and arranged to stay in place by pretensioned gripping action when placed in position.

D. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.


1. Not less than 6 inches wide by 4 mils thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend indicating type of underground line.

F. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

G. Brass or Aluminum Tags: 2 by 2 by 0.05 inch metal tags with stamped legend, punched for fastener.

2.2 NAMEPLATES AND SIGNS


B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.
   1. Engraved legend with black letters on white face.
   2. Punched or drilled for mechanical fasteners.

C. Baked-Enamel Signs for Interior Use: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.

D. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.

E. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

2.3 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon cable ties.
   2. Tensile Strength: 50 lb minimum.
   3. Temperature Range: Minus 40 to plus 185 deg F.

B. Paint: Formulated for the type of surface and intended use.
   1. Primer for Galvanized Metal: Single-component acrylic vehicle formulated for galvanized surfaces.
   2. Primer for Concrete Masonry Units: Heavy-duty-resin block filler.
   3. Primer for Concrete: Clear, alkali-resistant, binder-type sealer.
   4. Enamel: Silicone-alkyd or alkyd urethane as recommended by primer manufacturer.

PART 3 - EXECUTION
3.1 INSTALLATION

A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.

C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before applying.

E. Install painted identification according to manufacturer’s written instructions and as follows:
   1. Clean surfaces of dust, loose material, and oily films before painting.
   2. Prime surfaces using type of primer specified for surface.
   3. Apply one intermediate and one finish coat of enamel.

F. Caution Labels for Indoor Boxes and Enclosures for Power and Lighting: Install pressure-sensitive, self-adhesive labels identifying system voltage with black letters on orange background. Install on exterior of door or cover.

G. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 12 inches below finished grade. Where width of multiple lines installed in a common trench does not exceed 16 inches overall, use a single line marker.

H. Color-Coding of Secondary Phase Conductors: Use the following colors for phase conductors:
   1. 208/120-V Conductors:
      a. Phase A: Black.
      b. Phase B: Red.
      c. Phase C: Blue.
      d. Neutral: White
      e. Ground: Green.
   2. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 10 AWG.
      a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.
b. Colored cable ties applied in groups of three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten to a snug fit, and cut off excess length.

I. Power-Circuit Identification: Metal tags or aluminum, wraparound marker bands for cables, feeders, and power circuits in vaults, pull and junction boxes, manholes, and switchboard rooms.

1. Legend: 1/4 inch steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
2. Tag Fasteners: Nylon cable ties.

J. Apply identification to conductors as follows:

1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.
2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.
3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.

K. Apply warning, caution, and instruction signs as follows:

1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

L. Device Identification Labels: Adhesive Labels: Preprinted, flexible, self-adhesive vinyl with legend overlaminated with a clear, weather- and chemical-resistant coating. Install on each device cover of power receptacles, switches and tele/data outlets with feeder source (i.e. panelboard, MDF, IDF) and circuit number information.

M. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2-inch high lettering on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:

1. Branch feeder breakers at switchboard and distribution panel.
2. Enclosed circuit breakers.
3. Telephone switching equipment.

END OF SECTION 26 05 53

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SECTION 26 24 13

SWITCHBOARDS

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 service and distribution switchboards rated 600 V and less.

1.3 SUBMITTALS

A. Product Data: For each type of switchboard, overcurrent protective device, ground-fault protector, accessory, and component indicated. Include dimensions and manufacturers’ technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each switchboard and related equipment.

   1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:

      a. Enclosure types and details for types other than NEMA 250, Type 1.
      b. Bus configuration, current, and voltage ratings.
      c. Short-circuit current rating of switchboards and overcurrent protective devices.
      d. UL listing for series rating of installed devices.
      e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

   2. Wiring Diagrams: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency that is a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.

   1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NEMA PB 2.

D. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver in sections of lengths that can be moved past obstructions in delivery path.

B. Store indoors in clean dry space with uniform temperature to prevent condensation. Protect from exposure to dirt, fumes, water, corrosive substances, and physical damage.

C. Handle switchboards according to NEMA PB 2.1.

1.6 COORDINATION

A. Coordinate layout and installation of switchboards and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

PART 2 - PRODUCT

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by Square D Co. as district standard.

2.2 MANUFACTURED UNITS

A. Front-Connected, Front-Accessible Switchboard: Fixed, individually mounted main device, group mounted branches, and sections rear aligned in NEMA 3R enclosure.

B. Nominal System Voltage: 480Y/277V, 3-phase, 4-wire.

C. Main-Bus Continuous: 1200 ampere, 80% rated
2.3 FABRICATION AND FEATURES

A. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.

B. Utility Metering Compartment: Fabricated compartment and section complying with utility company's requirements. If separate vertical section is required for utility metering, match and align with basic switchboard.

