

Project Manual

PROJECT MANUAL for
Moss Landing Harbor District
North Harbor Building Warm Shell Project



WRD Project #22084
October 1, 2023

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**MOSS LANDING HARBOR DISTRICT
7881 Sandholdt Road
Moss Landing, California 95039**



**CONTRACT DOCUMENTS
FOR
NORTH HARBOR BUILDING CONSTRUCTION PROJECT
at Moss Landing, California**

Date: October 1, 2023

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NOTICE INVITING BIDS

1. Bid Information. The Moss Landing Harbor District, a subdivision of the State of California, (“Owner”), will accept sealed bids for its North Harbor Building Construction Project (“Project”), by or before **November 1, 2023 at 2:00 p.m.**, at its office located at 7881 Sandholdt Road, Moss Landing, California at which time the bids will be publicly opened and read aloud. Owner reserves the right to reject any and all bids and to waive any non-substantive irregularities.

2. Project Information.

2.1 Location and Description. The Project is located at 2460 Highway 1, Moss Landing, CA on a portion of APN 413-022-003 and consists interior improvements to a waterfront building.

2.2 Time for Completion. 210 calendar days. The planned timeframe for commencement and completion of construction of the Project is: Commencing November 13, 2023 and completion June 10, 2024.

3. License and Registration Requirements.

3.1 License. This Project requires a valid California contractor’s license for the following classification(s): B.

3.2 DIR Registration. Owner will not accept a Bid Proposal from or enter into the Contract with a bidder, without proof that the bidder and its Subcontractors are registered with the California Department of Industrial Relations (“DIR”) to perform public work under Labor Code Section 1725.5, subject to limited legal exceptions.

4. Contract Documents. The plans, specifications, bid and contract documents for the Project (“Contract Documents”) may be obtained electronically from Lou Bartlett, WRD Architects at 2340 Garden Road, Suite 100, Monterey, CA, phone 831.649.4642, email loub@wrdarch.com.

5. Bid Proposal and Security.

5.1 Bid Proposal Form. Each bid must be submitted using the Bid Proposal form provided with the Contract Documents.

5.2 Bid Security. Each Bid Proposal must be accompanied by bid security of ten percent of the maximum bid amount, in the form of a cashier’s or certified check made payable to Owner, or a bid bond executed by a surety licensed to do business in the State of California on the Bid Bond form included with the Contract Documents. The bid security must guarantee that upon award of the bid, the bidder will execute the Contract and submit payment and performance bonds and insurance certificates as required by the Contract Documents within ten days after issuance of the notice of award.

6. Prevailing Wage Requirements.

6.1 General. This Project is subject to the prevailing wage requirements applicable to the locality in which the Work is to be performed for each craft, classification or type of worker needed to perform the Work, including employer payments for health and welfare, pension, vacation, apprenticeship and similar purposes.

6.2 Rates. Prevailing rates are available online at <http://www.dir.ca.gov/DLSR>. Each Contractor and Subcontractor must pay no less than the specified rates to all workers employed to work on the Project. The schedule of per diem wages is based upon a working day of eight hours. The rate for holiday and overtime work must be at least time and one-half.

6.3 Compliance. The Contract will be subject to compliance monitoring and enforcement by the California Department of Industrial Relations, under Labor Code Section 1771.4 and 1772.5.

7. Performance and Payment Bonds. The successful bidder will be required to provide performance and payment bonds for 100% of the Contract Price.

8. Substitution of Securities. Substitution of appropriate securities in lieu of retention amounts from progress payments is permitted under Public Contract Code Section 22300.

9. Subcontractor List. Each bidder must submit the name, location of the place of business, and California contractor license number and the DIR Registration number of each Subcontractor who will perform work or service or fabricate or install work for the prime contractor in excess of one-half of 1% of the bid price, using the Subcontractor List form included with the Contract Documents.

10. No Bid Withdrawal. No bid may be withdrawn for a period of 90 days after the deadline for bid submission, except for material error under Public Contract Code Sections 5100 et seq.

11. Instructions for Bidders. Additional and more detailed information is provided in the Instructions for Bidders, which should be carefully reviewed by all bidders before submitting a Bid Proposal. Questions should be submitted in writing and directed to Wald, Ruhnke & Dost Architects, attention Lou Bartlett at loub@wrdarch.com.

/S/

Tommy Razzeca
General Manager/Harbor Master
Moss Landing Harbor District

Dated: October 1, 2023

END OF NOTICE INVITING BIDS

Instructions to Bidders

Each Bid Proposal submitted to Moss Landing Harbor District ("Owner") for its North Harbor Building Construction Project ("Project") must be submitted in accordance with the following instructions and requirements:

1. Bid Submission.

1.1 General. Each bid ("Bid Proposal") must be signed, sealed and submitted to Owner, using the form provided in the Contract Documents, by or before the date and time set forth in the Notice Inviting Bids, or as amended by subsequent addendum. Faxed or emailed Bid Proposals will not be accepted, unless otherwise specified. Late submissions will be returned unopened. Owner reserves the right to postpone the date and time for receiving or opening bids. Each bidder is solely responsible for all of its costs to prepare and submit its bid and by submitting a bid waives any right to recover those costs from Owner. The bid price(s) must include all costs to perform the Work as specified, including all indirect costs such as applicable taxes, insurance and field offices.

1.2 Bid Envelope. The envelope containing the sealed Bid Proposal and all required forms and attachments must be clearly labeled and addressed as follows:

BID PROPOSAL:

North Harbor Building Construction Project
Tommy Razzeca
General Manager/Harbor Master
7881 Sandholdt Road
Moss Landing, CA 95039

The envelope must also be clearly labeled, as follows, with the bidder's name, address, and its registration number with the California Department of Industrial Relations ("DIR") for bidding on public works contracts (Labor Code sections 1725.5 and 1771.1):

[Contractor company name]

[street address]

[Owner, state, zip code]

DIR Registration No: _____

1.3 DIR Registration. Owner will not accept a Bid Proposal from, or enter into the Contract with, a bidder without proof that the bidder and its Subcontractors are registered with the DIR to perform public work under Labor Code section 1725.5, subject to limited legal exceptions. If Owner is unable to confirm that the bidder's DIR registration is current, Owner must disqualify the bidder and return its bid unopened. (Labor Code section 1725.5.)

2. Bid Proposal Form and Enclosures. Each Bid Proposal must be completed in ink using the Bid Proposal form included in the Contract Documents. The Bid Proposal form should be fully completed without interlineations, alterations, or erasures. Any necessary corrections must be clear and legible, and must be initialed by the bidder's authorized representative. A Bid Proposal submitted with terms such as "negotiable," "will negotiate," or similar, will be considered non-responsive. Each Bid Proposal must be accompanied by bid security, as set forth in Section 4 below, and by a completed Subcontractor List and Non-Collusion Declaration using the forms included in the Contract Documents.

3. Authorization and Execution. Each Bid Proposal must be signed by the bidder's authorized representative. A Bid Proposal submitted by a partnership must be signed in the partnership name by a general partner with authority to bind the partnership. A Bid Proposal submitted by a corporation must be signed with the legal name of the corporation, followed by the signature and title of two officers of the

corporation with full authority to bind the corporation to the terms of the Bid Proposal, under California Corporation Code section 313.

4. Bid Security. Each Bid Proposal must be accompanied by bid security of ten percent of the maximum bid amount, in the form of a cashier's check, certified check, or bid bond using the form included in the Contract Documents and executed by a surety licensed to do business in the State of California, made payable to Owner. The bid security must guarantee that, upon award of the Contract, the bidder will: execute and submit the Contract on the form included in the Contract Documents; submit payment and performance bonds for 100% of the maximum Contract Price; and submit the insurance certificates and endorsements as required by the Contract Documents within ten days after issuance of the notice of award.

5. Pre-Bid Investigation

5.1 Contract Documents. Each bidder is solely responsible for diligent and thorough review of the Contract Documents (as defined in the General Conditions), examination of the Project site, and reasonable and prudent inquiry concerning known and potential site conditions prior to submitting a Bid Proposal. However, except for any areas that are open to the public at large, bidders may not enter Owner's property or the Project site without prior written authorization from Owner. Bidders are responsible for reporting any errors or omissions in the Contract Documents to Owner prior to submitting a Bid Proposal, subject to the limitations of Public Contract Code section 1104. Owner expressly disclaims responsibility for assumptions a bidder might draw from the presence or absence of information provided by Owner.

5.2 Project Site. If applicable Soil and soil test data, water table elevations, and soil analyses for test holes may be available for inspection in the Owner's main office or as otherwise specified in the Special Conditions. Any additional subsurface exploration at the Project site must be done at the bidder's expense, but only with prior written authorization from Owner. All soil data and analyses available for inspection or provided in the Contract Documents apply only to the test hole locations. Any water table elevation indicated by a soil test report existed on the date the test hole was drilled. The bidder is responsible for determining and allowing for any differing soil or water table conditions during construction. Because groundwater levels may fluctuate, difference(s) in elevation between ground water shown in soil boring logs and ground water actually encountered during Project construction will not be considered changed Project site conditions. Actual locations and depths must be determined by bidder's field investigation. The bidder may request access to underlying or background information in Owner's possession that is necessary for bidder to form its own conclusions.

5.3 Utility Company Standards. The Project must be completed in a manner that satisfies the standards and requirements of the affected utility companies or agencies (collectively, "utility owners"). The successful bidder may be required by the utility owners to provide detailed plans prepared by a California registered civil engineer showing the necessary temporary support of the utilities during coordinated construction work. Bidders are directed to contact the utility owners about their requirements before submitting a Bid Proposal.

6. Bidders Interested in More Than One Bid. No person, firm, or corporation may submit or be a party to more than one Bid Proposal unless alternate bids are specifically called for. However, a person, firm, or corporation that has submitted a subcontract proposal or quote to a bidder may submit subcontract proposals or quotes to other bidders, and may also submit a Bid Proposal as a prime contractor.

7. Requests for Information. Questions or requests for clarifications regarding the Project, the bid procedures, or any of the Contract Documents must be submitted in writing to WRD Architects at 2340 Garden road, Suite 100, Monterey, CA, phone 831-649-4642 attention Lou Bartlett at loub@wrdarch.com. Final questions to be submitted in writing no later than five (5) days prior to bid date. Bidders should

submit such inquiries at least five working days before the scheduled bid opening. Questions received any later might not be addressed before the bid deadline.

8. Addenda. Any addenda issued prior to the bid opening are part of the Contract Documents. Subject to the limitations of Public Contract Code section 4104.5, Owner reserves the right to issue addenda prior to bid time. Each bidder is responsible for ensuring it has received and reviewed all addenda prior to submitting its bid. Bidders should check Owner's website periodically for any addenda or updates on the Project at: <http://www.mosslandingharbor.dst.ca.us>.

9. Brand Designations and "Or Equal" Substitutions. Any specification designating a material, product, thing, or service by specific brand or trade name, followed by the words "or equal," is intended only to indicate quality and type of item desired, and bidders may request use of any equal material, product, thing, or service. All data substantiating the proposed substitute as an equal item must be submitted with the written request for substitution. A request for substitution must be submitted within the time period(s) provided in the Contract Documents. This provision does not apply to materials, products, things, or services that may lawfully be designated by a specific brand or trade name under Public Contract Code section 3400(c).

10. Withdrawal of Bid Proposals. A Bid Proposal may not be withdrawn for a period of 90 days after the bid opening without forfeiture of the bid security, except as authorized for material error under Public Contract Code section 5100 et seq.

11. Bid Protest. Any bid protest must be in writing and received by Owner at 7881 Sandholdt Road, Moss Landing, CA 95039 before 5:00 p.m. no later than two Working Days following bid opening (the "Bid Protest Deadline") and must comply with the following requirements:

11.1 General. Only a bidder who has actually submitted a Bid Proposal is eligible to submit a bid protest against another bidder. Subcontractors are not eligible to submit bid protests. A bidder may not rely on the bid protest submitted by another bidder, but must timely pursue its own protest. If required by Owner, the protesting bidder must submit a non-refundable fee in the amount specified by Owner, based upon Owner's reasonable costs to administer the bid protest. Any such fee must be submitted to Owner no later than the Bid Protest Deadline, unless otherwise specified. For purposes of this Section 11, a "Working Day" means a day that Owner is open for normal business, and excludes weekends and holidays observed by Owner.

11.2 Protest Contents. The bid protest must contain a complete statement of the basis for the protest and all supporting documentation. Material submitted after the Bid Protest Deadline will not be considered. The protest must refer to the specific portion or portions of the Contract Documents upon which the protest is based. The protest must include the name, address, email address, and telephone number of the protesting bidder and any person representing the protesting bidder.

11.3 Copy to Protested Bidder. A copy of the protest and all supporting documents must be concurrently transmitted by fax or by email, by or before the Bid Protest Deadline, to the protested bidder and any other bidder who has a reasonable prospect of receiving an award depending upon the outcome of the protest.

11.4 Response to Protest. The protested bidder may submit a written response to the protest, provided the response is received by Owner before 5:00 p.m., within two Working Days after the Bid Protest Deadline or after actual receipt of the bid protest, whichever is sooner (the "Response Deadline"). The response must include all supporting documentation. Material submitted after the Response Deadline will not be considered. The response must include the name, address, email address, and telephone number of the person representing the protested bidder if different from the protested bidder.

11.5 Copy to Protesting Bidder. A copy of the response and all supporting documents must be concurrently transmitted by fax or by email, by or before the Response Deadline, to the protesting bidder and any other bidder who has a reasonable prospect of receiving an award depending upon the outcome of the protest.

11.6 Exclusive Remedy. The procedure and time limits set forth in this section are mandatory and are the bidder's sole and exclusive remedy in the event of bid protest. A bidder's failure to comply with these procedures will constitute a waiver of any right to further pursue a bid protest, including filing a Government Code Claim or initiation of legal proceedings.

11.7 Right to Award. Owner reserves the right to award the Contract to the bidder it has determined to be the responsible bidder submitting the lowest responsive bid, and to issue a notice to proceed with the Work notwithstanding any pending or continuing challenge to its determination.

12. Reservation of Rights. Owner reserves the right, acting in its sole discretion, to waive immaterial bid irregularities, to accept or reject any and all bids, or to abandon the Project entirely. The Contract will be awarded, if at all, within 90 days after opening of bids or as otherwise specified in the Special Conditions, to the responsible bidder that submitted the lowest responsive bid. Any date given for planned commencement of the Project given in Section 2.2 of the Notice Inviting Bids is provided as informative of the Owner's expectations at the time the Notice Inviting Bids was first issued. The Owner is not bound to issue a Notice to Proceed by or before such planned commencement date, and reserves the right to issue the Notice to Proceed when the Owner determines, in its sole discretion, the appropriate time for commencing the Work.

13. Bonds. The successful bidder is required to submit payment and performance bonds as specified in the Contract Documents using the bond forms included in the Contract Documents. All required bonds must be calculated on the maximum total Contract Price as awarded, including additive alternates, if applicable.

14. Evidence of Responsibility. Within 24 hours following a request by Owner, a bidder must submit to Owner satisfactory evidence showing the bidder's financial resources, the bidder's experience in the type of work being required by Owner, the bidder's organization available for the performance of the Contract, and any other required evidence of the bidder's qualifications to perform the proposed Contract. Owner may consider such evidence before making its decision awarding the proposed Contract.

15. License(s). The successful bidder and its Subcontractor(s) must possess the California contractor's license(s) in the classification(s) required by law to perform the Work. The successful bidder and Subcontractors must also obtain any business permit that may be required by the County of Monterey license within 7 days following Owner's issuance of the notice of award.

16. Ineligible Subcontractor. Any Subcontractor who is ineligible to perform work on a public works project under Labor Code sections 1777.1 or 1777.7 is prohibited from performing work on the Project.

17. Bid Schedule. Each bidder must complete the Bid Schedule form with unit prices as indicated, and submit the completed Bid Schedule with its Bid Proposal.

17.1 Incorrect Totals. In the event a computational error for any bid item (base bid or alternate) results in an incorrect extended total for that item, the submitted base bid or bid alternate total will be adjusted to reflect the corrected amount) as the product of the estimated quantity and the unit cost), unless the cumulative amount of correction changes the total amount of the base bid or bid alternate by more than five percent. In the event of a discrepancy between the actual total of the itemized or unit prices shown on the Bid Schedule for the base bid, and the amount entered as the base bid on the Bid Proposal form, the actual total of the itemized or unit prices shown on the Bid Schedule for the base bid will be deemed the base bid price. Likewise, in the event of a discrepancy between the actual total of the

itemized or unit prices shown on the Bid Schedule for any bid alternate, and the amount entered for the alternate on the Bid Proposal form, the actual total of the itemized prices shown on the Bid Schedule for that alternate will be deemed the alternate price. Nothing in this provision is intended to prevent a bidder from requesting to withdraw its bid for material error under Public Contract Code section 5100 et seq.

17.2 Estimated Quantities. The quantities shown on the Bid Schedule are estimated and the actual quantities required to perform the Work may be greater or less than the estimated amount. The Contract Price will be adjusted to reflect the actual quantities required for the Work based on the itemized or unit prices provided in the Bid Schedule, with no allowance for anticipated profit for quantities that are deleted or decreased, and no increase in the unit price.

18. Permits and Agency Letters. Prior to submitting a bid, each bidder is advised to review all requirements contained in Owner's permits and agency consultation letters referenced in section 12 of the Special Conditions, and attached thereto.

19. Bidder's Questionnaire. A completed, signed Bidder's Questionnaire must be submitted with the Bid Proposal, using the form provided by Owner. A bid that does not fully comply with this requirement may be rejected as nonresponsive. A bidder who submits a Bidder's Questionnaire which is subsequently determined to contain false or misleading information, or material omissions, may be disqualified as non-responsible.

END OF INSTRUCTIONS TO BIDDERS

Bid Proposal

North Harbor Building Construction Project

_____ (“Bidder”) hereby submits this Bid Proposal to Moss Landing Harbor District (“Owner”) for the above-referenced project (“Project”) in response to the Notice Inviting Bids and in accordance with the Contract Documents referenced therein.

1. Base Bid. Bidder proposes to perform and fully complete the Work for the Project as specified in the Contract Documents, within the time required for full completion of the Work, for the following price (“Base Bid”): \$ _____.

2. Addenda. Bidder agrees that it has confirmed receipt of or access to, and reviewed, all addenda issued for this Bid. Bidder specifically acknowledges receipt of the following addenda:

Addendum:	Date Received:	Addendum:	Date Received:
#01	_____	#05	_____
#02	_____	#06	_____
#03	_____	#07	_____
#04	_____	#08	_____

3. Bidder’s Warranties. By signing and submitting this Bid Proposal, Bidder warrants the following:

3.1 Examination of Contract Documents. Bidder has thoroughly examined the Contract Documents and represents that, to the best of Bidder’s knowledge, there are no errors, omissions, or discrepancies in the Contract Documents, subject to the limitations of Public Contract Code section 1104.

3.2 Examination of Worksite. Bidder has had the opportunity to examine the Worksite and local conditions at the Project location.

3.3 Bidder is Qualified. Bidder is fully qualified to perform the Work.

3.4 Responsibility for Bid. Bidder has carefully reviewed this Bid Proposal and is solely responsible for any errors or omissions contained in its completed Bid.

4. Award of Contract. By signing and submitting this Bid Proposal, Bidder agrees that if Bidder is awarded the Contract for the Project, within ten days following issuance of the notice of award to Bidder, Bidder will do all of the following:

4.1 Execute Contract. Enter into the Contract with Owner in accordance with the terms of this Bid Proposal, by signing and submitting to Owner the Contract prepared by Owner using the form included with the Contract Documents;

4.2 Submit Required Bonds. Submit to Owner a payment bond and a performance bond, each for 100% of the Contract Price, using the bond forms provided and in accordance with the requirements of the Contract Documents; and

4.3 Insurance Requirements. Submit to Owner the insurance certificate(s) and endorsement(s) as required by the Contract Documents.

5. Bid Security. As a guarantee that, if awarded the Contract, Bidder will perform its obligations under Section 4 above, Bidder is enclosing bid security in the amount of ten percent of its maximum bid amount in one of the following forms (check one):

_____ A cashier's check or certified check payable to Owner and issued by
_____ [Bank name] in the amount of
\$ _____.

_____ A bid bond, using the Bid Bond form included with the Contract Documents, payable to Owner and executed by a surety licensed to do business in the State of California.

This Bid Proposal is hereby submitted on _____, 20__.

s/ _____
Name and Title [print]

s/ _____
[See Section 3 of Instructions to Bidders]

_____ Name and Title [print]

_____ Company Name

_____ License #, Expiration Date, and Classification

_____ Address

_____ DIR Registration #

_____ Owner, State, Zip

_____ Phone

_____ Contact Name

_____ Contact Email

END OF BID PROPOSAL

Bid Schedule – Not Used

Bid Schedule – Not Used

Subcontractor List

For each Subcontractor that will perform a portion of the Work in an amount in excess of one-half of 1% of the Bidder's total Contract Price,¹ the bidder must list a description of the Work, the name of the Subcontractor, its California contractor license number, the location of its place of business, its DIR registration number, and the portion of the Work that the Subcontractor is performing based on a percentage of the Base Bid price.

DESCRIPTION OF WORK	SUBCONTRACTOR NAME	CALIFORNIA CONTRACTOR LICENSE NO.	LOCATION OF BUSINESS	DIR REG. NO.	PERCENT OF WORK

END OF SUBCONTRACTOR LIST

¹ For street or highway construction this requirement applies to any subcontract of \$10,000 or more.

Noncollusion Declaration

TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID

The undersigned declares:

I am the _____ [title] of _____
[business name], the party making the foregoing bid.

The bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation. The bid is genuine and not collusive or sham. The bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid. The bidder has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or to refrain from bidding. 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. All statements contained in the bid are true. 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, to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof, to effectuate a collusive or sham bid, and has not paid and will not pay, any person or entity for such purpose.

This declaration is intended to comply with California Public Contract Code section 7106 and Title 23 U.S.C section 112.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration is executed on _____ [date], at _____ [City], _____ [state].

s/ _____

Name [print]

END OF NONCOLLUSION DECLARATION

Bid Bond

_____ (“Bidder”) has submitted a bid, dated _____, 20____ (“Bid”), to Moss Landing Harbor District (“Owner”) for work on the North Harbor Building Construction Project (“Project”). Under this duly executed bid bond (“Bid Bond”), Bidder as Principal and _____, its surety (“Surety”), are bound to Owner as obligee in the penal sum of ten percent of the maximum amount of the Bid (the “Bond Sum”). Bidder and Surety bind themselves and their respective heirs, executors, administrators, successors and assigns, jointly and severally, as follows:

1. General. If Bidder is awarded the Contract for the Project, Bidder will enter into the Contract with Owner in accordance with the terms of the Bid.

2. Submittals. Within ten days following issuance of the notice of award to Bidder, Bidder must submit to Owner the following:

2.1 Contract. The executed Contract, using the form provided by Owner in the Project contract documents (“Contract Documents”);

2.2 Payment Bond. A payment bond for 100% of the maximum Contract Price, executed by a surety licensed to do business in the State of California using the Payment Bond form included with the Contract Documents;

2.3 Performance Bond. A performance bond for 100% of the maximum Contract Price, executed by a surety licensed to do business in the State of California using the Performance Bond form included with the Contract Documents; and

2.4 Insurance. The insurance certificate(s) and endorsement(s) required by the Contract Documents, and any other documents required under the Instructions for Bidders.

3. Enforcement. If Bidder fails to execute the Contract and to submit the bonds and insurance certificates as required by the Contract Documents, Surety guarantees that Bidder forfeits the Bond Sum to Owner. Any notice to Surety may be given in the manner specified in the Contract and delivered or transmitted to Surety as follows:

Attn: _____

Address: _____

Owner/State/Zip: _____

Phone: _____

Fax: _____

Email: _____

4. Duration; Waiver. If Bidder fulfills its obligations under Section 2, above, then this obligation will be null and void; otherwise it will remain in full force and effect for 90 days following award of the Contract or until this Bid Bond is returned to Bidder, whichever occurs first. Surety waives the provisions of Civil Code sections 2819 and 2845.

[Signatures are on the following page.]

This Bid Bond is entered into and effective on _____, 20_____.

SURETY: _____
Business name

s/ _____

Name/Title

(Attach Acknowledgement with Notary Seal, and Attorney-In-Fact Certificate)

BIDDER: _____
Business name

s/ _____

Name/Title

END OF BID BOND

Bidder's Questionnaire

NORTH HARBOR BUILDING CONSTRUCTION PROJECT

Within 48 hours following a request by Owner, a bidder must submit to Owner a completed, signed Bidder's Questionnaire using this form and including all required attachments. Owner may request the Questionnaire from one or more of the apparent low bidders following the bid opening, and may use the completed Questionnaire to evaluate a bidder's qualifications for this Project. The Questionnaire must be filled out completely, accurately, and legibly. Any errors, omissions, or misrepresentations in completion of the Questionnaire may be grounds for rejection of the bid or termination of a Contract awarded pursuant to the bid.

Part 1: General Information

Bidder Business Name: _____ ("Bidder")

Check One: Corporation
 Partnership
 Sole Proprietorship

Joint Venture of: _____
 Other: _____

Address: _____

Phone: _____

Owner of Company: _____

Contact Person: _____

Email: _____

Bidder's California Contractor's License Number(s): _____

Part 2: Bidder Experience

1. How many years has Bidder been in business under its present business name? _____ years

2. Has Bidder completed projects similar in type and size to this Project as a general contractor?
 Yes No

3. Has Bidder ever been disqualified on grounds that it is not responsible?
 Yes No

If yes, provide additional information on a separate sheet of paper regarding the disqualification, including the name and address of the agency or owner of the subject project, the type and size of the project, the reasons that Bidder was disqualified as not responsible, and the month and year in which the disqualification occurred.

4. Has Bidder ever been terminated from a construction project, either as a general contractor or as a subcontractor?
 Yes No

If yes, provide additional information on a separate sheet of paper regarding the termination, including the name and address of the agency or owner of the subject project, the type and size of the project, whether Bidder was under contract as a general contractor or a subcontractor, the reasons that Bidder was terminated, and the month and year in which the termination occurred.

5. Provide information about Bidder's past projects performed as general contractor as follows:

5.1 Six most recently completed public works projects within the last three years;

5.2 Three largest completed projects within the last three years; and

5.3 Any project which is similar to this Project.

6. Use separate sheets of paper to provide all of the following information for each project identified in response to the above three categories:

- 6.1 Project name
- 6.2 Location
- 6.3 Owner
- 6.4 Owner contact (name and current phone number)
- 6.5 Architect or engineer name
- 6.6 Architect or engineer contact (name and current phone number)
- 6.7 Project manager (name and current phone number)
- 6.8 Description of project, scope of work performed
- 6.9 Initial contract value (at time of bid award)
- 6.10 Final cost of construction (including change orders)
- 6.11 Original scheduled completion date
- 6.12 Time extensions granted (number of days)
- 6.13 Actual date of completion
- 6.14 Number and amount of stop notices or mechanic's liens filed
- 6.15 Amount of liquidated damages assessed against Bidder
- 6.16 Nature and resolution of any claim, lawsuit, and/or arbitration between Bidder and the owner.

Part 3: Verification

In signing this document, I, the undersigned, declare that I am duly authorized to sign and submit this Bidder's Questionnaire on behalf of the named Bidder, and that all responses and information set forth in this Bidder's Questionnaire and accompanying attachments are, to the best of my knowledge, true, accurate and complete as of the date of submission. **I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.**

Signature: _____ Date: _____

By: _____
Name and Title

END OF BIDDER'S QUESTIONNAIRE

Contract

This public works contract ("Contract") is entered into by and between Moss Landing Harbor District ("Owner") and _____ ("Contractor"), for work on the North Harbor Building Construction Project ("Project").

The parties agree as follows:

1. Award of Contract. In response to the Notice Inviting Bids, Contractor has submitted a Bid Proposal to perform work on the Project. On _____, 20____, Owner authorized award of this Contract to Contractor for the amount of Contractor's bid.

2. Contract Documents. The Contract Documents incorporated into this Contract include and are comprised of all of the following:

- 2.1 Notice Inviting Bids;
- 2.2 Instructions to Bidders;
- 2.3 Addenda, if any;
- 2.4 Bid Proposal and attachments thereto;
- 2.5 Contract;
- 2.6 Payment, Performance and Warranty Bonds;
- 2.7 General Conditions;
- 2.8 Special Conditions and attachments thereto;
- 2.9 Project Drawings and Specifications;
- 2.10 Change Orders, if any;
- 2.11 Notice of Award;
- 2.12 Notice to Proceed; and
- 2.13 The following permits:

United States Army Corps of Engineers
California Coastal Commission
Regional Water Quality Control Board
Monterey County.

3. Contractor's Obligations. Contractor agrees to perform all of the Work required for the Project, as specified in the Contract Documents. Contractor must provide, furnish, and supply all things necessary and incidental for the timely performance and completion of the Work, including all necessary labor, materials, equipment, transportation, and utilities, unless otherwise specified in the Contract Documents. Contractor must use its best efforts to complete the Work in a professional and expeditious manner and to meet or exceed the performance standards required by the Contract Documents.

4. Payment. As full and complete compensation for Contractor's timely performance and completion of the Work in strict accordance with the terms and conditions of the Contract Documents, Owner will pay Contractor \$_____ (the "Contract Price"), in accordance with the payment provisions in the General Conditions.

5. Time for Completion. Contractor will fully complete the Work for the Project within 90 days from the commencement date given in the Notice to Proceed ("Contract Time"). By signing below, Contractor expressly waives any claim for delayed early completion.

6. Liquidated Damages. If Contractor fails to complete the Work within the Contract Time, Owner will assess liquidated damages in the amount of \$1,000.00 per day for each day of

unexcused delay in completion, and such liquidated damages may be deducted from Owner's payments due or to become due to Contractor under this Contract.

7. Labor Code Compliance.

7.1 General. This Contract is subject to Davis-Bacon federal prevailing wage requirements and is all applicable requirements of Chapter 1 of Part 7 of Division 2 of the California Labor Code, including requirements pertaining to wages, working hours and workers' compensation insurance.

7.2 Prevailing Wages. This Project is subject to the prevailing wage requirements applicable to the locality in which the Work is to be performed for each craft, classification or type of worker needed to perform the Work, including employer payments for health and welfare, pension, vacation, apprenticeship and similar purposes. Copies of these prevailing rates are available online at <http://www.dir.ca.gov/DLSR>.

7.3 DIR Registration. Owner will not enter into the Contract with a bidder without proof that the bidder and its Subcontractors are registered with the California Department of Industrial Relations to perform public work under Labor Code section 1725.5, 1771.1 and 1773.3(a) subject to limited legal exceptions.

8. Workers' Compensation Certification. Under Labor Code section 1861, by signing this Contract, Contractor certifies as follows: "I am aware of the provisions of Labor Code section 3700 which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the Work on this Contract."

9. Conflicts of Interest. Contractor, its employees, Subcontractors and agents, may not have, maintain or acquire a conflict of interest in relation to this Contract in violation of any Owner ordinance or policy or in violation of any California law, including under Government Code section 1090 et seq. and under the Political Reform Act as set forth in Government Code section 81000 et seq. and its accompanying regulations. Any violation of this Section constitutes a material breach of the Contract.

10. Independent Contractor. Contractor is an independent contractor under this Contract and will have control of the Work and the manner in which it is performed. Contractor and its Subcontractors are not employees of Owner and are not entitled to participate in any health, retirement, or any other employee benefits from Owner.

11. Notice. Any notice, billing, or payment required by the Contract Documents must be made in writing, and sent to the other party by personal delivery, U.S. Mail, a reliable overnight delivery service, facsimile, or by email as a PDF (or comparable) file. Notice is deemed effective upon delivery unless otherwise specified. Notice for each party must be given as follows:

Owner:

Name: Tommy Razzeca
General Manager/Harbor Master
7881 Sandholdt Road
Moss Landing, CA 95039
(831) 633-5417
mcintyre@mosslandingharbor.dst.ca.us

Contractor:

Name: _____
Address: _____
Owner/State/Zip: _____
Phone: _____
Attn: _____
Email: _____
Copy to: _____

12. General Provisions.

12.1 Assignment and Successors. Contractor may not assign its rights or obligations under this Contract, in part or in whole, without Owner's written consent. This Contract is binding on Contractor's successors and permitted assigns.

12.2 Third Party Beneficiaries. There are no intended third party beneficiaries to this Contract except as expressly provided in the General Conditions or Special Conditions.

12.3 Governing Law and Venue. This Contract will be governed by California law and venue will be in the Superior Court of Monterey County, and no other place.

12.4 Amendment. No amendment or modification of this Contract will be binding unless it is in a writing duly authorized and signed by the parties to this Contract.

12.5 Integration; Severability. This Contract and the Contract Documents incorporated herein, including authorized amendments or Change Orders thereto, constitute the final, complete, and exclusive terms of the agreement between Owner and Contractor. If any provision of the Contract Documents, or portion of a provision, is determined to be illegal, invalid, or unenforceable, the remaining provisions of the Contract Documents will remain in full force and effect.

12.6 Authorization. Each individual signing below warrants that he or she is authorized to do so by the party that he or she represents, and that this Contract is legally binding on that party. If Contractor is a corporation, signatures from two officers of the corporation are required pursuant to California Corporation Code section 313.

[Signatures are on the following page.]

The parties agree to this Contract as witnessed by the signatures below:

OWNER:

Approved as to form:

s/ _____

s/ _____

Name/Title

Name/Title

Date: _____

Date: _____

CONTRACTOR: _____
Business Name

s/ _____

Seal:

Name/Title

Date: _____

s/ _____

Name/Title

Date: _____

Contractor's California License Number(s) and Expiration Date(s)

END OF CONTRACT

Payment Bond

Moss Landing Harbor District ("Owner") and _____ ("Contractor") have entered into a contract, dated _____, 20__ ("Contract") for work on the North Harbor Building Construction Project ("Project"). The Contract is incorporated by reference into this Payment Bond ("Bond").

- 1. General.** Under this Bond, Contractor as principal and _____, its surety ("Surety"), are bound to Owner as obligee in an amount not less than \$ _____, under California Civil Code sections 9550, et seq.
- 2. Surety's Obligation.** If Contractor or any of its Subcontractors fails to pay any of the persons named in California Civil Code section 9100 amounts due under the Unemployment Insurance Code with respect to work or labor performed under the Contract, or for any amounts required to be deducted, withheld, and paid over to the Employment Development Department from the wages of employees of Contractor and its Subcontractors, under California Unemployment Insurance Code section 13020, with respect to the work and labor, then Surety will pay for the same.
- 3. Beneficiaries.** This Bond inures to the benefit of any of the persons named in California Civil Code section 9100, so as to give a right of action to those persons or their assigns in any suit brought upon this Bond. Contractor must promptly provide a copy of this Bond upon request by any person with legal rights under this Bond.
- 4. Duration.** If Contractor promptly makes payment of all sums for all labor, materials, and equipment furnished for use in the performance of the Work required by the Contract, in conformance with the time requirements set forth in the Contract and as required by California law, Surety's obligations under this Bond will be null and void. Otherwise, Surety's obligations will remain in full force and effect.
- 5. Waivers.** Surety waives any requirement to be notified of alterations to the Contract or extensions of time for performance of the Work under the Contract. Surety waives the provisions of Civil Code sections 2819 and 2845. Owner waives requirement of a new bond for any supplemental contract under Civil Code section 9550. Any notice to Surety may be given in the manner specified in the Contract and delivered or transmitted to Surety as follows:

Attn: _____
Address: _____
Owner/State/Zip: _____
Phone: _____
Fax: _____
Email: _____
- 6. Law and Venue.** This Bond will be governed by California law, and any dispute pursuant to this Bond will be venued in the Superior Court of Monterey County in which the Project is located, and no other place. Surety will be responsible for Owner's attorneys' fees and costs in any action to enforce the provisions of this Bond.

7. Effective Date; Execution. This Bond is entered into and is effective on _____, 20___. Three identical counterparts of this Bond, each of which is deemed an original for all purposes, are hereby executed and submitted.

SURETY: _____
Business Name

s/ _____

Name/Title

(Attach Acknowledgment with Notary Seal and Power of Attorney)

CONTRACTOR: _____
Business Name

s/ _____

Name/Title

s/ _____

Name/Title

APPROVED BY OWNER:

s/ _____

Name/Title

END OF PAYMENT BOND

Performance Bond

Moss Landing Harbor District ("Owner") and _____ ("Contractor") have entered into a contract, dated _____, 20____ ("Contract") for work on the North Harbor Building Construction Project ("Project"). The Contract is incorporated by reference into this Performance Bond ("Bond").

- 1. General.** Under this Bond, Contractor as Principal and _____, its surety ("Surety"), are bound to Owner as obligee for an amount not less than \$_____. By executing this Bond, Contractor and Surety bind themselves and their respective heirs, executors, administrators, successors and assigns, jointly and severally, to the provisions of this Bond.
- 2. Surety's Obligations; Waiver.** If Contractor fully performs its obligations under the Contract, including its warranty obligations under the Contract, Surety's obligations under this Bond will become null and void upon recordation of the notice of completion, provided Contractor has timely provided a warranty bond as required under the Contract. Otherwise Surety's obligations will remain in full force and effect until expiration of the one year warranty period under the Contract. Surety waives any requirement to be notified of and further consents to any alterations to the Contract made under the applicable provisions of the Contract Documents, including changes to the scope of Work or extensions of time for performance of Work under the Contract. Surety waives the provisions of Civil Code sections 2819 and 2845.
- 3. Application of Contract Balance.** Upon making a demand on this Bond, Owner will make the Contract Balance available to Surety for completion of the Work under the Contract. For purposes of this provision, the Contract Balance is defined as the total amount payable by Owner to Contractor as the Contract Price minus amounts already paid to Contractor, and minus any liquidated damages, credits, or backcharges to which Owner is entitled under the terms of the Contract.
- 4. Contractor Default.** Upon written notification from Owner that Contractor is in default under Article 13 of the Contract General Conditions, time being of the essence, Surety must act within the time specified in Article 13 to remedy the default through one of the following courses of action:

 - 4.1** Arrange for completion of the Work under the Contract by Contractor, with Owner's consent, but only if Contractor is in default solely due to its financial inability to complete the Work;
 - 4.2** Arrange for completion of the Work under the Contract by a qualified contractor acceptable to Owner, and secured by performance and payment bonds issued by an admitted surety as required by the Contract Documents, at Surety's expense; or
 - 4.3** Waive its right to complete the Work under the Contract and reimburse Owner the amount of Owner's costs to have the remaining Work completed.
- 5. Surety Default.** If Surety defaults on its obligations under the Bond, Owner will be entitled to recover all costs it incurs due to Surety's default, including legal, design professional, or delay costs.
- 6. Notice.** Any notice to Surety may be given in the manner specified in the Contract and delivered or transmitted to Surety as follows:

Attn: _____
Address: _____
Owner/State/Zip: _____
Phone: _____
Fax: _____
Email: _____

7. Law and Venue. This Bond will be governed by California law, and any dispute pursuant to this Bond will be venued in the Superior Court for Monterey County in which the Project is located, and no other place. Surety will be responsible for Owner's attorneys' fees and costs in any action to enforce the provisions of this Bond.

8. Effective Date; Execution. This Bond is entered into and effective on _____, 20____. Three identical counterparts of this Bond, each of which is deemed an original for all purposes, are hereby executed and submitted.

SURETY: _____
Business Name

s/ _____

Name/Title [print]

(Attach Acknowledgment with Notary Seal and Power of Attorney)

CONTRACTOR: _____
Business Name

s/ _____

Name/Title

s/ _____

Name/Title

APPROVED BY OWNER:

s/ _____

Name/Title

END OF PERFORMANCE BOND

Warranty Bond

Moss Landing Harbor District ("Owner") and _____ ("Contractor") have entered into a contract, dated _____, 20____ ("Contract") for work on the North Harbor Building Construction Project ("Project"). The Contract is incorporated by reference into this Warranty Bond ("Bond").

1. **General.** Under this Bond, Contractor as principal and _____, its surety ("Surety"), are bound to Owner as obligee in the maximum amount of 15% of the final Contract Price.
2. **Warranty Period.** The Contract requires Contractor to guarantee its work and that of its Subcontractors on the Project, against defects in materials or workmanship which are discovered during the one year period commencing with recordation of the notice of completion (the "Warranty Period").
3. **Surety's Obligations.** If Contractor faithfully carries out and performs its guarantee under the Contract, and, on due notice from Owner, repairs and make good at its sole expense any and all defects in materials and workmanship in the Project which are discovered during the Warranty Period, or if Contractor promptly reimburses Owner for all loss and damage that Owner sustains because of Contractor's failure to makes such repairs in accordance with the Contract requirements, then Surety's obligations under this Bond will be null and void. Otherwise, Surety's obligations will remain in full force and effect.
4. **Waiver.** Surety waives the provisions of Civil Code sections 2819 and 2845.
5. **Notice.** Any notice to Surety may be given in the manner specified in the Contract and delivered or transmitted to Surety as follows:

Attn: _____
Address: _____
Owner/State/Zip: _____
Phone: _____
Fax: _____
Email: _____

6. **Law and Venue.** This Bond will be governed by California law, and any dispute pursuant to this Bond will be venued in the Superior Court for the County in which the Project is located, and no other place. Surety will be responsible for Owner's attorneys' fees and costs in any action to enforce the provisions of this Bond.
7. **Effective Date; Execution.** This Bond is entered into and is effective on _____, 20_____. Three identical counterparts of this Bond, each of which is deemed an original for all purposes, are hereby executed and submitted.

[Signatures are on the following page.]

SURETY: _____
Business Name

s/ _____

Name/Title [print]

(Attach Acknowledgment with Notary Seal and Power of Attorney)

CONTRACTOR: _____
Business Name

s/ _____

Name/Title

s/ _____

Name/Title

APPROVED BY OWNER:

s/ _____

Name/Title

END OF WARRANTY BOND

General Conditions

Article 1 - Definitions

Definitions. The following definitions apply to all of the Contract Documents unless otherwise indicated. Defined terms and titles of documents are capitalized in the Contract Documents, with the exception of the words "day," "furnish," "including," "install," "work day" or "working day."

Allowance means an amount included in the Bid Proposal for Work that may or may not be included in the Project, depending on conditions that will not become known until after bids are opened. If the Contract Price includes an Allowance and the cost of performing the Work covered by that Allowance is greater or less than the Allowance, the Contract Price will be increased or decreased accordingly.

Article, as used in these General Conditions, means a numbered Article of the General Conditions, unless otherwise indicated by the context.

Change Order means a written document duly approved and executed by Owner, which changes the scope of Work, the Contract Price, or the Contract Time.

Claim means a separate demand by Contractor for a change in the Contract Time or Contract Price, that has previously been submitted to Owner in accordance with the requirements of the Contract Documents, and which has been rejected by Owner, in whole or in part; or a written demand by Contractor objecting to the amount of Final Payment.

Contract means the signed agreement between Owner and Contractor.

Contract Documents means, collectively, all of the documents listed as such in Section 2 of the Contract, including the Notice Inviting Bids; the Instructions to Bidders; addenda, if any; the Bid Proposal, and attachments thereto; the Contract; the notice of award and notice to proceed; the payment, performance and warranty bonds; the General Conditions; the Special Conditions; the Project Drawings and Specifications; any Change Orders; and any other documents expressly made part of the Contract Documents.

Contract Price means the total compensation to be paid to Contractor for performance of the Work, as set forth in the Contract and as amended by Change Order or adjusted for an Allowance. The Contract Price is not subject to adjustment due to inflation or due to the increased cost of labor, material, or equipment following submission of the Bid Proposal.

Contract Time means the number of calendar days for performance of the Work, as set forth in the Contract and as amended by Change Order.

Contractor means the individual, partnership, corporation, or joint-venture that has signed the Contract with Owner to perform the Work.

Day means a calendar day unless otherwise specified.

Design Professional means the licensed individual(s) or firm(s) retained by Owner to provide architectural or engineering services for the Project. If no Design Professional has been retained for this Project, any reference to Design Professional is deemed to refer to the Engineer.

DIR means the California Department of Industrial Relations.

Drawings means the Owner-provided plans and graphical depictions of the Project requirements, and does not include Shop Drawings.

Engineer means the Engineer for Owner and his or her authorized delegee(s) designated to oversee and manage the Project on Owner's behalf.

Extra Work means new or unforeseen work added to the Project, as determined by the Engineer in his or her sole discretion, that: (A) is not covered by Contract unit prices; (B) is not part of or incidental to the scope of the Work when the Contractor's bid was submitted; (C) is substantially different from the Work as described in the Contract Documents at bid time; or (D) results from a substantially differing and unforeseeable Project condition.

Final Completion means Contractor has fully completed all of the Work required by the Contract Documents, including all punch list items, any required commissioning, and has provided all required submittals, including the warranty bond, instructions and manuals, and as-built drawings to Owner's satisfaction.

Final Payment means payment to Contractor of the unpaid Contract Price, including release of undisputed retention, less amounts withheld pursuant to the Contract Documents, including liquidated damages, up to 125% of the amount of any unreleased stop notice, amounts subject to setoff, up to 150% of any unresolved third-party claim for which Contractor is required to indemnify Owner, and up to 150% of any amount in dispute as authorized by Public Contract Code section 7107.

Furnish means to purchase and deliver to the Worksite designated for installation.

Hazardous Materials means any substance or material identified now or in the future as hazardous under any federal, state, or local law or regulation, or any other substance or material that may be considered hazardous or otherwise subject to statutory or regulatory requirements governing handling, disposal, or cleanup.

Including, whether or not capitalized, means "including, but not limited to," unless the context requires otherwise.

Inspector means the individual(s) or firm(s) retained by Owner to inspect the workmanship, materials, and manner of construction of the Project and its components to ensure compliance with the Contract Documents and all applicable codes, regulations, and permits.

Install means to fix in place for materials, and to fix in place and connect for equipment.

Owner means Moss Landing Harbor District, which has entered into the Contract with Contractor for performance of the Work, acting through its Board of Harbor Commissioners, officers, employees, Engineer, and any other authorized representatives.

Plans has the same meaning as Drawings.

Project means the public works project referenced in the Contract.

Project Manager means the individual designated by Owner to oversee and manage the Project on Owner's behalf and may include his or her authorized delegee(s) when the Project Manager is unavailable. If no Project Manager has been designated for this Project, any reference to Project Manager is deemed to refer to the Engineer.

Request for Information or RFI means Contractor's written request for information submitted to Owner, in the manner and format specified by Owner, about the Contract Documents, the Work or the Project.

Section as used in these General Conditions, means a numbered Section of the General Conditions, unless otherwise indicated by the context, e.g., statutory references.

Shop Drawings means drawings, plan details or other graphical depictions prepared by or on behalf of Contractor, and subject to Owner approval, which are intended to provide details for fabrication, installation, and the like, of items required by or shown in the Drawings and Specifications.

Specifications means the technical, text specifications describing the Project requirements, which are prepared for and incorporated into this Project by or on behalf of Owner, and does not include the Contract, General Conditions or Special Conditions.

Subcontractor means an individual, partnership, corporation, or joint-venture retained by Contractor directly or indirectly through a subcontract to perform a specific portion of the Work. The term Subcontractor applies to subcontractors, suppliers, fabricators, and equipment lessors of all tiers, unless otherwise indicated by the context.

Technical Specifications means Specifications.

Work means all of the construction and services necessary for or incidental to completing the Project in conformance with the requirements of the Contract Documents.

Work Day or Working Day, whether or not capitalized, means a weekday which is not a holiday observed by Owner.

Worksite means the place or places where the Work is performed.

Article 2 - Roles and Responsibilities

2.1 Owner.

(A) **Engineer.** The Engineer, acting within the authority conferred by the Board of Commissioners, has primary responsibility for administration of the Project on behalf of Owner, including authority to provide directions to the Design Professional and to Contractor to ensure proper and timely completion of the Project.

(B) **Design Professional.** The Design Professional is responsible for the overall design of the Project and, to the extent authorized by Owner, may act on Owner's behalf to ensure performance of the Work in compliance with the Contract Documents. The Design Professional's interpretation of the Drawings or Specifications is final and conclusive.

2.2 Contractor.

(A) **General.** Contractor must provide all labor, materials, equipment and services necessary to perform and timely complete the Work in strict accordance with the Contract Documents, and in an economic and efficient manner in the best interests of Owner.

(B) **Responsibility for the Work and Risk of Loss.** Contractor is responsible for supervising and directing all aspects of the Work to facilitate the efficient and timely completion of the Work. Contractor is solely responsible for and required to exercise full control over the Work,

including the construction means, methods, techniques, sequences, procedures, and coordination of all portions of the Work with that of all other contractors and Subcontractors, except to the extent that the Contract Documents provide other specific instructions. From the date of commencement of the Work until either the date on which Owner formally accepts the Project or the effective date of termination of the Contract, whichever is later, Contractor bears all risks of injury or damage to the Work and the materials and equipment delivered to the Work site, by any cause including fire, earthquake, wind, weather, vandalism or theft.

(C) **Project Administration.** Contractor must provide sufficient and competent administration, staff, and skilled workforce necessary to perform and timely complete the Work in accordance with the Contract Documents. Before starting the Work, Contractor must designate in writing and provide complete contact information, including telephone numbers and email address, for the officer or employee in Contractor's organization who is to serve as Contractor's primary representative for the Project, and who has authority to act on Contractor's behalf. A Subcontractor may not serve as Contractor's primary representative.

(D) **On-Site Superintendent.** Contractor must, at all times during performance of the Work, provide a qualified and competent full-time superintendent acceptable to Owner, and assistants as necessary, who must be physically present at the Project site while any aspect of the Work is being performed. Owner's approval of the superintendent is required before the Work commences. If Owner is not satisfied with the superintendent's performance, Owner may request a qualified replacement of the superintendent. Failure to comply may result in temporary suspension of the Work, at Contractor's sole expense and with no extension of Contract Time, until the approved superintendent is physically present to supervise the Work. Contractor must provide written notice to Owner, as soon as practicable, before replacing the superintendent.

(E) **Standards; Compliance.** Contractor must, at all times, ensure that the Work is performed in a good, workmanlike manner following best practices and in full compliance with the Contract Documents and all applicable laws, regulations, codes, standards, and permits, including Owner's municipal code, rules, and regulations, and any orders of the administrative or judicial bodies with jurisdiction over the Work.

(F) **Meetings.** Contractor, and the Subcontractors requested by Owner, must attend a Pre-Construction Conference, if requested by Owner, as well as weekly Project progress meetings with Owner that Owner will schedule.

(G) **Responsible Party.** Contractor is solely responsible to Owner for the acts or omissions of any Subcontractor(s), or any other party or parties performing portions of the Work or providing equipment, materials or services for or on behalf of Contractor or the Subcontractors. Owner may, at any time, reasonably request in writing that Contractor remove from the Project, at no cost to Owner, any employee or Subcontractor of Contractor who has proven during the course of the Work to be incompetent, intemperate or disorderly, or who has failed or refused to perform the Work as required under the Contract Documents.

(H) **Correction of Defects.** Contractor must promptly correct, at Contractor's sole expense, any Work that is determined by Owner to be deficient or defective in workmanship, materials, or equipment. Workmanship, materials or equipment that do not conform to the requirements under the Drawings, Specifications and every other Contract Document, as determined by Owner, will be considered defective and subject to rejection. Contractor must also promptly correct, at Contractor's sole expense, any Work performed beyond the lines and grades shown on the Plans or established by Owner, and any Extra Work performed without Owner's prior written approval.

(I) **Contractor's Records.** Contractor must maintain all of its records relating to the Project in any form, including paper documents, photos, videos and electronic records. Project records

subject to this provision include, but are not limited to, Project cost records and records relating to preparation of Contractor's bid.

(1) Contractor's cost records must include all supporting documentation, including original receipts, invoices, and payroll records, evidencing its direct costs to perform the Work, including, but not limited to, costs for labor, materials and equipment. Each cost record should include, at a minimum, a description of the expenditure with references to the applicable requirements of the Contract Documents, the amount actually paid, the date of payment, and whether the expenditure is part of the original Contract Price, related to an executed Change Order, or otherwise categorized by Contractor as Extra Work. Contractor's failure to comply with this provision as to any claimed cost operates as a waiver of any rights to recover the claimed cost.

(2) Contractor must continue to maintain its Project records in an organized manner for a period of four years after Owner's acceptance of the Project or following Contract termination, whichever occurs first. Subject to prior notice to Contractor, Owner is entitled to inspect or audit any of Contractor's Project records relating to the Project or to investigate Contractor's plant or equipment during Contractor's normal business hours.

(J) **Copies of Contract Documents.** Contractor and its Subcontractors must keep copies, at the Project site, of the Work-related documents, including the Contract, Drawings, Specifications, Addenda, Contract amendments, Change Orders, RFIs and RFI responses, approved Shop Drawings, and any related written interpretations. The Contract Documents, as-built drawings, and all Worksite copies must be available to Owner for reference at all times.

2.3 Subcontractors.

(A) **General.** All Work which is not performed by Contractor with its own forces must be performed by Subcontractors. Owner reserves the right to approve or reject any and all Subcontractors proposed to perform the Work. Each Subcontractor must obtain a Owner business license before performing any Work.

(B) **Contractual Obligations.** Contractor must require every Subcontractor to be bound to the provisions of the Contract Documents as they apply to the Subcontractor's portion(s) of the Work, and to likewise bind their subcontractors or suppliers. Nothing in these Contract Documents creates a contractual relationship between a Subcontractor and Owner, but Owner is deemed to be a third-party beneficiary of the contract between Contractor and each Subcontractor.

(C) **Termination.** If the Contract is terminated, each Subcontractor's agreement must be assigned by Contractor to Owner, subject to the prior rights of any surety, provided that Owner accepts the assignment by written notification, and assumes all rights and obligations of Contractor pursuant to each such subcontract agreement.

(D) **Substitution of Subcontractor.** If Contractor requests substitution of a listed Subcontractor under Public Contract Code section 4107, Contractor is solely responsible for all costs Owner incurs in responding to the request, including legal fees and costs to conduct a hearing.

2.4 Coordination of Work.

(A) **Concurrent Work.** Owner reserves the right to perform or to have performed other work on or adjacent to the Project site while the Work is being performed. Contractor is responsible for coordinating its Work with other work being performed on or adjacent to the Project site, including by any utility companies or agencies, and must avoid hindering, delaying, or interfering with the work of other contractors and subcontractors. To the full extent permitted by law, Contractor

must hold harmless and indemnify Owner against any and all claims arising from or related to Contractor's avoidable, negligent, or willful hindrance of, delay to, or interference with the work of any utility company or agency or another contractor or subcontractor.

(B) **Defects.** Before proceeding with any portion of the Work affected by the construction or operations of others, Contractor must give the Project Manager prompt written notification of any defects Contractor discovers which will prevent the proper execution of the Work. Failure to give notice of any such known defects will be deemed acknowledgement by Contractor that the work of others is not defective and will not prevent the proper execution of the Work.

2.5 Submittals. Unless otherwise specified, Contractor must submit to the Project Manager for review and acceptance all schedules, Shop Drawings, samples, product data and similar submittals required by the Contract Documents, or upon request by the Project Manager. Unless otherwise specified, all submittals, including Requests for Information, are subject to the provisions of this Section.

(A) **General.** Contractor is responsible for ensuring that its submittals are accurate and conform to the Contract Documents.

(B) **Time and Manner of Submission.** Contractor must ensure that its submittals are prepared and delivered in a manner consistent with the current Owner-accepted schedule for the Work and within the applicable time specified elsewhere in the Contract Documents, or if no time is specified, in such time and sequence so as not to delay the performance of the Work or completion of the Project.

(C) **Required Contents.** Each submittal must include the Project name and contract number, Contractor's name and address, the name and address of any Subcontractor or supplier involved with the submittal, the date, references to applicable Specification section(s) and/or drawing and detail number(s), and a transmittal letter. Any manufacturer's standard drawings or data sheets must be clearly marked to show the portions of data used. Submittals must include spaces for the Contractor and Owner's review stamps.

(D) **Required Corrections.** If corrections are required, Contractor must promptly make and submit any required corrections as specified in full conformance with the requirements of this Section.

(E) **Effect of Review and Approval.** Review and acceptance of a submittal by Owner will not relieve Contractor from complying with the requirements of the Contract Documents. Contractor is responsible for any errors in any submittal, and review or acceptance of a submittal by Owner is not an assumption of risk or liability by Owner.

(F) **Enforcement.** Any Work performed or material used without Owner's prior acceptance of a required submittal will be performed at Contractor's risk, and Contractor may be required to bear the costs incident thereto, including the cost of removing and replacing such Work, repairs to other affected portions of the Work, and the cost of additional time or services required of Owner, including costs for the Design Professional, Project Manager, or Inspector.

(G) **Excessive RFIs.** A Request for Information (RFI) will be considered excessive or unnecessary if Owner determines that the explanation or response to the RFI is clearly and unambiguously discernable in the Contract Documents. Owner's costs to review and respond to excessive or unnecessary RFI may be deducted from payments otherwise due to Contractor.

2.6 Shop Drawings. When Shop Drawings are required by the Specifications or requested by the Engineer, they must be prepared according to best practices at Contractor's expense. The Shop Drawings must be of a size and scale to show all necessary details. Unless otherwise

specified by Owner, three copies must be provided to the Engineer for review and acceptance at least 30 days before the Work will be performed. If Owner requires changes, three copies of the corrected Shop Drawings must be resubmitted to the Engineer for review and acceptance. For all Project components requiring Shop Drawings, Contractor will not furnish materials or perform any Work until the Shop Drawings for those components are accepted by Owner. Contractor is responsible for any errors and omissions in the Shop Drawings, shop fits and field corrections, any deviations from the Contract Documents, and for the results obtained by the use of Shop Drawings. Acceptance of Shop Drawings by the Owner does not relieve Contractor of such responsibility.

Article 3 - Contract Documents

3.1 Interpretation of Contract Documents.

(A) **Drawings and Specifications.** The Drawings and Specifications included in the Contract Documents are complementary. If Work is shown on one but not on the other, Contractor must perform the Work as though fully described on both, consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results. The Drawings and Specifications are deemed to include and require everything necessary and reasonably incidental to completion of the Work, whether or not particularly mentioned or shown. Contractor must perform all work and services and supply all things reasonably related to and inferable from the Contract Documents. In the event of a conflict between the Drawings and Specifications, the Specifications will control.

(B) **Duty to Notify and Seek Direction.** If Contractor becomes aware of a changed condition in the Project, or of any ambiguity, conflict, inconsistency, discrepancy, omission, or error in the Contract Documents, including under the Drawings or Specifications, Contractor must immediately submit a Request for Information to the Engineer and wait for a response from Owner before proceeding further with the related Work. The RFI must notify Owner of the issue and request clarification, interpretation or direction. The Engineer's clarification, interpretation or direction will be final and binding on Contractor. If Contractor proceeds with the related Work before obtaining Owner's response, Contractor will be responsible for any resulting costs, including the cost of correcting any incorrect or defective Work that results. Owner will not extend the Contract Time due to Contractor's failure to submit a timely RFI to the Engineer.

(C) **Figures and Dimensions.** Figures control over scaled dimensions.

(D) **Technical or Trade Terms.** Any terms that have well-known technical or trade meanings will be interpreted in accordance with those meanings, unless otherwise specifically defined in the Contract Documents.

(E) **Measurements.** Contractor must verify all relevant measurements at the Worksite before ordering any material or performing any Work, and will be responsible for the correctness of those measurements.

3.2 Order of Precedence. Information included in one Contract Document but not in another will not be considered a conflict or inconsistency. Unless otherwise specified in the Special Conditions, in case of any conflict or inconsistency among the Contract Documents, the following order of precedence will apply, beginning from highest to lowest:

- (A) Change Orders;
- (B) Addenda;
- (C) Contract;
- (D) Notice to Proceed;

- (E) Notice of Award;
- (F) Special Conditions;
- (G) General Conditions;
- (H) Payment, Performance and Warranty Bonds;
- (I) Specifications;
- (J) Drawings;
- (K) Contractor's Bid Proposal and attachments;
- (L) Notice Inviting Bids;
- (M) Instructions to Bidders;
- (N) the Owner's standard specifications, as applicable; and
- (O) Any documents prepared by and on behalf of a third party, that were not prepared specifically for this Project, such as the Caltrans Standard Specifications or Caltrans Special Provisions.

3.3 Caltrans Standard Specifications. Any reference to or incorporation of the Standard Specifications of the State of California, Department of Transportation ("Caltrans"), including "Standard Specifications," "Caltrans Specifications," "State Specifications," or "CSS," means the most current edition of Caltrans' Standard Specifications, unless otherwise specified ("Standard Specifications"), including the most current amendments as of the date that Contractor's bid was submitted for this Project. The following provisions apply to use of or reference to the Caltrans Standard Specifications or Special Provisions:

(A) **Limitations.** None of the "General Provisions" of the Caltrans Standard Specifications, i.e., Sections 1 through 9, applies to these Contract Documents with the exception of any specific provisions, if any, which are expressly stated to apply to these Contract Documents.

(B) **Conflicts or Inconsistencies.** If there is a conflict or inconsistency between any provision in the Caltrans Standard Specifications or Special Provisions and a provision of these Contract Documents, as determined by Owner, the provision in the Contract Documents will govern.

(C) **Meanings.** Terms used in the Caltrans Standard Specifications or Special Provisions are to be interpreted as follows:

(1) Any reference to the "Engineer" is deemed to mean the Owner Engineer.

(2) Any reference to the "Special Provisions" is deemed to mean the Special Conditions, unless the Caltrans Special Provisions are expressly included in the Contract Documents listed in Section 2 of the Contract.

(3) Any reference to the "Department" or "State" is deemed to mean Owner.

3.4 For Reference Only. Contractor is responsible for the careful review of any document, study, or report provided by Owner or appended to the Contract Documents solely for informational purposes and identified as "For Reference Only." Nothing in any document, study, or report so appended and identified is intended to supplement, alter, or void any provision of the Contract Documents. Contractor is advised that Owner or its representatives may be guided by information or recommendations included in such reference documents, particularly when making determinations as to the acceptability of proposed materials, methods, or changes in the Work. Any record drawings or similar final or accepted drawings or maps that are not part of the Contract Documents are deemed to be For Reference Only. The provisions of the Contract Documents are not modified by any perceived or actual conflict with provisions in any document that is For Reference Only.

3.5 Plans and Specifications. Any arrangement or division of the Plans and Specifications into sections is for convenience and is not intended to limit the Work required by separate trades. A conclusion presented in the Plans or Specifications is only a recommendation. Actual locations and depths must be determined by Contractor's field investigation. Contractor may request access to underlying or background information in Owner's possession that is necessary for Contractor to form its own conclusions.

3.6 Current Versions. Unless otherwise specified by Owner, any reference to standard specifications, technical specifications, or any Owner or state codes or regulations means the latest specification, code or regulation in effect at the time the Contract is signed.

3.7 Conformed Copies. If Owner prepares a conformed set of the Contract Documents following award of the Contract, it will provide Contractor with two hard copy (paper) sets and one copy of the electronic file in PDF format. It is Contractor's responsibility to ensure that all Subcontractors, including fabricators, are provided with the conformed set of the Contract Documents at Contractor's sole expense.

Article 4 - Bonds, Indemnity, and Insurance

4.1 Payment and Performance Bonds. Within ten days following issuance of the notice of award, Contractor is required to provide a payment bond and a performance bond, each in the penal sum of not less than 100% of the Contract Price, using the bond forms included with the Contract Documents.

(A) **Surety.** Each bond must be issued by a surety admitted in California. If an issuing surety cancels the bond or becomes insolvent, within seven days following written notice from Owner, Contractor must substitute a surety acceptable to Owner. If Contractor fails to substitute an acceptable surety within the specified time, Owner may, at its sole discretion, withhold payment from Contractor until the surety is replaced to Owner's satisfaction, or terminate the Contract for default.

(B) **Supplemental Bonds for Increase in Contract Price.** If the Contract Price increases during construction by five percent or more over the original Contract Price, Contractor must provide supplemental or replacement bonds within ten days of written notice from Owner pursuant to this Section, covering 100% of the increased Contract Price and using the bond forms included with the Contract Documents.

4.2 Indemnity. To the fullest extent permitted by law, Contractor must indemnify, defend, and hold harmless Owner, its agents and consultants, and Design Professional (individually, an "Indemnatee," and collectively the "Indemnitees") from and against any and all liability, loss, damage, claims, expenses (including, without limitation, attorney fees, expert witness fees, paralegal fees, and fees and costs of litigation or arbitration) (collectively, "Liability") of every nature arising out of or in connection with the acts or omissions of Contractor, its employees, Subcontractors, representatives, or agents, in bidding or performing the Work or in failing to comply with any obligation of Contractor under the Contract, except such Liability caused by the active negligence, sole negligence, or willful misconduct of an Indemnatee. This indemnity requirement applies to any Liability arising from alleged defects in the content or manner of submission of Contractor's bid for the Contract. Contractor's failure or refusal to timely accept a tender of defense pursuant to this Contract will be deemed a material breach of the Contract. Owner will timely notify Contractor upon receipt of any third-party claim relating to the Contract, as required by Public Contract Code section 9201. Contractor's indemnity obligations under this Contract will survive the expiration or any early termination of the Contract.

4.3 Insurance. No later than ten days following issuance of the notice of award, Contractor

must procure and provide proof of the insurance coverage required by this Section in the form of certificates and endorsements acceptable to Owner. The required insurance must cover the activities of Contractor and its Subcontractors relating to or arising from the performance of the Work, and must remain in full force and effect at all times during the period covered by the Contract, through the date of Owner's acceptance the Project. All required insurance must be issued by a company licensed to do business in the State of California, and each such insurer must have an A.M. Best's financial strength rating of "A" or better and a financial size rating of "VIII" or better. If Contractor fails to provide any of the required coverage in full compliance with the requirements of the Contract Documents, Owner may, at its sole discretion, purchase such coverage at Contractor's expense and deduct the cost from payments due to Contractor, or terminate the Contract for default. The procurement of the required insurance will not be construed to limit Contractor's liability under this Contract or to fulfill Contractor's indemnification obligations under this Contract.

(A) **Policies and Limits.** The following insurance policies and limits are required for this Contract unless otherwise specified in the Special Conditions:

(1) **Commercial General Liability ("CGL") Insurance:** The CGL insurance policy must be issued on an occurrence basis, written on a comprehensive general liability form, and must include coverage for liability arising from Contractor's or its Subcontractor's acts or omissions in the performance of the Work, including contractor's protected coverage, blanket contractual, completed operations, vehicle coverage and employer's non-ownership liability coverage, with limits of at least \$2,000,000.00 per occurrence and at least \$4,000,000.00 general aggregate. The CGL insurance coverage may be arranged under a single policy for the full limits required or by a combination of underlying policies with the balance provided by excess or umbrella policies, provided each such policy complies with the requirements set forth herein.

(2) **Builder's Risk Insurance:** The builder's risk insurance policy must be issued on an occurrence basis, for all-risk or "all perils" coverage on a 100% completed value basis on the insurable portion of the Project for the benefit of Owner.

(3) **Automobile Liability Insurance:** The automobile liability insurance policy must provide coverage of at least \$1,000,000 combined single-limit per accident for bodily injury, death or property damage.

(4) **Workers' Compensation Insurance and Employer's Liability:** The workers' compensation and employer's liability insurance policy must comply with the requirements of the California Workers' Compensation Insurance and Safety Act, providing coverage of at least \$1,000,000.00 or as otherwise required by the statute. If Contractor is self-insured, Contractor must provide its Certificate of Permission to Self-Insure, duly authorized by the DIR.

(5) **Pollution Liability:** The pollution liability policy must be issued on an occurrence basis, with limits of at least \$500,000.00 per occurrence and at least \$10,000.00 aggregate.

(B) **Notice.** Each certificate of insurance must state that the coverage afforded by the policy or policies will not be reduced, cancelled or allowed to expire without at least 30 days written notice to Owner, unless due to non-payment of premiums, in which case ten days written notice must be made to Owner.

(C) **Waiver of Subrogation.** Each required policy must include an endorsement providing that the carrier agrees to waive any right of subrogation it may have against Owner.

(D) **Required Endorsements.** The CGL policy, the builder's risk policy and the automobile liability policy must include the following specific endorsements:

(1) The Moss Landing Harbor District, including its officers, employees, elected officials, agents and volunteers (collectively, "Additional Insured") must be named as an additional insured for all liability arising out of the operations by or on behalf of the named insured, and the policy must protect the Additional Insured against any and all liability for personal injury, death or property damage or destruction arising directly or indirectly in the performance of the contract.

(2) The inclusion of more than one insured will not operate to impair the rights of one insured against another, and the coverages afforded will apply as though separate policies have been issued to each insured.

(3) The insurance provided is primary and no insurance held or owned by Owner may be called upon to contribute to a loss.

(4) This policy does not exclude explosion, collapse, underground excavation hazard, or removal of lateral support.

(E) **Subcontractors.** Contractor must ensure that each Subcontractor is required to maintain the same insurance coverage required under this Section 4.3, with respect to its performance of Work on the Project, including those requirements related to the additional insureds and waiver of subrogation.

4.4 Warranty Bond. As a condition precedent to Final Completion, Contractor must submit a warranty bond, using the form included with the Contract Documents, to guarantee its Work as specified in Article 11, Completion and Warranty Procedures. The warranty bond must be issued by a surety admitted in California for 15% of the final Contract Price or as otherwise specified in the Contract Documents. If an issuing surety cancels the bond or becomes insolvent, within seven days following written notice from Owner, Contractor must substitute a surety acceptable to Owner.

Article 5 - Contract Time

5.1 Time is of the Essence. Time is of the essence in Contractor's performance and completion of the Work, and Contractor must diligently prosecute the Work and complete it within the Contract Time.

(A) **General.** Contractor must commence the Work on the date indicated in the Notice to Proceed, and must fully complete the Work in strict compliance with all requirements of the Contract Documents and within the Contract Time.

(B) **Rate of Progress.** Contractor and its Subcontractors must, at all times, provide workers, materials, and equipment sufficient to maintain the rate of progress necessary to ensure full completion of the Work within the Contract Time. If Owner determines that Contractor is failing to prosecute the Work at a sufficient rate of progress, Owner may, in its sole discretion, direct Contractor to provide additional workers, materials, or equipment, or to work additional hours or days without additional cost to Owner, in order to achieve a rate of progress satisfactory to Owner. If Contractor fails to comply with Owner's directive in this regard, Owner may, at Contractor's expense, separately contract for additional workers, materials, or equipment or use Owner's own forces to achieve the necessary rate of progress. Alternatively, Owner may terminate the Contract based on Contractor's default.

5.2 Schedule Requirements. All schedules must be prepared using standard scheduling software acceptable to Owner, and must provide schedules in electronic and paper form as requested.

(A) **Baseline (As-Planned) Schedule.** Within ten calendar days following Owner's issuance of the Notice to Proceed (or as otherwise specified in the Special Conditions), Contractor must submit to Owner for review and acceptance a baseline (as-planned) schedule using critical path methodology showing in detail how Contractor plans to perform and fully complete the Work within the Contract Time. The baseline schedule must show the order of the major items of Work and the dates of start and completion of each item, including when the materials and equipment will be procured. The schedule must also include the work of all trades, reflecting anticipated labor or crew hours and equipment loading for the construction activities, and must be sufficiently comprehensive and detailed to enable progress to be monitored on a day-by-day basis. For each activity, the baseline schedule must be dated, provided in the format specified in the Contract Documents or as required by Owner, and must include, at a minimum, a description of the activity, the start and completion dates of the activity, and the duration of the activity.

(1) **Specialized Materials Ordering.** Within five calendar days following issuance of the Notice to Proceed, Contractor must order any specialized material or equipment for the Work that is not readily available from material suppliers. Contractor must also retain documentation of the purchase orders date(s).

(B) **Owner's Review of Schedules.** Owner will review and may note exceptions to the baseline schedule, and to the progress schedules submitted as required below, to assure completion of the Work within the Contract Time. Contractor is solely responsible for resolving any exceptions noted in a schedule and must, within seven days, correct the schedule to address them.

(C) **Progress Schedules.** After Owner accepts the final baseline schedule with no exceptions, Contractor must submit an updated progress schedule and three-week look-ahead schedule, in the format specified by Owner, for review and acceptance with each application for a progress payment, or when otherwise specified by Owner, until completion of the Work. The updated progress schedule must: show how the actual progress of the Work as constructed to date compares to the baseline schedule; reflect any proposed changes in the method of

operations, including to achieve Project milestones within the Contract Time; and identify any actual or potential impacts to the critical path. Contractor must also submit periodic reports to Owner of any changes in the projected material or equipment delivery dates for the Project.

(1) **Float.** The progress schedule must show early and late completion dates for each task. The number of days between those dates will be designated as the "float." Any float belongs to the Project and not to Contractor.

(2) **Failure to Submit Schedule.** Reliable, up-to-date schedules are essential to efficient and cost-effective administration of the Project and timely completion. If Contractor fails to submit a schedule within the time periods specified in this Section, or submits a schedule to which Owner has noted exceptions that are not corrected, Owner may withhold up to ten percent from payment(s) otherwise due to Contractor until the exceptions are resolved, the schedule is corrected and resubmitted, and Owner has accepted the schedule. In addition, Contractor's failure to comply with the schedule requirements in this Section 5.2 will be deemed a waiver of any claims for Excusable Delay or loss of productivity arising when Contractor is out of compliance, subject only to the limits of Public Contract Code section 7102.

(D) **Recovery Schedule.** If Owner determines that the Work is more than one week behind schedule, within seven days following written notice of such determination, Contractor must submit a recovery schedule, showing how Contractor intends to perform and complete the Work within the Contract Time, based on actual progress to date.

(E) **Effect of Acceptance.** Contractor and its Subcontractors must perform the Work in accordance with the most current Owner-accepted schedule unless otherwise directed by Owner. Owner's acceptance of a schedule does not operate to extend the time for completion of the Work or any component of the Work, and will not affect Owner's right to assess liquidated damages for Contractor's unexcused delay in completing the Work within the Contract Time.

(F) **Posting.** Contractor must at all times maintain a copy of the most current Owner-accepted progress or recovery schedule posted prominently in its on-site office.

(G) **Reservation of Rights.** Owner reserves the right to direct the sequence in which the Work must be performed or to make changes in the sequence of the Work in order to facilitate the performance of work by Owner or others, or to facilitate Owner's use of its property. The Contract Time or Contract Price may be adjusted to the extent such changes in sequence actually increase or decrease Contractor's time or cost to perform the Work.

(H) **Authorized Working Days and Times.** Contractor is limited to working Monday through Friday, excluding holidays, during Owner's normal business hours, except as provided in the Special Conditions or as authorized in writing by Owner. Owner reserves the right to charge Contractor for additional costs incurred by Owner due to Work performed on days or during hours not expressly authorized in the Contract Documents, including reimbursement of costs incurred for inspection, testing, and construction management services.

5.3 Delay and Extensions of Contract Time.

(A) **Excusable Delay.** The Contract Time may be extended if Contractor encounters "Excusable Delay," which is an unavoidable delay in completing the Work within the Contract Time due to causes completely beyond Contractor's control, and which Contractor could not have avoided or mitigated through reasonable care, planning, foresight, and diligence. Grounds for Excusable Delay may include fire, natural disasters including earthquake or unusually severe weather, acts of terror or vandalism, epidemic, unforeseeable adverse government actions, unforeseeable actions of third parties, encountering unforeseeable hazardous materials, unforeseeable site conditions, or suspension for convenience under Article 13.

(B) **Non-Excusable Delay.** Delay which Contractor could have avoided or mitigated through reasonable care, planning, foresight and diligence is "Non-Excusable Delay." Contractor is not entitled to an extension of Contract Time or any compensation for Non-Excusable Delay, or for Excusable Delay that is concurrent with Non-Excusable Delay. Non-Excusable Delay includes delay caused by:

(1) weather conditions which are normal for the location of the Project, as determined by reliable records, including monthly rainfall averages, for the preceding ten years;

(2) Contractor's failure to order equipment and materials sufficiently in advance of the time needed for timely completion of the Work;

(3) Contractor's failure to provide adequate notification to utility companies or agencies for connections or services necessary for the timely performance and completion of the Work;

(4) foreseeable conditions which Contractor could have ascertained from reasonably diligent inspection of the Worksite or review of the Contract Documents or other information provided or available to Contractor; or

(5) Contractor's financial inability to perform the Work, including insufficient funds to pay its Subcontractors or suppliers.

(C) **Compensable Delay.** Pursuant to Public Contract Code section 7102, in addition to entitlement to an extension of Contract Time, Contractor is entitled to compensation for costs incurred due to delay caused solely by Owner, when that delay is unreasonable under the circumstances involved and not within the contemplation of the parties ("Compensable Delay"). Contractor is not entitled to an extension of Contract Time or recovery of costs for Compensable Delay that is concurrent with Non-Excusable Delay.

(D) **Recoverable Costs.** Contractor is not entitled to compensation for Excusable Delay unless it is Compensable Delay, as defined above. Contractor is entitled to recover only the actual, direct, reasonable, and substantiated costs ("Recoverable Costs") for each working day that the Compensable Delay prevents Contractor from proceeding with more than 50% of the critical path Work scheduled for that day, based on the most recent progress schedule accepted by Owner. Recoverable Costs will not include home office overhead or lost profit.

(E) **Request for Extension of Contract Time or Recoverable Costs.** A request for an extension of Contract Time or any associated Recoverable Costs must be submitted in writing to Owner within ten calendar days of the date the delay is first encountered, even if the duration of the delay is not yet known at that time, or any entitlement to the Contract Time extension or to the Recoverable Costs will be deemed waived. In addition to complying with the requirements of this Article 5, the request must be submitted in compliance with the Change Order request procedures in Article 6 below. Strict compliance with these requirements is necessary to ensure that any delay or consequences of delay may be mitigated as soon as possible, and to facilitate cost-efficient administration of the Project and timely performance of the Work. Any request for an extension of Contract Time or Recoverable Costs that does not strictly comply with all of the requirements of Article 5 and Article 6 will be deemed waived.

(1) **Required Contents.** The request must include a detailed description of the cause(s) of the delay, and must also describe the measures that Contractor has taken to mitigate the delay and/or its effects, including efforts to mitigate the cost impact of the delay, such as by workforce management or by a change in sequencing. If the delay is still ongoing at the time the request is submitted, the request should also include Contractor's plan for continued mitigation of the delay or its effects.

(2) *Delay Days and Costs.* The request must specify the number of days of Excusable Delay claimed, or provide a realistic estimate if the duration of the delay is not yet known. If Contractor believes it is entitled to Recoverable Costs for Compensable Delay, the request must specify the amount and basis for the Recoverable Costs that are claimed, or provide a realistic estimate if the amount is not yet known. Any estimate of delay duration or cost must be updated in writing and submitted with all required supporting documentation as soon as the actual time and cost is known. The maximum extension of Contract Time will be the number of days, if any, by which an Excusable Delay or a Compensable Delay exceeds any concurrent Non-Excusable Delay. Contractor is entitled to an extension of Contract Time, or compensation for Recoverable Costs, only if, and only to the extent that, such delay will unavoidably delay Final Completion.

(3) *Supporting Documentation.* The request must also include any and all supporting documentation necessary to evidence the delay and its actual impacts, including scheduling and cost impacts with a time impact analysis using critical path methodology and demonstrating the unavoidable delay to Final Completion. The time impact analysis must be submitted in a form or format acceptable to Owner.

(4) *Burden of Proof.* Contractor has the burden of proving that: the delay was an Excusable or Compensable Delay, as defined above; Contractor has made reasonable efforts to mitigate the delay and its schedule and cost impacts; the delay will unavoidably result in delaying Final Completion; and any Recoverable Costs claimed by Contractor were actually incurred and were reasonable under the circumstances.

(5) *Legal Compliance.* Nothing in this Section 5.3 is intended to require the waiver, alteration, or limitation of the applicability of Public Contract Code section 7102.

(6) *No Waiver.* Any grant of an extension of Contract Time, or compensation for Recoverable Costs due to Compensable Delay, will not operate as a waiver of Owner's right to assess liquidated damages for Non-Excusable Delay.

(7) *Dispute Resolution.* In the event of a dispute over entitlement to an extension of Contract Time or compensation for Recoverable Costs, Contractor may not stop working pending resolution of the dispute, but must continue to comply with its duty to diligently prosecute the performance and timely completion of the Work. Contractor's sole recourse for an unresolved dispute based on Owner's rejection of a Change Order request for an extension of Contract Time or compensation for Recoverable Costs is to comply with the Dispute Resolution provisions set forth in Article 12 below.

5.4 Liquidated Damages. It is expressly understood that if Final Completion is not achieved within the Contract Time, Owner will suffer damages from the delay that are difficult to determine and accurately specify. Pursuant to Public Contract Code section 7203, if Contractor fails to achieve Final Completion within the Contract Time, Owner will charge Contractor in the amount specified in the Contract for each day that Final Completion is delayed beyond the Contract Time, as liquidated damages and not as a penalty.

(A) **Liquidated Damages.** Liquidated damages will not be assessed for any Excusable or Compensable Delay, as set forth above.

(B) **Milestones.** Liquidated damages may also be separately assessed for failure to meet milestones specified elsewhere in the Contract Documents.

(C) **Setoff.** Owner is entitled to deduct the amount of liquidated damages assessed against any payments otherwise due to Contractor, including unreleased retention. If there are

insufficient Contract funds remaining to cover the full amount of liquidated damages assessed, Owner is entitled to recover the balance from Contractor or its performance bond surety.

(D) **Occupancy or Use.** Occupancy or use of the Project in whole or in part prior to Final Completion does not constitute Owner's acceptance of the Project and will not operate as a waiver of Owner's right to assess liquidated damages for Contractor's Non-Excusable Delay in achieving Final Completion.

(E) **Other Remedies.** Owner's right to liquidated damages under this Section applies only to damages arising from Contractor's Non-Excusable Delay or failure to complete the Work within the Contract Time. Owner retains its right to pursue all other remedies under the Contract for other types of damage, including damage to property or persons, or for defective materials or workmanship.

Article 6 - Contract Modification

6.1 Contract Modification and Changes in Work. Modifications to the Contract are valid and legally binding only pursuant to a written, duly authorized and signed Change Order. Owner also reserves the right to make changes in the Work without invalidating the Contract. Owner may direct changes in the Work, which may include Extra Work as set forth in subsection (B) below, or deletion or modification of portions of the Work. Any change in the Work, whether directed by Owner or pursuant to Contractor's request for a Change Order under Section 6.2 below, will not be a valid and binding change to the Contract unless it is formalized in a Change Order, which may include commensurate changes in the Contract Price or Contract Time as applicable. Contractor must promptly comply with Owner-directed changes in the Work in accordance with the original Contract Documents, even if Contractor and Owner have not yet reached agreement as to adjustments to the Contract Price or Contract Time for the change in the Work or for the Extra Work.

(A) **Disputes.** In the event of a dispute over entitlement to or the amount of a change in Contract Time or a change in Contract Price related to a Owner-directed change in the Work, Contractor must perform the Work as directed and may not delay its Work or cease Work pending resolution of the dispute, but must continue to comply with its duty to diligently prosecute the performance and timely completion of the Work, including the Work in dispute. In the event that Owner and Contractor dispute whether a portion or portions of the Work are already required by the Contract Documents or constitute Extra Work, or otherwise dispute the interpretation of any portion(s) of the Contract Documents, Contractor must perform the Work as directed and may not delay its Work or cease Work pending resolution of the dispute, but must continue to comply with its duty to diligently prosecute the performance and timely completion of the Work, including the Work in dispute, as directed by Owner. Contractor's sole recourse for an unresolved dispute related to changes in the Work or performance of any Extra Work is to comply with the dispute resolution provisions set forth in Article 12, below.

(B) **Extra Work.** Contractor must promptly perform any Extra Work authorized by Owner in accordance with the original Contract Documents, even if Contractor and Owner have not yet reached agreement on the adjustments to the Contract Price or Contract Time for such work. Contractor must maintain detailed daily records that itemize the cost of each element of Extra Work, and sufficiently distinguish the direct cost of the Extra Work from the cost of other Work performed. Contractor must also provide Owner with summary report(s) of the Extra Work performed and the related costs, together with copies of certified payroll, invoices, and other documentation substantiating the costs. The Engineer will make any adjustments to Contractor's Extra Work report(s) based on the Engineer's records of such Work. When an Extra Work report(s) is agreed on and signed by both Owner and Contractor, the report(s) will become the basis for payment under a duly authorized and signed Change Order.

(C) **Remedy for Non-Compliance.** Contractor's failure to promptly comply with a Owner-directed change is deemed a material breach of the Contract, and in addition to all other remedies available to it, Owner may, at its sole discretion, hire another contractor or use its own forces to complete the disputed Work at Contractor's sole expense, and may deduct the cost from the Contract Price.

6.2 Contractor Change Order Requests. Contractor must submit a request or proposal for a change in the Work or a change in the Contract Price or Contract Time as a written Change Order request or proposal.

(A) **Time for Submission.** Any request for a change in the Contract Price or the Contract Time must be submitted in writing to the Engineer within ten calendar days of the date that Contractor first encounters the circumstances, information or conditions giving rise to the Change Order request, even if the total amount of the requested change in the Contract Price or impact on the Contract Time is not yet known at that time. If Owner requests that Contractor propose the terms of a Change Order, unless otherwise specified in Owner's request, Contractor must provide the Engineer with a written proposal for the change in the Contract Price or Contract Time within five working days of receiving Owner's request, in a form satisfactory to the Engineer.

(B) **Required Contents.** Any Change Order request or proposal submitted by Contractor must include a complete breakdown of actual or estimated costs and credits, and must itemize labor, materials, equipment, taxes, insurance, and subcontract amounts. Any estimated cost must be updated in writing as soon as the actual amount is known.

(C) **Required Documentation.** All claimed costs must be fully documented, and any related request for an extension of time or delay-related costs must be included at that time and in compliance with the requirements of Article 5 of the General Conditions.

(D) **Required Form.** Contractor must use Owner's form(s) for submitting all Change Order requests or proposals, unless otherwise specified by Owner.

(E) **Certification.** All Change Order requests must be signed by Contractor and must include the following certification:

"The undersigned Contractor certifies under penalty of perjury that its statements and representations in this Change Order request are true and correct. Contractor warrants that this Change Order request is comprehensive and complete, and agrees that any costs, expenses, or time extension request not included herein is deemed waived. Contractor understands that submission of claims which have no basis in fact or which Contractor knows to be false may violate the False Claims Act, as set forth in Government Code sections 12650 et seq."

6.3 Adjustments to Contract Price. The amount of any increase or decrease in the Contract Price will be determined based on one of the following methods, but in the order provided:

(A) **Unit Pricing.** Amounts previously provided by Contractor in the form of unit prices, either in a bid schedule or schedule of values, will apply if unit pricing has previously been provided in Contractor's accepted bid schedule or schedule of values for the affected Work. No additional markup for overhead, profit, or other indirect costs will be added to the calculation.

(B) **Lump Sum.** A mutually agreed upon lump sum with no additional markups for overhead, profit, or other indirect costs.

(C) **Time and Materials.** On a time and materials basis, including allowed markup for overhead, profit, and all other indirect costs, and which may include a not-to-exceed limit, calculated as the total of the following sums:

- (1) All direct labor costs plus 15% markup;
- (2) All direct material costs, including sales tax, plus 15% markup;
- (3) All direct plant and equipment rental costs, plus 15% markup;
- (4) All direct subcontract costs plus ten percent markup; and
- (5) Increased bond or insurance premium costs computed at 1.5% of total of the previous four sums.

6.4 Unilateral Change Order. If the parties dispute the terms of a proposed Change Order, including disputes over the amount of compensation or extension of time that Contractor has requested, dispute over the value of deleted or changed Work, or disputes as to quantities used, Owner may elect to issue a unilateral Change Order, directing performance of the Work, and authorizing a change in the Contract Price or Contract Time in the amount Owner believes is merited. Contractor's sole recourse to dispute the terms of a unilateral Change Order is to submit a timely Claim pursuant to Article 12, below.

6.5 Non-Compliance Deemed Waiver. Contractor waives its entitlement to any increase in the Contract Price or Contract Time if Contractor fails to fully comply with the provisions of this Article. Contractor will not be paid for unauthorized Extra Work.

Article 7 - General Construction Provisions

7.1 Permits and Taxes.

(A) **General.** Contractor must obtain and pay for all permits, fees, or licenses required to perform the Work, including a Owner business license. Contractor must cooperate with and provide notifications to all government agencies with jurisdiction over the Project, as may be required. Contractor must provide Owner with copies of all notices, permits, licenses, and renewals required for the Work.

(B) **Federal Excise Tax.** Contractor must pay for all taxes on labor, material and equipment, except Federal Excise Tax to the extent that Owner is exempt from Federal Excise Tax.

7.2 Temporary Facilities. Contractor must provide, at Contractor's sole expense, any and all temporary facilities for the Project, including an onsite staging area for material and equipment, a field office, sanitary facilities, utilities, storage, scaffolds, barricades, walkways, and any other temporary structure required to safely perform the Work along with any utility services incidental thereto.

(A) **Standards.** Such structures must be safe and adequate for the intended use, and installed and maintained in accordance with all applicable federal, state, and local laws, codes, and regulations.

(B) **Screening.** Contractor must fence and screen the Project site and staging area, and its operation must minimize inconvenience to neighboring properties.

(C) **Utilities.** Contractor must install and maintain the light, power, water and all other utilities required for the Project site, including the piping, wiring, lamps and related equipment necessary to perform the Work.

(D) **Removal and Repair.** Contractor must promptly remove all such temporary facilities when they are no longer needed or upon completion of the Work, whichever comes first. Contractor must promptly repair any damage to Owner's property caused by the installation, use, or removal of the temporary facilities, and must promptly restore the property to its original or intended condition.

(E) **Additional Requirements.** Additional provisions pertaining to temporary facilities may be included in the Specifications or Special Conditions.

7.3 Noninterference and Additional Work Areas. Contractor must avoid interfering with Owner's use of its property at or adjacent to the Project site, including use of roadways, entrances, parking areas, walkways, and structures. Contractor must also minimize disruption of access to private property in the Project vicinity. Contractor must coordinate with affected property owners, tenants, and businesses, and maintain some vehicle and pedestrian access to their residences or properties at all times. Temporary access ramps, fencing or other measures must be provided as needed. Before blocking access to a private driveway or parking lot, Contractor must notify the affected parties of the pending closure and allow them to remove vehicles. Private driveways, residences and parking lots must have access to a roadway during non-Work hours.

(A) **Offsite Acquisition.** Unless otherwise provided by Owner, Contractor must acquire, use and dispose of, at its sole expense, any additional Work areas, easements, and temporary facilities necessary to access and perform the Work.

(B) **Offsite Staging Area and Field Office.** If additional space beyond the Project site is needed for the staging area or the field office, Contractor may need to make arrangements with the nearby property owner(s) to secure the space. Before occupying any property owned by a third party, Contractor must provide Owner with a copy of the necessary license agreement, easement, or other written authorization from the property owner, together with a written release from the property owner holding Owner harmless from any related liability.

7.4 Signs. No signs may be displayed on or about Owner's property, except signage which is required by law or by the Contract Documents, without Owner's prior written approval as to size, design, and location.

7.5 Worksite and Nearby Property Protections.

(A) **General.** Contractor is responsible at all times, on a 24-hour basis and at its sole cost, for protecting the Work, the Project site, and the materials and equipment to be incorporated into the Work, until the notice of completion has been recorded. Except as specifically authorized by Owner, Contractor must confine its operations to the area of the Project site indicated in the Drawings. Contractor is liable for any damage caused to the Work, Owner's real or personal property, the real or personal property of adjacent or nearby property owners, and the work or personal property of other contractors working for Owner.

(1) Subject to Owner's approval, Contractor will provide and install safeguards to protect the Work, the Project site, Owner's real or personal property, and the real or personal property of adjacent or nearby property owners.

(2) Owner's wastewater systems may not be interrupted. If the Work disrupts existing sewer facilities, Contractor must immediately notify Owner and establish a plan, subject to Owner's

approval, to convey the sewage in closed conduits back into the sanitary sewer system. Sewage must not be permitted to flow in trenches or be covered by backfill.

(3) Contractor must remove with due care, and store at Owner's request, any objects or material from the Project site that Owner will salvage or reuse at another location(s).

(B) **Securing Project Site.** After completion of Work each day, Contractor must secure the Project site and, to the extent feasible, make the area reasonably accessible to the public unless Owner approves otherwise. All excess materials and equipment not protected by approved traffic control devices must be relocated to the staging area or demobilized. Trench spoils must be hauled off the Project site daily and open excavations must be protected with steel plates. Contractor and Subcontractor personnel may not occupy or use the Project site for any purpose during non-Work hours, except as may be provided in the Contract Documents or pursuant to prior written authorization from Owner.

(C) **Unforeseen Conditions.** If Contractor encounters facilities, utilities, or other unknown conditions not shown on or reasonably inferable from the Drawings or apparent from inspection of the Project site, Contractor must immediately notify the Owner and promptly submit a Request for Information to the Engineer. Contractor must avoid taking any action which could cause damage to the facilities or utilities pending further direction from the Engineer. The Engineer's written response will be final and binding on Contractor. If the Engineer's subsequent direction to Contractor affects Contractor's cost or time to perform the Work, Contractor may submit a Change Order request as set forth in Article 6 above.

(D) **Support; Adjacent Properties.** Contractor must provide, install, and maintain all shoring, bracing, and underpinning necessary to provide support to Owner's property and adjacent properties and improvements thereon. Contractor must provide notifications to adjacent property owners as may be required by law.

7.6 Materials and Equipment.

(A) **General.** Unless otherwise specified, all materials and equipment required for the Work must be new, free from defects, and of the best grade for the intended purpose, and furnished in sufficient quantities to ensure the proper and expeditious performance of the Work. Contractor must employ measures to preserve the specified quality and fitness of the materials and equipment. Unless otherwise specified, all materials and equipment required for the Work are deemed to include all components required for complete installation and intended operation, and must be installed in accordance with the manufacturer's recommendation. Contractor is responsible for all shipping, handling, and storage costs associated with the materials and equipment required for the Work, and is responsible for providing security and protecting the Work and all of the required materials, supplies, tools and equipment at Contractor's sole cost until Owner has formally accepted the Project as set forth in Section 11.1 below. Contractor will not assign, sell, mortgage, or hypothecate any materials or equipment for the Project, or remove any materials or equipment that have been installed or delivered.

(B) **Owner-Provided.** If the Work includes installation of materials or equipment to be provided by Owner, Contractor is solely responsible for the proper examination, handling, storage, and installation of such items in accordance with the Contract Documents. Contractor must promptly notify Owner of any defects discovered in Owner-provided materials or equipment. Contractor is solely responsible for any loss of or damage to such items which occurs while the items are in Contractor's custody and control, the cost of which may be offset from the Contract Price and deducted from any payment(s) due to Contractor.