C. Buses and Connections: Three phase, four wire. Include the following features:

2. Ground Bus: 1/4-by-2-inch minimum size, drawn-temper copper of 98 percent conductivity, equipped with pressure connectors for feeder and branch-circuit ground conductors.
3. Contact Surfaces of Buses: Silver plated.
4. Main Phase Buses, Neutral Buses, and Equipment Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections.

N. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

2.4 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

3. Electronic Trip Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
   a. Instantaneous trip.
   b. Long- and short-time pickup levels.
   c. Long- and short-time time adjustments.
   d. Ground-fault pickup level, time delay, and I²t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. **Integrally Fused Circuit Breakers**: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.

B. **Molded-Case Circuit-Breaker Features and Accessories**: Standard frame sizes, trip ratings, and number of poles.

1. **Lugs**: Mechanical style, suitable for number, size, trip ratings, and material of conductors.
2. **Application Listing**: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
3. **Ground-Fault Protection**: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

C. **Enclosed, Insulated-Case Circuit Breaker**: Fully rated, encased-power circuit breaker with interrupting capacity rating to meet available fault current.

1. Fixed circuit-breaker mounting.
2. Two-step, stored-energy closing.
3. Microprocessor-based trip units with interchangeable rating plug, LED trip indicators, and the following field-adjustable settings:
   
   a. Instantaneous trip (except main circuit breaker).
   b. Long- and short-time pickup levels.
   c. Long- and short-time time adjustments with \(I^2t\) response.
   d. Ground-fault pickup level, time delay, and \(I^2t\) response.

2.5 **INSTRUMENTATION**

A. **Multifunction Digital-Metering Monitor**: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:

1. Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:
   
   a. Phase Currents, Each Phase: Plus or minus 1 percent.
   b. Phase-to-Phase Voltages, Three Phase: Plus or minus 1 percent.
   c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 1 percent.
   d. Megawatts: Plus or minus 2 percent.
   e. Megavars: Plus or minus 2 percent.
   f. Power Factor: Plus or minus 2 percent.
   g. Frequency: Plus or minus 0.5 percent.
   h. Megawatt Demand: Plus or minus 2 percent; demand interval programmable from 5 to 60 minutes.
   i. Accumulated Energy, Megawatt Hours: Plus or minus 2 percent. Accumulated values unaffected by power outages up to 72 hours.
2. Mounting: Display and control unit flush or semiflush mounted in instrument compartment door.

PART 3 - EXECUTION

3.1 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

3.2 EXAMINATION

A. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Install switchboards and accessories according to NEMA PB 2.1.

B. Support switchboards on concrete bases, 4-inch nominal thickness.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.

D. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.

3.4 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Electrical Identification".

B. Switchboard Nameplates: Label each switchboard compartment with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws. Provide engraved nameplate for main circuit breaker and each feeder circuit breaker.

3.5 CONNECTIONS

A. Install equipment grounding connections for switchboards with ground continuity to main electrical ground bus.
B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.6 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:
   1. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

B. Testing Agency: Engage a qualified independent testing agency to perform specified testing.
   1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Sections 7.1, 7.5, 7.6, 7.9, 7.10, 7.11, and 7.14 as appropriate. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switchboard. Remove front panels so joints and connections are accessible to portable scanner.
   1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
   2. Record of Infrared Scanning: Prepare a certified report that identifies switchboards checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.7 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges according to the coordination report per Section 26 05 73.

3.8 CLEANING

A. On completion of installation, inspect interior and exterior of switchboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 26 24 13
SECTION 26 27 26

WIRING DEVICES

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 receptacles, connectors, switches, and finish plates.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

1.4 SUBMITTALS

A. Product Data: For each product specified.

B. Maintenance Data: For materials and products to include in maintenance manuals specified in Division 1.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

B. Comply with NEMA WD 1.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Wiring Devices:
   a. Bryant Electric, Inc.
   b. GE Company; GE Wiring Devices.
   d. Leviton Manufacturing Co., Inc.
   e. Pass & Seymour/Legrand; Wiring Devices Div.
   f. Pyle-National, Inc.; an Amphenol Co.

2.2 RECEPTACLES
   A. Straight-Blade and Locking Receptacles: General-Duty grade.
   B. GFCI Receptacles: Feed-through type, with integral NEMA WD 6, Configuration 5-20R duplex receptacle arranged to protect connected downstream receptacles on same circuit. Design units for installation in a 2-3/4 inch deep outlet box without an adapter.

2.3 WALL PLATES
   A. Single and combination types match corresponding wiring devices.
      1. Plate-Securing Screws: Metal with head color to match plate finish.
      2. Material for Unfinished Spaces: 0.04 inch thick, Type 302, satin-finished stainless steel.