(C) **Intellectual Property Rights.** Contractor must, at its sole expense, obtain any authorization required for use of patented or copyright protected materials, equipment, devices or

processes that are incorporated into the Work. Contractor's indemnity obligation in Article 4 applies to any claimed violation of intellectual property rights in violation of this provision.

7.7 Substitutions.

(A) **"Or Equal."** Any specification designating a material, product, or thing (collectively, "item") or service by specific brand or trade name, followed by the words "or equal," is intended only to indicate the quality and type of item or service desired, and Contractor may request use of any equal item or service.

(B) **Request for Substitution.** A request for substitution of an item or service must be submitted in writing to the Engineer for approval in advance, within the applicable time period provided in the Contract Documents. If no time period is specified, the substitution request may be submitted any time within 35 days after the date of award of the Contract, or sufficiently in advance of the time needed to avoid delay of the Work, whichever is earlier.

(C) **Substantiation.** Any available data substantiating the proposed substitute as an equal item or service must be submitted with the written request for substitution. Contractor's failure to timely provide all necessary substantiation, including any required test results as soon as they are available, is grounds for rejection of the proposed substitution, without further review.

(D) **Burden of Proving Equality.** Contractor has the burden of proving the equality of the proposed substitution at Contractor's sole cost, including testing using methods acceptable to Owner. Owner has sole discretion to determine whether a proposed substitution is equal, and Owner's determination is final.

(E) **Approval or Rejection.** If the proposed substitution is approved, Contractor is solely responsible for any additional costs or time associated with the substituted item or service. If the proposed substitution is rejected, Contractor must, without delay, install the item or use the service as specified by Owner.

(F) **Contractor's Obligations.** Owner's approval of a proposed substitution will not relieve Contractor from any of its obligations under the Contract Documents. In the event Contractor makes an unauthorized substitution, Contractor will be solely responsible for all resulting cost impacts, including the cost of removal and replacement and the impact to other design elements.

7.8 Testing and Inspection.

(A) **General.** All materials, equipment, and workmanship used in the Work are subject to inspection and testing by Owner at all times and locations during construction and/or fabrication and at any Work site, including at shops and yards as well as at the Project site. All manufacturers' application or installation instructions must be provided to the Inspector at least ten days prior to the first such application or installation. Contractor must, at all times, make the Work available for inspection.

(B) **Scheduling and Notification.** Contractor must cooperate with Owner in coordinating the inspections and testing. Contractor must schedule all tests required by the Contract Documents in time to avoid any delay to the progress of the Work. Contractor must notify the Engineer no later than noon of the Working Day before any inspection or testing, and must provide timely notice to the other necessary parties as specified in the Contract Documents. If Contractor schedules an inspection or test beyond specified Work hours, or on a Saturday, Sunday, or recognized Owner holiday, Contractor must notify the Engineer at least two Working Days in advance for approval. If approved, Contractor must reimburse Owner for the cost of the overtime inspection or testing.

(C) **Responsibility for Costs.** Owner will bear the initial cost of testing to be performed by independent testing consultants retained by Owner, subject to the following exceptions:

(1) Contractor will be responsible for the costs of any subsequent tests which are required to substantiate compliance with the Contract Documents, and any associated remediation costs.

(2) Contractor will be responsible for inspection costs, at Owner's hourly rates, for inspection time lost because the Work is not ready or Contractor fails to appear for a scheduled inspection.

(3) If any portion of the Work that is subject to inspection or testing is covered or concealed by Contractor prior to the inspection or testing, Contractor will bear the cost of making that portion of the Work available for the inspection or testing required by the Contract Documents, and any associated repair or remediation costs.

(4) Contractor is responsible for properly shoring all compaction test sites deeper than five feet below grade, as required under Section 7.15 below.

(5) Any Work or material that is defective or fails to comply with the requirements of the Contract Documents must be promptly repaired, removed, replaced, or corrected by Contractor, at Contractor's sole expense, even if that Work or material was previously inspected or included in a progress payment.

(D) **Contractor's Obligations.** Contractor is solely responsible for any delay occasioned by remediation of defective or noncompliant Work or material. Inspection of the Work does not in any way relieve Contractor of its obligations to perform the Work as specified. Any Work done without the required inspection(s) will also be subject to rejection by Owner. Contractor is responsible for delivering any required certificates of inspection to the Owner.

(E) **Distant Locations.** If required off-site testing or inspection must be conducted at a location more than 100 miles from the Project site, Contractor is solely responsible for the additional travel costs required for testing and/or inspection at such locations.

(F) **Final Inspection.** The provisions of this Section 7.8 apply to final inspection under Article 11, Completion and Warranty Provisions.

7.9 Worksite Maintenance and Operation. Contractor must at all times, on a 24 hour basis and at its sole cost, maintain the Project site and staging and storage areas in clean and neat condition and in compliance with all regulatory requirements for air quality and dust control. Contractor must also, on a daily basis and at its sole cost, remove and properly dispose of the debris and waste materials from the Project site. Project site maintenance expenses are deemed to have been included in Contractor's Bid Proposal.

(A) **Air Emissions Control.** Contractor must not discharge smoke or other air contaminants into the atmosphere in violation of any applicable law, regulation or rule.

(B) **Dust and Debris.** Contractor must minimize and confine dust and debris resulting from the Work. Contractor must abate dust nuisance by cleaning, sweeping, and immediately sprinkling with water excavated areas of dirt or other materials prone to cause dust, and within one hour after the Engineer notifies Contractor that an airborne nuisance exists. The Engineer may direct that Contractor provide an approved water-spraying truck for this purpose. If the Engineer determines that the dust control is not adequate, Owner may have the work done by others and deduct the cost from the Contract Price. Contractor will immediately remove any excess excavated material from the Worksite and any dirt deposited on public streets.

(C) **Clean up.** Before discontinuing Work in an area, Contractor must clean the area and remove all rubbish and debris along with the construction equipment, tools, machinery, waste and surplus materials.

(1) Except as otherwise specified, all excess Project materials, and the materials removed from existing improvements on the Project site with no salvage value or intended reuse by Owner, will be Contractor's property.

(2) Hauling trucks and other vehicles leaving the Project site must be cleaned of exterior mud or dirt before traveling on Owner streets. Materials and loose debris must be delivered and loaded to prevent dropping materials or debris. Contractor must immediately remove spillage from hauling on any publicly traveled way. Streets affected by Work on the Project must be kept clean by street sweeping.

(D) **Disposal.** Contractor must dispose of all Project debris and waste materials in a safe and legal manner. Contractor may not burn or bury waste materials on the Project site. Contractor will not allow any dirt, refuse, excavated material, surplus concrete or mortar, or any associated washings, to be disposed of onto streets, into manholes or into Owner's storm drain system.

(E) **Completion.** At the completion of the Work, Contractor must remove from the Worksite all of its equipment, tools, surplus materials, waste materials and debris, presenting a clean and neat appearance. Before demobilizing from the Worksite, Contractor must ensure that all surfaces are cleaned, sealed, waxed, or finished as applicable, and that all marks, stains, paint splatters, and the like have been properly removed from the completed Work and the surrounding areas. Contractor must ensure that all parts of the construction are properly joined with the previously existing and adjacent improvements and conditions. Contractor must provide all cutting, fitting and patching needed to accomplish that requirement. Contractor must also repair or replace all existing improvements that are damaged or removed during the Work, both on and off the Project site, including curbs, sidewalks, driveways, fences, signs, utilities, street surfaces and structures. Repairs and replacements must be at least equal to the previously existing improvements, and the condition, finish and dimensions must match the previously existing improvements.

(F) **Non-Compliance.** If Contractor fails to comply with its maintenance and cleanup obligations or any Owner clean up order, Owner may, acting in its sole discretion, elect to suspend the Work until the condition(s) is corrected with no increase in the Contract Time or Contract Price, or undertake appropriate cleanup measures without further notice and the cost will be deducted from any amounts due or to become due to Contractor.

7.10 Instructions and Manuals. Contractor must provide to Owner three copies each of all instructions and manuals required by the Contract Documents, unless otherwise specified. These must be complete as to drawings, details, parts lists, performance data, and other information that may be required for Owner to easily maintain and service the materials and equipment installed for this Project.

(A) **Submittal Requirements.** All manufacturers' application or installation instructions must be provided to Owner at least ten days prior to the first such application. The instructions and manuals, along with any required guarantees, must be delivered to Owner for review.

(B) **Instruction of Personnel.** Contractor or its Subcontractors must instruct Owner's personnel in the operation and maintenance of any complex equipment as a condition precedent to Final Completion, if required in the Contract Documents.

7.11 As-built Drawings. Contractor and its Subcontractors must maintain at the Project site a separate complete set of the Drawings which will be used solely for the purpose of recording

changes made in any portion of the Work in order to create accurate record drawings at the end of the Project.

(A) **Duty to Update.** The as-built drawings must be updated as changes occur, on a daily basis if necessary. Progress payments may be delayed, in whole or in part, until the as-built drawings are brought up to date to the satisfaction of Owner. Actual locations to scale must be identified on the as-built drawings for all runs of mechanical and electrical work, including all site utilities installed underground, in walls, floors, or otherwise concealed. Deviations from the original Drawings must be shown in detail. The location of all main runs, whether piping, conduit, ductwork or drain lines, must be shown by dimension and elevation.

(B) **Final Completion.** Contractor must verify that all changes in the Work are depicted in the as-built drawings and must deliver the complete set of as-built drawings to Owner for review and approval as a condition precedent to Final Completion.

7.12 Existing Utilities. As required by Government Code section 4215, if, during the performance of the Work, Contractor discovers utility facilities not identified by Owner in the Contract Documents, Contractor must immediately provide written notice to Owner and the utility. Owner assumes responsibility for the timely removal, relocation, or protection of existing main or trunkline utility facilities located on the Project site if those utilities are not identified in the Contract Documents. Contractor will be compensated in accordance with the provisions of the Contract Documents for the costs of locating, repairing damage not due to Contractor's failure to exercise reasonable care, and removing or relocating such utility facilities not indicated in the Drawings or Specifications with reasonable accuracy, and for equipment on the Project necessarily idled during such work. Contractor will not be assessed liquidated damages for delay in completion of the Work, to the extent such delay was caused by Owner's failure to provide for removal or relocation of the utility facilities.

7.13 Notice of Excavation. Government Code section 4216.2 requires that, except in an emergency, Contractor must contact the appropriate regional notification center, or Underground Services Alert, at least two working days but not more than 14 calendar days before starting any excavation if the excavation will be conducted in an area that is known, or reasonably should be known, to contain subsurface installations, and, if practical, Contractor must delineate with white paint or other suitable markings the area to be excavated.

7.14 Trenching and Excavations of Four Feet or More. As required by Public Contract Code section 7104, if the Work includes digging trenches or other excavations that extend deeper than four feet below the surface, the following provisions in this Section apply to the Work and the Project.

(A) **Duty to Notify.** Contractor must promptly, and before the following conditions are disturbed, provide written notice to Owner if Contractor finds any of the following conditions:

(1) Material that Contractor believes may be a 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;

(2) Subsurface or latent physical conditions at the Worksite differing from those indicated by information about the Worksite made available to bidders prior to the deadline for submitting bids; or

(3) Unknown physical conditions at the Worksite of any unusual nature, materially different from those ordinarily encountered and generally recognized as inherent in work of the character required by the Contract Documents.

(B) **Owner Investigation.** Owner will promptly investigate the conditions and if Owner finds that the conditions do materially differ or do involve hazardous waste, and cause a decrease or increase in Contractor's cost of, or the time required for, performance of any part of the Work, Owner will issue a Change Order.

(C) **Disputes.** In the event that a dispute arises between Owner and Contractor regarding any of the conditions specified in subsection (A) above, Contractor will not be excused from any scheduled completion date provided for in the Contract Documents, but must proceed with all Work to be performed under the Contract. Contractor will retain any and all rights provided either by the Contract or by law which pertain to the resolution of disputes between Contractor and Owner.

7.15 Trenching of Five Feet or More. As required by Labor Code section 6705, if the Contract Price exceeds \$25,000 and the Work includes the excavation of any trench or trenches of five feet or more in depth, a detailed plan must be submitted to Owner for acceptance in advance of the excavation. The detailed plan must show the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation. If the plan varies from the shoring system standards, it must be prepared by a California registered civil or structural engineer. Use of a shoring, sloping, or protective system less effective than that required by the Construction Safety Orders is prohibited.

7.16 New Utility Connections. Owner will pay connection charges and meter costs for new permanent utilities required by the Contract Documents, if any. Contractor must notify Owner sufficiently in advance of the time needed to request service from each utility provider so that connections and services are initiated in accordance with the Project schedule.

7.17 Lines and Grades. Contractor is required to use any benchmark provided by the Engineer. Unless otherwise specified in the Contract Documents, Contractor must provide all lines and grades required to execute the Work. Contractor must also provide, preserve, and replace if necessary, all construction stakes required for the Project. All stakes or marks must be set by a California licensed surveyor or a California registered civil engineer. Contractor must notify the Engineer of any discrepancies found between Contractor's staking and grading and information provided by the Contract Documents. Upon completion, all Work must conform to the lines, elevations, and grades shown in the Plans.

7.18 Historic or Archeological Items.

(A) **Contractor's Obligations.** Contractor must ensure that all persons performing Work at the Project site are required to immediately notify the Project Manager, upon discovery of any potential historic or archeological items, including historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological site, including fossilized footprints or other archeological, paleontological or historical feature on the Project site (collectively, "Historic or Archeological Items").

(B) **Discovery; Cessation of Work.** Upon discovery of any potential Historic or Archeological Items, Work must be stopped within an 85-foot radius of the find and may not resume until authorized in writing by Owner. If required by Owner, Contractor must assist in protecting or recovering the Historic or Archeological Items, with any such assistance to be compensated as Extra Work on a time and materials basis under Article 6, Contract Modification. Any suspension of Work required due to discovery of Historic or Archeological Items will be treated as a suspension for convenience under Article 13.

7.19 Environmental Control. Contractor must not pollute any drainage course or its tributary inlets with fuels, oils, bitumens, acids, insecticides, herbicides or other harmful materials. Contractor must prevent the release of any hazardous material or hazardous waste into the soil

or groundwater, and prevent the unlawful discharge of pollutants into Owner's storm drain system as required below. Contractor and its Subcontractors must at all times in the performance of the Work comply with all applicable federal, state, and local laws and regulations concerning pollution of waterways.

(A) **Stormwater Permit.** Contractor must comply with all applicable conditions of the State Water Resources Control Board National Pollutant Discharge Elimination System General Permit for Waste Discharge Requirements for Discharges of Stormwater Runoff Associated with Construction Activity ("Stormwater Permit").

(B) **Contractor's Obligations.** If required for the Work, a copy of the Stormwater Permit is on file in Owner's principal administrative offices, and Contractor must comply with the same without adjustment of the Contract Price or the Contract Time. Contractor must timely and completely submit required reports and monitoring information required by the conditions of the Stormwater Permit. Contractor also must comply with all other applicable state, municipal or regional laws, ordinances, rules or regulations governing discharge of stormwater, including applicable municipal stormwater management programs.

7.20 Noise Control. Contractor must comply with all applicable noise control laws, ordinances, regulations and rules. Noise control requirements apply to all equipment used for the Work or related to the Work, including trucks, transit mixers or transient equipment that may or may not be owned by Contractor.

Article 8 - Payment

8.1 Schedule of Values. Prior to submitting its first application for payment, Contractor must prepare and submit to the Project Manager a schedule of values apportioned to the various divisions and phases of the Work, including mobilization and demobilization. If a Bid Schedule was submitted with Contractor's bid, the amounts must be consistent with the Bid Schedule. Each line item contained in the schedule of values must be assigned a value such that the total of all items equals the Contract Price. The items must be sufficiently detailed to enable accurate evaluation of the percentage of completion claimed in each application for payment, and the assigned value consistent with any itemized or unit pricing submitted with Contractor's bid.

(A) **Measurements for Unit Price Work.** Materials and items of Work to be paid for on the basis of unit pricing will be measured according to the methods stipulated in the Contract Documents.

(B) **Deleted or Reduced Work.** Contractor will not be compensated for Work that Owner has deleted or reduced in scope, except for any labor, material or equipment costs for such Work that Contractor reasonably incurred before Contractor learned that the Work could be deleted or reduced. Contractor will only be compensated for those actual, direct and documented costs incurred, and will not be entitled to any mark up for overhead or lost profits.

8.2 Progress Payments. Following the last day of each month, or as otherwise required by the Special Conditions or Specifications, Contractor will submit to the Project Manager a monthly application for payment for Work performed during the preceding month based on the estimated value of the Work performed during that preceding month.

(A) **Application for Payment.** Each application for payment must be itemized to include labor, materials, and equipment incorporated into the Work, and materials and equipment delivered to the Worksite, as well as authorized and approved Change Orders. Each pay application must be supported by Contractor's Bid Schedule or schedule of values and any other substantiating data required by the Contract Documents.

(B) **Payment of Undisputed Amounts.** Owner will pay the undisputed amount due within thirty (30) days after Contractor has submitted a complete and accurate payment application, subject to Public Contract Code section 20104.50. Owner will deduct a percentage from each progress payment as retention, as set forth in Section 8.5, below, and may withhold additional amounts as set forth in Section 8.3, below.

8.3 Adjustment of Payment Application. Owner may adjust the amount requested, withhold disputed sums, or reject a payment application, including application for Final Payment, in whole or in part, based upon any of the circumstances and amounts listed below. Contractor will be notified in writing of the basis for the modification to the amount requested, and will be released when the basis for that modification has been remedied and no longer exists.

(A) Contractor's unexcused failure to perform the Work as required by the Contract Documents, including correction or completion of punch list items in an amount based on the Owner's estimated cost to correct or complete the Work;

(B) Loss or damage caused by Contractor or its Subcontractor(s) arising out of or relating to performance of the Work or any failure to protect the Worksite based on the amount to repair or replace;

(C) Contractor's failure to pay its Subcontractors and suppliers when payment is due;

- (D) Contractor's failure to timely correct rejected, nonconforming, or defective Work in an amount based on the Owner's estimated cost to correct or complete the Work;
- (E) Any unreleased stop notice, retained as 125% of the amount claimed;
- (F) Contractor's failure to submit any required schedule or schedule update in the manner and within the time specified in the Contract Documents in an amount equal to five percent of the total amount requested;
- (G) Contractor's failure to maintain or submit as-built documents in the manner and within the time specified in the Contract Documents, in an amount based on the Owner's continued cost to prepare the as-builts;
- (H) Work performed without approved Shop Drawings, when approved Shop Drawings are required before proceeding with the Work, in an amount based on the costs to correct unsatisfactory work or diminution in value;
- (I) Fines assessed under the Labor Code; or
- (J) Any other costs or charges that may be offset against payments due, as provided in the Contract Documents, including liquidated damages.

8.4 Acceptance of Work. Neither Owner's payment of progress payments nor its partial or full use or occupancy of the Project constitutes acceptance of any part of the Work.

8.5 Retention. Owner will retain five percent of the amount due on each progress payment, or the percentage stated in the Notice Inviting Bids, whichever is greater, as retention to ensure full and satisfactory performance of the Work.

(A) **Substitution of Securities.** As provided by Public Contract Code section 22300, Contractor may request in writing that it be allowed, at its sole expense, to substitute securities for the retention withheld by Owner. Any escrow agreement entered into pursuant to this provision must fully comply with Public Contract Code section 22300, and will be subject to approval as to form by Owner's legal counsel.

(B) **Release of Undisputed Retention.** All undisputed retention, less any amounts that may be assessed as liquidated damages, retained for stop notices, or otherwise withheld under Section 8.3 or Section 8.6, will be released as Final Payment to Contractor no sooner than 35 days following recordation of the notice of completion, and no later than 60 days following acceptance of the Project by Owner's governing body or authorized designee pursuant to Section 11.1(E) below, or, if the Project has not been accepted, no later than 60 days after the Project is otherwise considered complete under Public Contract Code section 7107(c).

8.6 Setoff. Owner is entitled to set off any amounts due from Contractor against any payments due to Contractor. Owner's entitlement to setoff includes progress payments as well as Final Payment and unreleased retention.

8.7 Payment to Subcontractors and Suppliers. Each month, Contractor must promptly pay each Subcontractor and supplier the value of the portion of labor, materials, and equipment incorporated into the Work or delivered to the Worksite by the Subcontractor or supplier during the preceding month. Such payments must be made in accordance with the requirements of the law, and those of the Contract Documents and applicable subcontract or supplier contract.

(A) **Withholding for Stop Notice.** Pursuant to Civil Code section 9358, Owner will withhold 125% of the amount claimed by an unreleased stop notice, a portion of which may be retained by

Owner for the costs incurred in handling the stop notice claim, including attorneys' fees and costs, as authorized by law.

(B) **Joint Checks.** Owner reserves the right to issue joint checks made payable to Contractor and its Subcontractors or suppliers. As a condition to release of payment by a joint check, the joint check payees may be required to execute a joint check agreement in a form provided or approved by Owner. The joint check payees will be jointly and severally responsible for the allocation and disbursement of funds paid by joint check. Payment by joint check will not be construed to create a contractual relationship between Owner and a Subcontractor or supplier of any tier beyond the scope of the joint check agreement.

8.8 Final Payment. Contractor's application for Final Payment must comply with the requirements for submitting an application for a progress payment as stated in Section 8.2, above. Corrections to previous progress payments, including adjustments to estimated quantities for unit priced items, may be included in the Final Payment. The date of Final Payment is deemed to be effective on the date that Owner acts to release undisputed retention as final payment to Contractor, or otherwise provides written notice to Contractor of Final Payment. If the amount due from Contractor to Owner exceeds the amount of Final Payment, Owner retains the right to recover the balance from Contractor or its sureties.

8.9 Release of Claims. Owner may, at any time, require that payment of the undisputed portion of any progress payment or Final Payment be contingent upon Contractor furnishing Owner with a written release of all claims against Owner arising from or related to the portion of Work covered by those undisputed amounts in accordance with Civil Code section 8120 et seq. Any disputed amounts may be specifically excluded from the release.

8.10 Warranty of Title. Contractor warrants that title to all work, materials, or equipment incorporated into the Work and included in a request for payment will pass over to Owner free of any claims, liens, or encumbrances upon payment to Contractor.

Article 9 - Labor Provisions

9.1 Discrimination Prohibited. Discrimination against any prospective or present employee engaged in the Work on grounds of race, color, ancestry, national origin, ethnicity, religion, sex, sexual orientation, age, disability, or marital status is strictly prohibited. Contractor and its Subcontractors are required to comply with all applicable federal and California laws, including the California Fair Employment and Housing Act (Government Code sections 12900 et seq.), Government Code section 11135, and Labor Code sections 1735, 1777.5, 1777.6, and 3077.5.

9.2 Labor Code Requirements.

(A) **Eight Hour Day.** Under Labor Code section 1810, eight hours of labor constitute a legal day's work under this Contract.

(B) **Penalty.** Under Labor Code section 1813, Contractor will forfeit to Owner as a penalty, the sum of \$25.00 for each day during which a worker employed by Contractor or any Subcontractor is required or permitted to work more than eight hours in any one calendar day or more than 40 hours per calendar week, except if such workers are paid overtime under Labor Code section 1815.

(C) **Apprentices.** Contractor is responsible for compliance with the requirements governing employment and payment of apprentices, as set forth in Labor Code section 1777.5, which is fully incorporated by reference.

(D) **Notices.** Under Labor Code section 1771.4, Contractor is required to post all job site notices prescribed by law or regulation.

9.3 Prevailing Wages. Each worker performing Work under this Contract that is covered under Labor Code section 1720 or 1720.9, including cleanup at the Project site, must be paid at a rate not less than the prevailing wage as defined in sections 1771 and 1774 of the Labor Code. The prevailing wage rates are available online at <http://www.dir.ca.gov/dlsr>. Contractor must post a copy of the applicable prevailing rates at the Worksite.

(A) **Penalties.** Under Labor Code section 1775, Contractor and any Subcontractor will forfeit to Owner as a penalty up to \$200.00 for each calendar day, or portion a day, for each worker paid less than the applicable prevailing wage rate. Contractor must also pay each worker the difference between the applicable prevailing wage rate and the amount actually paid to that worker.

(B) **Federal Requirements.** This Project is subject to federal prevailing wage requirements under the Davis-Bacon Act in addition to California prevailing wage requirements. Contractor and its Subcontractors are required to pay the higher of the current applicable prevailing wage rates under federal law, available online at <http://www.access.gpo.gov/davisbacon/ca.html>.

9.4 Payroll Records. Contractor must comply with the provisions of Labor Code sections 1776 and 1812 and all implementing regulations, which are fully incorporated by this reference, including requirements for electronic submission of payroll records. Contractor must also comply with payroll record requirements under the Davis-Bacon Act.

(A) **Contractor and Subcontractor Obligations.** Contractor and each Subcontractor must keep accurate payroll records, showing the name, address, social security number, work classification, 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 in connection with the Work. Each payroll record must contain or be verified by a written declaration that it is made under penalty of perjury, stating both of the following:

(1) The information contained in the payroll record is true and correct; and

(2) Contractor or the Subcontractor has complied with the requirements of Labor Code sections 1771, 1811, and 1815 for any Work performed by its employees on the Project.

(B) **Certified Record.** A certified copy of an employee's payroll record must be made available for inspection or furnished to the employee or his or her authorized representative on request, to Owner, to the Division of Labor Standards Enforcement, to the Division of Apprenticeship Standards of the DIR, and as further required by the Labor Code.

(C) **Enforcement.** Upon notice of noncompliance with Labor Code section 1776, Contractor or Subcontractor has ten days in which to comply with requirements of this section. If Contractor or Subcontractor fails to do so within the ten day period, Contractor or Subcontractor will forfeit a penalty of \$100.00 per day, or portion a day, for each worker for whom compliance is required, until strict compliance is achieved. Upon request by the Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement, these penalties will be withheld from progress payments then due.

9.5 Labor Compliance. Under Labor Code section 1771.4, the Contract for this Project, if awarded on or after January 15, 2015, is subject to compliance monitoring and enforcement by the DIR.

Article 10 - Safety Provisions

10.1 Safety Precautions and Programs. Contractor and its Subcontractors are fully responsible for safety precautions and programs, and for the safety of persons and property in the performance of the Work. Contractor and its Subcontractors must comply with all applicable safety laws, rules and regulations and seek to avoid injury, loss, or damage to persons or property by taking reasonable steps to protect its employees and other persons at the Worksite, materials and equipment stored on or off site, and property at or adjacent to the Worksite.

(A) **Reporting Requirements.** Contractor must immediately provide a written report to Owner of all recordable accidents and injuries occurring at the Worksite. If Contractor is required to file an accident report with a government agency, Contractor will provide a copy of the report to Owner.

(B) **Legal Compliance.** Contractor's safety program must comply with the applicable legal and regulatory requirements. Contractor must provide Owner with copies of all notices required by law or regulation.

(C) **Contractor's Obligations.** Any damage or loss caused by Contractor arising from the Work which is not insured under property insurance must be promptly remedied by Contractor.

(D) **Remedies.** If Owner determines, in its sole discretion, that any part of the Work or Worksite is unsafe, Owner may, without assuming responsibility for Contractor's safety program, require Contractor or its Subcontractor to cease performance of the Work or to take corrective measures to Owner's satisfaction. If Contractor fails to promptly take the required corrective measures, Owner may perform them and deduct the cost from the Contract Price. Contractor agrees it is not entitled to submit a Claim for damages, for an increase in Contract Price, or for a change in Contract Time based on Contractor's compliance with Owner's request for corrective measures pursuant to this provision.

10.2 Hazardous Materials. Unless otherwise specified in the Contract Documents, this Contract does not include the removal, handling, or disturbance of any asbestos or other Hazardous Materials. If Contractor encounters materials on the Worksite that Contractor reasonably believes to be asbestos or other Hazardous Materials, and the asbestos or other Hazardous Materials have not been rendered harmless, Contractor may continue Work in unaffected areas reasonably believed to be safe, but must immediately cease work on the area affected and report the condition to Owner. No asbestos, asbestos-containing products or other Hazardous Materials may be used in performance of the Work.

10.3 Material Safety. Contractor is solely responsible for complying with section 5194 of Title 8 of the California Code of Regulations, including by providing information to Contractor's employees about any hazardous chemicals to which they may be exposed in the course of the Work. A hazard communication program and other forms of warning and training about such exposure must be used. Contractor must also maintain Material Safety Data Sheets ("MSDS") at the Worksite, as required by law, for materials or substances used or consumed in the performance of the Work. The MSDS will be accessible and available to Contractor's employees, Subcontractors, and Owner.

(A) **Contractor Obligations.** Contractor is solely responsible for the proper delivery, handling, use, storage, removal, and disposal of all materials brought to the Worksite and/or used in the performance of the Work. Contractor must notify the Engineer if a specified product or material cannot be used safely.

(B) **Labeling.** Contractor must ensure proper labeling on any material brought onto the Worksite so that any persons working with or in the vicinity of the material may be informed as to

the identity of the material, any potential hazards, and requirements for proper handling, protections, and disposal.

10.4 Hazardous Condition. Contractor is solely responsible for determining whether a hazardous condition exists or is created during the course of the Work, involving a risk of bodily harm to any person or risk of damage to any property. If a hazardous condition exists or is created, Contractor must take all precautions necessary to address the condition and ensure that the Work progresses safely under the circumstances. Such conditions may result from, but are not limited to, use of specified materials or equipment, the Work location, the Worksite condition, the method of construction, or the way any Work must be performed.

Article 11 - Completion and Warranty Provisions

11.1 Final Completion.

(A) **Final Inspection.** When the Work required by this Contract is fully performed, Contractor must provide written notification to Owner requesting final inspection. Based on that inspection, Owner will prepare a punch list of items that are incomplete, incorrectly installed, or not operating as required by the Contract Documents. The omission of any such item from this punch list will not relieve Contractor from fulfilling all requirements of the Contract Documents.

(B) **Punch List.** Owner will deliver the punch list to Contractor and will specify the time by which all of the punch list items must be completed or corrected. The punch list may include Owner's estimated cost to complete each punch list item if Contractor fails to do so within the specified time.

(C) **Requirements for Final Completion.** Final Completion will be achieved upon completion or correction of all punch list items, as verified by Owner inspection, and upon satisfaction of all other Contract requirements, including any commissioning required under the Contract Documents and submission of all final submittals, including a warranty bond as required under Section 4.4, instructions and manuals as required under Section 7.10, and as-built drawings as required under Section 7.11, all to Owner's satisfaction.

(D) **Acceptance.** Following Final Completion, the Project will be considered accepted only after the Board of Commissioners takes action during a public meeting to accept the Project. If the Board of Commissioners authorizes the Engineer to accept the Project, the Project will be considered accepted upon the Engineer's issuance of a written notice of acceptance.

(E) **Final Payment.** Final Payment and release of retention, less any sums withheld pursuant to the provisions of the Contract Documents, will not be made sooner than 35 days after recordation of the notice of completion. If Contractor fails to complete all of the punch list items within the specified time, Owner may, acting in its sole discretion, elect to accept the Project, record the notice of completion, and withhold up to 150% of Owner's estimated cost to complete the remaining items from Final Payment.

11.2 Warranty.

(A) **General.** Contractor warrants that all materials and equipment will be new unless otherwise specified, of good quality, in conformance with the Contract Documents, and free from defective workmanship and materials. Contractor further warrants that the Work will be free from material defects not intrinsic in the design or materials required in the Contract Documents. At Owner's request, Contractor must furnish satisfactory evidence of the quality and type of materials and equipment furnished. Contractor's warranty does not extend to damage caused by normal wear and tear, or improper use or maintenance.

(B) **Warranty Period.** Contractor's warranty must guarantee its Work for a period of one year from the date of recordation of the notice of completion (the "Warranty Period"), except when a longer guarantee is provided by a supplier or manufacturer or is required by the Specifications or Special Conditions. Contractor must obtain from its Subcontractors, suppliers and manufacturers any special or extended warranties required by the Contract Documents.

(C) **Warranty Documents.** As a condition precedent to acceptance, Contractor must supply Owner with all warranty and guarantee documents relevant to equipment and materials incorporated into the Work and guaranteed by their suppliers or manufacturers.

(D) **Subcontractors.** The warranty obligations in the Contract Documents apply to Work performed by Contractor and its Subcontractors, and Contractor expressly agrees to act as co-guarantor of such Work.

(E) **Contractor's Obligations.** Upon written notice from Owner to Contractor of any defect in the Work discovered during the Warranty Period, Contractor or its responsible Subcontractor must promptly correct the defective Work at its own cost. Contractor's obligation to correct defects discovered during the Warranty Period will continue past the expiration of the Warranty Period as to any defects in Work for which Contractor was notified prior to expiration of the Warranty Period.

(F) **Owner's Remedies.** If Contractor or its responsible Subcontractor fails to correct defective Work within ten days following notice by Owner, or sooner if required by the circumstances, Contractor expressly agrees that Owner may correct the defects to conform with the Contract Documents at Contractor's sole expense. Contractor must reimburse Owner for its costs within 30 days following Owner's submission of a demand(s) for payment pursuant to this provision. If Owner is required to initiate legal action to compel Contractor's compliance with this provision, and Owner is the prevailing party in such action, Contractor and its surety are solely responsible for all of Owner's attorney's fees and legal costs expended to enforce Contractor's warranty obligations herein in addition to any and all costs Owner incurs to correct the defective Work.

(G) **Emergency Repairs.** In cases of emergency where any delay in correcting defective Work could cause harm, loss or damage, Contractor expressly agrees that Owner may immediately correct the defects to conform with the Contract Documents at Contractor's sole expense. Contractor must reimburse Owner for its costs within 30 days following Owner's submission of a demand(s) for payment pursuant to this provision. If Owner is required to initiate legal action to compel Contractor's compliance with this provision, and Owner is the prevailing party in such action, Contractor and its surety are solely responsible for all of Owner's attorney's fees and legal costs expended to enforce Contractor's warranty obligations herein in addition to any and all costs Owner incurs to immediately correct the defective Work, including any associated overtime charges.

11.3 Use Prior to Final Completion. Owner reserves the right to occupy or make use of the Project, or any portions of the Project, prior to Final Completion if Owner has determined that the Project or portion of it is in a condition suitable for the proposed occupation or use, and that it is in its best interest to occupy or make use of the Project, or any portions of it, prior to Final Completion. Owner will notify Contractor in writing of its intent to occupy or make use of the Project or any portions of the Project, pursuant to this provision.

(A) **Non-Waiver.** Occupation or use prior to Final Completion will not operate as acceptance of the Work or any portion of it, nor will it operate as a waiver of any of Owner's rights or Contractor's duties pursuant to these Contract Documents, and will not affect nor bear on the determination of the time of substantial completion with respect to any statute of repose pertaining to the time for filing an action for construction defect.

(B) **Owner's Responsibility.** Owner will be responsible for the cost of maintenance and repairs due to normal wear and tear with respect to those portions of the Project that are being occupied or used before Final Completion. The Contract Price or the Contract Time may be adjusted pursuant to the applicable provisions of these Contract Documents if, and only to the extent that, any occupation or use under this Section actually adds to Contractor's cost or time to perform the Work.

11.4 Substantial Completion. For purposes of determining "substantial completion" with respect to any statute of repose pertaining to the time for filing an action for construction defect, "substantial completion" is deemed to mean the last date that Contractor or any Subcontractor performs Work on the Project prior to recordation of the notice of completion, except for warranty work performed under this Article.

Article 12 - Dispute Resolution

12.1 Claims. This Article applies to and provides the exclusive procedures for any Claim arising from or related to the Contract or performance of the Work.

(A) **Definition.** "Claim" means a separate demand by Contractor, submitted in writing, for change in the Contract Time or Contract Price that has previously been submitted to Owner in accordance with the requirements of the Contract Documents, and which has been rejected by Owner, in whole or in part.

(B) **Limitations.** A Claim may only include the portion of a previously rejected demand that remains in dispute between Contractor and Owner. With the exception of any dispute regarding the amount of money actually paid to Contractor as Final Payment, Contractor is not entitled to submit a Claim demanding a change in the Contract Time or the Contract Price, which has not previously been submitted to Owner in full compliance with Article 5 and Article 6, and subsequently rejected in whole or in part by Owner.

(C) **Scope of Article.** This Article is intended to provide the exclusive procedures for submission and resolution of Claims of any amount, and applies in addition to the provisions of Public Contract Code sections 20104, et seq.

(D) **No Work Delay.** Notwithstanding the submission of a Claim or any other dispute between the parties related to the Project or the Contract Documents, Contractor must perform the Work and may not delay or cease Work pending resolution of the Claim or other dispute, but must continue to diligently prosecute the performance and timely completion of the Work, including the Work pertaining to the Claim or other dispute.

12.2 Claims Submission. The following requirements apply to any Claim subject to this Article:

(A) **Substantiation.** The Claim must be submitted to Owner in writing, clearly identified as a "Claim" submitted pursuant to this Article 12, and must include all of the documents necessary to substantiate the Claim including the Change Order request that was rejected in whole or in part, and a copy of Owner's written rejection that is in dispute. The Claim must clearly identify and describe the dispute, including relevant references to applicable portions of the Contract Documents, and a chronology of relevant events. Any Claim for additional payment must include a complete, itemized breakdown of all labor, materials, taxes, insurance, and subcontract, or other costs. Substantiating documentation such as payroll records, receipts, invoices, or the like, must be submitted in support of each claimed cost. Any Claim for an extension of time or delay

costs must be substantiated with schedule analysis and narrative depicting and explaining claimed time impacts.

(B) **Claim Format.** A Claim must be submitted in the following format:

(1) General introduction, specifically identifying the submission as a "Claim" submitted under this Article 12.

(2) Relevant background information, including identification of the specific demand at issue, and the date of Owner's rejection of that demand.

(3) Detailed explanation of the issue(s) in dispute. For multiple issues, separately number and identify each issue and include the following for each separate issue:

(a) The background of the issue, including references to relevant provisions of the Contract Documents;

(b) A succinct statement of the matter in dispute, including Contractor's position and the basis for that position;

(c) A chronology of relevant events;

(d) The identification and attachment of all supporting documents (see subsection (A), above, on Substantiation); and

(e) Use of a separate page for each issue.

(4) Summary of issues and damages.

(5) The following certification, executed by Contractor's authorized representative:

"The undersigned Contractor certifies under penalty of perjury that its statements and representations in this Claim are true and correct. Contractor warrants that this Claim is comprehensive and complete as to the matters in dispute, and agrees that any costs, expenses, or delay claim not included herein are deemed waived. Contractor understands that submission of a Claim which has no basis in fact or which Contractor knows to be false may violate the False Claims Act (Government Code section 12650 et seq.)."

(C) **Submission Deadlines.**

(1) A Claim must be submitted within 15 days following the date that Owner notified Contractor in writing that a request for a change in the Contract Time or Contract Price, duly submitted in compliance with Article 5 and Article 6, has been rejected in whole or in part.

(2) With the exception of any dispute regarding the amount of Final Payment, any Claim must be filed on or before the date of Final Payment, or will be deemed waived.

(3) A Claim disputing the amount of Final Payment must be submitted within 15 days of the effective date of Final Payment, under Section 8.8, above.

(4) Strict compliance with these Claim submission deadlines is necessary to ensure that any dispute may be mitigated as soon as possible, and to facilitate cost-efficient administration of the Project. **Any Claim that is not submitted within the specified deadlines will be deemed waived by Contractor.**

12.3 Claims Under \$50,000. For any Claim of less than \$50,000.00, Owner will respond in writing within 45 days of receipt of the Claim, or may first request, in writing, within 30 days of receipt of the Claim, any additional documentation supporting the Claim or relating to defenses to the Claim that Owner may have against Contractor. If Contractor fails to submit the additional documentation to Owner within 15 days of receipt of Owner's request, the claim will be deemed waived.

(A) **Additional Information.** If additional information is thereafter required, it may be requested and provided upon mutual agreement of Owner and Contractor.

(B) **Owner's Response.** Owner's written response to the Claim, as further documented, will be submitted to Contractor within 15 days after receipt of the further documentation or within a period of time no greater than that taken by Contractor in producing the additional information, whichever is greater.

(C) **Non-Waiver.** Any failure by Owner to respond within the times specified above may not be construed as acceptance of the Claim in whole or in part, or as a waiver of any provision of these Contract Documents.

12.4 Claims From \$50,000 to \$375,000. For any Claim of over \$50,000.00, and less than or equal to \$375,000.00, Owner will respond in writing within 60 days of receipt of the Claim, or may request, in writing, within 30 days of receipt of the Claim, any additional documentation supporting the Claim or relating to the defenses to the Claim that Owner may have against Contractor. If Contractor fails to submit the additional documentation to Owner within 30 days of receipt of Owner's request, the claim will be deemed waived.

(A) **Additional Information.** If additional information is thereafter required, it may be requested and provided upon mutual agreement of Owner and Contractor.

(B) **Owner's Response.** Owner's written response to the Claim, as further documented, will be submitted to Contractor within 30 days of receipt of the further documentation, or within a period of time no greater than that taken by Contractor in producing the additional information or requested documentation, whichever is greater.

(C) **Non-Waiver.** Any failure by Owner to respond within the times specified above may not be construed as acceptance of the Claim in whole or in part, or as a waiver of any provision of these Contract Documents.

12.5 Claims Over \$375,000. For any Claim of over \$375,000.00, Owner will respond in writing within 90 days of receipt of the Claim. Owner may request, in writing, within 45 days of receipt of the Claim, any additional documentation supporting the Claim relating to defenses to the Claim that Owner may have against Contractor. If Contractor fails to submit the additional documentation to Owner within 45 days of receipt of Owner's request, the claim will be deemed waived.

(A) **Additional Information.** If additional information is thereafter required, it may be requested and provided upon mutual agreement of Owner and Contractor.

(B) **Owner's Response.** Owner's response to the Claim, as further documented, will be submitted to Contractor within 45 days after receipt of the further documentation, or within a period of time no greater than that taken by Contractor in producing the additional information or requested documentation, whichever is greater.

(C) **Non-Waiver.** Any failure by Owner to respond within the times specified above may not be construed as acceptance of the Claim in whole or in part, or as a waiver of any provision of these Contract Documents.

12.6 Meet and Confer.

(A) **Claims up to \$375,000.** For Claims less than or equal to \$375,000.00, if Contractor disputes Owner's written response, or Owner fails to respond within the specified time, Contractor must notify Owner in writing, either within 15 days of receipt of Owner's response, or within 15 days of Owner's failure to respond within the specified time, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. If Contractor fails to dispute Owner's response, in writing, within the specified times, Contractor's Claim will be deemed waived.

(1) Upon receipt of the demand to meet and confer, Owner will schedule the meet and confer conference to be held within 30 days, or later if needed to ensure the mutual availability of all of the individuals that each party requires to represent its interests at the meet and confer conference.

(2) The meet and confer conference will be scheduled at a location at or near Owner's principal office.

(3) If the Claim or any portion remains in dispute following the meet and confer conference, the parties may agree to mediation, as set forth in Section 12.7, below, or if unable to agree, Contractor may file a claim as provided in Government Code section 900 et seq. (a "Government Code Claim").

(B) **Claims over \$375,000.** For any Claim greater than \$375,000.00, if Contractor disputes Owner's written response, or Owner fails to respond within the specified time, Contractor must notify Owner in writing, either within 30 days of receipt of Owner's response, or within 30 days of Owner's failure to respond within the specified time, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. If Contractor fails to dispute Owner's response, in writing, within the specified times, Contractor's Claim will be deemed waived.

(1) Upon receipt of the demand to meet and confer, Owner will schedule the meet and confer conference to be held within 60 days, or later if needed to ensure the mutual availability of all of the individuals that each party requires to represent its interests at the meet and confer conference.

(2) The meet and confer conference will be scheduled at a location at or near Owner's principal office.

(3) For any Claim or any portion(s) of a Claim that remains in dispute following the meet and confer conference, the parties agree to make a good faith effort to resolve the dispute through mediation as a condition precedent to filing a Government Code Claim and initiating litigation.

12.7 Mediation and Government Code Claims.

(A) **Mediation.** Mediation under this Article will be scheduled within 60 days following conclusion of the meet and confer process, with a mediator that the parties mutually agreed upon. The mediation itself may take place more than 60 days following conclusion of the meet and confer process to ensure the mutual availability of the selected mediator and all of the individuals that each party requires to represent its interests. The parties must share the costs of mediation

equally, except costs incurred by each party for representation by legal counsel or any other consultant.

(B) **Government Code Claims.**

(1) Timely presentment of a Government Code Claim is a condition precedent to filing any legal action based on or arising from the Contract.

(2) The time for filing a Government Code Claim will be tolled from the time Contractor submits its written Claim pursuant to Section 12.2, above, until the time that Claim is denied as a result of the meet and confer process, including any period of time used by the meet and confer process. If the parties agree to mediation, the time for filing a Government Code Claim will be tolled until conclusion of the mediation if the Claim is not fully resolved by mutual agreement of the parties during the mediation or any continuation of the mediation.

12.8 Tort Claims. This Article does not apply to tort claims and nothing in this Article is intended nor will be construed to change the time periods for filing tort-based Government Code Claims.

12.9 Arbitration. It is expressly agreed, under California Code of Civil Procedure section 1296, that in any arbitration to resolve a dispute relating to this Contract, the arbitrator's award must be supported by law and substantial evidence.

12.10 Damages. Contractor bears the burden of proving entitlement to and the amount of any claimed damages. Contractor is not entitled to damages calculated on a total cost basis, but must prove actual damages. Contractor is not entitled to recovery of any alleged home office overhead. The Eichleay Formula may not be used for any recovery under the Contract. Contractor is not entitled to consequential damages, including home office overhead or any form of overhead not directly incurred at the Worksite; lost profits; loss of productivity; lost opportunity to work on other projects; diminished bonding capacity; increased cost of financing for the Project; extended capital costs; non-availability of labor, material or equipment due to delays; or any other indirect loss arising from the Contract.

12.11 Multiple Claims. In the interest of efficiency, Owner, acting in its sole discretion, may elect to process multiple Claims concurrently, in which case the applicable procedures above will be based on the total amount of such Claims rather than the amount of each individual Claim. Any such election will not operate to change or waive any other requirements of this Article.

12.12 Other Disputes. The procedures in this Article 12 will apply to any and all disputes or legal actions, in addition to Claims, arising from or related to this Contract, unless and only to the extent that compliance with a procedural requirement is expressly and specifically waived by Owner. Nothing in this Article is intended to delay suspension or termination under Article 13.

Article 13 - Suspension and Termination

13.1 Suspension for Cause. In addition to all other remedies available to Owner, if Contractor fails to perform or correct work in accordance with the Contract Documents, Owner may immediately order the Work, or any portion of it, suspended until the cause for the suspension has been eliminated to Owner's satisfaction.

(A) **Failure to Comply.** Contractor will not be entitled to an increase in Contract Time or Contract Price for a suspension occasioned by Contractor's failure to comply with the Contract Documents.

(B) **No Duty to Suspend.** Owner's right to suspend the Work will not give rise to a duty to suspend the Work, and Owner's failure to suspend the Work will not constitute a defense to Contractor's failure to comply with the requirements of the Contract Documents.

13.2 Suspension for Convenience. Owner reserves the right to suspend, delay, or interrupt the performance of the Work in whole or in part, for a period of time determined to be appropriate for Owner's convenience, and not due to any act or omission by Contractor or its Subcontractors. Upon notice by Owner pursuant to this provision, Contractor must immediately suspend, delay, or interrupt the Work as directed by Owner. The Contract Price and the Contract Time will be equitably adjusted by Change Order to reflect the cost and delay impact occasioned by such suspension for convenience.