2.4 FINISHES
   A. Color: Bright white, unless otherwise indicated or required by Code.

PART 3 - EXECUTION

3.1 INSTALLATION
   A. Install devices and assemblies plumb and secure.
   B. Install wall plates when painting is complete.
   C. Do not share neutral conductor on load side of dimmers.
   D. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on bottom. Group adjacent switches under single, multigang wall plates.
   E. Protect devices and assemblies during painting.
   F. Adjust locations at which floor service outlets are installed to suit arrangement of partitions and furnishings.
3.2 IDENTIFICATION

A. Comply with Division 26 Section "Electrical Identification."

B. Comply with Division 26 Section "Basic Electrical Materials and Methods."

1. Switches: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on wall plate.

2. Receptacles: Identify panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

3.3 CONNECTIONS

A. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.

B. Isolated-Ground Receptacles: Connect to isolated-ground conductor routed to designated isolated equipment ground terminal of electrical system.

C. Tighten electrical connectors and terminals according to manufacturers published torque-tightening values. If manufacturers torque values are not indicated, use those specified in UL 486A.

3.4 FIELD QUALITY CONTROL

A. Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.

B. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

C. Replace damaged or defective components.

3.5 CLEANING

A. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION 26 27 26
SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

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 individually mounted enclosed switches and circuit breakers used for the following:

1. Motor and equipment disconnecting means.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

B. RMS: Root mean square.

C. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Product Data: For each type of switch, circuit breaker, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Maintenance Data: For enclosed switches and circuit breakers and for components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Closeout Procedures," include the following:

1. Routine maintenance requirements for components.
2. Manufacturer's written instructions for testing and adjusting switches and circuit breakers.
3. Time-current curves, including selectable ranges for each type of circuit breaker.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency that is a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.
1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NEMA AB 1 and NEMA KS 1.

D. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Fusible Switches:

   b. General Electric Co.; Electrical Distribution & Control Division.
   c. Square D Co.

2. Molded-Case Circuit Breakers:

   b. General Electric Co.; Electrical Distribution & Control Division.
   c. Square D Co.

3. Combination Circuit Breaker and Ground-Fault Trip:

   b. General Electric Co.; Electrical Distribution & Control Division.
   c. Square D Co.

4. Molded-Case, Current-Limiting Circuit Breakers:

b. General Electric Co.; Electrical Distribution & Control Division.
c. Square D Co.

5. Integrally Fused, Molded-Case Circuit Breakers:
   b. General Electric Co.; Electrical Distribution & Control Division.
   c. Square D Co.

2.2 ENCLOSED SWITCHES

   A. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle.

   B. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, Type HD, with clips to accommodate specified fuses, lockable handle with two padlocks, and interlocked with cover in closed position.

2.3 ENCLOSED CIRCUIT BREAKERS

   A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.


   3. Electronic Trip Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
      a. Instantaneous trip.
      b. Long- and short-time pickup levels.
      c. Long- and short-time time adjustments.
      d. Ground-fault pickup level, time delay, and I²t response.

   4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.

   5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.


   7. Molded-Case Switch: Molded-case circuit breaker without trip units.

   B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
1. **Lugs:** Mechanical style suitable for number, size, trip ratings, and material of conductors.
2. **Application Listing:** Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
3. **Ground-Fault Protection:** Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
4. **Shunt Trip:** 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
5. **Auxiliary Switch:** Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
6. **Key Interlock Kit:** Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
7. **Zone-Selective Interlocking:** Integral with electronic trip unit; for interlocking ground-fault protection function.

2.4 **ENCLOSURES**

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.
   1. **Outdoor Locations: NEMA 250, Type 3R.**
   2. **Kitchen Areas: NEMA 250, Type 4X, stainless steel.**
   3. **Other Wet or Damp Indoor Locations: NEMA 250, Type 4.**

2.5 **FACTORY FINISHES**

A. Manufacturer's standard prime-coat finish ready for field painting.

**PART 3 - EXECUTION**

3.1 **EXAMINATION**

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 **INSTALLATION**

A. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.3 **IDENTIFICATION**

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Electrical Identification".
B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.4 CONNECTIONS

A. Install equipment grounding connections for switches and circuit breakers with ground continuity to main electrical ground bus.

B. Install power wiring. Install wiring between switches and circuit breakers, and control and indication devices.

C. Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.5 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:
   1. Test insulation resistance for each enclosed switch, circuit breaker, component, and control circuit.
   2. Test continuity of each line- and load-side circuit.

B. Testing Agency: Engage a qualified independent testing agency to perform specified testing.

C. Testing: After installing enclosed switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
   1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.6 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.7 CLEANING

A. On completion of installation, inspect interior and exterior of enclosures. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 26 28 16