13.3 Termination for Default. Contractor may be deemed in default for a material breach of or inability to perform the Contract, including Contractor's refusal or failure to supply sufficient skilled workers, proper materials, or equipment to perform the Work within the Contract Time; refusal or failure to make prompt payment to its employees, Subcontractors, or suppliers or to correct rejected work; disregard of laws, regulations, ordinances, rules, or orders of any public agency with jurisdiction over the Project; lack of financial capability to complete the Work within the Contract Time; or responsibility for any other material breach of the Contract requirements.

(A) **Notice.** Upon Owner's determination that Contractor is in default, Owner may provide Contractor and its surety written notice of default and intent to terminate the Contract.

(B) **Termination.** Within seven calendar days after notice of intent to terminate for default has been given, unless the default is cured or arrangements to cure the default have been made and memorialized in writing, to Owner's satisfaction, Owner may terminate the Contract by written notice to Contractor with a copy to Contractor's surety.

(C) **Waiver.** Time being of the essence in the performance of the Work, if Contractor's surety fails to arrange for completion of the Work in accordance with the Performance Bond, within seven calendar days from the date of the notice of termination, Contractor's surety will be deemed to have waived its right to complete the Work under the Contract, and Owner may immediately make arrangements for the completion of the Work through use of its own forces, by hiring a replacement contractor, or by any other means that Owner determines advisable under the circumstances. Contractor and its surety will be jointly and severally liable for any additional cost incurred by Owner to complete the Work following termination. In addition, Owner will have the right to use any materials, supplies, and equipment belonging to Contractor and located at the Worksite for the purposes of completing the remaining Work.

(D) **Wrongful Termination.** If a court of competent jurisdiction or an arbitrator later determines that the termination for default was wrongful, the termination will be deemed to be a termination for convenience, and Contractor's damages will be strictly limited to the compensation provided for termination for convenience under Section 13.4, below. Contractor waives any claim

for any other damages for wrongful termination including consequential damages, lost opportunity costs or lost profits.

13.4 Termination for Convenience. Owner reserves the right to terminate all or part of the Contract for convenience upon written notice to Contractor. Upon receipt of such notice, Contractor must: immediately stop the Work, including under any terms or conditions that may be specified in the notice; comply with Owner's instructions to protect the completed Work and materials; and use its best efforts to minimize further costs. Subject to Owner's directions in the notice, Contractor must not place further orders or enter into new subcontracts for materials, equipment, services or facilities, except as may be necessary to complete any portion of the Work that is not terminated. Contractor must also promptly cancel, on the most favorable terms possible, all existing subcontracts that relate to performance of the discontinued Work.

(A) **Compensation to Contractor.** In the event of Owner's termination for convenience, Contractor waives any claim for damages, including for loss of anticipated profits from the Project. The following will constitute full and fair compensation to Contractor, and Contractor will not be entitled to any additional claim or compensation:

(1) *Completed Work.* The value of its Work satisfactorily performed to date, based on Contractor's schedule of values and unpaid costs for items delivered to the Project site that were fabricated for incorporation in the Work;

(2) *Demobilization.* Actual and substantiated demobilization costs; and

(3) *Markup.* Five percent of the total value of the Work performed as of the date of notice of termination or five percent of the value of the Work yet to be completed, whichever is less, which is deemed to cover all overhead and profit to date.

13.5 Effect of Any Contract Termination. Upon any termination pursuant to this Article, Owner may enter upon and take possession of the Project and the Work. Owner may also take possession of, for the sole purpose of completing the Work, all of Contractor's tools, equipment and appliances, and all materials on the Work site or stored off the Work site that will be incorporated in the Work. Regardless of any Contract termination, Contractor's obligations for portions of the Work already performed will continue and the provisions of the Contract Documents will remain in effect as to any claim, indemnity obligation, warranties, guarantees, submittals of as-built drawings, instructions, or manuals, or other such rights and obligations arising prior to the termination date.

Article 14 - Miscellaneous Provisions

14.1 Assignment of Unfair Business Practice Claims. Under Public Contract Code section 7103.5, Contractor and its Subcontractors agree to assign to Owner 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. section 15) or under the Cartwright Act (Chapter 2 (commencing with section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the Contract or any subcontract. This assignment will be effective at the time Owner tenders Final Payment to Contractor, without further acknowledgement by the parties.

14.2 Provisions Deemed Inserted. Every provision of law required to be inserted in the Contract Documents is deemed to be inserted, and the Contract Documents will be construed and enforced as though such provision has been included. If it is discovered that through mistake or otherwise that any required provision was not inserted, or not correctly inserted, the Contract Documents will be deemed amended accordingly.

14.3 Waiver. Owner's waiver of a breach, failure of any condition, or any right or remedy contained in or granted by the provisions of the Contract Documents will not be effective unless it is in writing and signed by Owner. Owner's waiver of any breach, failure, right, or remedy will not be deemed a waiver of any other breach, failure, right, or remedy, whether or not similar, nor will any waiver constitute a continuing waiver unless specified in writing by Owner.

14.4 Titles, Headings, and Groupings. The titles and headings used and the groupings of provisions in the Contract Documents are for convenience only and may not be used in the construction or interpretation of the Contract Documents or relied upon for any other purpose.

14.5 Statutory and Regulatory References. With respect to any amendments to any statutes or regulations referenced in these Contract Documents, the reference is deemed to be the version in effect on the date that that bids were due.

END OF GENERAL CONDITIONS

Special Conditions

1. Pre-Construction Meeting. A pre-construction meeting will be held within seven days after award of the Contract. Project administration procedures and coordination between Owner and Contractor will be discussed.

2. Site Coordination. Contractor will not interrupt or inconvenience businesses at the Project Site, nor interfere with any other construction projects or traffic near the Project Site.

3. Geotechnical Investigation. See Specifications.

4. Drawings. Drawings which accompany and form part of the Contract Documents are entitled as follows:

Moss Landing Harbor District
North Harbor Building
2460 Highway One, Moss Landing, California 95039

5. Contract Documents. Owner will supply Contractor with one printed copy of the Contract Documents at Owner's sole cost and expense.

6. Correspondence and Notice. Unless and to the extent waived in writing by Owner, all correspondence must be in writing by mail or hand delivery. Emailed correspondence may be accepted as advance information, but unless authorized in writing by Owner, no action will be required of Owner until hard copy correspondence is received.

7. Temporary Electric Services. If any temporary electric services are provided by Owner, Contractor will be charged a flat monthly rate (to be determined by Owner) or based on meter readings taken by the utility company. Any necessary meters must be installed by the Contractor at no additional cost to Owner. Contractor is responsible for all coordination with utility companies.

8. Photographs. As evidence of Work completed, and at Contractor's sole cost and expense, Contractor will furnish Owner with before- and after-construction color photographs of the Project before Contractor's request for Final Payment. Photographs must be 8"x10". Photographs must be taken using a zoom digital camera with a resolution of at least 8 megapixels. Project evolution photographs must be taken from the same location each time, to the extent feasible. All photographs must also be submitted to Owner on a compact disc or DVD as .jpg files. All electronic files must include a text file to link the photograph description to the file name for each image. All photographs and electronic files will be the Owner's property, and Contractor will have no possession or distribution rights.

9. Surveys. Contractor, at Contractor's sole cost and expense, must retain a third party California Registered Professional Land Surveyor to be accepted by the Engineer.

10. Contractor's Access. Contractor's landside access for equipment and materials to the Project Site must adhere to the Contract Drawings. Contractor will not stage vehicles outside the limits/area(s) designated as Staging Areas in the Contract Drawings, and vehicles may be required to be parked at a remote site, if necessary. Contractor must not interfere with any boat launch activities.

11. Site Inspection. Bidders may visit the Project Site anytime at their own convenience to familiarize themselves with Project Site conditions. The Project Sites are open to the public, and

no special arrangement needs to be made with Owner. Bidders will not disrupt the businesses and any construction activity during any Project Site visit.

12. Permits. See Specifications.

13. Subcontractor Payment. Once Contractor has received a monthly progress payment, Contractor must pay all subcontractors within 15 days.

14. As-Built Drawings. Contractor must provide CAD drawings (24x36) showing as-built conditions, including final elevations.

END OF SPECIAL CONDITIONS

SECTION 011000

SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Work covered by the Contract Documents.
 - 2. Type of the Contract.
 - 3. Use of premises.
 - 4. Work restrictions.
 - 5. Specification formats and conventions.
- B. Related Sections include the following:
 - 1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: North Harbor Restaurant
 - 1. Project Location: 2460 Highway One, Moss Landing
- B. Owner: Moss Landing Harbor District
 - 1. Owner's Representative: Tommy Razzeca
7881 Sandholt Road
Moss Landing, CA 95039
831-633-5417
- C. Architect: Wald, Ruhnke & Dost Architects, LLP, 2340 Garden Road, Monterey, CA 93940
 - 1. Architect Representative: Lou Bartlett, AIA.
- D. The Work consists of the following:
Warm Shell Improvements to an existing two-story 9,499 square foot building.
The building warm shell will be completed under this scope of work including:
Completion of previously started Stairway and Elevator Construction
Completion of Building First Floor Slab on Grade
New Interior spaces including core function Restrooms and Utility Rooms
Completion of Electrical, Plumbing and Mechanical systems in advance of future final tenant improvements.

1.4 TYPE OF CONTRACT

- A. Project will be constructed under a single prime contract.

1.5 TIME OF COMPLETION

- A. As designated in District Bidding Documents.

1.6 USE OF PREMISES

- A. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.
- B. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Limits: Confine constructions operations to within the construction contract limits.
 - 2. Driveways and Entrances: Keep driveways parking lots, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

1.7 WORK RESTRICTIONS

- A. On-Site Work Hours: Work shall be generally performed during normal business working hours of 8:00 a.m. to 6:30 p.m., Monday through Friday, unless other arrangements have been made.
 - 1. Weekend Hours: Upon architect and owner's approval.

1.8 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "MasterFormat" numbering system.
 - 1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
 - 2. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 - 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for

clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

- a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012600

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections:
 - 1. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request or 14 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Quotation Form: Use forms acceptable to Architect.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect.

1.4 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: Refer to Division 01 Section "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.
- B. Unit Price Adjustment: Refer to Division 01 Section "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit price work.

1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900
PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include the following:
 - 1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 2. Division 01 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets.
 - b. Submittals Schedule.
 - c. Contractor's Construction Schedule.
 - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than ten (10) days after date established in Notice to Proceed.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
2. Submit draft of AIA Document G703 Continuation Sheets.
3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value.
 - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.
7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit four (4) signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Products list.
 5. Submittals Schedule (preliminary if not final).
 6. List of Contractor's staff assignments.
 7. List of Contractor's principal consultants.
 8. Initial progress report.
 9. Report of preconstruction conference.

10. Certificates of insurance and insurance policies.
- H. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. Evidence that claims have been settled.
 7. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013200

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Preliminary Construction Schedule.
 - 2. Contractor's Construction Schedule.
 - 3. Submittals Schedule.
 - 4. Daily construction reports.
 - 5. Material location reports.
 - 6. Field condition reports.
 - 7. Special reports.
- B. Related Sections include the following:
 - 1. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
 - 2. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the Schedule of Values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Architect.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Milestone: A key or critical point in time for reference or measurement.

1.4 SUBMITTALS

- A. Qualification Data: For scheduling consultant.
- B. Submittals Schedule: Submit five (5) copies of schedule. Arrange the following information in a tabular format:
 - 1. Scheduled date for first submittal.
 - 2. Specification Section number and title.
 - 3. Submittal category (action or informational).
 - 4. Name of subcontractor.
 - 5. Description of the Work covered.
- C. Preliminary Construction Schedule: Submit three (3) opaque copies.
 - 1. Approval of cost-loaded preliminary construction schedule will not constitute approval of Schedule of Values for cost-loaded activities.
- D. Contractor's Construction Schedule: Submit three (3) opaque copies of initial schedule, large enough to show entire schedule for entire construction period.
- E. Daily Construction Reports: Contractor to maintain at regular place of business and make available when needed.
- F. Special Reports: Submit three (3) copies at time of unusual event.

1.5 QUALITY ASSURANCE

- A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:
 - 1. Discuss constraints, including work stages.

2. Review time required for review of submittals and resubmittals.
3. Review requirements for tests and inspections by independent testing and inspecting agencies.
4. Review time required for completion and startup procedures.
5. Review and finalize list of construction activities to be included in schedule.
6. Review submittal requirements and procedures.
7. Review procedures for updating schedule.

1.6 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 1. Secure time commitments for performing critical elements of the Work from parties involved.
 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
 1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
 2. Initial Submittal: Submit concurrently with preliminary bar-chart schedule. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.
 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

2. Provide float time in the schedule as defined in section 1.3 F of this Section.

- C. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.
- D. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven (7) days of date established for the Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first sixty (60) days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized, time-scaled CPM network analysis diagram for the Work.
 - 1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than thirty (30) days after date established for the Notice to Proceed.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
 - 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 - 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 - 4. Use "one workday" as the unit of time. Include list of nonworking days and holidays incorporated into the schedule.
- C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.
 - 1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.

- c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing.
2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
- D. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Principal events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.
- E. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.
 6. Changes in total float or slack time.
 7. Changes in the Contract Time.

2.5 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. Equipment at Project site.
 5. Material deliveries.
 6. High and low temperatures and general weather conditions.
 7. Accidents.
 8. Meetings and significant decisions.

9. Unusual events (refer to special reports).
 10. Stoppages, delays, shortages, and losses.
 11. Emergency procedures.
 12. Orders and requests of authorities having jurisdiction.
 13. Change Orders received and implemented.
- B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.
- C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect and Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013300
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
 - 2. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
 - 3. Division 01 Section "Quality Requirements" for submitting test and inspection reports and for mockup requirements.
 - 4. Division 01 Section "Closeout Procedures" for submitting warranties.
 - 5. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 6. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 7. Divisions 02 through 49 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.
- B. Coordination: 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 reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow fifteen (15) days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow fifteen (15) days for review of each resubmittal.
- E. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 6 by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06100.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06100.01.A).
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Other necessary identification.

- F. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.
- G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
1. Transmittal Form: Provide locations on form for the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Specification Section number and title.
 - i. Drawing number and detail references, as appropriate.
 - j. Transmittal number, numbered consecutively.
 - k. Submittal and transmittal distribution record.
 - l. Remarks.
 - m. Signature of transmitter.
 2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.
- H. Resubmittals: Make resubmittals 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.
 3. Resubmit submittals until they are marked "as accepted."
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Use only final submittals with mark indicating "as accepted" taken by Architect.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.

- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Mill reports.
 - j. Standard product operation and maintenance manuals.
 - k. Compliance with specified referenced standards.
 - l. Testing by recognized testing agency.
 - m. Application of testing agency labels and seals.
 - n. Notation of coordination requirements.
 4. Submit Product Data before or concurrent with Samples.
 5. Number of Copies: Submit two (2) copies of Product Data, unless otherwise indicated. Architect will return one (1) copy. Mark up and retain one returned copy as a Project Record Document.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 - m. Relationship to adjoining construction clearly indicated.
 - n. Seal and signature of professional engineer if specified.
 - o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 42 inches (750 by 1000 mm).
 3. Number of Copies: Submit seven (7) copies of each submittal, unless copies are required for operation and maintenance manuals. Architect will retain one (1) copy; remainder will be returned. Mark up and retain one returned copy as a Project Record Drawing.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of appropriate Specification Section.
 3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 4. 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 two (2) full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
 5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from 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: Submit three (3) sets of Samples. Architect will retain one (1) Sample set; remainder will be returned. Mark up and retain one returned Sample set as a Project Record Sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

- 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three (3) sets of paired units that show approximate limits of variations.
- E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product.
 2. Number and name of room or space.
 3. Location within room or space.
 4. Number of Copies: Submit three (3) copies of product schedule or list, unless otherwise indicated. Architect will return two (2) copies.
 - a. Mark up and retain one returned copy as a Project Record Document.
- F. Submittals Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- G. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."
- H. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."
- I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
1. Name, address, and telephone number of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.
 4. Number of Copies: Submit three (3) copies of subcontractor list, unless otherwise indicated. Architect will return two (2) copies.
 - a. Mark up and retain one returned copy as a Project Record Document.

2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
1. Number of Copies: Submit two (2) copies of each submittal, unless otherwise indicated. Architect will not return copies.
 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 3. Test and Inspection Reports: Comply with requirements specified in Division 01 Section "Quality Requirements."

- B. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."
- C. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- D. 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.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- F. 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.
- G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- J. 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.
- K. 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.
- L. 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:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- M. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."

- N. Preconstruction Test Reports: Prepare 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.
- O. Compatibility Test Reports: Prepare 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.
- P. 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 or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- Q. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- R. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- S. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
1. Preparation of substrates.
 2. Required substrate tolerances.
 3. Sequence of installation or erection.
 4. Required installation tolerances.
 5. Required adjustments.
 6. Recommendations for cleaning and protection.
- T. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.

- U. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

2.3 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three (3) copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S/ ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

- D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.
- F. **END OF SECTION 013300**

SECTION 014000
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
 - 1. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
 - 2. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

- D. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: 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.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- J. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five (5) previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

- A. General: 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.
- B. 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.

1.5 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1.6 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirement for specialists shall not supersede building codes and regulations governing the Work.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

- c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

1.7 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a 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. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 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 Owner, unless agreed to in writing by Owner.
 2. Notify testing agencies at least twenty-four (24) hours in advance of time when Work that requires testing or inspecting will be performed.
 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: 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 Division 01 Section "Submittal Procedures."
- D. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

F. 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.

G. 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.

1.8 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency and special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

1. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
2. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
3. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
4. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
5. Retesting and re-inspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 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 log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
- 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 014000

SECTION 015000

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Sections include the following:
 - 1. Division 01 Section "Summary" for limitations on utility interruptions and other work restrictions.
 - 2. Division 01 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
 - 3. Division 01 Section "Execution" for progress cleaning requirements.
 - 4. Divisions 02 through 49 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.
 - 5. Division 32 Section "Dewatering" for disposal of ground water at Project site.

1.3 DEFINITIONS

- A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to Architect, Owner, Project Inspector, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Pay water-service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.5 SUBMITTALS

- A. Site Plan (Contractor Staging Plan): Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.6 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.7 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide concrete bases for supporting posts.

2.2 TEMPORARY FACILITIES

- A. Common-Use Field Office: Of sufficient size to accommodate needs of construction personnel. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
 - 2. Conference room of sufficient size to accommodate meetings of ten (10) individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- (1.2-m-) square tack board.
 - 3. Drinking water.
 - 4. Coffee machine and supplies.
 - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).

6. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.
- B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
1. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained heaters with individual space thermostatic control.
1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of eight (8) at each return air grille in system and remove at end of construction.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- 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.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- E. Heating: Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- F. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- I. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one (1) telephone line(s) for each field office.
 - 1. Provide additional telephone lines for the following:
 - a. Provide a dedicated telephone line for each facsimile machine and computer in each field office.
 - 2. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Architect's office.
 - e. Engineers' offices.
 - f. Owner's office.
 - g. Principal subcontractors' field and home offices.
 - 3. Provide superintendent with cellular telephone for use when away from field office.
- J. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail, in common-use facilities.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:

1. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas in same location as permanent roads and paved areas. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 Section "Earth Moving."
 3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
 4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section "Asphalt Paving."
- C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- D. Parking: Provide temporary parking areas for construction personnel.
- E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
- F. Project Identification and Temporary Signs: Contractor to provide Project identification and other signs. Project Identification sign to be 4'x8' plywood with 4x4 support posts, Project sign content to be approved by Architect and Owner prior to installation. Other signs are prohibited.
- G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.
- H. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- 3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION
- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
1. Comply with work restrictions specified in Division 01 Section "Summary."

- B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
 - 1. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- E. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner with one set of keys.
- F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- G. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

3.5 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. 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.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial 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.

1. Materials and facilities that constitute temporary facilities are property of Contractor.
2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 015000

SECTION 016000
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. Related Sections include the following:
 - 1. Division 01 Section "Closeout Procedures" for submitting warranties for Contract closeout.
 - 2. Divisions 02 through 49 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified 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.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.4 SUBMITTALS

- A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
 2. Form: Tabulate information for each product under the following column headings:
 - a. Specification Section number and title.
 - b. Generic name used in the Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.
 - f. Installer's name and address.
 - g. Projected delivery date or time span of delivery period.
 - h. Identification of items that require early submittal approval for scheduled delivery date.
 3. Initial Submittal: Within thirty (30) days after date of commencement of the Work, submit three (3) copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 - a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
 4. Completed List: Within sixty (60) days after date of commencement of the Work, submit three (3) copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 5. Architect's Action: Architect will respond in writing to Contractor within fifteen (15) days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.
- B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.

- f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven (7) days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within fifteen (15) days of receipt of request, seven (7) days of receipt of additional information or documentation, whichever is later.
- a. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.
- C. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.
- a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
 - b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.
- D. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.
- 1.5 QUALITY ASSURANCE
- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
- C. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.
 - 2. Store materials in a manner that will not endanger Project structure.
 - 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 - 4. Store cementitious products and materials on elevated platforms.
 - 5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 - 6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 - 7. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.

3. Refer to Divisions 02 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
 7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
 1. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
 2. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
 3. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
 4. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.

5. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
6. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

- A. Timing: Architect will consider requests for substitution if received within sixty (60) days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
- B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 2. Requested substitution does not require extensive revisions to the Contract Documents.
 3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 4. Substitution request is fully documented and properly submitted.
 5. Requested substitution will not adversely affect Contractor's Construction Schedule.
 6. Requested substitution has received necessary approvals of authorities having jurisdiction.
 7. Requested substitution is compatible with other portions of the Work.
 8. Requested substitution has been coordinated with other portions of the Work.
 9. Requested substitution provides specified warranty.
 10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

2.3 COMPARABLE PRODUCTS

- A. Conditions: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300

EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. General installation of products.
 - 4. Coordination of Owner-installed products.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
 - 8. Correction of the Work.
- B. Related Sections include the following:
 - 1. Division 01 Section "Submittal Procedures" for submitting surveys.
 - 2. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- D. Certified Surveys: Submit two (2) copies signed by land surveyor.
- E. Final Property Survey: Submit three (3) copies showing the Work performed and record survey data.

1.4 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing 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.
 - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. 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 observations.
 - 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner 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. Coordinate with authorities having jurisdiction.
- B. 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, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 3. Inform installers of lines and levels to which they must comply.
 - 4. Check the location, level and plumb, of every major element as the Work progresses.
 - 5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 - 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two (2) permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that

adequate provisions are made for locating and installing products to comply with indicated requirements.

- G. 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.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. 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.
- H. 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.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Recycling nonhazardous demolition and construction waste.
 - 2. Disposing of nonhazardous demolition and construction waste.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 75 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:

1.4 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan to Owner and Authorities Having Jurisdiction.

1.5 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition site-clearing and construction waste generated by the Work. Use Forms CW-1 through CW-8 as applicable. Include estimated quantities and assumptions for estimates.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
 - 1. Distribute waste management plan to everyone concerned within three days of submittal return.
 - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - 2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 - 3. Store items in a secure area until installation.
 - 4. Protect items from damage during transport and storage.
 - 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Sale and Donation: Not Permitted on Project site.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.

- B. Recycling Receivers and Processors: List below is provided for information only; available recycling receivers and processors include, but are not limited to, the following:
- C. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
- D. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- E. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - 4. Store components off the ground and protect from the weather.
 - 5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING CONSTRUCTION AND DEMOLITION WASTE

- A. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
- B. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
 - 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- C. Metals: Separate metals by type.
 - 1. Structural Steel: Stack members according to size, type of member, and length.
 - 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- D. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- E. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- F. Conduit: Reduce conduit to straight lengths and store by type and size.

G. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

H. Other: Sort and stack members according to size and type.

3.5 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

3.6 FORMS CWM-1 THROUGH CWM-8

FORM CWM-1: CONSTRUCTION WASTE IDENTIFICATION							
MATERIAL CATEGORY	GENERATION POINT	EST. QUANTITY of materials RECEIVED* (a)	EST. WASTE - % (b)	TOTAL est. QUANTITY OF WASTE* (c = a X b)	EST. volume cy (cm)	est. weight tons (tonnes)	remarks and assumptions
Packaging: Cardboard							
Packaging: Boxes							
Packaging: Plastic Sheet or Film							
Packaging: Polystyrene							
Packaging: Pallets or Skids							
Packaging: Crates							
Packaging: Paint Cans							

Packaging: Plastic Pails							
Site-Clearing Waste							
Masonry or CMU							
Lumber: Cut- Offs							
Lumber: Warped Pieces							
Plywood or OSB (scraps)							
Wood Forms							
Wood Waste Chutes							
Wood Trim (cut-offs)							
Metals							
Insulation							
Roofing							
Joint Sealant Tubes							
Gypsum Board (scraps)							
Carpet and Pad (scraps)							
Piping							
Electrical Conduit							
Other:							

FORM CWM-2: DEMOLITION WASTE IDENTIFICATION				
MATERIAL description	est. QUANTITY	est. volume cy (cm)	est. weight tons (tonnes)	REMARKS AND ASSUMPTIONS
Asphaltic Concrete Paving				
Concrete				
Brick				
CMU				
Lumber				
Plywood and OSB				
Wood Paneling				
Wood Trim				
Miscellaneous Metals				
Structural Steel				
Rough Hardware				
Insulation				
Roofing				
Doors and Frames				
Door Hardware				
Windows				
Glazing				
Acoustical Tile				
Carpet				

Carpet Pad				
Demountable Partitions				
Equipment				
Cabinets				
Plumbing Fixtures				
Piping				
Piping Supports and Hangers				
Valves				
Sprinklers				
Mechanical Equipment				
Electrical Conduit				
Copper Wiring				
Light Fixtures				
Lamps				
Lighting Ballasts				
Electrical Devices				
Switchgear and Panelboards				
Transformers				
Other:				

FORM CWM-3: CONSTRUCTION WASTE reduction WORK PLAN						
MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE tons (tonnes)	disposal method and quantity			Handling and transportation procedures
			est. AMOUNT salvagED tons (tonnes)	est. AMOUNT RECYCLED tons (tonnes)	est. amount disposed to landfill tons (tonnes)	
Packaging: Cardboard						
Packaging: Boxes						
Packaging: Plastic Sheet or Film						
Packaging: Polystyrene						
Packaging: Pallets or Skids						
Packaging: Crates						
Packaging: Paint Cans						
Packaging: Plastic Pails						
Site-Clearing Waste						

Masonry or CMU						
Lumber: Cut-Offs						
Lumber: Warped Pieces						
Plywood or OSB (scraps)						
Wood Forms						
Wood Waste Chutes						
Wood Trim (cut-offs)						
Metals						
Insulation						
Roofing						
Joint Sealant Tubes						
Gypsum Board (scraps)						
Carpet and Pad (scraps)						
Piping						
Electrical Conduit						
Other:						

FORM CWM-4: demolition WASTE reduction WORK PLAN						
MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE tons (tonnes)	disposal method and quantity			Handling and transportation procedures
			est. AMOUNT salvagED tons (tonnes)	est. AMOUNT RECYCLED tons (tonnes)	est. amount disposed to landfill tons (tonnes)	
Asphaltic Concrete Paving						
Concrete						
Brick						
CMU						
Lumber						
Plywood and OSB						
Wood Paneling						
Wood Trim						
Miscellaneous Metals						

Structural Steel						
Rough Hardware						
Insulation						
Roofing						
Doors and Frames						
Door Hardware						
Windows						
Glazing						
Acoustical Tile						
Carpet						
Carpet Pad						
Demountable Partitions						
Equipment						
Cabinets						
Plumbing Fixtures						
Piping						
Supports and Hangers						
Valves						
Sprinklers						
Mechanical Equipment						
Electrical Conduit						
Copper Wiring						
Light Fixtures						
Lamps						
Lighting Ballasts						
Electrical Devices						
Switchgear and Panelboards						
Transformers						
Other:						

FORM CWM-5: cost/revenue analysis OF construction waste REDUCTION WORK PLAN								
materials	total quantity of materials (VOL. OR WEIGHT) (a)	est. cost of disposal (B)	total EST. cost of disposal (c = A X b)	revenue from salvaged materials (d)	revenue from recycled materials (e)	landfill tipping fees avoided (f)	handling and transportation costs AVOIDED (G)	net COST SAVINGS OF WORK PLAN (h = d+e+f+g)
Packaging: Cardboard								
Packaging: Boxes								

Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

FORM CWM-6: cost/revenue analysis OF demolition WASTE REDUCTION WORK PLAN								
materials	total quantity of materials (VOL. OR WEIGHT) (a)	est. cost of disposal (B)	total EST. cost of disposal (c = A X b)	revenue from salvaged materials (d)	revenue from recycled materials (e)	landfill tipping fees avoided (f)	handling and transportation costs AVOIDED (G)	net cost savings OF WORK PLAN (h = d+e+f+g)
Asphaltic Concrete Paving								
Concrete								
Brick								
CMU								
Lumber								

Plywood and OSB								
Wood Paneling								
Wood Trim								
Miscellaneous Metals								
Structural Steel								
Rough Hardware								
Insulation								
Roofing								
Doors and Frames								
Door Hardware								
Windows								
Glazing								
Acoustical Tile								
Carpet								
Carpet Pad								
Demountable Partitions								
Equipment								
Cabinets								
Plumbing Fixtures								
Piping								
Supports and Hangers								
Valves								
Sprinklers								
Mech. Equipment								
Electrical Conduit								
Copper Wiring								
Light Fixtures								
Lamps								
Lighting Ballasts								
Electrical Devices								
Switchgear and Panelboards								
Transformers								
Other:								

FORM CWM-7: CONSTRUCTION WASTE REDUCTION progress report						
MATERIAL CATEGORY	GENE RATIO N	TOTAL QUANTI TY	QUANTITY OF WASTE salvagED	QUANTITY OF WASTE RECYCLED	TOTAL QUANTI TY OF	total quantity OF

	POINT	OF WASTE tons (tonnes) (A)	ESTIMATED tons (tonnes)	ACTUAL tons (tonnes) (b)	ESTIMATED tons (tonnes)	ACTUAL tons (tonnes) (c)	WASTE RECOVERED tons (tonnes) (d = b + c)	WASTE recovered % (d / a X 100)
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

FORM CWM-8: DEMOLITION WASTE REDUCTION PROGRESS REPORT								
MATERIAL CATEGORY	GENERATION POINT	TOTAL WASTE tons (A)	QUANTITY WASTE salvagED		QUANTITY WASTE RECYCLED		TOTAL WASTE RECOVERED tons (d = b + c)	total WASTE recovered % (d / a X 100)
			ESTIMATED tons	ACTUAL tons (b)	ESTIMATED tons	ACTUAL tons (c)		
Asphaltic Concrete Paving								

Concrete								
Brick								
CMU								
Lumber								
Plywood and OSB								
Wood Paneling								
Wood Trim								
Miscellaneous Metals								
Structural Steel								
Rough Hardware								
Insulation								
Roofing								
Doors and Frames								
Door Hardware								
Windows								
Glazing								
Acoustical Tile								
Carpet								
Carpet Pad								
Demountable Partitions								
Equipment								
Cabinets								
Plumbing Fixtures								
Piping								
Supports and Hangers								
Valves								
Sprinklers								
Mechanical Equipment								
Electrical Conduit								
Copper Wiring								
Light Fixtures								
Lamps								
Lighting Ballasts								
Electrical Devices								
Switchgear & Panelboards								
Transformers								
Other:								

END OF SECTION 01 74 19

SECTION 017700
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Warranties.
3. Final cleaning.

- B. Related Sections include the following:

1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
2. Division 01 Section "Execution" for progress cleaning of Project site.
3. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
4. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
5. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Prepare and submit Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
5. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
6. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
7. Complete startup testing of systems.

8. Submit test/adjust/balance records.
9. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
10. Advise Owner of changeover in heat and other utilities.
11. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
12. Complete final cleaning requirements, including touchup painting.
13. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three (3) copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.

1.6 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Replace parts subject to unusual operating conditions.
 - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - q. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - s. Leave Project clean and ready for occupancy.

- C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700

SECTION 017823

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation manuals for systems, subsystems, and equipment.
 - 2. Maintenance manuals for the care and maintenance of products, materials, finishes, systems and equipment.
- B. Related Sections include the following:
 - 1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
 - 2. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
 - 3. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
 - 4. Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

- A. Initial Submittal: Submit two (2) draft copies of each manual at least fifteen (15) days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return one (1) copy of draft and mark whether general scope and content of manual are acceptable.
- B. Final Submittal: Submit three (3) copies of each manual in final form at least fifteen (15) days before final inspection. Architect will return copy with comments within fifteen (15) days after final inspection.

1. Correct or modify each manual to comply with Architect's comments. Submit three (3) copies of each corrected manual within fifteen (15) days of receipt of Architect's comments.

1.5 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
 1. List of documents.
 2. List of systems.
 3. List of equipment.
 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 1. Title page.
 2. Table of contents.
 3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
 1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Name, address, and telephone number of Contractor.
 6. Name and address of Architect.

7. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
 4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions.
 2. Performance and design criteria if Contractor is delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.

8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.

3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
1. Standard printed maintenance instructions and bulletins.
 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 5. Aligning, adjusting, and checking instructions.
 6. Demonstration and training videotape, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- C. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- D. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original Project Record Documents as part of operation and maintenance manuals.
 - 2. Comply with requirements of newly prepared Record Drawings in Division 01 Section "Project Record Documents."
- E. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
- B. Related Sections include the following:
 - 1. Division 01 Section "Closeout Procedures" for general closeout procedures.
 - 2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. Divisions 02 through 49 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one (1) set(s) of marked-up Record Prints.
 - 2. Number of Copies: Submit copies of Record Drawings as follows:
 - a. Initial Submittal: Submit one (1) set of plots from corrected Record CAD Drawings and one (1) set of marked-up Record Prints. Architect will initial and date each plot and mark whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Architect will return plots and prints for organizing into sets, printing, binding, and final submittal.
 - b. Final Submittal: Submit one (1) set of marked-up Record Prints. Print each Drawing whether or not changes and additional information were recorded.
- B. Record Specifications: Submit one (1) copy of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one (1) copy of each Product Data submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
 1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Order numbers, and similar identification, where applicable.
- B. Record Transparencies: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect. When authorized, prepare a full set of corrected transparencies of the Contract Drawings and Shop Drawings.

1. Incorporate changes and additional information previously marked on Record Prints. Erase, redraw, and add details and notations where applicable.
 2. Refer instances of uncertainty to Architect for resolution.
 3. Print the Contract Drawings and Shop Drawings for use as Record Transparencies. Architect will make the Contract Drawings available to Contractor's print shop.
- C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
- D. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 017839

SECTION 031000
CONCRETE FORMWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Formwork for cast in place concrete, with shoring, bracing and anchorage.
 - 2. Openings for other work.
 - 3. Form accessories.
 - 4. Form stripping.

- B. Related Sections include the following:
 - 1. Section 032000 - Concrete Reinforcement.
 - 2. Section 033000 - Cast-in-Place Concrete.
 - 3. Section 042200 – Concrete Unit Masonry.
 - 4. Supply of mechanical items for placement by this Section.
 - 5. Supply of electrical items for placement by this Section.

1.2 REFERENCES

- A. ACI 117 – Standard Specifications for Tolerances for Concrete Construction and Materials.
- B. ACI 301- Structural Concrete for Buildings.
- C. ACI 318 - Building Code Requirements for Reinforced Concrete.
- D. ACI 347 - Recommended Practice For Concrete Formwork.
- E. PS 1 - Construction and Industrial Plywood.

1.3 DESIGN REQUIREMENTS

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

- B. Form, shoring and reshoring design shall be the sole responsibility of the Contractor, including metal decking acting as forms. All forms and shoring shall be designed, stamped, and signed by

a Civil or Structural Engineer licensed in the State of California.

1.4 SUBMITTALS FOR REVIEW

- A. Section 013000 - Submittals: Procedures for submittals.
- B. Submit Shop Drawings: Indicate pertinent dimensions, materials, bracing, and arrangement of joints, reveals, chamfers, textures, plugs, tie holes, embedded items, and any item which will be exposed to view in the finished pour.
- C. Limitation of Review: Structural Engineers' review of shop drawings is of a general nature only, and responsibility for conformance with intent of drawings shall remain with the Contractor. Review does not imply or state that fabricator has correctly interpreted the construction drawings.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with the tolerances specified in ACI-347, Section 3.3, unless noted otherwise.
- B. Design shoring under direct supervision of the Civil or Structural Engineer responsible for the design.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Form Materials: Shall be at the discretion of the Contractor. Forms shall impart a smooth uniform appearance to the concrete without mottles and color variations caused by non-uniform absorption of moisture or chemical reaction. Use only one type of form throughout project for specific element (walls, decks, etc).

2.2 FORMWORK ACCESSORIES

- A. Form Ties: Shall be removable or snap-off type with cones. When forms are removed, all metal shall be not less than 1-1/2 inches from the surface and shall not impart fractures, spalls, or other surface defects. Holes from cones shall be patched.
- B. Form Release Agent: Colorless mineral oil which will not stain concrete, absorb moisture, or impair surface finish, bonding or coating.
- C. Corners Chamfers: Provide 3/4 inch chamfers at all vertical and horizontal edges of beams and columns.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify lines, levels, and centers before proceeding with formwork. Ensure that dimensions agree with drawings.
- B. Verify that work from other trades has been completed to the point where formwork installation may properly commence.
- C. Verify that the reinforcing steel has been inspected prior to concealing with formwork.

3.2 EARTH FORMS

- A. Earth forms are permitted where adequate tolerances can be achieved.
- B. Remove loose soil and debris at the bottom of the excavation prior to placing concrete.

3.3 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301. Formwork should be sufficiently uniform and tight to prevent leakage of concrete paste, readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- D. Align joints and make watertight. Keep form joints to a minimum.
- E. Obtain approval before framing openings in structural members which are not indicated on Drawings.
- F. Provide chamfer strips on external corners of beams and columns.

3.4 FINISH

- A. Forms shall be smooth and impart no texture to surface of concrete.
- B. Vertical form joints are to be plumb and horizontal joints level.
- C. Form ties shall be aligned vertically and horizontally
- D. At inside corners, miter plywood forms.

3.5 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings which are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep steel form surfaces coated with with a non-staining, rust-preventing form oil or otherwise protect against rusting prior to placement of concrete. Rust-stained steel formwork will be rejected.

3.6 INSERTS, EMBEDDED PARTS AND OPENINGS

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
- B. Locate, set in place, and adequately secure items which will be cast directly into concrete.
- C. Coordinate the requirements and limitations amongst all project disciplines when forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.
- D. Install accessories straight, level, plumb, and in accordance with manufacturer's instructions,. Ensure items are not disturbed during concrete placement.
- E. Do not run conduits, wires or pipes in concrete unless approved by the Structural Engineer. Pipe sleeves shall be provided for thermal expansion and as shown on the construction documents.
- F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- G. Provide openings as required for vibrators and concrete placing.
- H. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.7 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
- C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

3.8 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 117 unless noted otherwise. Tolerances for formed surfaces exposed to view in the completed structure shall conform to Class B as defined in table 3.1 of ACI 347 unless designated otherwise elsewhere. All other work shall conform to Class D. See Architectural for additional finish requirements.
- B. Forms shall have sufficient rigidity so as not to deflect more than 1/8 inch between supports after the concrete has been placed.

3.9 FORM REMOVAL

- A. Time of form removal shall depend on the strength of the concrete and the curing. The following time periods shall be considered a minimum and may be extended by the Structural Engineer:
 - 1. Do not remove shoring and forms until the concrete has hardened sufficiently to permit safe removal and the concrete has attained sufficient strength to safely support imposed loads. The minimum elapsed time for removal of forms after concrete has been placed shall be as follows:
 - a. Beams elevated slabs and similar overhead conditions: 28 days unless adequate shoring is provided.
 - b. Footings: 7 days minimum. If backfilled immediately, side forms may be removed 24 hours after concrete is placed.
 - c. Side forms of slab on grade shall remain in place for 7 days.
 - d. Columns and structural walls: 7 days unless in an overhead application.
 - e. Retaining walls: 21 days.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Form removal shall be done at uniform time periods for each type of work throughout the job to ensure uniform color and finish.
- D. All forms below ground surface, with all shores and braces, shall be removed before backfilling.

3.10 RE-USE OF FORMS

- A. Re-use of forms shall in no way delay or change the schedule for placement of concrete from the schedule obtained if all forms were new, nor shall quality, appearance, or performance of the final structure be reduced.

END OF SECTION 03100

SECTION 032000

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Reinforcing steel bars, wire fabric and accessories for cast-in-place concrete.
- B. Related Sections include the following:
 - 1. Section 031000 Concrete Formwork.
 - 2. Section 033000 Cast-in-Place Concrete.
 - 3. Section 042200 – Concrete Unit Masonry.

1.2 REFERENCES

- A. ACI 117 – Standard Specifications for Tolerances for Concrete Construction and Materials.
- B. ACI 301 - Structural Concrete for Buildings.
- C. ACI 315 – Details and Detailing of Concrete Reinforcing.
- D. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
- E. ASTM A706 – Low Alloy Steel Deformed Bars for Concrete Reinforcement
- F. AWS D1.4 - Structural Welding Code for Reinforcing Steel.

1.3 SUBMITTALS FOR REVIEW

- A. Section 013000 - Submittals: Procedures for submittals.
- B. Shop Drawings: Shall be completely detailed (including bending schedules and bending diagrams) and submitted to the SEOR for review. Shop drawings shall show placing details, size and location of reinforcing steel, and any required welding of the reinforcing. Shop drawings shall clearly specify locations and spacing of bars. On elevations of beams and columns, identify sleeves that conflict with typical details or reinforcing so that clarification can be provided prior to construction. Shop drawings shall not be copies of Construction Drawings.
- C. Architectural, structural, mechanical, electrical, and other contract documents shall be reviewed

for anchor bolt schedules, location for anchors, inserts, conduits, sleeves, and any other items required to be cast in concrete. Provisions shall be made so that reinforcing steel will not interfere with the placement of such embedded items, and clearance shall conform to that provided in the construction documents. Any discrepancies are to be brought to the attention of the EOR so that clarification can be provided prior to construction.

- D. Reinforcing steel shall not be fabricated or placed before the shop drawings have been reviewed by the Structural Engineer.
- E. Review of shop drawings is of a general nature only and responsibility for conformance with intent of drawings shall remain with the Contractor. Review does not imply or state that fabricator has correctly interpreted the construction drawings.
- F. Mill Test Reports: Certified mill test reports (tensile and bending strength) for each heat or melt of reinforcing steel shall be submitted to the EOR (contractor?) before delivery of any material to the site. All sizes of reinforcing for the project shall have a test report. Where reinforcing is to be welded, mill test reports shall be provided, as required by ASTM A706.

1.4 DELIVERY AND STORAGE

- A. Reinforcing shall be delivered to site properly bundled and tagged. Store reinforcing steel off the ground and as required to prevent excessive rusting. Protect reinforcing from any coating that will interfere with bond. Do not use damaged or reworked materials.

PART 2 - PRODUCTS

2.1 REINFORCEMENT

- A. Reinforcing Steel:
 - 1. ASTM A615, Grade 60, deformed bar, unless noted otherwise.
 - 2. ASTM A706, deformed bars for moment frame longitudinal reinforcement of columns and beams, and where reinforcement is to be welded.
 - 3. ASTM A1044, headed studs and headed stud assemblies in concrete.
 - 4. Shall be new, free from rust, scale, oil, and dirt.
- B. Welded Wire Fabric: ASTM A1064 "Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed for Concrete".
- C. Spiral Reinforcement: ASTM A1064 if specified as plain wire or A1035 Grade 60, deformed, if specified by bar size.

2.2 ACCESSORIES

- A. Tie Wire: Minimum 16 gage annealed type.
- B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions.
- C. Where supports bear on earth, use concrete blocks. For surfaces exposed to view, stainless steel support chairs, spacers, or bolsters shall be used.
- D. The use of wood or organic supports or spacers inside the forms is not permitted.
- E. Mechanical Splices: Bar-Lock Coupler (ESR- 2495) capable of providing a Type 2 splice per ACI 318-11 Section 12.14.3.2, as manufactured by Dayton Superior or equal with prior approval.
- F. Headed Reinforcement: Lenton Terminator (D6), capable of providing the equivalent of a hooked bar development, as manufactured by Erico or equal with prior approval.

2.3 FABRICATION

- A. Fabricate concrete reinforcing in accordance with ACI 301.
- B. Weld reinforcement in accordance with AWS D1.4 using either shielded metal arc welding, gas metal arc welding, or flux cored arc welding. As a minimum, use E70XX, ER70S-X, or E7XT-XX electrodes respectively for each welding process.
- C. Reinforcing splices not indicated on drawings shall be located at points of minimum stress and approved by the Structural Engineer prior to placement.
- D. In case of fabrication errors, do not rebend reinforcement in a manner that will damage or weaken the material.

PART 3 - EXECUTION

3.1 PLACEMENT

- A. Reinforcing steel shall be placed in accordance with the Construction Drawings, the reviewed shop drawings, and the requirements of the references. Place, support and secure reinforcement against displacement due to workmen and the placement of concrete. Do not deviate from required position.

- B. Maintain concrete cover around reinforcing as follows unless noted otherwise:

Item	Coverage
Beam Stirrups	2 inch
Column Ties	2 inch
Concrete Formed Against Earth	3 inches

- C. Obstructions: Where conduits, piping, inserts, sleeves, etc., interfere with placing of reinforcing steel, obtain acceptance from the Structural Engineer for resolution before placing concrete.
- D. Accommodate placement of formed openings.
- E. Do not displace or damage vapor barriers.
- F. Tying: Push in tie wire so that concrete placement will not force the wire ends to the surface of exposed concrete.
- G. Splicing: Locate splices as specified in the Construction Drawings. Stagger splices in adjacent bars wherever possible.
- H. Field Bending: All reinforcing shall be bent cold. Assure that minimum bend radiuses are maintained. Do not rebend reinforcement within 6 inches of previously bent areas without approval from the Structural Engineer. Reinforcing partially embedded in concrete shall not be field bent.

3.2 FIELD QUALITY CONTROL

- A. Schedule inspections with special inspectors and Architect a minimum of 48 hours prior to placing concrete.

END OF SECTION 032000

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Cast-in-place concrete required for this Work as indicated on the drawings and includes, but not necessarily limited to, foundations, piles, beams, columns, slabs and walls.
- B. Related Sections include the following:
 - 1. Section 031000 - Concrete Formwork.
 - 2. Section 032000 - Concrete Reinforcement.
 - 3. Section 042200 – Concrete Unit Masonry.
 - 4. Section 051200 - Structural Steel.
 - 5. Section 316200 - Prestressed Concrete Piles.

1.2 REFERENCES

- A. ACI 117 – Standard Specifications for Tolerances for Concrete Construction and Materials.
- B. ACI 301 - Structural Concrete for Buildings.
- C. ACI 302 - Guide for Concrete Floor and Slab Construction.
- D. ACI 308 - Standard Practice for Curing Concrete.
- E. ACI 309 - Guide for Consolidation of Concrete.
- F. ASTM C33 - Concrete Aggregates.
- G. ASTM C94 - Ready-Mixed Concrete.
- H. ASTM C150 - Portland Cement.
- I. ASTM C309 - Liquid Membrane-Forming Compounds.
- J. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.

1.3 SUBMITTALS

- A. Section 013000 - Submittals: Procedures for submittals.
 - 1. Mix Designs - Submit to the Structural Engineer proposed concrete mix designs for each concrete type required for work. Mix designs must be stamped by a structural or civil engineer currently licensed in the State of California. The submittal should include a history of uses and test reports and product data sheets; all materials, source of materials, admixtures and their proportions; shrinkage limits of mix design; hose size if pumping mix is not feasible. Resubmit revised designs if the original designs are adjusted or changed for any reason.
 - 2. Submit curing method for review by the Structural Engineer.
 - 3. Shop Drawings - Submit schedule of concrete placement operations, including shop drawings showing locations of construction, contraction, and expansion joints, before commencing work.
 - 4. Shop Drawings - Submit coordination drawings indicating all embedded items, penetrations, openings, and other coordination items related to the finished concrete work.
- B. Product Data: Submit manufacturer's data on manufactured products and other concrete related materials such as bond breakers, cure/sealer, admixtures, etc. Demonstrate compliance with specified characteristics. Provide samples of items upon request. Indicate installation procedures and interface required with adjacent construction for concrete accessories.
- C. Limitations of Review: the Structural Engineer's review will be for general conformance with design intent as indicated in the Contract Documents and does not relieve the Contractor of full responsibility for conformance with the Contract Documents.

1.4 SUBMITTALS AT PROJECT CLOSEOUT

- A. Accurately record actual locations of embedded items, utilities, and components which are concealed from view. Submit to the owner at project closeout.
- B. All test and inspection reports. All transit mix delivery slips.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301 and ACI 318.
- B. Maintain one copy of latest construction documents on site, including design drawings, approved shop drawings, and permit drawings.
- C. Common Sourcing : Provide each of the following materials from a single source for the entire project.
 - 1. Cement
 - 2. Fly ash or slag

3. Aggregate.

D. Special Inspections: The following special inspections, as required by Section 1701 of the California Building Code, shall be provided during construction on the following types of work. The contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner. The owner shall bear costs of tests and/or inspections. Re-testing due to defective materials or workmanship will be back charged to the Contractor.

1. Concrete, per Section 1704.4; Inspection of concrete placement and compression tests.
2. Reinforcing Steel, per Section 1704.4, during placement of reinforcing.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Cementitious materials:

1. Portland cement: ASTM C150, Type II, low alkali and shall be provided by one manufacturer.
2. Fly Ash (pozzolan): ASTM C618, Class F.

B. Aggregates:

1. Coarse shall conform to ASTM C33 size 57 or 67.
2. Fine shall conform to ASTM C33.
3. Pea Gravel or smooth aggregate shall not be used.
4. Lightweight aggregate shall conform to ASTM C330 and C332.

C. Water: shall conform to ASTM C1602 and be clean, potable, and not detrimental to concrete.

2.2 ADMIXTURES

A. No admixtures shall be allowed without written acceptance by the Structural Engineer. Admixtures that have a negative impact on concrete finish shall not be used. Calcium chloride or admixtures containing chloride shall not be used in prestressed concrete, concrete containing embedded aluminum, or concrete cast against stay-in-place steel forms. When more than one admixture is used, admixtures shall be compatible. Provide letter from admixture manufacturer that it is appropriate for proposed mix design.

B. Air Entrainment: ASTM C260; "Daravair", "Micro-Air", manufactured by W.R. Grace, Master Builders or equal.

C. Corrosion inhibitor: ASTM C494 Type C, "DCI", manufactured by W.R. Grace, or equal.

D. Shrinkage reducing admixture manufactured by W.R. Grace, Master Builders or equal.

2.3 ACCESSORIES

- A. Non-Shrink Grout: Premixed compound per ASTM C1107 consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days when placed in a fluid state. SIKAGrout 212, Masterflow 928, or approved equal.
- B. Epoxy Grout: Two-part epoxy adhesive product that conforms to the requirements of Simpson SET-XP High Strength Epoxy (ICC-ES-ESR-2508) by Simpson Strong Tie or equal product with prior written approval of the Structural Engineer. Installation shall be in strict conformance with the manufacturer's recommendations.
- C. Waterstops: self adhesive bentonite waterstop strip intended to seal cold joints in concrete that conforms to the requirements of Superstop by Tremco Sealants or approved equal.

2.4 CONCRETE MIXES

- A. Mix and deliver concrete in accordance with ASTM C94.
- B. Addition of water to the mix after leaving the plant is not permitted.
- C. Provide concrete to the following criteria:
 - 1. Portland Cement: ASTM C150
 - 2. Compressive Strength (28 day): 4000 psi.
 - 3. Normal Weight Aggregate.
 - 4. Water/Cementitious Material Ratio (maximum): 40 percent by weight.
 - 5. 20% of total cementitious material shall be Fly-Ash (class C).
 - 6. Aggregate Size (maximum): 1-1/2 inch.
 - 7. Slump: 4 inches.
 - 8. Drying Shrinkage Limit: 0.04 percent. Drying shrinkage limit is percentage of change in length after 21 days of drying when tested per ASTM C157.
- D. Special mix design requirements for concrete floor slabs over metal deck:
 - 1. Compressive Strength (28 day): 3000 psi
 - 2. Water/Cementitious Material Ratio (maximum): 50 percent by weight.
 - 3. Aggregate Size (maximum): 3/4"

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify requirements for concrete cover over reinforcement.
- B. Verify that anchors, seats, plates, water stops, sleeves, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.2 PREPARATION

- A. Prepare joints in previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
- B. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.

3.3 PLACING CONCRETE

- A. Place concrete in accordance with ACI 301.
- B. Notify Structural Engineer and Special Inspector minimum 48 hours prior to commencement of operations. Do not place concrete until forms and reinforcement as well as other required inspections have occurred and the Special Inspector is present to perform observations and testing during placement.
- C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.
- D. Separate slabs on grade from vertical surfaces with 1/2 inch thick joint filler, unless noted otherwise on plans or details. Place joint filler to required elevations. Secure to resist movement by wet concrete.
- E. Extend joint filler from bottom of slab to within 1/8 inch of finished slab surface.
- F. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- G. Place concrete continuously between predetermined contraction joints.
- H. Do not interrupt successive placement; do not permit cold joints to occur.
- I. Form contraction joints as detailed on plans. Joints shall be formed immediately after final finishing with an approved "SOFF-Cut" concrete-sawing machine as manufactured by "SOFF-Cut International: Corona, California (909) 272-2330. Avoid dislodging aggregates. Unless otherwise indicated or directed, the joints shall be 1/8 inch wide and 1" deep. Do not use zip-strips. Saw contraction joints to true alignment with "SOFF-Cut" concrete-sawing machines adequate in number and power and with sufficient replacement blades to complete the sawing at the required rate. Joints shall be cut as the concrete has hardened sufficiently to permit walking on the slab, and as recommended by the saw manufacturer. Unless otherwise approved, saw joints in the sequence of concrete placement. Remove cutting debris. Saw cuts shall be made in accordance with manufacturer's instructions.
- J. Screed slabs on grades shown, maintaining surface to tolerance of 1/4 inch maximum in 10 feet.

3.4 CONCRETE FINISHING

- A. Provide formed vertical concrete surfaces to be left exposed with a smooth formed finish, unless

noted otherwise. Coordinate with Architect.

- B. Provide a 3/4" chamfer on all exposed concrete edges, unless noted otherwise. Coordinate with Architect.
- C. Concealed concrete surfaces can be Class D finish, unless noted otherwise.
- D. Finish concrete floor surfaces in accordance with ACI 301. Provide a non-slip surface where concrete floor surfaces are left exposed, unless noted otherwise. Coordinate with Architect.
- E. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings.

3.5 CURING AND PROTECTION

- A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Cure floor surfaces in accordance with ACI 308.
- D. Spraying: Spray water over floor slab areas and maintain wet for 7 days.

3.6 FIELD QUALITY CONTROL

- A. Provide free access to Work and cooperate with Owner, Architect and Structural Engineer.
- B. Submit proposed mix design of each class of concrete to special inspection and testing firm for review prior to commencement of Work.
- C. Tests of cement and aggregates may be performed to ensure conformance with specified requirements.
- D. One additional test cylinder will be taken during cold weather concreting, cured on job site under same conditions as concrete it represents.
- E. At a minimum one slump test will be taken for each set of test cylinders taken.

3.7 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not conforming to required compressive strength, lines, quality standards, details, dimensions, tolerances or specified requirements as determined by the Architect/Engineer.
- B. Repair or replacement of defective concrete will be determined by the Architect/Structural Engineer who may order additional testing and inspection at his/her option. The cost of additional testing shall be borne by the Contractor when defective concrete is identified.
- C. Allow Architect/ Engineer to inspect concrete surfaces immediately upon removal of forms if

defects are present.

- D. Excessive honeycomb, cracking or embedded debris in concrete is not acceptable. Notify Engineer upon discovery. Engineer shall determine if concrete is defective. Patch imperfections in accordance with ACI 301 or as directed by Engineer. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect or Engineer for each individual area.
- E. Methods of placing of concrete, pour sequence, and locations of construction joints shall be at the discretion of the contractor unless noted otherwise. Any surface cracks greater than .007" in the cured concrete will be repaired by the Contractor using pressure epoxy injection methods in strict conformance with the epoxy manufacturer's recommendations. The repairs will be performed to the satisfaction of the Architect or Engineer and at no additional cost to the Owner.
- F. No additional compensation will be allowed for repair of defective concrete.

END OF SECTION 03300

SECTION 051200
STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Provide structural steel for building construction including sub-framing units which are part of the general framing system. Include anchors, bases, bearing plates, and connections.

1.2 REFERENCES

- A. ASTM A36/A36M or A572 Grade 50 – Structural Steel: C-shapes, I-shapes, and Plates
- B. ASTM A992 or A572 Grade 50 – Structural Steel: WF-shapes, WT-shapes
- C. ASTM A307 or A36 – Machine bolts.
- D. ASTM A500 –Rectangular, or Square HSS, $F_y = 46$ KSI
- E. ASTM A53 Grade B – Pipes, $F_y = 35$ KSI
- F. ASTM F1554 Grade 36, A36, or A307 – Anchor rods and threaded rods.
- G. ASTM A108 – Welded threaded studs, $F_u = 65$ KSI
- H. AWS D1.1 – Structural Welding Code.
- I. SSPC – Painting Manual

1.3 SUBMITTALS FOR REVIEW

- A. Section 013000 - Submittals: Procedures for submittals.
- B. Submit to the Structural Engineer detailed shop drawings. Shop drawings shall be drawn to scale. Changes to the Construction drawings shall be noted. Structural steel shall not be fabricated or erected before the Structural Engineer has reviewed the shop drawings.
- C. Submit to the Structural Engineer detailed shop drawing showing anchor bolt template layout

plan and setting details. Delivery of concrete shall not be scheduled before the Structural Engineer has reviewed the anchor bolt shop drawings.

- D. Certified material test reports (mill test) for all structural steel.
- E. Manufacturer's Certifications and product data sheets for all welding filler metal (electrodes).
- F. Submit to the structural Engineer detailed shop drawings and calculations (stamped and signed by a licensed engineer) for Special Moment Frames. Moment frames to be prefabricated PACO Steel Moment Frames, Simpson Moment Frames with Link Connection, Hardy Moment Frames with SidePlate connectors, or approved equal.

1.4 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Special moment frames shall be fabricated by an approved steel fabricator. Moment frames to be prefabricated PACO Steel Moment Frames, Simpson Moment Frames with Link Connection, Hardy Moment Frames with SidePlate connectors, or approved equal.
- C. Qualification of Welders:
 - 1. All welding shall be performed by operators who are qualified for the types of welds used. Each operator shall have been qualified as prescribed by AWS.
 - 2. Each welder working on the project shall be qualified for each process and position as a result of having performed a weld qualification test using the consumables and procedures to be used on this project.
- D. Visual inspection of welding shall be the primary method to confirm that the procedures, materials, and workmanship incorporated in construction are those that have been specified and approved for the project. Visual inspection shall be conducted by qualified personnel, in accordance with a written practice. Nondestructive testing of welds in conformance with AWS D1.1 shall serve as a backup, but shall not serve to replace visual inspection. All complete and partial penetration welds shall be tested using approved nondestructive methods conforming to AWS D1.1. When welds of the continuity plate to the "k-area" of the column occur, the "k-area" adjacent to the welds shall be inspected using approved non-destructive methods.
- E. Special Inspections: Per Section 1704.3 of the California Building Code:
 - 1. Structural Steel Welding:
 - a. The special inspector shall:
 - i. Ascertain that all fabrication and erection by welding is performed in accordance with the requirements of the approved plans, specifications, the

- building code and AWS standards.
- ii. Verify that only materials and procedures conforming to the requirements of AWS, AISC, or ASTM, and specified on approved plans are used.
- iii. Inspect all field welding.
- iv. Visual inspection of shop welding performed by approved Fabricator using certified Welders with appropriate documentation.
- v. All welding inspectors shall be trained and thoroughly experienced in inspecting welding operations, and qualified in accordance with AWS D1.1.
- b. The Special Inspector shall provide continuous inspection for shop and field welding of special moment-resisting steel frames, or any member or connection that is designed to resist loads and forces. Continuous inspection also includes 3/8 inch and larger fillet welds, multi-pass welds, groove welds, where specifically indicated on drawings.
- c. Periodic inspections are permitted during welding of the following items, provided visual inspection is conducted prior to completion and/or shipment of shop welds.
 - i. Single-pass fillet welds not exceeding 5/16 in.
 - ii. Floor and roof deck welding.
 - iii. Welded studs in structural diaphragm or composite systems.
 - iv. Cold-formed studs and joists.
 - v. Stair and Railing Systems.
 - vi. ASTM A706 Reinforcing steel, not larger than No. 5 bars, per exception in CBC 1704.3.
- d. Except for special moment-resisting steel frames, special inspections are not required where the work is performed on the premises of a fabricator registered and approved by the building official and the DPR to perform such work without special inspection per CBC Section 1704.2.2.
- e. Non-destructive testing for fully restrained connections in ordinary and special moment-resisting frames by ultrasonic testing or by radiology, unless required otherwise in Section 1704.3 of the CBC, the approved plans and specification.
 - i. Complete joint penetration groove welds.
 - ii. Partial penetration groove welds in column splices.
 - iii. Base metal thicker than 1-1/2 inches (38mm) when subject to through-thickness weld shrinkage strains.
 - iv. When welds of the continuity plate to the “k-area” of the column occur, the “k-area” adjacent to the welds shall be inspected using approved non-destructive methods.
- 2. High Strength Bolting:
 - a. High strength bolting shall be installed in accordance with the “Specifications for Structural Joints using ASTM A325 or A490 Bolts” as approved by the research council on structural connections of the engineering foundation, unless otherwise noted on the approved plans and specifications.
 - b. While the work is in progress, the special inspector shall determine that the requirements of this section for bolts, nuts, washers and paint; bolted parts, installation and tightening standards are met.
 - c. The special inspector shall observe the calibration procedures when such procedures are required by the plans and specifications, and shall monitor the installation of bolts to determine that all plies of connected materials have been

drawn together and that the selected procedure is properly used to tighten all bolts.

- d. For all bolted connections that are specified to be slip critical or subject to axial tension, the special inspector shall verify that the specified procedures were followed to achieve the pretension specified.
- e. Bolts in connection, identified as not being slip-critical nor subject to direct tension need not be inspected for bolt tension other than to ensure that the plies of the connected elements have been brought into snug contact.
- f. Periodic inspection for bolted connections may be performed in accordance with the requirements of section 1701.6.2 of the CBC, or as defined in this section.
- g. Expansion anchors and epoxy set bolts require special inspection per the corresponding ESR or ICC report requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Wide Flange Sections: ASTM A992, Grade 50.
- B. Wide Flange Column Base Plates, Continuity Plates, and Doubler Plates: ASTM A572, Grade 50.
- C. Other shapes, plates and bars: ASTM A36.
- D. Pipe Columns:
 - 1. $t < 0.625$ inch: ASTM A500.
 - 2. $t \geq 0.625$ inch: ASTM 53 type E or S.
- E. Steel Tubing: ASTM A500 grade B.
- F. Anchor bolts and anchor rods: ASTM F1554, Grade 36, unless noted otherwise on plans
- G. Mild steel threaded fasteners: ASTM A36 or A307 (designated MB on plans)
- H. High strength threaded fasteners: ASTM A325
- I. Welding: AWS D1.1. FEMA 350.
- J. Welding Electrodes:
 - 1. As required by AISC "specification for structural steel buildings" and AWS code. Electrode selection shall be based on actual properties of connected metals.
 - 2. As a minimum use E70XX electrodes with shielded metal arc welds, F7XX-EXXX for submerged arc welds (shop welds only, ER70S-X for gas metal arc welds, and E7XT-XX for flux core welds).
 - 3. Use low hydrogen electrodes unless noted otherwise.

- K. Complete joint penetration groove welds shall be made with a filler metal that has a minimum Charpy V-notch toughness of 20 ft-lbs at minus 20 degrees Fahrenheit, as determined by AWS classification or manufacturer certification.
- L. Non-Shrink Grout: Premixed compound per ASTM C1107 consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 7,000 psi in 28 days when placed in a fluid state. SIKAGROUT 212, Mastflow 928, or approved equal.

2.2 CONNECTORS

- A. Expansion anchors: Kwik Bolt TZ as manufactured by Hilti, Inc. or equal with prior approval.
- B. Headed studs: Lengths specified shall correspond to the installed length. Conform to requirements of AWS D1.1 Section 7 for Type B studs (Table 7.1).

2.3 PAINT

- A. Shop finish for interior exposed structural steel: SSPC SP-6 cleaning; Thnemec Series 37 Chem-Prime, universal rust inhibitive primer, compatible with epoxy & urethane top coats. Coordinate with Architect.
- B. Finish for exterior exposed structural steel to be hot dipped galvanized unless noted otherwise on architectural plans specifying paint. Exterior steel to be painted shall conform to the Architecturally Exposed Painted Steel section.

2.4 FABRICATION

- A. General
 - 1. Fabrication will be performed in accordance with Chapter M of AISC "Specification for Structural Steel Buildings" and the Drawings and Specifications.
 - 2. Provide holes and accessories required for securing other Work to the Structural steel.
 - 3. Where thickness of plate exceeds 1 inch or the diameter of hole, drill or ream holes after punching. Flame cut holes for fasteners are not acceptable.
 - 4. Fabricate beams and girders with natural camber upward, unless otherwise shown or indicated on the Drawings.
 - 5. When minimum AISC fillet weld thickness requirement exceeds welds shown on details, provide minimum AISC weld
 - 6. After fabrication, all steel shall be cleaned free of rust, loose mill, scale and oil.
 - 7. The Contractor shall be responsible for the control of all erection procedures and sequences including but not limited to temperature differentials and weld shrinkage.
 - 8. Structural elements having fabrication or erection errors or which do not satisfy tolerance limits shall be repaired at no additional expense to owner. Submit drawings showing reasons for, and details of, proposed corrective work for approval by the Engineer prior to performing corrective work.
 - 9. There shall be no field cutting of structural steel members with out prior approval of the

Engineer.

B. Architecturally Exposed Painted Steel:

1. Fabricate with special care using materials selected for best appearance. Store materials off ground and keep clean. Cut, fit and assemble work with surfaces smooth, square and with complete contact at joints. Set cambers up. Weld all work continuously; grind smooth and flush to make seams invisible after priming. Prepare surfaces to comply with SSPC SP-6; apply prime coat within 24 hours after cleaning. Welds exposed to view shall be uniformly made and ground smooth. Weld splatter shall be removed.

C. Bolts, General

1. Bolts shall be of a length that will extend entirely through but not more than ¼-inch beyond the nuts unless otherwise shown on the Drawings.
2. Washers shall be used on Bolts. Use beveled washers where bolts bear on sloping surface.
3. Bolts shall be installed such that no threads occur in the shear plane.
4. Manufacturers symbol and grade markings shall appear on all bolts and nuts.
5. Product containers must be marked so that correspondence with mill reports can be established.
6. Bolt holes shall be 1/16" larger than the bolt. Holes in column baseplates shall 1/8-inch larger than the nominal bolt size
7. Slotted holes shall be as per AISC Table J3.3 or as detailed in the construction documents.

D. High Strength Bolts

1. High strength bolts shall be installed in accordance with "Specification for Structural Joints Using ASTM A325 or A490 Bolts".
2. Unless otherwise noted, all connections are "bearing type."
3. Tighten nuts using Direct Tension Indicator. Calibrated wrench and "Turn of Nut" methods are not acceptable.

E. Shop Painting

1. The following surfaces shall not be shop painted:
 - a. Welded shear studs.
 - b. Machined surfaces.
 - c. 4-inches on each side of field welds.
 - d. Surfaces around High Strength Bolts and surfaces held together by High Strength Bolts.
 - e. Surfaces encased in concrete or cementitious fireproofing.
 - f. Tops of beam flanges directly supporting metal decking, except where weldable paint is provided.
2. Touch-up field welds and abraded areas with shop primer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with AISC codes and specifications, and with AWS "Structural Welding Code".
- B. Secure field measurements required for proper and adequate fabrication and installation of the work. Assume responsibility for exact measurements.
- C. Prior to commencing with the erection of structural steel, the job site shall be inspected to verify that the structural steel may be erected in accordance with the Drawings and Specifications.
- D. Discrepancies:
 - 1. In the event of discrepancy, immediately notify the Architect and Structural Engineer in writing.
 - 2. Do not proceed with construction in the region of the discrepancy until all such discrepancies have been resolved.
- E. Preparation:
 - 1. Furnish templates for exact locations of items to be embedded in concrete and masonry, and any setting instructions required for installation.
- F. Erection, General:
 - 1. Structural steel shall be erected in accordance with Chapter M of AISC Specifications and the Drawings and Specifications.
 - 2. Care shall be taken to protect work already installed from damages resulting from structural steel erection.
 - 3. Steel erection may be allowed prior to supporting concrete reaching specified strengths if the contractor provides technical justification and the Structural Engineer concurs.
 - 4. Erection of architecturally exposed structural steel shall be in accordance with Section 10 of AISC Code of Standard Practice.
- G. Temporary Shoring and Bracing:
 - 1. Provide temporary bracing and shoring adequate to protect the structure against damage due to construction loads and other loads such as wind and seismic forces.
 - 2. Provide temporary works as necessary to erect the structure.
 - 3. Items installed before concrete is placed shall be properly braced to prevent distortion by pressure of concrete. Watch and maintain bracing during concrete operations.
 - 4. Contractor is responsible for identifying need for temporary construction.
- H. Field Assembly:

1. Set structural members to the lines and elevations indicated. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 2. Before assembly clean bearing surfaces and other surfaces which will be in permanent contact after assembly.
 3. Splice members only where indicated on Structural Drawings or where accepted by the Structural Engineer.
 4. Do not enlarge unfair holes in members by burning or by the use of drift pins. Ream holes that need to be enlarged to admit bolts. Where a hole is required to be enlarged by more than 3/32-inch ream to and use next larger bolt size.
 5. Do not use gas cutting torches in the field for correcting fabricating errors in the structural framing unless accepted by the Architect. Finish gas cut sections equal to a sheared appearance when permitted.
 6. The quality of field welds or bolting shall be the same as that performed in the shop.
 7. Erection bolts for welded connection shall be tightened securely and left in place.
- I. Setting Anchor Bolts:
1. Anchor bolts shall be placed using metal template. Templates shall be constructed of 1/8" sheet metal, minimum.
 2. Locations and elevations of anchor bolts shall be verified by a licensed surveyor prior to placing concrete. Any anchor bolts out of position shall be repositioned prior to placing concrete.
- J. Setting Base Plates:
1. Clean concrete bearing surfaces and roughen to improve bond. Clean the bottom surface of base plates.
 2. Tighten anchor bolts after the supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the base plate prior to packing with grout.
- K. Expansion Bolts:
1. Install in accordance with the manufacturer's recommendations.
 2. Use washers on all bolts.
 3. Use care to avoid cutting or damaging reinforcing bars.
 4. When exposed to view in the final structure, bolts shall be of a length that will extend entirely through but not more than 1/4-inch beyond the nuts unless noted otherwise on the Drawings.
- L. Expansion anchors shall be proof tested after installation as required by the respective ICC ESR report.

END OF SECTION 051200

SECTION 052100
OPEN WEB STEEL JOISTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Open web steel joists, with bridging, attached seats and anchors.
2. Loose bearing plates.
3. Framed openings greater than 9" inches.

1.2 REFERENCES

A. ASTM International:

1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A108 - Standard Specification for Steel Bars, Carbon, and Cold Finished, Standard Quality.
3. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
4. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
5. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
6. ASTM A529/A529M High-Strength Low-Alloy Columbium-Vanadium Structural Steel, Grade 50
7. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
8. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
9. ASTM F436 - Standard Specification for Hardened Steel Washers.
10. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

B. American Welding Society:

1. AWS D1.1 - Structural Welding Code - Steel.

C. Steel Joist Institute:

1. SJI - Standard Specifications and Load Tables.

D. SSPC: The Society for Protective Coatings:

1. SSPC - Steel Structures Painting Manual.
2. SSPC SP 1 - Solvent Cleaning.
3. SSPC SP 10 - Near-White Blast Cleaning.

1.3 SUBMITTALS

- A. Section 013000 - Submittal Procedures: Submittal requirements.
- B. Shop Drawings:
 - 1. Indicate standard designations, configuration, sizes, spacing, locations of joists, joist leg extensions.
 - 2. Joist coding, bridging, connections, and attachments
 - 3. Cambers
 - 4. Connection details.
- C. Submit to the Structural Engineer, the complete design calculation. The joist design shall be under the supervision of a Civil or Structural Engineer registered in the State of California, and the calculations and shop drawings shall bear his seal and signature. The submittal shall be stamped reviewed by the Structural Engineer prior to fabrication.
- D. Welders' Certificates: Submit manufacturer's certificates, certifying welders employed on the Work, verifying AWS qualification within previous 12 months.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with SJI, Load Tables, and Weight Tables, [including headers and other supplementary framing].
- B. Maintain one copy of each document on site.
- C. Special Inspections: Per Section 1704.3 of the California Building Code.
 - 1. All field welding.
 - 2. Visual inspection of shop welding performed by approved Fabricator using certified Welders with appropriate documentation.

1.5 QUALIFICATIONS

- A. Fabricator: Company specializing in performing Work of this section with minimum 3 years experience.
- B. Erector: Company specializing in performing Work of this section with minimum 3 years experience.
- C. Design connections not detailed on drawings under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of California.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 016000 - Product Requirements: Product storage and handling requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Open Web Joists Members: SJI Type K, LH Longspan, and Joist Girders. Conforming to SJI specifications. Designed for the loads specified on the construction drawings.
- B. Nuts: ASTM A563 heavy hex type.
 - 1. Finish: galvanized
- C. Washers: ASTM F436; Type 1, circular, beveled, or Furnish clipped washers where space limitations require.
 - 1. Finish: galvanized
- D. Shear Connectors: ASTM A108; Grade B, headed, unfinished and in accordance with AWS D1.1; Type B.
- E. Structural Steel For Supplementary Framing and Joist Leg Extensions: ASTM A36/A36M.
- F. Welding Materials: AWS D1.1; type required for materials being welded.
- G. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.

2.2 FABRICATION

- A. Furnish bottom and top chord extensions as indicated on drawings.
- B. Space stud shear connectors as required on structural drawings.

2.3 FINISH

- A. Prepare joist component surfaces in accordance with SSPC SP 2.
- B. Shop prime joists and supplementary framing members. Do not prime surfaces that will be fireproofed or field welded.
- C. Painting if required, coordinate with Architect.

PART 3 - EXECUTION

3.1 ERECTION

- A. Erect and bear joists on supports.
- B. Allow for erection loads. Install sufficient temporary bracing to maintain framing safe, plumb, and in alignment.

- C. After joist alignment and installation of framing, field weld joist seat to bearing plates and angles.
- D. Position and field weld joist chord extensions and wall attachments as detailed.
- E. Frame floor and roof openings greater than 9 inches with supplementary framing.
- F. Do not permit erection of decking until joists are braced and/or bridged, and secured or until completion of erection and installation of permanent bridging and bracing.
- G. Do not field cut or alter structural members without approval of Architect/Engineer.
- H. After erection, prime welds, abrasions, and surfaces not shop primed.

END OF SECTION 052100

SECTION 053100

STEEL DECK

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:

1. Provide steel deck and required accessories where indicated on plans.

1.2 REFERENCES

- A. AISI – Specification for the Design of Cold-Formed Steel.
- B. AWS D1.1 – Structural Welding Code.
- C. ICBO Evaluation Report ER-2078P.
- D. SSPC – Painting Manual

1.3 SUBMITTALS FOR REVIEW

- A. Section 013000 - Submittals: Procedures for submittals.
- B. Submit to Structural Engineer, shop drawings showing deck layout, framing, and supports, with dimensions and details of accessories.

1.4 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Special Inspections: Per Section 1704.3.1.2 of the California Building Code.
1. All field welding.
 2. Visual inspection of shop welding performed by approved Fabricator using certified Welders with appropriate documentation.

1.5 PERFORMANCE REQUIREMENTS

- A. Diaphragm Shear Capacity: The gage and attachment of the deck is designed to provide a diaphragm shear capacity in accordance with current ESR Evaluation Report of the International Code Council.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Do not bend or mar decking.
- B. Store off ground with one end elevated for drainage.
- C. Protect from weather.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Galvanized Steel: ASTM A 653 SS Designation Grade 33, Minimum Yield 38 ksi.
 - 1. Zinc coated per ASTM A653, G60.
 - 2. Factory Prime Painted Grey: rust inhibitive light gray primer.
- B. Floor Deck: Gauge and styles per framing notes on the Structural Drawings.
- C. Decking Manufacturer: Verco Manufacturing Co. or accepted equal.
- D. Each metal decking type shall have a current ICC ESR Evaluation Report listing allowable vertical load values, diaphragm shear values and ratings for use in fire resistive assemblies.
- E. Welding electrodes: per AWS D1.3 and deck manufacturer use minimum E60XX Electrodes.

2.2 ACCESSORIES

- A. Metal Accessories: Same gage as decking except where noted or specified to be heavier material on drawings.
- B. Flashings and closures: galvanized sheet steel, 16 gauge minimum.

2.3 FABRICATION

- A. Form deck units in lengths to span three or more supports, with butted or 2" nested end laps and interlocking side laps formed with standing seam allowing button punch connection.
- B. Cantilevered units shall have the cantilever and at least the adjacent span in one continuous length.
- C. Fabricate such that end joints occur over supporting members.
- D. Sheets parallel to perimeter of diaphragms shall be full width sheets.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Check supporting structure for correct layout and alignment. Verify that surfaces to receive deck are free of debris. Notify Structural Engineer of any discrepancies or defects prior to proceeding with work.
- B. Install deck units and accessories in accordance with approved shop drawings.
- C. Placing Deck Units:
 - 1. Position on supporting steel framework and adjust to final position with ends bearing minimum two inches on supporting members.
 - 2. Place units end to end before permanently fastening.
 - 3. Align ribs over entire length of run.
- D. Fastening Deck Units:
 - 1. Secure to supporting members with $\frac{1}{2}$ in effective diameter spot welds.
 - 2. Weld or button punch at each support and connect side laps as shown on structural drawings.
 - 3. Comply with AWS requirements and procedures for welding sheet steel in structures.
- E. Install closures of sufficient strength to remain in place without distortion. Shore when necessary.
- F. Install sheet steel closures and angle flashings to close openings between deck and walls, columns, and openings, etc.
- G. Punch holes in bottom flutes as required for installation of hanger wires.
- H. Reinforce openings as shown on Structural Drawings.
- I. Cutting Openings:
 - 1. Where openings do not need reinforcement (exclusive of trim bars in concrete), do not cut deck until concrete has cured.
 - 2. If opening or opening group cuts through two decking units, do not cut opening until concrete has cured.
 - 3. If both edges of openings perpendicular to deck span are supported by a beam, opening may be cut prior to concrete placement.

3.2 PROTECTION

- A. Do not use deck units for storage or working platforms until permanently secured in position.
- B. Construction loads must not exceed carrying capacity of deck.
- C. Do not place pipes or conduit in concrete fill over deck.
- D. Concrete shall be placed with care, to avoiding impacts from dropping or dumping.

1. Runways shall be planked if using buggies.
 2. Heavy concentrated loads resulting from concrete or crews and uniform loads shall be investigated for shoring consideration.
- E. Shoring is the responsibility of the contractor.

END OF SECTION 053100

SECTION 055213

PIPE AND TUBE RAILINGS

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. Stainless-steel railings.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. 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.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Railing brackets.
 - 3. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Fittings and brackets.
3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.
- C. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 1. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 2 - Acceptable Manufacturer: C.R. Laurence Co., Inc. (CRL)
Tel: (800) 421-6144 Fax: (800) 587-7501
Email: railings@crlaurence.com
www.crl-arch.com
www.crlaurence.com

2.1 PERFORMANCE REQUIREMENTS

1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

- 1. Match CRL Components in Glass Railing System.

2.3 STAINLESS STEEL

- A. Tubing: ASTM A 554.
- B. Pipe: ASTM A 312/A 312M.

2.4 FASTENERS

- A. General: Provide the following:
 - 1. Stainless-Steel Railings: stainless-steel fasteners.
 - 2. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated.

2.5 FABRICATION

- A. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- B. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 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 flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
 - 5. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

- C. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

2.6 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines, or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches.
- C. Polished Finish: Oil-ground, uniform, fine, directionally textured finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.4 ATTACHING RAILINGS

- A. Attach railings to wall with wall brackets[, **except where end flanges are used**]. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- B. Secure wall brackets and railing end flanges to building construction as follows:
 - 1. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.

3.5 ADJUSTING AND CLEANING

- A. Clean by washing thoroughly with clean water and soap and rinsing with clean water.

3.6 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 055213

SECTION 057310

TAPER-LOC® DRY GLAZE GLASS RAILING SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Tempered Laminated Glass Dry Glazed Railing Assemblies.

1.2 REFERENCES

- A. ASTM C 1048 – Standard Specification for Heat Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass
- B. ASTM C1172—Standard Specification for Laminated Architectural Flat Glass
- C. NAAMM Metal Finishes Manual; national Association of Architectural Metal Manufacturers

1.3 SYSTEM DESCRIPTION

- A. Performance Requirements for Handrail Assembly:
 - 1. Support distributed load of 50 pounds per linear foot (0.73kN/M), applied horizontally at right angles in any direction to the handrail.
 - 2. Support concentrated horizontal load of 200 pounds (0.89kN), applied in any direction at any point along handrail system.
 - 3. 50 lbs (0.22kN) on 1 sf (0.093m²) perpendicular to guard at any location
 - 4. Wind loads 25 psf or as otherwise specified.
 - 5. Distributed loads and concentrated loads not to be applied simultaneously.

1.4 SUBMITTALS

- A. Submit under provisions of Submittals Section.
- B. Product Data: Submit Manufacturer's technical product data for railing components and accessories.
- C. Shop Drawings: Dimensioned drawings of railing assemblies indicating the following:
 - 1. Elevations; include joint locations, transitions, and terminations.

1. Manufacturer's installation and maintenance instructions.

D. Samples of manufacturer's finishes (As selected by Architect.)

1.5 QUALITY ASSURANCE

A. Components and installation are to be in accordance with state and local building codes.

B. All components and fittings are furnished by the same manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials properly protected against damage to finished surfaces during transit.

B. Inspect materials upon delivery for damage. Unless minor defects can be made to meet the Architect's specifications and satisfaction, damaged parts should be removed and replaced.

C. Store materials at building site under cover in dry location

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: **C.R. Laurence Co., Inc. (CRL)**
Tel: (800) 421-6144 Fax: (800) 587-7501
Email: railings@crlaurence.com
www.crl-arch.com
www.crlaurence.com

2.2 MATERIALS

A. Aluminum Components: Conforming to ASTM B 221/ASTM B221M, Alloy 6063-T52

B. Stainless Steel Components: Conforming to ASTM A 666, Type 304

C. Stainless Steel Components: Conforming to ASTM A 240 / A 666, Type 316

D. Brass Components: Conforming to ASTM B 248, No. 260, Yellow Brass

2.3 COMPONENTS

A. Glazing: Fully tempered ASTM C 1048 Kind FT, Quality q3.

1. Laminated Tempered Thickness: 9/16"
2. Color: Clear.

B. Interlayer (Option): Ionoplast

Basis of Design: DuPont™ SentryGlas® interlayer manufactured by DuPont Glass Laminating Solutions, www.sentryglas.com.

1. Thickness: [1.52mm]
2. Color: Clear
3. Interlayer Physical Properties:

Young's Modulus: 43 kpsi, when tested in accordance with ASTM D5026
Tensile Strength: 5.0 kpsi, when tested in accordance with ASTM D638.
Elongation: 400%, when tested in accordance with ASTM D638
Flex Modulus: 50 kpsi, when tested in accordance with D790.
Heat Deflection Temperature at 0.46 MPa: 110 deg F, when tested in accordance with D648.

C. Internal Handrail Cap Connection Sleeves: Metal tube, material compatible with handrail cap material.

D. TAPER-LOC® Dry Glazing System for Laminated Tempered Glass: Each TAPER-

LOC® Set consists of two or four Tapers, and one L-Setting Block. Designed for 9BL68 Shoe Bases.

E. Shoe Base:

1. Profile: **CRL Part # 9BL56**; 2 7/8" inches wide by 4-3/4 inches high rectangular cross-section. Designed to work with CRL's TAPER-LOC® Dry Glazed System with 9/16" (13.52 mm) laminated tempered glass.
2. Material: Aluminum 6063-T52.
3. Finish:
 - i. Base Cladding: Sheet metal cladding added to exposed shoe base sections. Adhere with double-sided tape and/or silicone adhesive. Provide end caps where ends of shoe base sections are exposed.
 - ii. 304 Brushed Stainless.

F. Metal Cap Railing:

1. Profile: **Part # GRCF5BS Flat Top U Channel**.
2. Finish: Brushed Stainless

G. Handrail Brackets:

1. Material: Brushed Stainless Steel.

H. Metal Handrail Tubing and accessories:

1. Profile: **Part # HR15**, round 1-1/2 inches (38.1 mm) diameter.
2. Finish: Brushed Stainless Steel.

I. Fasteners: Types and sizes indicated in shop drawings.

- A.** For **L56S and 9BL56** Base Shoes, for concrete attachment, hole size in base shoe is to be 9/16" (14.3 mm), counter bore 7/8" (22.2 mm) x depth 1/2" (12.7 mm), center-to-center spacing of holes is 12" (304.8mm). Use Hilti HSL3 Expansion Anchors 3-3/4" (95 mm) long **CRL Part # EBA334**, Washer is included.
- B.** For all other Laminated Base Shoes, for concrete attachment, hole size in base shoe is to be 13/16" (20.6 mm), counter bore 1-1/4" (31.7mm) x depth 1/2" (12.7 mm), center-to-center spacing of holes is 11.811" (300mm). Use Hilti HSL3 M12 Expansion Anchors 6-1/8" (156 mm) long **CRL Part # EBA335**, Washer is included.
- C.** For **L56S and 9BL56** Base Shoes, for steel attachment, hole size in base shoe is to be 9/16" (14.3 mm), counter bore 7/8" (22.2 mm) x depth 1/2" (12.7 mm), center-to-center spacing of holes is 12" (304.8mm). Use 1/2" – 13 x 1 stainless steel socket head cap screw **CRL Part # SHCS12X1**.
- D.** For all other Laminated Base Shoes, for steel attachment, hole size in base shoe is to be 13/16" (20.6 mm), counter bore 1-1/4" (31.7mm) x depth 1/2" (12.7 mm), center-to-center spacing of holes is 11.811" (300mm). Use M14-2.0 x 20mm Hex Head stainless steel screw **CRL Part # HHCS14X34**. 28mm stainless steel washer is included.

- J. Sill Angles for Tempered Glass Railing Assemblies: Steel angle profiles conforming to ASTM A 36, with anchoring devices, sizes indicated in shop drawing of section 05 5000, drilled and tapped for fastener types, sizes, and spacing indicated.

2.4 FABRICATION

- A. Fabricate handrail assembly components to lengths and configurations complying with shop drawings.
- B. Machine joint edges smooth and plane to produce hairline seams when site assembled; supply concealed sleeve connectors for joints.
- C. Isolate dissimilar metals to prevent electrolytic action by applying primer to concealed surfaces of metal components.

PART 3 INSTALLATION

3.1

- A. Install handrails in accordance with manufacturer's recommended installation instructions and approved shop drawings.

3.2 CLEANING

- A. Clean glazing surfaces after installation, complying with requirements contained in the manufacturer's instructions. Remove excess glazing sealant compounds, dirt or other substances.
- B. Remove protective films from metal surfaces.
- C. Clean railing surfaces with clean water and mild detergent. Do not use abrasive chemicals, detergents, or other implements that may mar or gouge the material.

3.3 PROTECTION

- A. Institute protective measures required throughout the remainder of the construction period to ensure that all the materials do not incur any damage or deterioration.
- B. Repair components damaged by subsequent construction activities in accordance with manufacturer's recommendations; replace damaged components that cannot be repaired to Architect's acceptance.

END OF SECTION

SECTION 061000
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. All labor, materials, equipment and services necessary for the completion of the carpentry work shown on the drawings, included but not limited to:
 - 1. Wood framing, sheathing, blocking, furring, nailers, backing panels for utilities, miscellaneous wood, metal connectors and hardware.
 - 2. Temporary shoring during construction.

1.2 SUBMITTALS FOR REVIEW

- A. Pursuant to Section 013300, Submittal Procedures.
- B. All submittals shall be reviewed and checked by the Contractor prior to submittal to the Engineer. Contractor shall affix his signature to each submittal indicating the Contractor has reviewed, checked and approved the submittal for compliance with all the requirements of the plans and specifications.
- C. Submit to the Structural Engineer product data for each product to be incorporated into the work.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Structural observation by Engineer of Record (EOR) at the following milestones:
 - 1. Shear wall sheathing fasteners and hardware prior to placing obscuring finishes.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Dimension Lumber: surfaced 4 sides, 19% maximum moisture content, manufactured and graded per WWPA grading rules and all pieces grade stamped:
 - 1. Sills: AWP A Preservative Treated DF No 2 or Foundation Grade Redwood
 - 2. Joists, Rafters, Beams, Headers: up to 4x DF No 2, 6x DF No 1
 - 3. Girders: DF No 1
 - 4. Studs: DF No 2
 - 5. Post and Double Top Plates: DF No 1

6. Miscellaneous Lumber; blocking, furring, nailers, sleepers, bucks, grounds and cant strips: DF No 3 or Stud, surface 4 sides, 19% maximum moisture content. Pressure preservative treat items exposed to weather or in contact with roofing, flashing, waterproofing, masonry, concrete or the ground.
- B. Engineered Lumber: Engineered lumber shall be manufactured by Weyerhaeuser Trus Joist or approved equal in a plant listed in the ESR reports referred to below and under the supervision of an approved third-party inspection agency. All members are to be free of finger or scarf joints or mechanical connections in full-length members. All engineered lumber shall be identified by a stamp indicating the product type and grade and ICC-ES evaluation report number, manufacture's name, plant number and the independent inspection agency's logo.
1. Parallel Strand Lumber: PSL products shall be designed and manufactured to the standards set forth in the ICC Evaluation Service Report No. ESR-1387.
 2. Laminated Veneer Lumber: LVL products shall be designed and manufactured to the standards set forth in the ICC Evaluation Service Report No. ESR-1387.
 3. Laminated Strand Lumber: LSL products shall be designed and manufactured to the standards set forth in the ICC Evaluation Service Report No. ESR-1387.
- C. Prefabricated plywood web and built-up wood floor and roof joists (I-Joists). TJI prefabricated wood I-Joist products shall be designed and manufactured by Weyerhaeuser or approved equal to the standards set forth in the ICC Evaluation Service Report No. ESR-1153.
- D. Plywood: APA rated, Exterior Exposure, manufactured per US Product Standard PS 1 for Construction and Industrial Plywood. All plies shall be group 1 or 2 species, minimum five plies. We do not recommend the use of Oriented Strand Board (OSB) in lieu of plywood sheathing due to the poor performance of this product when exposed to moisture. The builder owner needs to approve the use of OSB sheathing in lieu of the plywood as specified. Each sheet shall stamped with the PS and/or APA grade mark:
1. Roof Sheathing: 5/8" C-DX, species group 2 or better, identification index 32/16 or better.
 2. Floor Sheathing: 1 1/8" C-D T&G, species group 2 or better, floor span rating index 48" oc.
 3. Wall Sheathing: 1/2" C-DX or Structural 1, species group 2 or better, identification index 20/0.
 4. Parapet Sheathing (inside face for roofing attachment): 5/8" C-DX, species group 2 or better, identification index 20/0.
- E. Wood Treatment
1. Treat all above ground wood exposed to deterioration by moisture and all wood in contact with concrete, the ground, or fresh water.
 2. Lumber, Timbers, Bridge and Mine Ties in ground contact, concrete contact, exposed to moisture or fresh water - Preservative treatment: Pressure-treated with waterborne preservatives, to comply with AWPA Pressure treating standard C2. Minimum net retention shall be .4 pounds per cubic feet.

3. Plywood - Preservative treatment: Pressure-treated with waterborne preservatives, to comply with AWPA Pressure treating standard C9. Minimum net retention shall be .4 pounds per cubic feet.
4. Glued Laminated timbers (GLB): Preservative treatment: Pressure-treated with waterborne preservatives, to comply with AWPA Pressure treating standard C28. Minimum net retention shall be .4 pounds per cubic feet.
5. Pressure-treated lumber and plywood to bear approved quality mark by an accredited ALSC third party inspection agency to assure treatment is in conformance with appropriate AWPA standards.
6. To the extent possible all fabrication (boring, ripping, planning, sanding, and trimming) shall be specified and accomplished prior to pressure treating.
7. Handling, fabrication, field treating and disposal of cutoffs shall be in conformance with AWPA M4. Field treat with Copper Naphthenate solution with preservative concentration of no less than 2% copper metal.
8. Kiln dry after treatment to 19% maximum moisture content for lumber, and 15% for plywood.
9. Precautions for wood preservatives and treatment:
 - a. Post "Consumer Information Sheet: and "Material Safety Data Sheet: as required by California Proposition 65.
 - b. Store treated lumber and plywood only within a secure fenced area.
 - c. Take all possible steps to prevent unlawful use or disposal. Take all possible steps to insure that treated wood scraps are not burned.
 - d. Build an approved "Dip Tank" for flood coating and treating cut ends of wood members.
 - e. Keep wood preservative and dip tank in a cool and ventilated locked enclosure when not in use.

F. Fasteners

1. All nailing for structural work shall be in conformance with CBC Table 2304.9.1 Fastening Schedule. All nails exposed to earth or weather shall be hot dipped galvanized or shall be of stainless steel.
2. Pneumatically driven nails will be allowed only upon submission of ICC-ES evaluation report approving the nails for the use intended and with an equivalent load capacity as for the common wire nail specified. Pneumatically driven nails shall be driven flush with the surface of the wood.
3. All machine bolts shall conform to the requirements of ASTM Standard A 307, Grade A. All machine bolts, nuts and washers exposed to earth or weather in the completed structure shall be hot dipped galvanized.
4. Bolts shall be installed with cut washers under the heads and/or nuts where the head or nut would otherwise bear on the wood.
5. All connectors and fasteners exposed to earth or weather in the completed structure or treated lumber shall be hot dip galvanized after fabrication or Type 304 and 316 stainless steel. Never mix galvanized steel with stainless steel in the same connection to prevent physical contact of dissimilar metals.

G. Metal Framing Devices

1. Proprietary framing devices - Manufactured by Simpson Strong-Tie Company or approved equal, installed in conformance with the manufacturer's specifications. All specified fasteners must be installed. All such fasteners shall be of the largest size and quantity specified in the manufacturers published schedules, unless noted otherwise. All connectors and fasteners exposed to weather shall be hot dip galvanized after fabrication.
2. Fabricated Metal Devices- Specification Section 051000-Structural Steel

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Construction methods and project safety: the contract documents represent the finished structure and do not indicate methods, procedures or sequence of construction. Take necessary precautions to maintain and ensure the integrity of the structure during construction. Contractor shall design, construct and maintain all safety devices, including shoring and bracing, and solely responsible for conforming to all local, state and federal safety and health standards, laws and regulations.
- B. Wood framing: Comply with recommendations of CBC 2304 - General Construction Requirements and, CBC 2308 – Conventional Light Frame Construction, and NDS National Design Specifications for Wood Construction.
- C. Plywood: Comply with recommendations of APA Design and Construction Guide - Residential and Commercial. Space panel ends and edges with 1/8" minimum gap. Where wet or humid conditions prevail, double this spacing.
- D. Provide nailers, blocking and grounds where required. Set work plumb, level and accurately cut. Fire and draft blocks shall be as specified per CBC Section 717.
- E. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction. Coordinate with other work.
- F. Comply with manufacturer's requirements for cutting, handling, fastening and working with treated materials.
- G. Restore damaged components.
- H. Protect work from damage.

END OF SECTION 061000

SECTION 072100
THERMAL INSULATION

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. Glass-fiber blanket insulation.
- B. Related Sections:
 - 1. 061000 Rough Carpentry

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
 - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
 - 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. CertainTeed Corporation.
 2. Johns Manville.
 3. Owens Corning.
- B. Kraft-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type II (non-reflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).
- C. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:
1. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.
 2. Enhanced Insulation: Insulation shall exceed the R-value requirements listed in Chapter 4 of the 2004 International Energy Conservation Code by at least 5%.
 3. Install in accordance with Grade I specifications set by the National Home Energy Rating Standards.

2.2 SPRAY POLYURETHANE FOAM INSULATION

- A. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation.
 - b. Bio Based.
 - c. Dow Chemical.
 - d. Henry Company.
 - e. Johns Manville.
 - f. NCFI Polyurethane.
 - g. SWD Urethane Company.
 2. Minimum density of 1.5 lb/cu. ft. (24 kg/cu. m), thermal resistivity of 6.2 deg F x h x sq. ft./Btu x in. at 75 deg F (43 K x m/W at 24 deg C).
 3. Insulation shall be listed in State of California Department of Consumer Affairs 'Directory of Certified Insulation Materials' as acting as a Vapor Retarder.

2.3 SILL PLATE GASKET

A. Polyethylene Foam Sill Plate Gasket:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Owens Corning: "FoamSealR" Sill Plate Gasket.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.

2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 3. For wood-framed construction, install blankets according to ASTM C 1320 and as follows:
 - a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
 4. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
 - a. Exterior Walls: Set units with facing placed toward interior of construction..
 - b. Interior Walls: Set units with facing placed toward areas of high humidity.
- C. Spray-Applied Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.
- D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
- E. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
- F. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.
- G. Install insulation at exterior building envelope to meet the Grade 1 specifications set by the National Home Energy Rating Standards as follows:
1. Moderate to frequent installation defects, gaps around wiring, electric outlets, etc. and incomplete fill amounts to 2% or less of the total surface area covered by the insulation. Wall insulation is enclosed on all six sides and in substantial contact with the sheathing material on at least one side (interior or exterior) of the cavity.

3.4 PROTECTION

- A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 081113
HOLLOW-METAL DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes hollow-metal doors:

1.2 RELATED DOCUMENTS

1. Section 081213 "Hollow Metal Frames"
2. Section 099113 "Exterior Painting" for field painting factory-primed frames
3. Section 099123 "Interior Painting" for field painting factory-primed frames.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, and finishes.
- B. Schedule: Provide a schedule of hollow-metal doors prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal frame assembly, for tests performed by a qualified testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.
- B. Store hollow-metal doors vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each unit to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ceco Door Products; an Assa Abloy Group company.
 2. Republic Doors and Frames.
 3. Steelcraft; an Ingersoll-Rand company.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings[and temperature-rise limits] indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
- B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.2 INTERIOR HOLLOW-METAL DOORS

- A. Construct interior doors to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors: SDI A250.8, Level 2. At locations indicated in the Door Schedule.
- 1 Physical Performance: Level B according to SDI A250.4.
 2. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch (1.3 mm).
 3. Edge Construction: Model 1, Full Flush.
 4. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.

4. Exposed Finish: Prime.

2.3 EXTERIOR HOLLOW-METAL DOORS

- A. Construct exterior doors to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors: SDI A250.8, Level 2. At locations indicated in the Door Schedule.
 1. Physical Performance: Level B according to SDI A250.4.
 2. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A40 (ZF120) coating.
 3. Edge Construction: Model 1, Full Flush.
 4. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
 5. Exposed Finish: Prime.

2.4 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

2.5 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
 1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch (0.66 mm), steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches (152 mm) apart. Spot weld to face sheets no more than 5 inches (127 mm) o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
 2. Fire Door Cores: As required to provide fire-protection ratings indicated.
 3. Vertical Edges for Single-Acting Doors: Provide beveled or square edges at manufacturer's discretion.
 4. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.
 5. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping] with end closures or channels of same material as face sheets.

6. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

C. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce frames to receive nontemplated, mortised, and surface-mounted hardware.
2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

D. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior frames.
4. Provide loose stops and moldings on inside of hollow-metal work.
5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.6 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

3.3 INSTALLATION

- A. General: Install hollow-metal doors plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
- C. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Remove and replace defective work, including hollow-metal doors that is warped, bowed, or otherwise unacceptable.
- B. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION 081213

SECTION 081213
HOLLOW METAL FRAMES

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 hollow-metal frames.
- B. Related Requirements:
 - 1. Section 081416 "Flush Wood Doors" for wood doors installed in hollow-metal frames as occur.
 - 2.
 - 3. Section 099113 " Exterior Painting" for field painting factory-primed frames
 - 4. Section 099123 " Interior Painting" for field painting factory-primed frames.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, and finishes.
- B. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each unit to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ceco Door Products; an Assa Abloy Group company.
 - 2. Gensteel Doors Inc.
 - 3. Republic Doors and Frames.
 - 4. Steelcraft; an Ingersoll-Rand company.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 INTERIOR FRAMES AS OCCUR

- A. Construct interior frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Frames: SDI A250.8, Level 2. At locations indicated in the Door and Frame Schedule.
 - 1. Physical Performance: Level B according to SDI A250.4.
 - 2. Materials: steel sheet, minimum thickness of 0.053 inch (1.3 mm).
 - 3. Exposed Finish: Prime.

2.3 EXTERIOR HOLLOW-METAL FRAMES

- A. Construct exterior frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

- B. Heavy-Duty Frames: SDI A250.8, Level 2. At locations indicated in the Door and Frame Schedule.
 - 1. Physical Performance: Level B according to SDI A250.4.
 - 2. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A40 (ZF120) coating.
 - 3. Construction: Knocked down.
 - 4. Exposed Finish: Prime.

2.4 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
 - 2. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch (1.0 mm), and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 - 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at finish floor surface.

2.5 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

- G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. (96- to 192-kg/cu. m) density; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

2.6 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 2. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 - 3. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches (1524 mm) high.
 - 2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
 - b. Compression Type: Not less than two anchors in each frame.
 - c. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.
 - 4. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

5. Terminated Stops: Terminate stops 6 inches (152 mm) above finish floor with a 45 degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.

C. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce frames to receive nontemplated, mortised, and surface-mounted hardware.
2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

D. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior frames.
4. Provide loose stops and moldings on inside of hollow-metal work.
5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.7 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.8 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Drill and tap frames to receive nontemplated, mortised, and surface-mounted hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - b. Install frames with removable stops located on secure side of opening.
 - c. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - d. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - 3. Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
 - 4. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.

- c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.
- 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION 081213

SECTION 087100

DOOR HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions of Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.
- B. This Section includes the following, but is not necessarily limited to:
 - 1. Door Hardware, including electric hardware.
 - 2. Storefront and Entrance door hardware.
 - 3. Power supplies for electric hardware.
 - 4. Low-energy door operators plus sensors and actuators.
 - 5. Thresholds, gasketing and weather-stripping.
 - 6. Door silencers or mutes.
- C. Related Sections: The following sections are noted as containing requirements that relate to this Section, but may not be limited to this listing.
 - 1. Division 8: Section – Flush Wood Doors.

1.03 REFERENCES (Use date of standard in effect as of Bid date.)

- A. 2010 California Building Code, CCR, Title 24.
- B. BHMA - Builders' Hardware Manufacturers Association.
- C. DHI - Door and Hardware Institute.
- D. NFPA - National Fire Protection Association.
 - 1. NFPA 80 - Fire Doors and Other Opening Protectives
 - 2. NFPA 105 - Smoke and Draft Control Door Assemblies
- E. UL - Underwriters Laboratories.
 - 1. UL 10C - Fire Tests of Door Assemblies
 - 2. UL 305 - Panic Hardware
- F. WHI - Warnock Hersey Incorporated

G. SDI - Steel Door Institute

1.04 SUBMITTALS

- A. General: Submit in accordance with Conditions of the Contract and Division 1 Specification sections.
- B. Submit product data (catalog cuts) including manufacturers' technical product information for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
- D. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.
- E. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- F. Furnish as-built/as-installed schedule with close-out documents, including keying schedule and transcript, wiring/riser diagrams, manufacturers' installation and adjustment and maintenance information.
- G. Fire Door Assembly Testing: Submit a written record of each fire door assembly to the Owner to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections.

1.05 QUALITY ASSURANCE

- A. Obtain each type of hardware (latch and lock sets, hinges, closers, exit devices, etc.) from a single manufacturer.
- B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.
 - 1. Responsible for detailing, scheduling and ordering of finish hardware.
 - 2. Meet with Owner to finalize keying requirements and to obtain final instructions in writing.
 - 3. Stock parts for products supplied and are capable of repairing and replacing hardware items found defective within warranty periods.
- C. Hardware Installer: Company specializing in the installation of commercial door hardware with five years documented experience.
- D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only

items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not.

1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".

1.06 DELIVERY, STORAGE AND HANDLING

- A. Coordinate delivery of packaged hardware items to the appropriate locations (shop or field) for installation.
- B. Hardware items shall be individually packaged in manufacturers' original containers, complete with proper fasteners. Clearly mark packages on outside to indicate contents and locations in hardware schedule and in work.
- C. Provide locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, etc.
- D. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

1.07 WARRANTY

- A. Provide warranties of respective manufacturers' regular terms of sale from day of final acceptance as follows:
 1. Locksets: Two (2) years.
 2. Closers: Ten (10) years, except electronic closers shall be two (2) years.
 3. Exit devices: Three (3) years.
 4. All other hardware: Two (2) years.

1.08 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

	<u>Item</u>	<u>Manufacturer</u>	<u>Acceptable Substitutes</u>
A.	Hinges	Ives	Hager, Stanley, McKinney
B.	Locks, Latches & Cylinders	Schlage	Or Approved Equal

C.	Exit Devices	Von Duprin	Or Approved Equal
D.	Closers	LCN	Or Approved Equal
E.	Push, Pull & Protection Plates	Ives	Trimco, BBW, DCI
F.	Flush Bolts	Ives	Trimco, BBW, DCI
G.	Dust Proof Strikes	Ives	Trimco, BBW, DCI
H.	Coordinators	Ives	Trimco, BBW, DCI
I.	Stops	Ives	Trimco, BBW, DCI
J.	Overhead Stops	Glynn-Johnson	Or Approved Equal
K.	Thresholds	National Guard	Pemko, Zero
L.	Seals & Bottoms	National Guard	Pemko, Zero

2.02 MATERIALS

- A. Hinges: Exterior out-swinging door butts shall be non-ferrous material and shall have stainless steel hinge pins. All doors to have non-rising pins.
- Hinges shall be sized in accordance with the following:
 - Height:
 - Doors up to 41" wide: 4-1/2" inches.
 - Doors 42" to 48" wide: 5 inches.
 - Width: Sufficient to clear frame and trim when door swings 180 degrees.
 - Number of Hinges: Furnish 3 hinges per leaf to 7'-5" in height. Add one for each additional 2 feet in height.
 - Furnish non-removable pins (NRP) at all exterior out-swing doors and interior key lock doors with reverse bevels.
- B. Cylindrical Locks and Latches: Schlage "AL" Series as scheduled with "Neptune" design, fastened with through-bolts and threaded chassis hubs.
- Locksets to comply with ANSI A156.2, Series 4000, Grade 2; tested to exceed 800,000 cycles. Locksets shall meet ANSI A117.1, Accessible Code.
 - Chassis: One piece modular assembly and multi-functional allowing function interchange without disassembly of lockset.
 - Spindle shall be deep-draw manufactured not stamped. Spindle and spring cage to be one-piece integrated assembly.
 - Lever Trim: Accessible design, bi-directional, independent assemblies.
 - Locks shall be of such construction that when locked, the door may be opened from within by using lever and without the use of a key or special knowledge.
 - Thru-bolts to secure anti-rotation plate without sheer line. Fully threaded thru-bolts are not acceptable.

7. Latchbolt to be steel with minimum $\frac{1}{2}$ " throw deadlatch on keyed and exterior functions; $\frac{3}{4}$ " throw anti-friction latchbolt on pairs of doors.
 8. Strikes: ANSI curved lip, 1-1/4" x 4-7/8", with 1" deep dust box (K510-066). Lips shall be of sufficient length to clear trim and protect clothing.
- B. Deadlocks: Rotating cylinder trim rings of attack-resistant design. Mounting plates and actuator shields of plated cold-rolled steel. Mounting screws of $\frac{1}{4}$ " diameter steel and protected by drill-resistant ball bearings. Steel alloy deadbolt with hardened steel roller. Strike alloy deadbolt with reinforcer and two 3" long screws. ANSI A156.5, 2001 Grade 1 certified.
- C. Entry Door Locks: S200 Series. Schlage "S200" Series at unit entry doors as scheduled with "Neptuen" design.
- E. Closers: LCN 1461 Series as scheduled. Place closers inside building, stairs, room, etc.
1. Door closer cylinders shall be of high strength cast iron construction with double heat treated pinion shaft to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory.
 2. Closers shall be installed to permit doors to swing 180 degrees.
 3. All closers shall utilize a stable fluid withstanding temperature range of 120 degrees F. to -30 degrees F. without requiring seasonal adjustment of closer speed to properly close the door.
 4. Provide the manufactures drop plates, brackets and spacers as required at narrow head rails and special frame conditions. NO wood plates or spacers will be allowed.
 5. Maximum effort to operate closers shall not exceed 5 lbs., such pull or push effort being applied at right angles to hinged doors. Compensating devices or automatic door operators may be utilized to meet the above standards. When fire doors are required, the maximum effort to operate the closer may be increased but shall not exceed 15 lbs. when specifically approved by fire marshal. All closers shall be adjusted to operate with the minimum amount of opening force and still close and latch the door. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position. Door shall take at least 3 seconds to move from an open position of 70 degrees to a point of 3 inches from the latch jamb. Reference CBC Sections 1133B.2.1, 1133B.2.5 & 1133B2.5.1.
 6. Provide sex-bolted or through bolt mounting for all door closers.
- F. Flush Bolts & Dust Proof Strikes: Automatic Flush Bolts shall be of the low operating force design. Utilize the top bolt only model for interior doors where applicable and as permitted by testing procedures.
1. Manual flush bolts only permitted on storage or mechanical openings as scheduled.
 2. Provide dust proof strikes at openings using bottom bolts.
- G. Door Stops:

1. Unless otherwise noted in Hardware Sets, provide wall type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.
 2. Do not install floor stops more than four (4) inches from the face of the wall or partition (CBC Section 1133B.8.6).
 3. Overhead stops shall be made of stainless steel and non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.
- H. Protection Plates: Fabricate either kick, armor, or mop plates with four beveled edges. Provide kick plates 10" high and 2" LDW. Sizes of armor and mop plates shall be listed in the Hardware Schedule. Furnish with machine or wood screws of bronze or stainless to match other hardware.
- I. Seals: Provide silicone gasket at all rated and exterior doors.
1. Fire-rated Doors, Resilient Seals: UL10C Classified, Category "J" listed seals complying with NFPA 80 & NFPA 252 Standards. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements.
 2. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Category "G" furnish fire-labeled opening assembly complete and in full compliance with NFPA 252. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required.
 3. Smoke & Draft Control Doors, Provide Category "H" listed seals complying with NFPA 105 for use on "S" labeled Positive Pressure door assemblies.
- J. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occurs, or for fire-resistive-rated door assemblies.

2.03 KEYING

- A. Furnish a Schlage masterkey system as directed by the owner or architect. Key system to be designated and combined by the Schlage Master Key Department even if pinned by the Authorized Key Center, Authorized Security Center or a local authorized commercial dealer.
- D. A detailed keying schedule is to be prepared by the owner and/or architect in consultation with a representative the lock manufacturer.
- C. Establish a new masterkey system for this project as directed by the keying schedule.
- D. Furnish all cylinders in the Schlage conventional style except the exit device and removable mullion cylinders which will be supplied in Schlage Full Size Interchangeable Core (FSIC).
- E. Furnish construction keying for doors requiring locking during construction.
- F. Furnish mechanical keys as follows:

1. Furnish 2 cut change keys for each different change key code.
2. Furnish 1 uncut key blank for each change key code.

2.04 FINISHES

- A. Generally to be satin chrome US26D (626 on bronze and 652 on steel) unless otherwise noted.
- B. Furnish push plates, pull plates and kick or armor plates in satin stainless steel US32D (630) unless other wise noted.
- C. Door closers shall be powder-coated to match other hardware, unless otherwise noted.
- D. Aluminum items to be finished anodized aluminum except thresholds which can be furnished as standard mill finish.

2.05 FASTENERS

- A. Screws for strikes, face plates and similar items shall be flat head, countersunk type, provide machine screws for metal and standard wood screws for wood.
- B. Screws for butt hinges shall be flathead, countersunk, full-thread type.
- C. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.
- D. Provide expansion anchors for attaching hardware items to concrete or masonry.
- E. All exposed fasteners shall have a phillips head.
- F. Finish of exposed screws to match surface finish of hardware or other adjacent work.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify that doors and frames are square and plumb and ready to receive work and dimensions are as instructed by the manufacturer.
- B. Beginning of installation means acceptance of existing conditions.
- C. Fire-Rated Door Assembly Inspection: Upon completion of the installation, all fire door assemblies shall be inspected to confirm proper operation of the closing device and latching device and that only the manufacturer's furnished fasteners are used for installation and that it meets all criteria of a fire door assembly per NFPA 80 (Standard for Fire Doors and Other Opening Protectives) 2007 Edition. A written record shall be maintained and transmitted to the Owner to be made available to the Authority Having Jurisdiction (AHJ). The inspection of the swinging fire doors shall be performed by a certified FDAI (Fire Door Assembly Inspector) with knowledge and understanding of the operating components of the type of door being subjected to the inspection. The record shall list each fire door assembly throughout the

project and include each door number, an itemized list of hardware set components at each door opening, and each door location in the facility.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and requirements of DHI.
- B. Use the templates provided by hardware item manufacturer.
- C. Mounting heights for hardware shall be as recommended by the Door and Hardware Institute. Operating hardware will to be located between 30" and 44" AFF.
- D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- F. Set thresholds for exterior doors in full bed of butyl-rubber sealant.
- G. If hand of door is changed during construction, make necessary changes in hardware at no additional cost.

3.03 ADJUST AND CLEAN

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
- B. Clean adjacent surface soiled by hardware installation.
- C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy, return to that work area and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- D. Instruct Owner's Personnel in proper adjustment and maintenance of hardware finishes, during the final adjustment of hardware.
- E. Continued Maintenance Service: Approximately six months after the completion of the project, the Contractor accompanied by the Architectural Hardware Consultant, shall return to the project and re-adjust every item of hardware to restore proper functions of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.04 HARDWARE LOCATIONS

- A. Conform to CCR, Title 24, Part 2; and ADAAG; and the drawings for access-compliant positioning requirements for the disabled.

3.05 FIELD QUALITY CONTROL

- A. Architectural Hardware Consultant (AHC) to inspect installation and certify that hardware and its installation have been furnished and installed in accordance with manufacturer's instructions and as specified herein.

3.06 SCHEDULE

- A. Schedule is shown on the drawings.

END OF SECTION 087100

SECTION 092900

GYPSUM BOARD

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. Interior gypsum board.
 - 2. Specialty Gypsum Board.
 - 3. Tile backing panels as occur.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. American Gypsum.
 - 2. CertainTeed Corp.
 - 3. National Gypsum Company.
 - 4. USG Corporation.
- B. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch (15.9 mm).
 - 2. Long Edges: Tapered

2.3 SPECIALTY GYPSUM BOARD

- A. Gypsum Board, Type C: ASTM C 1396/C 1396M. Manufactured to have increased fire-resistive capability.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. USG Corporation; Firecode C Core.
 - 2. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
 - 3. Long Edges: Tapered.
- B. Glass-Mat Interior Gypsum Board: ASTM C 1658/C 1658M. With fiberglass mat laminated to both sides. Specifically designed for interior use.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Georgia-Pacific Gypsum LLC; DensArmour Plus.
 - 2. Core: 5/8 inch (15.9 mm), Type X.

3. Long Edges: Tapered.
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 1. Interior Gypsum Board: Paper.
 2. Exterior Gypsum Soffit Board: Paper.
 3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 4. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. Prefilling: At open joints, and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
- D. Joint Compound for Tile Backing Panels:
 1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

- C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

- D. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

- E. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

2.07 TEXTURE FINISHES

- A. Aggregate Finish: Water-based, job-mixed, aggregated, drying-type texture finish for spray application.
 - 1. Products
 - a. G-P Gypsum Corp.; GyProc Vermiculite Ceiling Texture.
 - b. United States Gypsum Co.; SHEETROCK Wall and Ceiling Spray Texture.
 - 2. Texture: Spatter knock-down

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

- H. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

B. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying face layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

- #### C. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 APPLYING TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at showers, tubs, and where indicated. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on Drawings.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners.
 - 2. LC-Bead: Use at exposed panel edges.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 2: Panels that are substrate for tile.
 - 2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
- E. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

3.7 APPLYING TEXTURE FINISHES

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.
- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.
- C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written recommendations.

3.8 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 09 91 23
INTERIOR PAINTING

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 surface preparation and the application of paint systems on interior substrates.
- B. Related Requirements:
 - 1. Section 09 91 13, "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
- C. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

1.4 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. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Kelly-Moore Paints.

2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 150 g/L.
 - 3. Dry-Fog Coatings: 400 g/L.
 - 4. Primers, Sealers, and Undercoaters: 200 g/L.
 - 5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
 - 6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.

7. Pretreatment Wash Primers: 420 g/L.
8. Floor Coatings: 100 g/L.
9. Shellacs, Clear: 730 g/L.
10. Shellacs, Pigmented: 550 g/L.

D. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Colors: As indicated in a color schedule.

2.3 PRIMERS/SEALERS

A. Kelly Moore Paints, 973 Acry-Plex Interior Wall Primer & Undercoat

2.4 WATER-BASED PAINTS

A. Kelly Moore Paints, 1500 Enviro-Coat

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 1. Wood: 15 percent.
 2. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

SECTION 104413

FIRE PROTECTION CABINETS

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. Fire-protection cabinets for the following:
 - a. Portable fire extinguishers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.5 COORDINATION

- A. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

2.2 FIRE-PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.

1. Products: Subject to compliance with requirements, provide one of the following:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide Larsen's Manufacturing Company; FS2409RT, with Larsen-Loc. or comparable product by one of the following:
 - a. Fire-End & Croker Corporation.
 - b. Potter Roemer LLC.
 - c. Strike First Corporation of America.
- B. Cabinet Construction: Nonrated.
- C. Cabinet Material: Cold-rolled steel sheet.
- D. Recessed Cabinet:
1. Trimless with Concealed Flange: Surface of surrounding wall finishes flush with exterior finished surface of cabinet frame and door, without overlapping trim attached to cabinet. Provide recessed flange, of same material as box, attached to box to act as plaster stop.
- E. Cabinet Trim Material: Steel sheet.
- F. Door Material: Steel sheet.
- G. Door Style: Fully glazed panel with frame.
- H. Door Glazing: Clear acrylic.
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
1. Provide manufacturer's standard.
 2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
- J. Accessories:
1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
 3. Alarm: Manufacturer's standard alarm that actuates when fire-protection cabinet door is opened and that is powered by batteries
- K. Materials:
1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
 - a. Finish: Baked enamel.

- b. Color: White.
- 2. Transparent Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet).

2.3 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 - 1. Weld joints and grind smooth.
 - 2. Provide factory-drilled mounting holes.
 - 3. Prepare doors and frames to receive locks.
 - 4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
 - 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
 - 2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated.
 - 1. Fire-Protection Cabinets: 48 inches (1219 mm) above finished floor to top of cabinet.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
 - 1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.
 - 2. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

SECTION 104416
FIRE EXTINGUISHERS

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 portable, hand-carried fire extinguishers.
- B. Related Requirements:
 - 1. Section 104413 "Fire Protection Cabinets."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fire End & Croker Corporation.
 - b. Larsens Manufacturing Company.
 - c. Potter Roemer LLC.
 - d. Strike First Corporation of America.
 2. Valves: Manufacturer's standard.
 3. Handles and Levers: Manufacturer's standard.
 4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.
- B. Multipurpose Dry-Chemical Type in Steel Container 2-A:10-B:C, 5-lb (2.3-kg) nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fire End & Croker Corporation.
 - b. Larsens Manufacturing Company.
 - c. Potter Roemer LLC.
 - d. Strike First Corporation of America.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
 - a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
 1. Mounting Brackets: 48 inches (1219 mm) above finished floor to top of fire extinguisher.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

SECTION 14 24 00

HYDRAULIC PASSENGER ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes: Hydraulic passenger elevators as shown and specified. Elevator work includes:
1. Standard pre-engineered hydraulic passenger elevators.
 2. Elevator car enclosures, hoistway entrances and signal equipment.
 3. Operation and control systems.
 4. Jack(s).
 5. Accessibility provisions for physically disabled persons.
 6. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
 7. Materials and accessories as required to complete the elevator installation.
- B. Related Sections:
1. Division 1 General Requirements: Meet or exceed all referenced sustainability requirements.
 2. Division 3 Concrete: Installing inserts, sleeves and anchors in concrete.
 3. Division 4 Masonry: Installing inserts, sleeves and anchors in masonry.
 4. Division 5 Metals:
 - a. Providing hoist beams, pit ladders, steel framing, auxiliary support steel and divider beams for supporting guide-rail brackets.
 - b. Providing steel angle sill supports and grouting hoistway entrance sills and frames.
 5. Division 9 Finishes: Providing elevator car finish flooring and field painting unfinished and shop primed ferrous materials.
 6. Division 16 Sections:
 - a. Providing electrical service to elevators, including fused disconnect switches.
 - b. Emergency power supply, transfer switch and auxiliary contacts.
 - c. Heat and smoke sensing devices.
 - d. Convenience outlets and illumination in control room, hoistway and pit.
 7. Division 22 Plumbing
 - a. Sump pit and oil interceptor.
 8. Division 23 Heating, Ventilation and Air Conditioning
 - a. Heating and ventilating hoistways and/or control room.

- C. Work Not Included: General contractor shall provide the following in accordance with the requirements of the Model Building Code and ANSI A17.1 Code. For specific rules, refer to ANSI A17.1, Part 3 for hydraulic elevators. State or local requirements must be used if more stringent. The cost of this work is not included in the Thyssenkrupp Elevator's proposal, since it is a part of the building construction.
1. Elevator hoist beam to be provided at top of elevator shaft. Beam must be able to accommodate proper loads and clearances for elevator installation and operation.
 2. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports and bracing including all setting templates and diagrams for placement.
 3. Hatch walls require a minimum two hours of fire rating. Hoistway should be clear and plumb with variations not to exceed 1/2" at any point.
 4. Elevator hoistways shall have barricades, as required.
 5. Install bevel guards at 75° on all recesses, projections or setbacks over 2" (4" for A17.1 2000 areas) except for loading or unloading.
 6. Provide rail bracket supports at pit, each floor and roof. For guide rail bracket supports, provide divider beams between hoistway at each floor and roof.
 7. Pit floor shall be level and free of debris. Reinforce dry pit to sustain normal vertical forces from rails and buffers.
 8. Where pit access is by means of the lowest hoistway entrance, a vertical ladder of non-combustible material extending 42" minimum, (48" minimum for A17.1-2000 areas) shall be provided at the same height, above sill of access door or handgrips.
 9. Machine room to be enclosed and protected.
 10. Machine Room temperature must be maintained between 55° and 90° F.
 11. If machine room is remote from the elevator hoistway, clear access must be available above the ceiling or metal/concrete raceways in floor for oil line and wiring duct from machine room.
 12. Access to the machinery space and machine room must be in accordance with the governing authority or code.
 13. Provide an 8" x 16" cutout through machine room wall, for oil line and wiring duct, coordinated with elevator contractor at the building site.
 14. All wire and conduit should run remote from the hoistways.
 15. When heat, smoke or combustion sensing devices are required, connect to elevator control cabinet terminals. Contacts on the sensors should be sided for 12 volt D.C.
 16. Install and furnish finished flooring in elevator cab.
 17. Finished floors and entrance walls are not to be constructed until after sills and door frames are in place. Consult elevator contractor for rough opening size. The general contractor shall supply the drywall framing so that the wall fire resistance rating is maintained, when drywall construction is used.
 18. Where sheet rock or drywall construction is used for front walls, it shall be of sufficient strength to maintain the doors in true lateral alignment. Drywall contractor to coordinate with elevator contractor.
 19. Before erection of rough walls and doors; erect hoistway sills, headers, and frames. After rough walls are finished; erect fascias and toe guards. Set sill level and slightly above finished floor at landings.
 20. To maintain legal fire rating (masonry construction), door frames are to be anchored to walls and properly grouted in place.
 21. The elevator wall shall interface with the hoistway entrance assembly and be in strict compliance with the elevator contractor's requirements.
 22. General Contractor shall fill and grout around entrances, as required.
 23. Elevator sill supports shall be provided at each opening.
 24. All walls and sill supports must be plumb where openings occur.

25. For applications with jack hole, free and clear access to the elevator pit area for the jack hole-drilling rig is required.
26. Where jack hole is required, remove all spoils from jack hole drilling.
27. When not provided by Elevator Contractor, jack hole shall accommodate the jack unit. If required the jack hole is to be provided in strict accordance with the elevator contractor's shop drawings.
28. Locate a light fixture (200 lx / 19 fc) and convenience outlet in pit with switch located adjacent to the access door.
29. A light switch and fused disconnect switch for each elevator should be located inside the machine room adjacent to the door, where practical, per the National Electrical Code (NFPA No. 70).
30. For signal systems and power operated door: provide ground and branch wiring circuits, including main line switch.
31. For car light and fan: provide a feeder and branch wiring circuits, including main line switch.
32. Wall thickness may increase when fixtures are mounted in drywall. These requirements must be coordinated between the general contractor and the elevator contractor.
33. Provide supports, patching and recesses to accommodate hall button boxes, signal fixtures, etc..
34. Locate telephone and convenience outlet on control panel.

1.2 SUBMITTALS

- A. Product data: When requested, the elevator contractor shall provide standard cab, entrance and signal fixture data to describe product for approval.
- B. Shop drawings:
 1. Show equipment arrangement in the corridor, pit, and hoistway and/or optional control room. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
 2. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
 3. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
 4. Indicate electrical power requirements and branch circuit protection device recommendations.
- C. Powder Coat paint selection: Submit manufacturer's standard selection charts for exposed finishes and materials.
- D. Plastic laminate selection: Submit manufacturer's standard selection charts for exposed finishes and materials.
- E. Metal Finishes: Upon request, standard metal samples provided.
- F. Operation and maintenance data. Include the following:
 1. Owner's manuals and wiring diagrams.
 2. Parts list, with recommended parts inventory.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: An approved manufacturer with minimum 15 years of experience in manufacturing, installing, and servicing elevators of the type required for the project.
1. The manufacturer of machines, controllers, signal fixtures, door operators cabs, entrances, and all other major parts of elevator operating equipment.
 - a. The major parts of the elevator equipment shall be manufactured by the installing company, and not be an assembled system.
 2. The manufacturer shall have a documented, on-going quality assurance program.
 3. ISO-9001:2000 Manufacturer Certified
 4. ISO-14001:2004 Environmental Management System Certified
 5. LEED Gold certified elevator manufacturing facility.
- B. Installer Qualifications: The manufacturer or an authorized agent of the manufacturer with not less than 15 years of satisfactory experience installing elevators equal in character and performance to the project elevators.
- C. Regulatory Requirements:
1. ASME A17.1 Safety Code for Elevators and Escalators, latest edition or as required by the local building code.
 2. Building Code: National.
 3. NFPA 70 National Electrical Code.
 4. NFPA 80 Fire Doors and Windows.
 5. Americans with Disabilities Act - Accessibility Guidelines (ADAAG)
 6. Section 407 in ICC A117.1, when required by local authorities
 7. CAN/CSA C22.1 Canadian Electrical Code
 8. CAN/CSA B44 Safety Code for Elevators and Escalators.
 9. California Department of Public Health Standard Method V1.1–2010, CA Section 01350
- D. Fire-rated entrance assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, CAN4-S104 (ULC-S104), UL10(b), and NFPA Standard 80. Provide entrance assembly units bearing Class B or 1 1/2 hour label by a Nationally Recognized Testing Laboratory (2 hour label in Canada).
- E. Inspection and testing:
1. Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
 2. Arrange for inspections and make required tests.
 3. Deliver to the Owner upon completion and acceptance of elevator work.
- F. Sustainable Product Qualifications:
1. Environmental Product Declaration:
 - a. GOOD: If Product Category Rules (PCR) are not available, produce a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that has at least a cradle to gate scope.

- b. BEST: If Product Category Rules (PCR) are available, produce and publish an Environmental Product Declaration (EPD) based on a critically reviewed life-cycle assessment conforming to ISO 14044, with external verification recognized by the EPD program operator.

2. Material Transparency:

- a. GOOD: Provide Health Product Declaration at any level
- b. BETTER: Provide Health Product Declaration (HPD v2 or later). Complete, published declaration with full disclosure of known hazards, prepared using the Health Product Declaration Collaborative's "HPD builder" on-line tool.
- c. BEST: Cradle to Cradle Material Health Certificate v3, Bronze level or higher.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Manufacturing shall deliver elevator materials, components and equipment and the contractor is responsible to provide secure and safe storage on job site.

1.5 PROJECT CONDITIONS

- A. Temporary Use: Elevators shall not be used for temporary service or for any other purpose during the construction period before Substantial Completion and acceptance by the purchaser unless agreed upon by Elevator Contractor and General Contractor with signed temporary agreement.
- B. Provide the hole for the jack unit (if required by the type of jack provided), based on excavation through normal soil or clay which can be removed by manual digging or by standard truck-mounted regular drilling unit. Provide a casing if required to retain the walls of the hole. General contractor shall remove excavation spoils deposited in the elevator pit.
 - 1. If a physical obstruction or hindrance is encountered below the ground surface, including boulders, rock, gravel, wood, metal, pilings, sand, water, quick sand, caves, public utilities or any other foreign material, obtain written authorization to proceed with excavating using special excavation equipment.
 - 2. Maintain a daily log of time and material costs involved.
 - 3. Elevator contractor will be compensated on a time and material basis for additional costs incurred after encountering the physical obstruction or hindrance, including the cost of the special excavation equipment.

1.6 WARRANTY

- A. Warranty: Submit elevator manufacturer's standard written warranty agreeing to repair, restore or replace defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or care for 12 months after final acceptance.

1.7 MAINTENANCE

- A. Furnish maintenance and call back service for a period of 3 months for each elevator after completion of installation or acceptance thereof by beneficial use, whichever is earlier, during normal working hours excluding callbacks.
 - 1. Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation. Maintenance work, including emergency call back repair service, shall be performed by trained employees of the elevator contractor during regular working hours.
 - 2. Submit parts catalog and show evidence of local parts inventory with complete list of recommended spare parts. Parts shall be produced by manufacturer of original equipment.
 - 3. Manufacturer shall have a service office and full time service personnel within a 100 mile radius of the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Design based around Thyssenkrupp Elevator's Endura hydraulic elevator.

2.2 MATERIALS, GENERAL

- A. All Elevator Cab materials including frame, buttons, lighting, wall and ceiling assembly, laminates and carpet shall have an EPD and an HPD, and shall meet the California Department of Public Health Standard Method V1.1-2010, CA Section 01350 as mentioned in 1.03.9 of this specification.
- B. Colors, patterns, and finishes: As selected by the Architect from manufacturer's full range of standard colors, patterns, and finishes.
- C. Steel:
 - 1. Shapes and bars: Carbon.
 - 2. Sheet: Cold-rolled steel sheet, commercial quality, Class 1, matte finish.
 - 3. Finish: Factory-applied baked enamel for structural parts, powder coat for architectural parts. Color selection must be based on elevator manufacture's standard selections.
- D. Plastic laminate: Decorative high-pressure type, complying with NEMA LD3, Type GP-50 General Purpose Grade, nominal 0.050" thickness. Laminate selection must be based on elevator manufacture's standard selections.
- E. Flooring by others.

2.3 HOISTWAY EQUIPMENT

- A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood sub-floor. Underside of the platform shall be fireproofed. The car platform shall be designed and fabricated to support one-piece loads weighing up to 25% of the rated capacity.
- B. Sling: Steel stiles bolted or welded to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.
- C. Guide Rails: Steel, omega shaped, fastened to the building structure with steel brackets.
- D. Guides: Slide guides shall be mounted on top and bottom of the car.
- E. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.
- F. Jack: A jack unit shall be of sufficient size to lift the gross load the height specified. Factory test jack to ensure adequate strength and freedom from leakage. Brittle material, such as gray cast iron, is prohibited in the jack construction. Provide the following jack type: Twin post holeless telescopic 2-stage. Two jacks piped together, mounted one on each side of the car with each having two telescopic sections designed to extend in a synchronized manner when oil is pumped into the assembly. Each jack section will be guided from within the casing or the plunger assembly used to house the section. Each plunger shall have a high pressure sealing system which will not allow for seal movement or displacement during the course of operation. Each jack assembly shall have a check valve built into the assembly to allow for automatically re-syncing the two plunger sections by moving the jack to its fully contracted position. The jack shall be designed to be mounted on the pit floor or in a recess in the pit floor. Each jack section shall have a bleeder valve to discharge any air trapped in the section..
- G. Automatic Self-Leveling: Provide each elevator car with a self-leveling feature to automatically bring the car to the floor landings and correct for over travel or under travel. Self-leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load.
- H. Wiring, Piping, and Oil: Provide all necessary hoistway wiring in accordance with the National Electrical Code. All necessary code compliant pipe and fittings shall be provided to connect the power unit to the jack unit.

2.4 POWER UNIT

- A. Power Unit (Oil Pumping and Control Mechanism): A self-contained unit consisting of the following items:
 - 1. An oil reservoir with tank cover.
 - 2. An oil hydraulic pump.
 - 3. An electric motor.
 - 4. An oil control valve with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and electro-magnetic controlling solenoids.

- B. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation. Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.
- C. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service. Duty rating shall be selected for specified speed and load.
- D. Oil Control Unit: The following components shall be built into a single housing. Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be made without removing the assembly from the oil line.
 - 1. Relief valve shall be adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve.
 - 2. Up start and stop valve shall be adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.
 - 3. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.
 - 4. Lowering valve and leveling valve shall be adjustable for down start speed, lowering speed, leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling after slowdown is initiated.
 - 5. Provided with constant speed regulation in both up and down direction. Feature to compensate for load changes, oil temperature, and viscosity changes.
 - 6. Solid State Starting: Provide an electronic starter featuring adjustable starting currents.
 - 7. Oil Type: Provide a zinc free, inherently biodegradable lubricant formulated with premium base stocks to provide outstanding protection for demanding hydraulic systems, especially those operating in environmentally sensitive areas.

2.5 HOISTWAY ENTRANCES

- A. Doors and Frames: Provide complete hollow metal type hoistway entrances at each hoistway opening bolted\knock down construction.
 - 1. Manufacturer's standard entrance design consisting of hangers, doors, hanger supports, hanger covers, fascia plates (where required), sight guards, and necessary hardware.
 - 2. Main landing door & frame finish: ASTM A1008 steel panels, factory applied powder coat finish.
 - 3. Typical door & frame finish: ASTM A 366 steel panels, factory applied powder coat finish.
- B. Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code. Provide door restriction devices as required by code.
- C. Door Hanger and Tracks: Provide sheave type two point suspension hangers and tracks for each hoistway horizontal sliding door.
 - 1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
 - 2. Hangers: Provide an adjustable device beneath the track to limit the up-thrust of the doors during operation.

3. Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.

D. Hoistway Sills: Extruded metal, with groove(s) in top surface. Provide mill finish on aluminum.

2.6 PASSENGER ELEVATOR CAR ENCLOSURE

A. Car Enclosure:

1. Walls: Cab type a laminate wall design, durable wood core finished on both sides with high pressure plastic laminate.
2. Canopy: Cold-rolled steel with hinged exit.
3. Ceiling: Suspended type, LED lighting with translucent diffuser mounted in a metal frame. Framework shall be finished with a factory applied powder coat finish.
4. Cab Fronts, Return, Transom, Soffit and Strike: Provide panels faced with No. 4 brushed stainless steel
5. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.
 - a. Door Finish: Stainless steel panels: No. 4 brushed finish.
 - b. Cab Sills: Extruded aluminum, mill finish.
6. Handrail: Provide 1.5" diameter cylindrical metal on side and rear walls on front opening cars and side walls only on front and rear opening cars. Handrails shall have a stainless steel, No. 4 brushed finish.
7. Ventilation: Manufacturer's standard exhaust fan, mounted on the car top.
8. Protection pads and buttons: Not required

B. Car Top Inspection: Provide a car top inspection station with an "Auto-Inspection" switch, an "emergency stop" switch, and constant pressure "up and down" direction and safety buttons to make the normal operating devices inoperative. The station shall give the inspector complete control of the elevator. The car top inspection station shall be mounted in the door operator assembly.

2.7 DOOR OPERATION

A. Door Operation: Provide a direct or alternating current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. The door control system shall be digital closed loop and the closed loop circuit shall give constant feedback on the position and velocity of the elevator door. The motor torque shall be constantly adjusted to maintain the correct door speed based on its position and load. All adjustments and setup shall be through the computer based service tool. Door movements shall follow a field programmable speed pattern with smooth acceleration and deceleration at the ends of travel. The mechanical door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. AC controlled units with oil checks, or other deviations are not acceptable.

1. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as a dispatch car.
2. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.
3. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not registered before the door closes to within 6 inches of fully closed, the travel shall reverse and the door shall reopen to answer the other call.
4. Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door closing is prevented for a field programmable time, a buzzer shall sound. When the obstruction is removed, the door shall begin to close at reduced speed. If the infra-red door protection system detects a person or object while closing on nudging, the doors shall stop and resume closing only after the obstruction has been removed.
5. Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors shall reverse and reopen. After the obstruction is cleared, the doors shall begin to close.
6. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors shall recycle closed then attempt to open six times to try and correct the fault.
7. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time, the doors shall recycle open then attempt to close six times to try and correct the fault.
8. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.

- B. Door Protection Device: Provide a door protection system using microprocessor controlled infra-red light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors shall immediately reopen.

2.8 CAR OPERATING STATION

- A. Car Operating Station, General: The main car control in each car shall contain the devices required for specific operation mounted in an integral swing return panel requiring no applied faceplate. Wrap return shall have a No. 4 brushed stainless steel finish. The main car operating panel shall be mounted in the return and comply with handicap requirements. Pushbuttons that illuminate using long lasting LED's shall be included for each floor served, and emergency buttons and switches shall be provided per code. Switches for car light and accessories shall be provided.
- B. Emergency Communications System: Integral phone system provided.
- C. Auxiliary Operating Panel: Not Required
- D. Column Mounted Car Riding Lantern: A car riding lantern shall be installed in the elevator cab and located in the entrance. The lantern, when illuminated, will indicate the intended direction of travel. The lantern will illuminate and a signal will sound when the car arrives at a floor where it will stop. The lantern shall remain illuminated until the door(s) begin to close.

2.9 CONTROL SYSTEMS

- A. Controller: The elevator control system shall be microprocessor based and software oriented. Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings.
- B. Automatic Light and Fan shut down: The control system shall evaluate the system activity and automatically turn off the cab lighting and ventilation fan during periods of inactivity. The settings shall be field programmable.
- C. Emergency Power Operation: (Battery Lowering 10-DOC) When the loss of normal power is detected, a battery lowering feature is to be activated. The elevator will lower to a predetermined level and open the doors. After passengers have exited the car, the doors will close and the car will shutdown. When normal power becomes available, the elevator will automatically resume operation. The battery lowering feature is included in the elevator contract and does not utilize a building-supplied standby power source.

2.10 HALL STATIONS

- A. Hall Stations, General: Buttons shall illuminate to indicate call has been registered at that floor for the indicated direction.
 - 1. Provide one pushbutton riser with faceplates having a No. 4 brushed stainless steel finish.
 - a. Phase 1 firefighter's service key switch, with instructions, shall be incorporated into the hall station at the designated level.
- B. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with Americans with Disabilities Act (ADA) requirements.
- C. Hall Position Indicator: An electronic dot matrix position indicator shall be provided and mounted for optimum viewing. As the car travels, its position in the hoistway shall be indicated by the illumination of the alphanumeric character corresponding to the landing which the elevator is stopped or passing. When hall lanterns are provided, the position indicator shall be combined with the hall lanterns in the same faceplate. Faceplates shall match hall stations. Provide at all typical landings.

2.11 MISCELLANEOUS ELEVATOR COMPONENTS

- A. Oil Hydraulic Silencer: Install multiple oil hydraulic silencers (muffler device) at the power unit location. The silencers shall contain pulsation absorbing material inserted in a blowout proof housing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and/or control room, as constructed, verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.
- B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.2 INSTALLATION

- A. Install elevator systems components and coordinate installation of hoistway wall construction.
 - 1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
 - 2. Comply with the National Electrical Code for electrical work required during installation.
- B. Jack unit excavation (if required by the type of jack provided): Drill or otherwise excavate below elevator pit construction as required to install the jack unit.
 - 1. Install casing for jack unit.
 - 2. Provide HDPE jack protection system for all in ground jacks.
 - 3. Set casing for jack unit assembly plumb, and partially fill with water set-tled sand, eliminating voids. Back fill depth shall be sufficient to hold the bottom of the jack in place over time.
- C. Perform work with competent, skilled workmen under the direct control and supervision of the elevator manufacturer's experienced foreman.
- D. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports, and bracing including all setting templates and diagrams for placement.
- E. Welded construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualification of welding operators.
- F. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.
- G. Install machinery, guides, controls, car and all equipment and accessories to provide a quiet, smoothly operating installation, free from side sway, oscillation or vibration.
- H. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills

and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.

- I. Erect hoistway sills, headers, and frames before erection of rough walls and doors; erect fascia and toe guards after rough walls finished. Set sill units accurately aligned and slightly above finish floor at landings.
- J. Lubricate operating parts of system, where recommended by manufacturer.

3.3 FIELD QUALITY CONTROL

- A. Acceptance testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required and recommended by Code and governing regulations or agencies. Perform other tests, if any, as required by governing regulations or agencies.
- B. Advise Owner, Contractor, Architect, and governing authorities in advance of dates and times tests are to be performed on the elevator.

3.4 ADJUSTING

- A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

3.5 CLEANING

- A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless steel shall be cleaned with soap and water and dried with a non-abrasive surface; it shall not be cleaned with bleach-based cleansers.
- B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoistway. Remove trash and debris.
 - 1. Use environmentally preferable and low VOC emitting cleaners for each application type. Cleaners that contain solvents, pine and/or citrus oils are not permitted.

3.6 PROTECTION

- A. At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

3.7 DEMONSTRATION

- A. Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at

time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions.

- B. Make a final check of each elevator operation, with Owner's personnel present, immediately before date of substantial completion. Determine that control systems and operating devices are functioning properly.

3.8 ELEVATOR SCHEDULE

A. Elevator Qty. 1

1. Elevator Model: endura Above-Ground (2-Stage)
2. Elevator Type: Hydraulic Passenger
3. Rated Capacity: 3500 lbs.
4. Rated Speed: 110 ft./min.
5. Operation System: TAC32H
6. Travel: 18'-3.5"
7. Landings: 3 total
8. Openings:
 - a. Front: 3
 - b. Rear: 0
9. Clear Car Inside: 6' - 8" wide x 5' - 5" deep
10. Cab Height: 8'-0" standard
11. Hoistway Entrance Size: 3' - 6" wide x 7'-0" high
12. Door Type: Single Speed
13. Power Characteristics: 208 volts, 3 Phase, 60 Hz.
14. Seismic Requirements: Zone 3+
15. Hoistway Dimensions: 8' - 4" wide x 6' - 11" deep
16. Pit Depth: 4' - 0"
17. Button & Fixture Style: Traditional Signal Fixtures
18. Special Operations: None

END OF SECTION 14 24 00

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SECTION 220513

COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with NEMA MG 1 unless otherwise indicated.
- B. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.
- B. 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.

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Energy efficient, as defined in NEMA MG 1.
- C. Service Factor: 1.15.
- D. Rotor: Random-wound, squirrel cage.
- E. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- F. Temperature Rise: Match insulation rating.
- G. Insulation: Class F.

2.4 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split phase.
 - 3. Capacitor start, inductor run.
 - 4. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 220517

SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Sleeves.
 - 2. Sleeve-seal systems.
 - 3. Grout.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- B. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

2.2 SLEEVE-SEAL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. [Advance Products & Systems, Inc.](#)
 - 2. [CALPICO, Inc.](#)
 - 3. [Metraflex Company \(The\).](#)
 - 4. [Pipeline Seal and Insulator, Inc.](#)
 - 5. [Proco Products, Inc.](#)

- B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
 - 1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Stainless steel.
 - 3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
 - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 - 1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
 - 2. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
 - 3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
 - 1. Cut sleeves to length for mounting flush with both surfaces.

2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 1. Exterior Concrete Walls above Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves.
 2. Concrete Slabs-on-Grade:
 - a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 3. Concrete Slabs above Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
 4. Interior Partitions:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

END OF SECTION

SECTION 220518

ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Escutcheons.
 - 2. Floor plates.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- C. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.

2.2 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.
- B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.
 - 1. Escutcheons for New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
 - c. Insulated Piping: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
 - e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
 - f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
 - g. Bare Piping in Equipment Rooms: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
- C. Install floor plates for piping penetrations of equipment-room floors.
- D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 - 1. New Piping: One-piece, floor-plate type.

3.2 FIELD QUALITY CONTROL

- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION

SECTION 220519

METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Liquid-in-glass thermometers.
 - 2. Thermowells.
 - 3. Dial-type pressure gages.
 - 4. Gage attachments.
 - 5. Test plugs.
- B. Related Sections:
 - 1. Section 221116 "Domestic Water Piping" for water meters inside the building.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of meter and gage, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 LIQUID-IN-GLASS THERMOMETERS

- A. Plastic-Case, Compact-Style, Liquid-in-Glass Thermometers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Flo Fab Inc.](#)
 - b. [Miljoco Corporation.](#)

- c. [Tel-Tru Manufacturing Company.](#)
- d. [Watts Regulator Co.; a div. of Watts Water Technologies, Inc.](#)
- e. [Weiss Instruments, Inc.](#)
- f. [WIKA Instrument Corporation - USA.](#)
2. Standard: ASME B40.200.
3. Case: Plastic; 6-inch nominal size.
4. Case Form: Straight unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue organic liquid.
6. Tube Background: Nonreflective with permanently etched scale markings graduated in deg F.
7. Window: Glass or plastic.
8. Stem: Aluminum or brass and of length to suit installation.
 - a. Design for Thermowell Installation: Bare stem.
9. Connector: 3/4 inch, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.2 THERMOWELLS

- A. Thermowells:
 1. Standard: ASME B40.200.
 2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
 3. Material for Use with Copper Tubing: CNR or CUNI.
 4. Type: Stepped shank unless straight or tapered shank is indicated.
 5. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
 6. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
 7. Bore: Diameter required to match thermometer bulb or stem.
 8. Insertion Length: Length required to match thermometer bulb or stem.
 9. Lagging Extension: Include on thermowells for insulated piping and tubing.
 10. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.
- B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.3 PRESSURE GAGES

- A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [AMETEK, Inc.; U.S. Gauge.](#)
 - b. [Ashcroft Inc.](#)
 - c. [Ernst Flow Industries.](#)
 - d. [Flo Fab Inc.](#)
 - e. [Marsh Bellofram.](#)
 - f. [Miljoco Corporation.](#)
 - g. [Noshok.](#)
 - h. [Palmer Wahl Instrumentation Group.](#)
 - i. [REOTEMP Instrument Corporation.](#)
 - j. [Tel-Tru Manufacturing Company.](#)
 - k. [Trerice, H. O. Co.](#)
 - l. [Watts Regulator Co.; a div. of Watts Water Technologies, Inc.](#)
 - m. [Weiss Instruments, Inc.](#)
 - n. [WIKA Instrument Corporation - USA.](#)
 - o. [Winters Instruments - U.S.](#)

2. Standard: ASME B40.100.
3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
4. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
7. Pointer: Dark-colored metal.
8. Window: Glass or plastic.
9. Ring: Metal.
10. Accuracy: Grade C, plus or minus 3 percent of middle half of scale range.

2.4 GAGE ATTACHMENTS

- A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and-type surge-dampening device. Include extension for use on insulated piping.
- B. Valves: Brass or stainless-steel needle, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

2.5 TEST PLUGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. [Flow Design, Inc.](#)
 2. [Miljoco Corporation.](#)
 3. [National Meter, Inc.](#)
 4. [Peterson Equipment Co., Inc.](#)
 5. [Sisco Manufacturing Company, Inc.](#)
 6. [Trerice, H. O. Co.](#)
 7. [Watts Regulator Co.; a div. of Watts Water Technologies, Inc.](#)
 8. [Weiss Instruments, Inc.](#)
- B. Description: Test-station fitting made for insertion into piping tee fitting.
- C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.
- D. Thread Size: NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe thread.
- E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.
- F. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees.
- B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.
- C. Install thermowells with extension on insulated piping.
- D. Fill thermowells with heat-transfer medium.
- E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
- F. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
- G. Install valve and snubber in piping for each pressure gage for fluids.
- H. Install test plugs in piping tees.
- I. Install thermometers in the following locations:
 - 1. Inlet and outlet of each water heater.
- J. Install pressure gages in the following locations:
 - 1. Building water service entrance into building.
 - 2. Inlet and outlet of each pressure-reducing valve.
 - 3. Suction and discharge of each domestic water pump.

3.2 CONNECTIONS

- A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.3 ADJUSTING

- A. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

- A. Thermometers at inlet and outlet of each domestic water heater shall be the following:
 - 1. Direct-mounted, plastic-case, vapor-actuated type.
- B. Thermometer stems shall be of length to match thermowell insertion length.
- C. Scale Range for Domestic Hot-Water Piping: 0 to 250 deg F.

3.5 PRESSURE-GAGE SCHEDULE

- A. Pressure gages at discharge of each water service into building shall be one of the following:
 - 1. Liquid-filled, direct-mounted, metal case.
- B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be the following:
 - 1. Liquid-filled, direct-mounted, metal case.
- C. Pressure gages at suction and discharge of each domestic water pump shall be the following:
 - 1. Liquid-filled, direct-mounted, metal case.

3.6 PRESSURE-GAGE SCALE-RANGE SCHEDULE

- A. Scale Range for Water Service Piping: 0 to 100 psi.
- B. Scale Range for Domestic Water Piping: 0 to 100 psi.

END OF SECTION

SECTION 220523

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Bronze angle valves.
2. Bronze ball valves.
3. Iron ball valves.
4. Bronze lift check valves.
5. Bronze swing check valves.
6. Iron swing check valves with closure control.
7. Iron gate valves.
8. Bronze globe valves.

- B. Related Sections:

1. Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.
2. Section 221116 "Domestic Water Piping" for valves applicable only to this piping.
3. Section 221319 "Sanitary Waste Piping Specialties" for valves applicable only to this piping.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Nonrising stem.
- E. OS&Y: Outside screw and yoke.
- F. RS: Rising stem.
- G. SWP: Steam working pressure.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve indicated.

1.5 QUALITY ASSURANCE

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 2. ASME B31.1 for power piping valves.
 - 3. ASME B31.9 for building services piping valves.
- 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 open to minimize exposure of functional surfaces.
 - 5. 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 handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to valve schedule articles for applications of valves.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- C. Valve Sizes: Same as upstream piping unless otherwise indicated.
- D. Valve Actuator Types:
 - 1. Handwheel: For valves other than quarter-turn types.
 - 2. Handlever: For quarter-turn valves NPS 6 and smaller.

- E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
 - 1. Gate Valves: With rising stem.
 - 2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
- F. Valve-End Connections:
 - 1. Flanged: With flanges according to ASME B16.1 for iron valves.
 - 2. Grooved: With grooves according to AWWA C606.
 - 3. Solder Joint: With sockets according to ASME B16.18.
 - 4. Threaded: With threads according to ASME B1.20.1.
- G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE ANGLE VALVES

- A. Class 125, Bronze Angle Valves with Nonmetallic Disc:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. NIBCO INC.
 - 2. Description:
 - a. Standard: MSS SP-80, Type 2.
 - b. CWP Rating: 200 psig.
 - c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
 - d. Ends: Threaded.
 - e. Stem: Bronze.
 - f. Disc: PTFE or TFE.
 - g. Packing: Asbestos free.
 - h. Handwheel: Malleable iron.

2.3 BRONZE BALL VALVES

- A. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Conbraco Industries, Inc.; Apollo Valves.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Hammond Valve.
 - d. Milwaukee Valve Company.
 - e. NIBCO INC.
 - f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - 2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig.
 - c. CWP Rating: 600 psig.
 - d. Body Design: Two piece.
 - e. Body Material: Bronze.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Stainless steel.

- i. Ball: Stainless steel, vented.
- j. Port: Full.

2.4 IRON BALL VALVES

- A. Class 150, Iron Ball Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [American Valve, Inc.](#)
 - b. [Conbraco Industries, Inc.; Apollo Valves.](#)
 - c. [Kitz Corporation.](#)
 - d. [Sure Flow Equipment Inc.](#)
 - e. [Watts Regulator Co.; a division of Watts Water Technologies, Inc.](#)
 - 2. Description:
 - a. Standard: MSS SP-72.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Split body.
 - d. Body Material: ASTM A 126, gray iron.
 - e. Ends: Flanged.
 - f. Seats: PTFE or TFE.
 - g. Stem: Stainless steel.
 - h. Ball: Stainless steel.
 - i. Port: Full.

2.5 BRONZE LIFT CHECK VALVES

- A. Class 125, Lift Check Valves with Nonmetallic Disc:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Flo Fab Inc.](#)
 - b. [Hammond Valve.](#)
 - c. [Kitz Corporation.](#)
 - d. [Milwaukee Valve Company.](#)
 - e. [NIBCO INC.](#)
 - f. [Red-White Valve Corporation.](#)
 - g. [Watts Regulator Co.; a division of Watts Water Technologies, Inc.](#)
 - 2. Description:
 - a. Standard: MSS SP-80, Type 2.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Vertical flow.
 - d. Body Material: ASTM B 61 or ASTM B 62, bronze.
 - e. Ends: Threaded.
 - f. Disc: NBR, PTFE, or TFE.

2.6 BRONZE SWING CHECK VALVES

- A. Class 125, Bronze Swing Check Valves with Nonmetallic Disc:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Crane Co.; Crane Valve Group; Crane Valves.](#)

- b. [Crane Co.; Crane Valve Group; Jenkins Valves.](#)
 - c. [Crane Co.; Crane Valve Group; Stockham Division.](#)
 - d. [Milwaukee Valve Company.](#)
 - e. [NIBCO INC.](#)
 - f. [Red-White Valve Corporation.](#)
 - g. [Watts Regulator Co.; a division of Watts Water Technologies, Inc.](#)
2. Description:
- a. Standard: MSS SP-80, Type 4.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded.
 - f. Disc: PTFE or TFE.

2.7 IRON SWING CHECK VALVES WITH CLOSURE CONTROL

- A. Class 125, Iron Swing Check Valves with Lever- and Weight-Closure Control:
- 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Crane Co.; Crane Valve Group; Crane Valves.Crane Co.; Crane Valve Group; Jenkins Valves.](#)
 - b. [Crane Co.; Crane Valve Group; Stockham Division.](#)
 - c. [Milwaukee Valve Company.](#)
 - d. [NIBCO INC.](#)
 - e. [Watts Regulator Co.; a division of Watts Water Technologies, Inc.](#)
 - 2. Description:
 - a. Standard: MSS SP-71, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Clear or full waterway.
 - d. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - e. Ends: Flanged.
 - f. Trim: Bronze.
 - g. Gasket: Asbestos free.
 - h. Closure Control: Factory-installed, exterior lever and weight.

2.8 IRON GATE VALVES

- A. Class 125, NRS, Iron Gate Valves:
- 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Crane Co.; Crane Valve Group; Crane Valves.](#)
 - b. [Crane Co.; Crane Valve Group; Jenkins Valves.](#)
 - c. [Crane Co.; Crane Valve Group; Stockham Division.](#)
 - d. [Milwaukee Valve Company.](#)
 - e. [NIBCO INC.](#)
 - f. [Red-White Valve Corporation.](#)
 - g. [Watts Regulator Co.; a division of Watts Water Technologies, Inc.](#)
 - 2. Description:
 - a. Standard: MSS SP-70, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Material: ASTM A 126, gray iron with bolted bonnet.

- d. Ends: Flanged.
- e. Trim: Bronze.
- f. Disc: Solid wedge.
- g. Packing and Gasket: Asbestos free.

2.9 BRONZE GLOBE VALVES

- A. Class 125, Bronze Globe Valves with Nonmetallic Disc:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Stockham Division.
 - c. NIBCO INC.
 - d. Red-White Valve Corporation.
 - 2. Description:
 - a. Standard: MSS SP-80, Type 2.
 - b. CWP Rating: 200 psig.
 - c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
 - d. Ends: Threaded or solder joint.
 - e. Stem: Bronze.
 - f. Disc: PTFE or TFE.
 - g. Packing: Asbestos free.
 - h. Handwheel: Malleable iron.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install check valves for proper direction of flow and as follows:
 - 1. Swing Check Valves: In horizontal position with hinge pin level.
 - 2. Lift Check Valves: With stem upright and plumb.

3.3 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.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Shutoff Service: Ball valves.
 - 2. Throttling Service: Globe valves.
 - 3. Pump-Discharge Check Valves:
 - a. NPS 2 and Smaller: Bronze swing check valves with nonmetallic disc.
 - b. NPS 2-1/2 and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 - 2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 3. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 4. For Grooved-End Copper Tubing and Steel Piping: Valve ends may be grooved.

3.5 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

- A. All pipe sizes:
 - 1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
 - 2. Bronze Angle Valves: Class 125, nonmetallic disc.
 - 3. Ball Valves: Two piece, full port, bronze with stainless-steel trim.
 - 4. Bronze Swing Check Valves: Class 125, nonmetallic disc.
 - 5. Bronze Globe Valves: Class 125, nonmetallic disc.

3.6 SANITARY-WASTE VALVE SCHEDULE

A. Pipe NPS 2-1/2 and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
2. Iron Ball Valves: Class 150.
3. Iron Swing Check Valves with Closure Control: Class 125, lever and weight.
4. Iron Gate Valves: Class 125, NRS.

END OF SECTION

SECTION 220529

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Fastener systems.
- B. Related Sections:
 - 1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Detail fabrication and assembly of trapeze hangers.
 - 2. Design Calculations: Calculate requirements for designing trapeze hangers.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.7 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Copper Pipe Hangers:
1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
 2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 FASTENER SYSTEMS

- A. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.4 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
 - 1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- F. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- G. Install lateral bracing with pipe hangers and supports to prevent swaying.
- H. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- I. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- K. Insulated Piping:

1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
3. 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.

3.2 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.3 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.4 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099123 "Interior Painting."
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.5 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.
- F. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.
- G. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
- H. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- I. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
- J. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 - 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
 - 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 - 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 - 5. C-Clamps (MSS Type 23): For structural shapes.
 - 6. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 - 7. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 - 8. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.

9. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 10. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
- K. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- L. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- M. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION

SECTION 220553

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Pipe labels.
 - 3. Valve tags.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
 - 1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
 - 2. Letter Color: White.
 - 3. Background Color: Red.
 - 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 7. Fasteners: Stainless-steel rivets or self-tapping screws.
 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

2.2 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 2. Lettering Size: At least 1-1/2 incheshigh.

2.3 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
 1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 2. Fasteners: Brass beaded chain.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

3.4 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

END OF SECTION

SECTION 220719

PLUMBING PIPING INSULATION

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 insulating the following plumbing piping services:
 1. Domestic hot-water piping.
 2. Domestic recirculating hot-water piping.
 3. Supplies and drains for handicap-accessible lavatories and sinks.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
- B. Comply with the following applicable standards and other requirements specified for miscellaneous components:
 1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.7 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. [Fibrex Insulations Inc.; Coreplus 1200.](#)
 - b. [Johns Manville; Micro-Lok.](#)
 - c. [Knauf Insulation; 1000-Degree Pipe Insulation.](#)
 - d. [Manson Insulation Inc.; Alley-K.](#)
 - e. [Owens Corning; Fiberglas Pipe Insulation.](#)
 - 2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 - 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.3 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Engineered Brass Company.](#)
 - b. [Insul-Tect Products Co.; a subsidiary of MVG Molded Products.](#)
 - c. [McGuire Manufacturing.](#)
 - d. [Plumberex.](#)
 - e. [Truebro; a brand of IPS Corporation.](#)
 - f. [Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.](#)
2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 1. Verify that systems to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- O. For above-ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Cleanouts.

3.4 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- C. Insulation Installation at Floor Penetrations:
 - 1. Pipe: Install insulation continuously through floor penetrations.
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 - 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
 - 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 - 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 - 8. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
 - 1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 - 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 - 3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
 - 4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
 - 1. Install preformed pipe insulation to outer diameter of pipe flange.
 - 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 - 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
 - 4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.
- C. Insulation Installation on Pipe Fittings and Elbows:
 - 1. Install preformed sections of same material as straight segments of pipe insulation when available.
 - 2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.
- D. Insulation Installation on Valves and Pipe Specialties:
 - 1. Install preformed sections of same material as straight segments of pipe insulation when available.
 - 2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
 - 3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 - 4. Install insulation to flanges as specified for flange insulation application.

3.7 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Drainage piping located in crawl spaces.

2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.
4. Domestic cold water piping except for supplies at ADA fixtures.

3.8 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Hot and Recirculated Hot Water:

1. NPS 1 and Smaller: Insulation shall be the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
2. NPS 1-1/4 and Larger: Insulation shall be the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inches thick.

END OF SECTION

SECTION 221116

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.
 - 2. Encasement for piping.

1.3 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.
- C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- D. Copper Unions:
 - 1. MSS SP-123.

2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

E. Copper Pressure-Seal-Joint Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Viega LLC.
2. Fittings for NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
3. Fittings for NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

F. Appurtenances for Grooved-End Copper Tubing:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International; a subsidiary of Mueller Water Products, Inc.
 - b. Victaulic Company.
2. Bronze Fittings for Grooved-End, Copper Tubing: ASTM B 75 copper tube or ASTM B 584 bronze castings.
3. Mechanical Couplings for Grooved-End Copper Tubing:
 - a. Copper-tube dimensions and design similar to AWWA C606.
 - b. Ferrous housing sections.
 - c. EPDM-rubber gaskets suitable for hot and cold water.
 - d. Bolts and nuts.
 - e. Minimum Pressure Rating: 300 psig.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

2.4 ENCASUREMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105/A21.5.

B. Form: Tube.

2.5 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

2.6 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Central Plastics Company.
 - b. Jomar Valve.
 - c. Watts; a Watts Water Technologies company.
 - d. Wilkins.
 - e. Zum Industries, LLC.
2. Standard: ASSE 1079.
3. Pressure Rating: 125 psig minimum at 180 deg F.
4. End Connections: Solder-joint copper alloy and threaded ferrous.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."

D. Install shutoff valve immediately upstream of each dielectric fitting.

- E. Install domestic water piping level without pitch and plumb.
- F. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- G. 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.
- H. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- I. Install piping to permit valve servicing.
- J. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- K. Install piping free of sags and bends.
- L. Install fittings for changes in direction and branch connections.
- M. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- N. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping."
- O. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 221123 "Domestic Water Pumps."
- P. Install thermometers on outlet piping from each water heater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."
- Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

- C. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- D. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.
- E. Joint Construction for Grooved-End Copper Tubing: Make joints according to AWWA C606. Roll groove ends of tubes. Lubricate and install gasket over ends of tubes or tube and fitting. Install coupling housing sections over gasket with keys seated in tubing grooves. Install and tighten housing bolts.

3.4 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.

3.5 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Vertical Piping: MSS Type 8 or 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.
- E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
 - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
 - 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 - 4. NPS 2-1/2: 108 inches with 1/2-inch rod.
 - 5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
 - 6. NPS 6: 10 feet with 5/8-inch rod.

7. NPS 8: 10 feet with 3/4-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.

2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.

3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.

4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.8 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.

b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.

2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

- c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
 - d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
2. Piping Tests:
- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
 - b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
 - c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 - e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
 - f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.10 ADJUSTING

- A. Perform the following adjustments before operation:
- 1. Close drain valves, hydrants, and hose bibbs.
 - 2. Open shutoff valves to fully open position.
 - 3. Open throttling valves to proper setting.
 - 4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
 - 5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
 - 6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
 - 7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
 - 8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
- 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 - 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

- a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Repeat procedures if biological examination shows contamination.
 - e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be the following:
 1. Soft copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.
- D. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:
 1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and soldered joints.
 2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
- E. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be one of the following:
 1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and soldered joints.
 2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
 3. Hard copper tube, ASTM B 88, Type L; grooved-joint, copper-tube appurtenances; and grooved joints.

3.13 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2 and larger.
 2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
 3. Hot-Water Circulation Piping, Balancing Duty: Calibrated balancing valves.

4. Drain Duty: Hose-end drain valves.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.
- C. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION

SECTION 221119

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Vacuum breakers.
 - 2. Backflow preventers.
 - 3. Balancing valves.
 - 4. Temperature-actuated, water mixing valves.
 - 5. Strainers.
 - 6. Hose stations.
 - 7. Hose bibbs.
 - 8. Wall hydrants.
 - 9. Drain valves.
 - 10. Water-hammer arresters.
 - 11. Air vents.
 - 12. Trap-seal primer valves.
 - 13. Flexible connectors.
- B. Related Requirements:
 - 1. Section 220519 "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.
 - 2. Section 221116 "Domestic Water Piping" for water meters.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Potable-water piping and components shall comply with NSF 61 Annex G and NSF 14.

2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

A. Hose-Connection Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cash Acme.
 - b. Conbraco Industries, Inc.
 - c. MIFAB, Inc.
 - d. Watts; a Watts Water Technologies company.
 - e. Woodford Manufacturing Company.
 - f. Zurn Industries, LLC.
2. Standard: ASSE 1011.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Chrome or nickel plated.

B. Pressure Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ames Co.
 - b. Conbraco Industries, Inc.
 - c. FEBCO.
 - d. Watts; a Watts Water Technologies company.
 - e. Zurn Industries, LLC.
2. Standard: ASSE 1020.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 5 psig maximum, through middle third of flow range.
5. Accessories:
 - a. Valves: Ball type, on inlet and outlet.

2.4 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ames Co.
 - b. Conbraco Industries, Inc.
 - c. FEBCO.
 - d. Watts; a Watts Water Technologies company.

- e. [Zurn Industries, LLC.](#)
 2. Standard: ASSE 1013.
 3. Operation: Continuous-pressure applications.
 4. Pressure Loss: 12 psig maximum, through middle third of flow range.
 5. Body: Bronze for NPS 2 and smaller; stainless steel for NPS 2-1/2 and larger.
 6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
 7. Configuration: Designed for horizontal, straight-through flow.
 8. Accessories:
 - a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
 - b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
 - c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.
- B. Beverage-Dispensing-Equipment Backflow Preventers:
1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:
 - a. [Conbraco Industries, Inc.](#)
 - b. [Watts; a Watts Water Technologies company.](#)
 - c. [Zurn Industries, LLC.](#)
 2. Standard: ASSE 1022.
 3. Operation: Continuous-pressure applications.
 4. Size: NPS 1/4 or NPS 3/8.
 5. Body: Stainless steel.
 6. End Connections: Threaded.
- C. Carbonated-Beverage-Dispenser, Dual-Check-Valve Backflow Preventers:
1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:
 - a. [Cash Acme.](#)
 - b. [Watts; a Watts Water Technologies company.](#)
 2. Standard: ASSE 1032.
 3. Operation: Continuous-pressure applications.
 4. Size: NPS 1/4 or NPS 3/8.
 5. Body: Stainless steel.
 6. End Connections: Threaded.
- D. Hose-Connection Backflow Preventers:
1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:
 - a. [Conbraco Industries, Inc.](#)
 - b. [Watts; a Watts Water Technologies company.](#)
 - c. [Woodford Manufacturing Company.](#)
 2. Standard: ASSE 1052.
 3. Operation: Up to 10-foot head of water back pressure.
 4. Inlet Size: NPS 1/2 or NPS 3/4.
 5. Outlet Size: Garden-hose thread complying with ASME B1.20.7.
 6. Capacity: At least 3-gpm flow.
- 2.5 BALANCING VALVES
- A. Copper-Alloy Calibrated Balancing Valves:
1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:
 - a. [Armstrong International, Inc.](#)
 - b. [Flo Fab inc.](#)
 - c. [ITT Corporation.](#)

- d. [NIBCO INC.](#)
- e. [Watts; a Watts Water Technologies company.](#)
2. Type: Ball or Y-pattern globe valve with two readout ports and memory-setting indicator.
3. Body: Brass or bronze.
4. Size: Same as connected piping, but not larger than NPS 2.
5. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

2.6 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Primary, Thermostatic, Water Mixing Valves:

1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:
 - a. [Armstrong International, Inc.](#)
 - b. [Lawler Manufacturing Company, Inc.](#)
 - c. [Leonard Valve Company.](#)
 - d. [Powers.](#)
 - e. [Zurn Industries, LLC.](#)
2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Type: Exposed-mounted, thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Valve Finish: Rough bronze.
9. Piping Finish: Copper.

2.7 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size:
 - a. Strainers NPS 2 and Smaller: 0.033 inch.
 - b. Strainers NPS 2-1/2 to NPS 4: 0.062 inch.
6. Drain: Factory-installed, hose-end drain valve.

2.8 HOSE STATIONS

A. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:

1. [Armstrong International, Inc.](#)
2. [Leonard Valve Company.](#)
3. [Strahman Valves, Inc.](#)
4. [T & S Brass and Bronze Works, Inc.](#)

B. Hot- and Cold-Water Hose Stations:

1. Standard: ASME A112.18.1.
2. Faucet Type: Blending valve.

3. Hose-Rack Material: Stainless steel.
4. Body Material: Bronze.
5. Body Finish: Rough bronze or chrome plated.
6. Mounting: Wall, with reinforcement.
7. Supply Fittings: Two NPS 3/4 gate, globe, or ball valves and check valves and NPS 3/4 copper, water tubing. Omit check valves if check stops are included with fitting.
8. Hose: Manufacturer's standard, for service fluid, temperature, and pressure; 50 feet long.
9. Nozzle: With hand-squeeze, on-off control.
10. Vacuum Breaker: Integral or factory-installed, nonremovable, manual-drain-type, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052; and garden-hose thread complying with ASME B1.20.7 on outlet.

2.9 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Wheel handle.
13. Operation for Finished Rooms: Wheel handle.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.10 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.

9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.11 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Josam Company](#).
 - b. [MIFAB, Inc.](#)
 - c. [Precision Plumbing Products, Inc.](#)
 - d. [Sioux Chief Manufacturing Company, Inc.](#)
 - e. [Smith, Jay R. Mfg. Co.](#)
 - f. [Watts; a Watts Water Technologies company.](#)
 - g. [Zurn Industries, LLC.](#)
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.12 TRAP-SEAL PRIMER DEVICE

A. Drainage-Type, Trap-Seal Primer Device:

1. **Manufacturers:** Subject to compliance with requirements, provide products by the following:
 - a. [Smith, Jay R. Mfg. Co.](#)
2. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 minimum, trap makeup connection.
3. Size: NPS 1-1/4 minimum.
4. Material: Chrome-plated, cast brass.

2.13 FLEXIBLE CONNECTORS

A. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:

1. [Flex-Hose Co., Inc.](#)
2. [Flexicraft Industries.](#)
3. [Metraflex Company \(The\).](#)

B. Bronze-Hose Flexible Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig.
2. End Connections NPS 2 and Smaller: Threaded copper pipe or plain-end copper tube.
3. End Connections NPS 2-1/2 and Larger: Flanged copper alloy.

C. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig.
2. End Connections NPS 2 and Smaller: Threaded steel-pipe nipple.
3. End Connections NPS 2-1/2 and Larger: Flanged steel nipple.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 - 1. Locate backflow preventers in same room as connected equipment or system.
 - 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
 - 3. Do not install bypass piping around backflow preventers.
- B. Install balancing valves in locations where they can easily be adjusted.
- C. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
- D. Install Y-pattern strainers for water on supply side of each pump.
- E. Install outlet boxes recessed in wall or surface mounted on wall. Install 2-by-4-inch fire-retardant-treated-wood blocking, wall reinforcement between studs. Comply with requirements for fire-retardant-treated-wood blocking in Section 061000 "Rough Carpentry."
- F. Install hose stations with check stops or shutoff valves on inlets and with thermometer on outlet.
 - 1. Install cabinet-type units recessed in or surface mounted on wall as specified. Install 2-by-4-inch fire-retardant-treated-wood blocking, wall reinforcement between studs. Comply with requirements for fire-retardant-treated-wood blocking in Section 061000 "Rough Carpentry."
- G. Install water-hammer arresters in water piping according to PDI-WH 201.
- H. Install drainage-type, trap-seal primer valves as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.

3.2 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
 - 1. Pressure vacuum breakers.
 - 2. Intermediate atmospheric-vent backflow preventers.
 - 3. Reduced-pressure-principle backflow preventers.
 - 4. Carbonated-beverage-machine backflow preventers.
 - 5. Calibrated balancing valves.
 - 6. Primary, thermostatic, water mixing valves.
 - 7. Hose stations.
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to

identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Test each pressure vacuum breaker and reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.
- B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Set field-adjustable flow set points of balancing valves.
- B. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION

SECTION 221123

DOMESTIC WATER PUMPS

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. In-line, sealless centrifugal pumps.

1.3 DEFINITIONS

- A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include materials of construction, rated capacities, certified performance curves with operating points plotted on curves, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For domestic water pumps to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Retain shipping flange protective covers and protective coatings during storage.

- B. Protect bearings and couplings against damage.
- C. Comply with pump manufacturer's written rigging instructions for handling.

1.8 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 IN-LINE, SEALLESS CENTRIFUGAL PUMPS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. [Armstrong Pumps, Inc.](#)
 2. [Bell & Gossett; a Xylem brand.](#)
 3. [Grundfos Pumps Corp.](#)
 4. [WILO USA LLC - WILO Canada Inc.](#)
- B. Description: Factory-assembled and -tested, in-line, close-coupled, canned-motor, sealless, overhung-impeller centrifugal pumps.
- C. Pump Construction:
 1. Pump and Motor Assembly: Hermetically sealed, replaceable-cartridge type with motor and impeller on common shaft and designed for installation with pump and motor shaft horizontal.
 2. Casing: Bronze, with threaded or companion-flange connections.
 3. Impeller: Plastic.
 4. Motor: Single speed, unless otherwise indicated.

2.2 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 220513 "Common Motor Requirements for Plumbing Equipment."
 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2.3 CONTROLS

- A. Thermostats: Electric; adjustable for control of hot-water circulation pump.
 1. Type: Water-immersion temperature sensor, for installation in piping.
 2. Range: 65 to 200 deg F.
 3. Enclosure: NEMA 250, Type 4X.
 4. Operation of Pump: On or off.
 5. Transformer: Provide if required.
 6. Power Requirement: 120 V, ac.

7. Settings: Start pump at 130 deg F and stop pump at 145 deg F.
- B. Timers: Electric, for control of hot-water circulation pump.
1. Type: Programmable, seven-day clock with manual override on-off switch.
 2. Enclosure: NEMA 250, Type 1, suitable for wall mounting.
 3. Operation of Pump: On or off.
 4. Transformer: Provide if required.
 5. Power Requirement: 120-V ac.
 6. Programmable Sequence of Operation: Up to two on-off cycles each day for seven days.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of domestic-water-piping system to verify actual locations of connections before pump installation.

3.2 PUMP INSTALLATION

- A. Comply with HI 1.4.
- B. Install in-line, sealless centrifugal pumps with shaft horizontal unless otherwise indicated.
- C. Install thermostats in hot-water return piping.
- D. Install timers on wall in mechanical room.

3.3 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to pumps to allow service and maintenance.
- C. Connect domestic water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles.
- D. Install shutoff valve and strainer on suction side of each pump, and check, shutoff, and throttling valves on discharge side of each pump. Install valves same size as connected piping. Comply with requirements for valves specified in Section 220523 "General Duty Valves for Plumbing Piping" and comply with requirements for strainers specified in Section 221119 "Domestic Water Piping Specialties."
1. Install pressure gage at suction of each pump and pressure gage at discharge of each pump. Install at integral pressure-gage tapings where provided or install pressure-gage connectors in suction and discharge piping around pumps. Comply with requirements for pressure gages and snubbers specified in Section 220519 "Meters and Gages for Plumbing Piping."

- E. Connect thermostats and timers to pumps that they control.

3.4 IDENTIFICATION

- A. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment" for identification of pumps.

3.5 STARTUP SERVICE

- A. Perform startup service.
 1. Complete installation and startup checks according to manufacturer's written instructions.
 2. Check piping connections for tightness.
 3. Clean strainers on suction piping.
 4. Set thermostats and timers for automatic starting and stopping operation of pumps.
 5. Perform the following startup checks for each pump before starting:
 - a. Verify bearing lubrication.
 - b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
 - c. Verify that pump is rotating in the correct direction.
 6. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
 7. Start motor.
 8. Open discharge valve slowly.
 9. Adjust temperature settings on thermostats.
 10. Adjust timer settings.

3.6 ADJUSTING

- A. Adjust domestic water pumps to function smoothly, and lubricate as recommended by manufacturer.
- B. Adjust initial temperature set points.

END OF SECTION

SECTION 221316

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipe, tube, and fittings.
 - 2. Specialty pipe fittings.
 - 3. Encasement for underground metal piping.
- B. Related Sections:
 - 1. Section 221329 "Sanitary Sewerage Pumps" for effluent and sewage pumps.

1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.
 - 2. Waste, Force-Main Piping: 50 psig.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.7 PROJECT CONDITIONS

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
1. Notify Architect no fewer than two days in advance of proposed interruption of sanitary waste service.
 2. Do not proceed with interruption of sanitary waste service without Architect's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. CISPI, Hubless-Piping Couplings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ANACO-Husky.
 - b. Fernco Inc.
 - c. MIFAB, Inc.
 - d. Mission Rubber Company; a division of MCP Industries, Inc.
 - e. Tyler Pipe.
 2. Standards: ASTM C 1277 and CISPI 310.
 3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
- C. Heavy-Duty, Hubless-Piping Couplings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ANACO-Husky.
 - b. Clamp-All Corp.
 - c. MIFAB, Inc.
 - d. Mission Rubber Company; a division of MCP Industries, Inc.
 - e. Tyler Pipe.
 2. Standards: ASTM C 1277 and ASTM C 1540.
 3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.3 DUCTILE-IRON PIPE AND FITTINGS

- A. Ductile-Iron, Grooved-Joint Piping:

1. Ductile-Iron Pipe: AWWA C151/A21.51 with round-cut-grooved ends according to AWWA C606.
2. Ductile-Iron-Pipe Appurtenances:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Anvil International.
 - 2) Victaulic Company.
 - b. Grooved-End, Ductile-Iron Fittings: ASTM A 536 ductile-iron castings with dimensions matching AWWA C110/A 21.10 ductile-iron pipe or AWWA C153/A 21.53 ductile-iron fittings and complying with AWWA C606 for grooved ends.

2.4 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
3. Pressure Transition Couplings:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cascade Waterworks Mfg. Co.
 - 2) Dresser, Inc.
 - 3) EBAA Iron, Inc.
 - 4) JCM Industries, Inc.
 - 5) Romac Industries, Inc.
 - 6) Smith-Blair, Inc.; a Sensus company.
 - 7) The Ford Meter Box Company, Inc.
 - 8) Viking Johnson.
 - b. Standard: AWWA C219.
 - c. Description: Metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
 - d. Center-Sleeve Material: Manufacturer's standard.
 - e. Gasket Material: Natural or synthetic rubber.
 - f. Metal Component Finish: Corrosion-resistant coating or material.

B. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
2. Dielectric Flanges:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Capitol Manufacturing Company.
 - 2) Matco-Norca, Inc.
 - 3) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - 4) Wilkins; a Zurn company.
 - b. Description:
 - 1) Standard: ASSE 1079.
 - 2) Factory-fabricated, bolted, companion-flange assembly.

- 3) Pressure Rating: 125 psig minimum at 180 deg F.
- 4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

2.5 ENCASEMENT FOR UNDERGROUND METAL PIPING

- A. Standard: ASTM A 674 or AWWA C105/A 21.5.
- B. Material: Linear low-density polyethylene film of 0.008-inch or high-density, cross-laminated polyethylene film of 0.004-inch minimum thickness.
- C. Form: Sheet or tube.
- D. Color: Black or natural.

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.

- J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- K. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- L. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 2 percent downward in direction of flow for piping NPS 4 and larger.
 - 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- M. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 - 1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.
- N. Install steel piping according to applicable plumbing code.
- O. Install force mains at elevations indicated.
- P. Plumbing Specialties:
 - 1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
 - 2. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."
- Q. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- B. 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.
- C. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.
- D. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

3.4 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
 - 1. Install transition couplings at joints of piping with small differences in OD's.
 - 2. In Drainage Piping: Unshielded, nonpressure transition couplings.
 - 3. In Underground Force Main Piping:
 - a. NPS 1-1/2 and Smaller: Fitting-type transition couplings.
 - b. NPS 2 and Larger: Pressure transition couplings.
- B. Dielectric Fittings:
 - 1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
 - 2. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

3.5 VALVE INSTALLATION

- A. General valve installation requirements are specified in Section 220523 "General Duty Valves for Plumbing Piping."
- B. Shutoff Valves:
 - 1. Install shutoff valve on each sewage pump discharge.
 - 2. Install gate or full-port ball valve for piping NPS 2 and smaller.
 - 3. Install gate valve for piping NPS 2-1/2 and larger.
- C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
 - 2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
 - 3. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 4. Install individual, straight, horizontal piping runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 - 5. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 6. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
 - 2. NPS 3: 60 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
 - 4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
 - 5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.
 - 6. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- F. Install supports for vertical cast-iron soil piping every 15 feet.
- G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
 - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.

5. Comply with requirements for cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."
 6. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.
- D. Connect force-main piping to the following:
1. Sanitary Sewer: To exterior force main.
 2. Sewage Pump: To sewage pump discharge.
- E. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- F. 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.

3.8 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 6. Prepare reports for tests and required corrective action.
- E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 4. Prepare reports for tests and required corrective action.

3.10 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.11 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 4 and smaller shall be the following:
 1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
- C. Aboveground, vent piping NPS 4 and smaller shall be the following:
 1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
- D. Underground, soil, waste, and vent piping NPS 4 and smaller shall be the following:
 1. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
- E. Underground sanitary-sewage force mains NPS 4 and smaller shall be the following:
 1. Ductile-iron, grooved-joint piping and grooved joints.

2. Fitting-type transition coupling for piping smaller than NPS 1-1/2 and pressure transition coupling for NPS 1-1/2 and larger if dissimilar pipe materials.

END OF SECTION

SECTION 221319

SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 1. Cleanouts.
 2. Floor drains.
 3. Trench drains.
 4. Miscellaneous sanitary drainage piping specialties.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:
 1. Grease interceptors.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

1.7 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."
- B. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

- A. Exposed Metal Cleanouts:
 - 1. ASME A112.36.2M, Cast-Iron Cleanouts:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) [Josam Company](#).
 - 2) [Smith, Jay R. Mfg. Co.](#)
 - 3) [Watts Drainage Products](#).
 - 4) [Zurn Plumbing Products Group](#).
 - 2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
 - 3. Size: Same as connected drainage piping
 - 4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
 - 5. Closure: Countersunk or raised-head, brass plug.
 - 6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
- B. Metal Floor Cleanouts:
 - 1. ASME A112.36.2M, Cast-Iron Cleanouts:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) [Josam Company](#).
 - 2) [Smith, Jay R. Mfg. Co.](#)
 - 3) [Watts Drainage Products](#).
 - 4) [Zurn Plumbing Products Group](#).
 - 2. Standard: ASME A112.36.2M for adjustable housing cleanout.
 - 3. Size: Same as connected branch.
 - 4. Adjustable Housing Material: Cast iron with threads.
 - 5. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
 - 6. Frame and Cover Shape: Round.
 - 7. Top Loading Classification: Medium Duty.
 - 8. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.
- C. Cast-Iron Wall Cleanouts:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Josam Company](#); Josam Div.
 - b. [Smith, Jay R. Mfg. Co.](#)
 - c. [Watts Drainage Products](#).
 - d. [Zurn Plumbing Products Group](#); Specification Drainage Operation.
 - 2. Standard: ASME A112.36.2M. Include wall access.

3. Size: Same as connected drainage piping.
4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, drilled-and-threaded brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. **Basis-of-Design Product:** Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. [Josam Company](#); Josam Div.
 - b. [Smith, Jay R. Mfg. Co.](#)
 - c. [Watts Drainage Products](#).
 - d. [Zurn Plumbing Products Group](#); Specification Drainage Operation.
2. Standard: ASME A112.6.3.
3. Pattern: Floor drain.

2.3 TRENCH DRAINS

A. Trench Drains:

1. **Basis-of-Design Product:** Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. [Josam Company](#); [Josam Div.](#)
 - b. [Smith, Jay R. Mfg. Co.](#); [Division of Smith Industries, Inc.](#)
 - c. [Watts Drainage Products Inc.](#)
 - d. [Zurn Plumbing Products Group](#); [Specification Drainage Operation](#).
2. Standard: ASME A112.6.3 for trench drains.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

B. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 - 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 - 2. Locate at each change in direction of piping greater than 45 degrees.
 - 3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
 - 4. Locate at base of each vertical soil and waste stack.
- B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
 - 1. Position floor drains for easy access and maintenance.
 - 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
 - a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
 - b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
 - c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.
 - 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
 - 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- E. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface, unless otherwise indicated.
- F. Assemble FRP channel drainage system components according to manufacturer's written instructions. Install on support devices so that top will be flush with adjacent surface.
- G. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
 - 1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
 - 2. Size: Same as floor drain inlet.
- H. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- I. Install wood-blocking reinforcement for wall-mounting-type specialties.
- J. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

- A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

3.3 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 223100

DOMESTIC WATER SOFTENERS

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. Commercial water softeners.
 - 2. Chemicals.
 - 3. Water-testing sets.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for water softeners.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
 - 3. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Source quality-control reports.
- B. Field quality-control reports.
- C. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For water softeners to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended application.

- B. UL Compliance: Fabricate and label water softeners to comply with UL 979, "Water Treatment Appliances."

1.7 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of water softeners that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures of mineral and brine tanks.
 - b. Faulty operation of controls.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
 - d. Attrition loss of resin exceeding 3 percent per year.
 - e. Mineral washed out of system during service run or backwashing period.
 - f. Effluent turbidity greater and color darker than incoming water.
 - g. Fouling of underdrain system, gravel, and resin with turbidity or by dirt, rust, or scale from water softener or soft water, while operating according to manufacturer's written operating instructions.
 - 2. Commercial Water Softeners, Warranty Period: From date of Substantial Completion.
 - a. Mineral Tanks: Five years.
 - b. Brine Tanks: 10 years.
 - c. Control Valve: One year(s).

1.9 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of water softener Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, cleaning, and adjusting as required for proper water softener operation at rated capacity. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

PART 2 - PRODUCTS

2.1 COMMERCIAL WATER SOFTENERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Culligan International Company, mode HE-150.
- B. Description: Factory-assembled, pressure-type water softener.
 - 1. Standard: Comply with NSF 61 Annex, "Drinking Water System Components - Health Effects."
 - 2. Configuration: Single unit with one mineral tank and one brine tank.

3. Mounting: On skids.
 4. Wetted Components: Suitable for water temperatures from.
 5. Mineral Tanks: FRP, pressure-vessel quality.
 - a. Construction: Non-ASME code.
 - b. Pressure Rating: 100 psig minimum.
 - c. Freeboard: 50 percent minimum for backwash expansion above normal resin bed level.
 - d. Upper Distribution System: Single, point type, fabricated from galvanized-steel pipe and fittings.
 - e. Lower Distribution System: Hub and radial-arm or header-lateral type; fabricated from nonmetallic pipe and fittings with individual, fine-slotted, nonclogging plastic strainers, and arranged for even flow distribution through resin bed.
 - f. Liner: PE, ABS, or other material suitable for potable water.
 6. Controls: Automatic; factory wired and factory mounted on unit.
 - a. Adjustable duration of various regeneration steps.
 - b. Push-button start and complete manual operation.
 - c. Electric time clock and switch for automatic operation except for manual return to service.
 - d. Sequence of Operation: Multiport pilot-control valve automatically pressure-actuates main operating valve through steps of regeneration.
 - e. Pointer on pilot-control valve shall indicate cycle of operation.
 - f. Includes means of manual operation of pilot-control valve if power fails.
 - g. Include Culligan Smart-Sensor technology to automatically adjust to changes in water conditions.
 7. Brine Tank: Combination measuring and wet-salt storing system.
 - a. Tank and Cover Material: Fiberglass, 3/16 inch thick; or molded PE, 3/8 inch thick.
 - b. Brine Valve: Float operated and plastic fitted for automatic control of brine withdrawal and freshwater refill.
 - c. Size: Large enough for at least four regenerations at full salting.
 8. Factory-Installed Accessories:
 - a. Piping, valves, tubing, and drains.
 - b. Sampling cocks.
 - c. Main-operating-valve position indicators.
 - d. Water meters.
- C. Capacities and Characteristics:
1. Continuous Service Flow Rate: 27.2 gpm at 15-psig pressure drop.
 2. Peak Service Flow Rate: 35.8 gpm at 25-psig pressure drop.
 3. Manifold Pipe Size: 1-1/4" NPS.
 4. Backwash-to-Drain Pipe Size: 1/2" NPS.
 5. Water Demand: 12 hours/day.
 6. Number of Mineral Tanks: One.
 7. Mineral Quantity, Each Tank: 5 cu. ft..
 8. Mineral Exchange Capacity: 20,000 grains/cu. ft. per lb of salt.
 9. Electrical Characteristics:
 - a. Volts: 120.
 - b. Phases: 1.
 - c. Hertz: 60.
 - d. Minimum Circuit Ampacity: 20.
 10. Salt Capacity: 75 lbs.
 11. Floor Area Required: 8 sq. ft..
 12. Height Required: 74 inches.

2.2 CHEMICALS

- A. Mineral: High-capacity, sulfonated-polystyrene, ion-exchange resin that is stable over entire pH range with good resistance to bead fracture from attrition or shock.
 - 1. Exchange Capacity: 30,000 grains/cu. ft. of calcium carbonate of resin when regenerated with 15 lb of salt.
- B. Salt for Brine Tanks: High-purity sodium chloride, free of dirt and foreign material. Rock and granulated forms are unacceptable.
 - 1. Form: Processed, food-grade salt pellets.

2.3 WATER-TESTING SETS

- A. Description: Manufacturer's standard water-hardness testing apparatus and chemicals with testing procedure instructions. Include metal container suitable for wall mounting.

2.4 SOURCE QUALITY CONTROL

- A. Hydrostatically test mineral tanks before shipment to a minimum of one and one-half times the pressure rating.
- B. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WATER SOFTENER INSTALLATION

- A. Equipment Mounting:
 - 1. Install commercial water softeners on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
- B. Install seismic restraints for tanks and floor-mounting accessories and anchor to building structure.
- C. Install brine lines and fittings furnished by equipment manufacturer but not specified to be factory installed.
- D. Prepare mineral-tank distribution system and underbed for minerals and place specified mineral into mineral tanks.
- E. Install water-testing sets mounted on wall, unless otherwise indicated, and near water softeners.

3.2 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

- B. Where piping is installed adjacent to equipment, allow space for service and maintenance of equipment.
- C. Install shutoff valves on raw-water inlet and soft-water outlet piping of each mineral tank, and on inlet and outlet headers.
 - 1. Metal general-duty valves are specified in Section 220523 "General Duty Valves for Plumbing Piping."
 - 2. Exception: Water softeners with factory-installed shutoff valves at locations indicated.
- D. Install pressure gages on raw-water inlet and soft-water outlet piping of each mineral tank. Pressure gages are specified in Section 220519 "Meters and Gages for Plumbing Piping."
 - 1. Exception: Water softeners with factory-installed pressure gages at locations indicated.
- E. Install valved bypass in water piping around water softeners.
 - 1. Metal general-duty valves are specified in Section 220523 "General Duty Valves for Plumbing Piping."
 - 2. Water piping is specified in Section 221116 "Domestic Water Piping."
- F. Install drains as indirect wastes to spill into open drains or over floor drains.

3.3 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Water softeners will be considered defective if they do not pass tests and inspections.
- C. 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.
- B. Add water to brine tanks and fill with the following form of salt:
 - 1. Commercial Water Softeners: Processed, food-grade salt pellets.

- C. Sample water softener effluent after startup and at three consecutive seven-day intervals (total of four samples), and prepare certified test reports for required water performance characteristics. Comply with the following:
1. ASTM D 859, "Test Method for Silica in Water."
 2. ASTM D 1067, "Test Methods for Acidity or Alkalinity of Water."
 3. ASTM D 1068, "Test Methods for Iron in Water."
 4. ASTM D 1126, "Test Method for Hardness in Water."
 5. ASTM D 1129, "Terminology Relating to Water."
 6. ASTM D 3370, "Practices for Sampling Water from Closed Conduits."

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain water softeners.

END OF SECTION

SECTION 223400

FUEL-FIRED, DOMESTIC-WATER HEATERS

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. Commercial, gas-fired, high-efficiency, storage, domestic-water heaters.
 - 2. Domestic-water heater accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings:
 - 1. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of commercial, gas-fired, domestic-water heater, from manufacturer.
- B. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.
- C. Source quality-control reports.
- D. Field quality-control reports.
- E. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fuel-fired, domestic-water heaters to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE/IESNA Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IESNA 90.1.
- C. ASME Compliance:
 - 1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects."

1.7 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including storage tank and supports.
 - b. Faulty operation of controls.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
 - 2. Warranty Periods: From date of Substantial Completion.
 - a. Commercial, Gas-Fired, Storage, Domestic-Water Heaters:
 - 1) Storage Tank: Three years.
 - 2) Controls and Other Components: One year(s).
 - b. Compression Tanks: Five years.

PART 2 - PRODUCTS

2.1 COMMERCIAL, GAS-FIRED, STORAGE, DOMESTIC-WATER HEATERS

- A. Commercial, Gas-Fired, High-Efficiency, Storage, Domestic-Water Heaters:

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Bradford White Corporation.](#)
 - b. [Rheem Manufacturing Company.](#)
 - c. [Smith, A. O. Corporation.](#)
 - d. [State Industries.](#)
2. Standard: ANSI Z21.10.3/CSA 4.3.
3. Description: Manufacturer's proprietary design to provide at least 95 percent combustion efficiency at optimum operating conditions.
4. Storage-Tank Construction: ASME-code steel with 150-psig minimum working-pressure rating.
 - a. Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.
 - 1) NPS 2 and Smaller: Threaded ends according to ASME B1.20.1.
 - 2) NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.
 - b. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
 - c. Lining: Glass complying with NSF 61 Annex G barrier materials for potable-water tank linings, including extending lining into and through tank fittings and outlets.
5. Factory-Installed Storage-Tank Appurtenances:
 - a. Anode Rod: Replaceable magnesium.
 - b. Dip Tube: Required unless cold-water inlet is near bottom of tank.
 - c. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
 - d. Insulation: Comply with ASHRAE/IESNA 90.1. Surround entire storage tank except connections and controls.
 - e. Jacket: Steel with enameled finish.
 - f. Burner or Heat Exchanger: Comply with UL 795 or approved testing agency requirements for gas-fired, high-efficiency, domestic-water heaters and natural-gas fuel.
 - g. Temperature Control: Adjustable thermostat.
 - h. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.
 - i. Combination Temperature-and-Pressure Relief Valves: ANSI Z21.22/CSA 4.4-M. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.

2.2 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:

1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- a. [AMTROL, Inc.](#)
 - b. [Smith, A. O. Corporation.](#)
 - c. [State Industries.](#)
2. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
 3. Construction:
 - a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
 - b. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
 - c. Air-Charging Valve: Factory installed.
 4. Capacity and Characteristics:
 - a. Working-Pressure Rating: 100 psig.
 - b. Capacity Acceptable: 7 gal. minimum.
- B. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.
 - C. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1.
 - D. Heat-Trap Fittings: ASHRAE 90.2.
 - E. Comply with requirements for ball-, butterfly-, or gate-type shutoff valves specified in Section 220523 "General Duty Valves for Plumbing Piping."
 - F. Comply with requirements for balancing valves specified in Section 221119 "Domestic Water Piping Specialties."
 - G. Gas Shutoff Valves: ANSI Z21.15/CSA 9.1-M, manually operated. Furnish for installation in piping.
 - H. Gas Pressure Regulators: ANSI Z21.18/CSA 6.3, appliance type. Include 1/2-psig pressure rating as required to match gas supply.
 - I. Automatic Gas Valves: ANSI Z21.21/CSA 6.5, appliance, electrically operated, on-off automatic valve.
 - J. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.
 1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.

2.3 SOURCE QUALITY CONTROL

- A. Factory Tests: Test and inspect assembled domestic-water heaters specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.
- B. Hydrostatically test commercial domestic-water heaters to minimum of one and one-half times pressure rating before shipment.
- C. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.
- D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

- A. Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters on concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."
 - 1. Maintain manufacturer's recommended clearances.
 - 2. Arrange units so controls and devices that require servicing are accessible.
 - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 5. Anchor domestic-water heaters to substrate.
- B. Install domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
 - 1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."
- C. Install gas-fired, domestic-water heaters according to NFPA 54.
 - 1. Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.
 - 2. Install gas pressure regulators on gas supplies to gas-fired, domestic-water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.
 - 3. Install automatic gas valves on gas supplies to gas-fired, domestic-water heaters if required for operation of safety control.
 - 4. Comply with requirements for gas shutoff valves, gas pressure regulators, and automatic gas valves specified in Section 231123 "Facility Natural-Gas Piping."

- D. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- E. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."
- F. Install thermometer on outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
- G. Install piping-type heat traps on inlet and outlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.
- H. Fill domestic-water heaters with water.
- I. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

- A. Comply with requirements for domestic-water piping specified in Section 221116 "Domestic Water Piping."
- B. Comply with requirements for gas piping specified in Section 231123 "Facility Natural-Gas Piping."
- C. Drawings indicate general arrangement of piping, fittings, and specialties.
- D. Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 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.
 - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.

4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

C. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain commercial, gas-fired, storage, domestic-water heaters.

END OF SECTION

SECTION 224213.13

COMMERCIAL WATER CLOSETS

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. Water closets.
 - 2. Flushometer valves.
 - 3. Toilet seats.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for water closets.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flushometer valves to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 WALL-MOUNTED WATER CLOSETS

- A. Water Closets: Wall mounted, top spud, accessible.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. American Standard America.
 - b. Crane Plumbing, L.L.C.
 - c. Kohler Co.
 - 2. Bowl:
 - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.

- b. Material: Vitreous china.
 - c. Type: Siphon jet.
 - d. Style: Flushometer valve.
 - e. Height: Standard.
 - f. Rim Contour: Elongated.
 - g. Water Consumption: 1.28 gal. per flush.
 - h. Spud Size and Location: NPS 1-1/2; top.
3. Support:
- a. Standard: ASME A112.6.1M.
 - b. Description: Waste-fitting assembly as required to match drainage piping material and arrangement with faceplates, couplings gaskets, and feet; bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.
- B. Water Closets: Floor mounted, floor outlet, close coupled (gravity tank), vitreous china.
- 1. **Basis-of-Design Product:** Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. [American Standard America.](#)
 - b. [Crane Plumbing, L.L.C.](#)
 - c. [Kohler Co.](#)
 - 2. Bowl:
 - a. Standards: ASME A112.19.2/CSA B45.1, ASME A112.19.5, and ASSE 1037.
 - b. Water Consumption: 1.28 gal. per flush.
 - c. Color: White.
 - 3. Supply Fittings:
 - a. Standard: ASME A112.18.1/CSA B125.1.
 - b. Supply Piping: Chrome-plated-brass pipe or chrome-plated-copper tube matching water-supply piping size. Include chrome-plated wall flange.
 - c. Stop: Chrome-plated-brass, one-quarter-turn, ball-type or compression stop with inlet connection matching water-supply piping type and size.
 - 1) Operation: Loose key.
 - d. Riser:
 - 1) Size: NPS 1/2.
 - 2) Material: ASME A112.18.6, braided- or corrugated-stainless-steel flexible hose riser.

2.2 FLUSHOMETER VALVES

- A. Lever-Handle, Diaphragm Flushometer Valves:
- 1. **Basis-of-Design Product:** Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. [Sloan Valve Company.](#)
 - b. [Zurn Industries, LLC; Commercial Brass and Fixtures.](#)
 - 2. Standard: ASSE 1037.
 - 3. Minimum Pressure Rating: 125 psig.
 - 4. Features: Include integral check stop and backflow-prevention device.
 - 5. Material: Brass body with corrosion-resistant components.
 - 6. Exposed Flushometer-Valve Finish: Chrome plated.
 - 7. Consumption: 1.28 gal. per flush.
 - 8. Minimum Inlet: NPS 1.
 - 9. Minimum Outlet: NPS 1-1/4.

2.3 TOILET SEATS

A. Toilet Seats:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. American Standard America.
 - b. Bemis Manufacturing Company.
 - c. Church Seats.
 - d. Kohler Co.
 - e. Olsonite Seat Co.
2. Standard: IAPMO/ANSI Z124.5.
3. Material: Plastic.
4. Type: Commercial (Standard).
5. Shape: Elongated rim, open front.
6. Hinge: Self-sustaining, check.
7. Hinge Material: Noncorroding metal.
8. Seat Cover: Not required.
9. Color: White.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before water-closet installation.
- B. Examine walls and floors for suitable conditions where water closets will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Water-Closet Installation:
 1. Install level and plumb according to roughing-in drawings.
 2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
 3. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.
- B. Support Installation:
 1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
 2. Use carrier supports with waste-fitting assembly and seal.
 3. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.
- C. Flushometer-Valve Installation:
 1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
 2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.

3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.

D. Install toilet seats on water closets.

E. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

F. Joint Sealing:

1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to water-closet color.
3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

- A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.4 ADJUSTING

- A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.
- B. Adjust water pressure at flushometer valves to produce proper flow.

3.5 CLEANING AND PROTECTION

- A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.
- B. Install protective covering for installed water closets and fittings.
- C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 224213.16

COMMERCIAL URINALS

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. Urinals.
 - 2. Flushometer valves.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for urinals.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flushometer valves to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 WALL-HUNG URINALS

- A. Urinals: Wall hung, back outlet, washout, accessible.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. American Standard America.
 - b. Crane Plumbing, L.L.C.
 - c. Kohler Co.
 - 2. Fixture:
 - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.

- b. Material: Vitreous china.
 - c. Type: Washout with extended shields.
 - d. Strainer or Trapway: Manufacturer's standard strainer with integral trap.
 - e. Water Consumption: Water saving.
 - f. Spud Size and Location: NPS 3/4, top.
 - g. Outlet Size and Location: NPS 2, back.
 - h. Color: White.
3. Waste Fitting:
 - a. Standard: ASME A112.18.2/CSA B125.2 for coupling.
 - b. Size: NPS 2.
 4. Support: ASME A112.6.1M, Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include rectangular, steel uprights.

2.2 URINAL FLUSHOMETER VALVES

- A. Lever-Handle, Diaphragm Flushometer Valves:
 1. **Basis-of-Design Product:** Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. [Coyne & Delany Co.](#)
 - b. [Sloan Valve Company.](#)
 - c. [Zurn Industries, LLC; Commercial Brass and Fixtures.](#)
 2. Standard: ASSE 1037.
 3. Minimum Pressure Rating: 125 psig.
 4. Features: Include integral check stop and backflow-prevention device.
 5. Material: Brass body with corrosion-resistant components.
 6. Exposed Flushometer-Valve Finish: Chrome plated.
 7. Style: Exposed.
 8. Consumption: 1/8 gal. Insert value per flush.
 9. Minimum Inlet: NPS 3/4.
 10. Minimum Outlet: NPS 3/4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before urinal installation.
- B. Examine walls and floors for suitable conditions where urinals will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Urinal Installation:
 1. Install urinals level and plumb according to roughing-in drawings.
 2. Install wall-hung, back-outlet urinals onto waste fitting seals and attached to supports.

3. Install accessible, wall-mounted urinals at mounting height for the handicapped/elderly, according to ICC/ANSI A117.1.

B. Support Installation:

1. Install supports, affixed to building substrate, for wall-hung urinals.
2. Use off-floor carriers with waste fitting and seal for back-outlet urinals.
3. Use carriers without waste fitting for urinals with tubular waste piping.
4. Use chair-type carrier supports with rectangular steel uprights for accessible urinals.

C. Flushometer-Valve Installation:

1. Install flushometer-valve water-supply fitting on each supply to each urinal.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install lever-handle flushometer valves for accessible urinals with handle mounted on open side of compartment.

D. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

E. Joint Sealing:

1. Seal joints between urinals and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to urinal color.
3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

- A. Connect urinals with water supplies and soil, waste, and vent piping. Use size fittings required to match urinals.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Where installing piping adjacent to urinals, allow space for service and maintenance.

3.4 ADJUSTING

- A. Operate and adjust urinals and controls. Replace damaged and malfunctioning urinals, fittings, and controls.
- B. Adjust water pressure at flushometer valves to produce proper flow.

3.5 CLEANING AND PROTECTION

- A. Clean urinals and fittings with manufacturers' recommended cleaning methods and materials.
- B. Install protective covering for installed urinals and fittings.
- C. Do not allow use of urinals for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 224216.13

COMMERCIAL LAVATORIES

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. Lavatories.
 - 2. Faucets.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

PART 2 - PRODUCTS

2.1 VITREOUS-CHINA, COUNTER-MOUNTED LAVATORIES

- A. Lavatory: Oval, vitreous china, undercounter mounted.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. [American Standard America.](#)
 - b. [Crane Plumbing, L.L.C.](#)
 - c. [Kohler Co.](#)
2. Fixture:
- a. Standard: ASME A112.19.2/CSA B45.1.
 - b. Type: For undercounter mounting.
 - c. Color: White.
 - d. Mounting Material: Sealant and undercounter mounting kit.

2.2 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

- A. Lavatory: Vitreous china, wall mounted, with back.
1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:
 - a. [American Standard America.](#)
 - b. [Crane Plumbing, L.L.C.](#)
 - c. [Kohler Co.](#)
 2. Fixture:
 - a. Standard: ASME A112.19.2/CSA B45.1.
 - b. Type: For wall hanging.
 - c. Color: White.
 - d. Mounting Material: Chair carrier.

2.3 SOLID-BRASS, AUTOMATICALLY OPERATED LAVATORY FAUCETS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.
- B. Lavatory Faucets: Automatic-type, hard-wired, electronic-sensor-operated, mixing, solid-brass valve.
1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:
 - a. [American Standard America.](#)
 - b. [Kohler Co.](#)
 - c. [Moen Incorporated.](#)
 - d. [Sloan Valve Company.](#)
 - e. [T & S Brass and Bronze Works, Inc.](#)
 2. Standards: ASME A112.18.1/CSA B125.1 and UL 1951.
 3. 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.
 4. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
 5. Body Type: Centerset.
 6. Body Material: Commercial, solid brass.
 7. Finish: Polished chrome plate.
 8. Maximum Flow Rate: 0.5 gpm.

2.4 SUPPLY FITTINGS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.
- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.
- D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping with loose key operation.
- E. Risers:
 - 1. NPS 1/2.
 - 2. ASME A112.18.6, braided- or corrugated-stainless-steel, flexible hose riser.

2.5 WASTE FITTINGS

- A. Standard: ASME A112.18.2/CSA B125.2.
- B. Drain: Grid type with NPS 1-1/4 offset and straight tailpiece.
- C. Trap:
 - 1. Size: NPS 1-1/2 by NPS 1-1/4.
 - 2. Material: Chrome-plated, one-piece, cast-brass trap with swivel 0.029-inch- thick tubular brass wall bend; and chrome-plated, brass or steel wall flange.
 - 3. Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch- thick stainless-steel tube to wall; and stainless-steel wall flange.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.
- B. Examine counters and walls for suitable conditions where lavatories will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install lavatories level and plumb according to roughing-in drawings.
- B. Install supports, affixed to building substrate, for wall-mounted lavatories.

- C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.
- D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- E. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
- F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.3 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

- A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

- A. After completing installation of lavatories, inspect and repair damaged finishes.
- B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed lavatories and fittings.
- D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 230513

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 1. Motor controllers.
 2. Torque, speed, and horsepower requirements of the load.
 3. Ratings and characteristics of supply circuit and required control sequence.
 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with NEMA MG 1 unless otherwise indicated.
- B. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.
- B. 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.

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Energy efficient, as defined in NEMA MG 1.
- C. Service Factor: 1.15.
- D. Rotor: Random-wound, squirrel cage.
- E. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- F. Temperature Rise: Match insulation rating.
- G. Insulation: Class F.
- H. Code Letter Designation:
 - 1. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.
- I. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Reduced-Voltage and Multispeed 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: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
 - 2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - 3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
 - 4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
- C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split phase.
 - 3. Capacitor start, inductor run.
 - 4. Capacitor start, capacitor run.

- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 230517

SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 1. Sleeves.
 2. Sleeve-seal systems.
 3. Grout.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

2.2 SLEEVE-SEAL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. [Advance Products & Systems, Inc.](#)
 2. [CALPICO, Inc.](#)
 3. [Metraflex Company \(The\).](#)
 4. [Pipeline Seal and Insulator, Inc.](#)
 5. [Proco Products, Inc.](#)
- B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Stainless steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 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 2 inches above finished floor level.
 2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
 1. Cut sleeves to length for mounting flush with both surfaces.
 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 - 1. Exterior Concrete Walls above Grade:
 - a. Piping Smaller Than NPS 6: Cast-iron wall sleeves.
 - 2. Concrete Slabs-on-Grade:
 - a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - 3. Concrete Slabs above Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
 - 4. Interior Partitions:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

END OF SECTION

SECTION 230518

ESCUTCHEONS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Escutcheons.
 - 2. Floor plates.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- C. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.

2.2 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.
- B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 - 1. Escutcheons for New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
 - c. Insulated Piping: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
 - e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
 - f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
 - g. Bare Piping in Equipment Rooms: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
- C. Install floor plates for piping penetrations of equipment-room floors.
- D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 - 1. New Piping: One-piece, floor-plate type.

3.2 FIELD QUALITY CONTROL

- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION

SECTION 230553

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 1. Equipment labels.
 2. Pipe labels.
 3. Duct labels.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
 1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
 2. Letter Color: White.
 3. Background Color: Red.
 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

2.2 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 2. Lettering Size: At least 1-1/2 incheshigh.

2.3 DUCT LABELS

- A. Self-Adhesive Duct Labels: Printed plastic with contact-type, permanent-adhesive backing.
- B. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.
 1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
 2. Lettering Size: At least 1-1/2 inches high.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

3.4 DUCT LABEL INSTALLATION

- A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:
 - 1. Blue: For cold-air supply ducts.
 - 2. Yellow: For hot-air supply ducts.
 - 3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
- B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

END OF SECTION

SECTION 230593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

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. Balancing Air Systems:
 - a. Constant-volume air systems.
 - b. Variable-volume air systems.
 - 2. Testing, Adjusting, and Balancing Equipment:
 - a. Motors.
 - b. Condensing units.
 - c. Heat-transfer coils.
 - 3. Control system verification.

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. BAS: Building automation systems.
- C. NEBB: National Environmental Balancing Bureau.
- D. TAB: Testing, adjusting, and balancing.
- E. TABB: Testing, Adjusting, and Balancing Bureau.
- F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- G. TDH: Total dynamic head.

1.4 INFORMATIONAL SUBMITTALS

- A. Certified TAB reports.
- B. Sample report forms.
- C. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.5 QUALITY ASSURANCE

- A. TAB Specialists Qualifications: Certified by AABC NEBB or TABB.
 1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC NEBB or TABB.
 2. TAB Technician: Employee of the TAB specialist and certified by AABC NEBB or TABB as a TAB technician.
- B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

1.6 FIELD CONDITIONS

- A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- B. Examine the approved submittals for HVAC systems and equipment.
- C. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- D. Examine equipment performance data including fan and pump curves.
 1. 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.
 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in

AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design."
Compare results with the design data and installed conditions.

- E. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- F. Examine test reports specified in individual system and equipment Sections.
- G. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- H. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.
- I. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- J. Examine operating safety interlocks and controls on HVAC equipment.
- K. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
 - 1. Airside:
 - a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
 - b. Duct systems are complete with terminals installed.
 - c. Volume, smoke, and fire dampers are open and functional.
 - d. Clean filters are installed.
 - e. Fans are operating, free of vibration, and rotating in correct direction.
 - f. Variable-frequency controllers' startup is complete and safeties are verified.
 - g. Automatic temperature-control systems are operational.
 - h. Ceilings are installed.
 - i. Windows and doors are installed.
 - j. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 - 2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."

3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," and Section 230719 "HVAC Piping Insulation."

- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check dampers for proper position to achieve desired airflow path.
- H. Check for airflow blockages.
- I. Check condensate drains for proper connections and functioning.
- J. Check for proper sealing of air-handling-unit components.
- K. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure total airflow.
 - a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
 - b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
 - c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
 - d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

2. Measure fan static pressures as follows:
 - a. Measure static pressure directly at the fan outlet or through the flexible connection.
 - b. Measure static pressure directly at the fan inlet or through the flexible connection.
 - c. Measure static pressure across each component that makes up the air-handling system.
 - d. Report artificial loading of filters at the time static pressures are measured.
 3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 4. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
 5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
1. Measure airflow of submain and branch ducts.
 2. Adjust submain and branch duct volume dampers for specified airflow.
 3. Re-measure each submain and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
 2. Measure inlets and outlets airflow.
 3. Adjust each inlet and outlet for specified airflow.
 4. Re-measure each inlet and outlet after they have been adjusted.
- D. Verify final system conditions.
1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
 2. Re-measure and confirm that total airflow is within design.
 3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
 4. Mark all final settings.
 5. Test system in economizer mode. Verify proper operation and adjust if necessary.
 6. Measure and record all operating data.
 7. Record final fan-performance data.

3.6 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

- A. Adjust the variable-air-volume systems as follows:
1. Measure fan static pressures as follows:
 - a. Measure static pressure directly at the fan outlet or through the flexible connection.
 - b. Measure static pressure directly at the fan inlet or through the flexible connection.
 - c. Measure static pressure across each component that makes up the air-handling system.
 - d. Report any artificial loading of filters at the time static pressures are measured.
 2. Set final exhaust and outside airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.

- a. Balance the return-air ducts and inlets the same as described for constant-volume air systems.
3. Re-measure the inlet static pressure at the most critical terminal unit and adjust the system static pressure set point to the most energy-efficient set point to maintain the optimum system static pressure. Record set point and give to controls contractor.
4. Verify final system conditions as follows:
 - a. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to match design if necessary.
 - b. Re-measure and confirm that total airflow is within design.
 - c. Re-measure final fan operating data, rpms, volts, amps, and static profile.
 - d. Mark final settings.
 - e. Test system in economizer mode. Verify proper operation and adjust if necessary. Measure and record all operating data.
 - f. Verify tracking between supply and exhaust fans.

3.7 PROCEDURES FOR MOTORS

- A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:
 1. Manufacturer's name, model number, and serial number.
 2. Motor horsepower rating.
 3. Motor rpm.
 4. Phase and hertz.
 5. Nameplate and measured voltage, each phase.
 6. Nameplate and measured amperage, each phase.
 7. Starter size and thermal-protection-element rating.
 8. Service factor and frame size.
- B. Motors Driven by Variable-Frequency Controllers: Test manual bypass of controller to prove proper operation.

3.8 PROCEDURES FOR CONDENSING UNITS

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record fan and motor operating data.

3.9 PROCEDURES FOR HEAT-TRANSFER COILS

- A. Measure, adjust, and record the following data for each refrigerant coil:
 1. Dry-bulb temperature of entering and leaving air.
 2. Wet-bulb temperature of entering and leaving air.
 3. Airflow.

3.10 CONTROLS VERIFICATION

- A. In conjunction with system balancing, perform the following:

1. Verify temperature control system is operating within the design limitations.
2. Confirm that the sequences of operation are in compliance with Contract Documents.
3. Verify that controllers are calibrated and function as intended.
4. Verify that controller set points are as indicated.
5. Verify the operation of lockout or interlock systems.
6. Verify the operation of valve and damper actuators.
7. Verify that controlled devices are properly installed and connected to correct controller.
8. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.
9. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.

- B. Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

3.11 TOLERANCES

- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
 2. Air Outlets and Inlets: Plus or minus 10 percent.
- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.12 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 2. Include a list of instruments used for procedures, along with proof of calibration.
 3. Certify validity and accuracy of field data.
- B. Final Report Contents: In addition to certified field-report data, include the following:
1. Pump curves.
 2. Fan curves.
 3. Manufacturers' test data.
 4. Field test reports prepared by system and equipment installers.
 5. Other information relative to equipment performance; do not include Shop Drawings and Product Data.
- C. General Report Data: In addition to form titles and entries, include the following data:
1. Title page.
 2. Name and address of the TAB specialist.
 3. Project name.
 4. Project location.
 5. Architect's name and address.
 6. Engineer's name and address.
 7. Contractor's name and address.
 8. Report date.
 9. Signature of TAB supervisor who certifies the report.

10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 12. Nomenclature sheets for each item of equipment.
 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Settings for supply-air, static-pressure controller.
 - g. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, return, and exhaust airflows.
 2. Water and steam flow rates.
 3. Duct, outlet, and inlet sizes.
 4. Pipe and valve sizes and locations.
 5. Terminal units.
 6. Balancing stations.
 7. Position of balancing devices.
- E. Apparatus-Coil Test Reports:
1. Coil Data:
 - a. System identification.
 - b. Location.
 - c. Coil type.
 - d. Number of rows.
 - e. Fin spacing in fins per inch o.c.
 - f. Make and model number.
 - g. Face area in sq. ft..
 - h. Tube size in NPS.
 - i. Tube and fin materials.
 - j. Circuiting arrangement.
 2. Test Data (Indicated and Actual Values):
 - a. Airflow rate in cfm.
 - b. Average face velocity in fpm.
 - c. Air pressure drop in inches wg.
 - d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
 - e. Return-air, wet- and dry-bulb temperatures in deg F.
 - f. Entering-air, wet- and dry-bulb temperatures in deg F.
 - g. Leaving-air, wet- and dry-bulb temperatures in deg F.
 - h. Refrigerant expansion valve and refrigerant types.
 - i. Refrigerant suction pressure in psig.
 - j. Refrigerant suction temperature in deg F.

- F. Gas-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:
1. Unit Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Fuel type in input data.
 - g. Output capacity in Btu/h.
 - h. Ignition type.
 - i. Burner-control types.
 - j. Motor horsepower and rpm.
 - k. Motor volts, phase, and hertz.
 - l. Motor full-load amperage and service factor.
 - m. Sheave make, size in inches, and bore.
 - n. Center-to-center dimensions of sheave and amount of adjustments in inches.
 2. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Entering-air temperature in deg F.
 - c. Leaving-air temperature in deg F.
 - d. Air temperature differential in deg F.
 - e. Entering-air static pressure in inches wg.
 - f. Leaving-air static pressure in inches wg.
 - g. Air static-pressure differential in inches wg.
 - h. Low-fire fuel input in Btu/h.
 - i. High-fire fuel input in Btu/h.
 - j. Manifold pressure in psig.
 - k. High-temperature-limit setting in deg F.
 - l. Operating set point in Btu/h.
 - m. Motor voltage at each connection.
 - n. Motor amperage for each phase.
 - o. Heating value of fuel in Btu/h.
- G. Fan Test Reports: For supply, return, and exhaust fans, include the following:
1. Fan Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 - g. Sheave make, size in inches, and bore.
 - h. Center-to-center dimensions of sheave and amount of adjustments in inches.
 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - g. Number, make, and size of belts.
 3. Test Data (Indicated and Actual Values):

- a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Suction static pressure in inches wg.
- H. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
- 1. Report Data:
 - a. System and air-handling-unit number.
 - b. Location and zone.
 - c. Traverse air temperature in deg F.
 - d. Duct static pressure in inches wg.
 - e. Duct size in inches.
 - f. Duct area in sq. ft..
 - g. Indicated airflow rate in cfm.
 - h. Indicated velocity in fpm.
 - i. Actual airflow rate in cfm.
 - j. Actual average velocity in fpm.
 - k. Barometric pressure in psig.
- I. Air-Terminal-Device Reports:
- 1. Unit Data:
 - a. System and air-handling unit identification.
 - b. Location and zone.
 - c. Apparatus used for test.
 - d. Area served.
 - e. Make.
 - f. Number from system diagram.
 - g. Type and model number.
 - h. Size.
 - i. Effective area in sq. ft..
 - 2. Test Data (Indicated and Actual Values):
 - a. Airflow rate in cfm.
 - b. Air velocity in fpm.
 - c. Preliminary airflow rate as needed in cfm.
 - d. Preliminary velocity as needed in fpm.
 - e. Final airflow rate in cfm.
 - f. Final velocity in fpm.
 - g. Space temperature in deg F.
- J. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:
- 1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Service.
 - d. Make and size.
 - e. Model number and serial number.
 - f. Water flow rate in gpm.
 - g. Water pressure differential in feet of head or psig.
 - h. Required net positive suction head in feet of head or psig.
 - i. Pump rpm.

- j. Impeller diameter in inches.
- k. Motor make and frame size.
- l. Motor horsepower and rpm.
- m. Voltage at each connection.
- n. Amperage for each phase.
- o. Full-load amperage and service factor.
- p. Seal type.
- 2. Test Data (Indicated and Actual Values):
 - a. Static head in feet of head or psig.
 - b. Pump shutoff pressure in feet of head or psig.
 - c. Actual impeller size in inches.
 - d. Full-open flow rate in gpm.
 - e. Full-open pressure in feet of head or psig.
 - f. Final discharge pressure in feet of head or psig.
 - g. Final suction pressure in feet of head or psig.
 - h. Final total pressure in feet of head or psig.
 - i. Final water flow rate in gpm.
 - j. Voltage at each connection.
 - k. Amperage for each phase.

K. Instrument Calibration Reports:

- 1. Report Data:
 - a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

3.13 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION

SECTION 230713

DUCT INSULATION

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 insulating the following duct services:
 1. Indoor, concealed supply and outdoor air.
 2. Indoor, exposed supply and outdoor air.
 3. Indoor, concealed, Type I, commercial, kitchen hood exhaust.
 4. Indoor, exposed, Type I, commercial, kitchen hood exhaust.
 5. Indoor, concealed warewash exhaust.
 6. Indoor, exposed warewash exhaust.
- B. Related Sections:
 1. Section 233113 "Metal Ducts" for duct liners.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. [CertainTeed Corp.; SoftTouch Duct Wrap.](#)
 - b. [Johns Manville; Microlite.](#)
 - c. [Knauf Insulation; Friendly Feel Duct Wrap.](#)
 - d. [Manson Insulation Inc.; Alley Wrap.](#)
 - e. [Owens Corning; SOFTR All-Service Duct Wrap.](#)
- F. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. [CertainTeed Corp.; Commercial Board.](#)
 - b. [Fibrex Insulations Inc.; FBX.](#)
 - c. [Johns Manville; 800 Series Spin-Glas.](#)
 - d. [Knauf Insulation; Insulation Board.](#)
 - e. [Manson Insulation Inc.; AK Board.](#)
 - f. [Owens Corning; Fiberglas 700 Series.](#)

2.2 FIRE-RATED INSULATION SYSTEMS

- A. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.
1. **Products:** Subject to compliance with requirements, provide the following:
 - a. [3M; Fire Barrier Wrap Products.](#)

2.3 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
 4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
 5. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping" firestopping and fire-resistive joint sealers.
- D. Insulation Installation at Floor Penetrations:
 - 1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.

2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
 1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
 5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.
- B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
 1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.

2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 FIRE-RATED INSULATION SYSTEM INSTALLATION

- A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.
- B. Insulate duct access panels and doors to achieve same fire rating as duct.
- C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section 078413 "Penetration Firestopping."

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. Inspect grease exhaust ductwork, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.8 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 - 1. Indoor, concealed supply and outdoor air.
 - 2. Indoor, concealed, Type I, commercial, kitchen hood exhaust.
 - 3. Indoor, exposed, Type I, commercial, kitchen hood exhaust.
 - 4. Indoor, concealed warewash exhaust.
 - 5. Indoor, exposed warewash exhaust.
- B. Items Not Insulated:
 - 1. Fibrous-glass ducts.
 - 2. Indoor, exposed supply and outdoor air.
 - 3. Indoor, concealed return located in unconditioned space.
 - 4. Indoor, exposed return located in unconditioned space.
 - 5. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
 - 6. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
 - 7. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
 - 8. Factory-insulated flexible ducts.
 - 9. Factory-insulated plenums and casings.
 - 10. Flexible connectors.
 - 11. Vibration-control devices.
 - 12. Factory-insulated access panels and doors.

3.9 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, round and flat-oval, supply-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.
- B. Concealed, round and flat-oval, outdoor-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.
- C. Concealed, rectangular, supply-air duct insulation shall be one of the following:
 - 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.
 - 2. Mineral-Fiber Board: 1-1/2 inches thick and 2-lb/cu. ft. nominal density.
- D. Concealed, rectangular, outdoor-air duct insulation shall be one of the following:
 - 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.
 - 2. Mineral-Fiber Board: 1-1/2 inches thick and 2-lb/cu. ft. nominal density.

- E. Concealed, Type I, Commercial, Kitchen Hood Exhaust Duct and Plenum Insulation: Fire-rated blanket; thickness as required to achieve 2-hour fire rating.
- F. Exposed, Type I, Commercial, Kitchen Hood Exhaust Duct and Plenum Insulation: Fire-rated blanket; thickness as required to achieve 2-hour fire rating.
- G. Exposed, outdoor-air plenum insulation shall be one of the following:
 - 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.
 - 2. Mineral-Fiber Board: 1-1/2 inches thick and 2-lb/cu. ft. nominal density.

END OF SECTION

SECTION 231123 - FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipes, tubes, and fittings.
 - 2. Piping specialties.
 - 3. Piping and tubing joining materials.
 - 4. Valves.
 - 5. Pressure regulators.

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, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4 PERFORMANCE REQUIREMENTS

- A. Minimum Operating-Pressure Ratings:
 - 1. Piping and Valves: 100 psig minimum unless otherwise indicated.
 - 2. Service Regulators: 65 psig minimum unless otherwise indicated.
- B. Natural-Gas System Pressure within Buildings: 0.5 psig or less.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
 - 1. Piping specialties.
 - 2. Corrugated, stainless-steel tubing with associated components.
 - 3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.

4. Pressure regulators. Indicate pressure ratings and capacities.
5. Dielectric fittings.

- B. Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.
 1. Shop Drawing Scale: 1/4 inch per foot.

1.6 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans and details, drawn to scale, on which natural-gas piping is shown and coordinated with other installations, using input from installers of the items involved.
- B. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For pressure regulators to include in emergency, operation, and maintenance manuals.

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.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.
- B. 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.
- C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.

1.10 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.
- B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces. Comply with requirements in Section 083113 "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
 2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
 3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
 4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - a. Material Group: 1.1.
 - b. End Connections: Threaded or butt welding to match pipe.
 - c. Lapped Face: Not permitted underground.
 - d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
 - e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.
- B. Corrugated, Stainless-Steel Tubing: Comply with ANSI/IAS LC 1.
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [OmegaFlex, Inc.](#)
 - b. [Parker Hannifin Corporation; Parflex Division.](#)
 - c. [Titeflex.](#)
 - d. [Tru-Flex Metal Hose Corp.](#)
 2. Tubing: ASTM A 240/A 240M, corrugated, Series 300 stainless steel.
 3. Coating: PE with flame retardant.
 - a. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1) Flame-Spread Index: 25 or less.
 - 2) Smoke-Developed Index: 50 or less.
 4. Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless-steel tubing and capable of metal-to-metal seal without gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.
 5. Striker Plates: Steel, designed to protect tubing from penetrations.
 6. Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
 7. Operating-Pressure Rating: 5 psig.

2.2 PIPING SPECIALTIES

- A. Appliance Flexible Connectors:
1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
 2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
 3. Corrugated stainless-steel tubing with polymer coating.
 4. Operating-Pressure Rating: 0.5 psig.
 5. End Fittings: Zinc-coated steel.
 6. Threaded Ends: Comply with ASME B1.20.1.

7. Maximum Length: 72 inches

B. Quick-Disconnect Devices: Comply with ANSI Z21.41.

1. Copper-alloy convenience outlet and matching plug connector.
2. Nitrile seals.
3. Hand operated with automatic shutoff when disconnected.
4. For indoor or outdoor applications.
5. Adjustable, retractable restraining cable.

C. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4 MANUAL GAS SHUTOFF VALVES

A. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

1. Threaded Ends: Comply with ASME B1.20.1.
2. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
5. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

B. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.

1. CWP Rating: 125 psig.
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

C. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [BrassCraft Manufacturing Company; a Masco company.](#)
 - b. [Conbraco Industries, Inc.; Apollo Div.](#)
 - c. [Lyll, R. W. & Company, Inc.](#)
 - d. [McDonald, A. Y. Mfg. Co.](#)
 - e. [Perfection Corporation; a subsidiary of American Meter Company.](#)
2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.

4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

D. Bronze Plug Valves: MSS SP-78.

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Lee Brass Company.](#)
 - b. [McDonald, A. Y. Mfg. Co.](#)
2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig.
7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.5 MOTORIZED GAS VALVES

A. Automatic Gas Valves: Comply with ANSI Z21.21.

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [ASCO Power Technologies, LP; Division of Emerson.](#)
 - b. [Dungs, Karl, Inc.](#)
 - c. [Eaton Corporation; Controls Div.](#)
 - d. [Eclipse Combustion, Inc.](#)
 - e. [Honeywell International Inc.](#)
2. Body: Brass or aluminum.
3. Seats and Disc: Nitrile rubber.
4. Springs and Valve Trim: Stainless steel.
5. Normally closed.
6. Visual position indicator.
7. Mechanical operator for actuation by appliance automatic shutoff device.

2.6 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.

3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.

B. Service Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Actaris.](#)
 - b. [American Meter Company.](#)
 - c. [Fisher Control Valves and Regulators; Division of Emerson Process Management.](#)
 - d. [Invensys.](#)
 - e. [Richards Industries; Jordan Valve Div.](#)
2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 100 psig.

C. Appliance Pressure Regulators: Comply with ANSI Z21.18.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Canadian Meter Company Inc.](#)
 - b. [Eaton Corporation; Controls Div.](#)
 - c. [Harper Wyman Co.](#)
 - d. [Maxitrol Company.](#)
 - e. [SCP, Inc.](#)
2. Body and Diaphragm Case: Die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
9. Maximum Inlet Pressure: 1 psig.

2.7 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Capitol Manufacturing Company.](#)
 - b. [Central Plastics Company.](#)

- c. [Hart Industries International, Inc.](#)
 - d. [Jomar International Ltd.](#)
 - e. [Matco-Norca, Inc.](#)
 - f. [McDonald, A. Y. Mfg. Co.](#)
 - g. [Watts Regulator Co.; a division of Watts Water Technologies, Inc.](#)
 - h. [Wilkins; a Zurn company.](#)
2. Description:
- a. Standard: ASSE 1079.
 - b. Pressure Rating: 125 psig minimum at 180 deg F.
 - c. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
1. [Manufacturers](#): Subject to compliance with requirements, provide products by one of the following:
- a. [Capitol Manufacturing Company.](#)
 - b. [Central Plastics Company.](#)
 - c. [Matco-Norca, Inc.](#)
 - d. [Watts Regulator Co.; a division of Watts Water Technologies, Inc.](#)
 - e. [Wilkins; a Zurn company.](#)
2. Description:
- a. Standard: ASSE 1079.
 - b. Factory-fabricated, bolted, companion-flange assembly.
 - c. Pressure Rating: 125 psig minimum at 180 deg F.
 - d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

2.8 LABELING AND IDENTIFYING

- A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Inspect natural-gas piping according to NFPA 54 to determine that natural-gas utilization devices are turned off in piping section affected.
- B. Comply with NFPA 54 requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 for installation and purging of natural-gas piping.
- B. Steel Piping with Protective Coating:
 - 1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
 - 2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
 - 3. Replace pipe having damaged PE coating with new pipe.
- C. Install fittings for changes in direction and branch connections.
- D. Install pressure gage downstream from each service regulator. Pressure gages are specified in Section 230519 "Meters and Gages for HVAC Piping."

3.4 INDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 for installation and purging of natural-gas piping.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.
- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Locate valves for easy access.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Verify final equipment locations for roughing-in.

- K. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
- L. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
 - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
- M. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
- N. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
- O. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.
 - 1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
 - 2. In Floors: Install natural-gas piping with welded or brazed joints and protective coating in cast-in-place concrete floors. Cover piping to be cast in concrete slabs with minimum of 1-1/2 inches of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.
 - 3. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.
 - a. Exception: Tubing passing through partitions or walls does not require striker barriers.
 - 4. Prohibited Locations:
 - a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
 - b. Do not install natural-gas piping in solid walls or partitions.
- P. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- Q. Connect branch piping from top or side of horizontal piping.
- R. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.
- S. Do not use natural-gas piping as grounding electrode.
- T. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

- U. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.5 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.
- B. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

3.6 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints:
 - 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
 - 2. Cut threads full and clean using sharp dies.
 - 3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
 - 4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
 - 5. 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.
- D. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.
- E. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.

3.7 HANGER AND SUPPORT INSTALLATION

- A. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 - 2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
 - 5. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

3.8 CONNECTIONS

- A. Connect to utility's gas main according to utility's procedures and requirements.
- B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- C. Install piping adjacent to appliances to allow service and maintenance of appliances.
- D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.
- E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.9 LABELING AND IDENTIFYING

- A. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for piping and valve identification.
- B. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.10 PAINTING

- A. Comply with requirements in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" for painting interior and exterior natural-gas piping.
- B. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.
 - 1. Alkyd System: MPI EXT 5.1D.
 - a. Prime Coat: Alkyd anticorrosive metal primer.
 - b. Topcoat: Exterior alkyd enamel (flat).
 - c. Color: Gray.
- C. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.11 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Test, inspect, and purge natural gas according to NFPA 54 and authorities having jurisdiction.
- C. Natural-gas piping will be considered defective if it does not pass tests and inspections.

- D. Prepare test and inspection reports.

3.12 OUTDOOR PIPING SCHEDULE

- A. Aboveground natural-gas piping shall be the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.

3.13 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

- A. Aboveground, branch piping NPS 1 and smaller shall be the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.
- B. Aboveground, distribution piping shall be the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.

3.14 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Valves for pipe sizes NPS 2 and smaller at service meter shall be one of the following:
 - 1. Two-piece, full-port, bronze ball valves with bronze trim.
 - 2. Bronze plug valve.
- B. Valves for pipe sizes NPS 2-1/2 and larger at service meter shall be one of the following:
 - 1. Two-piece, full-port, bronze ball valves with bronze trim.
 - 2. Bronze plug valve.
- C. Distribution piping valves for pipe sizes NPS 2 and smaller shall be one of the following:
 - 1. Two-piece, full-port, bronze ball valves with bronze trim.
 - 2. Bronze plug valve.
- D. Distribution piping valves for pipe sizes NPS 2-1/2 and larger shall be one of the following:
 - 1. Two-piece, full-port, bronze ball valves with bronze trim.
 - 2. Bronze plug valve.
- E. Valves in branch piping for single appliance shall be one of the following:
 - 1. Two-piece, full-port, bronze ball valves with bronze trim.
 - 2. Bronze plug valve.

END OF SECTION

SECTION 233113

METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.
7. Seismic-restraint devices.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.
3. Seismic-restraint devices.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.

11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ductmate Industries, Inc.
 - b. Lindab Inc.
 - c. McGill AirFlow LLC.

- d. SEMCO Incorporated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.
- D. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
- E. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- 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.

2.4 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Knauf Insulation.
 - d. Owens Corning.
 - 1) Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 2. Solvent-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
 - a. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."
1. 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.
 2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
 3. Butt transverse joints without gaps, and coat joint with adhesive.
 4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
 5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
 6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
 7. 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.
 8. 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:
 - a. Fan discharges.
 - b. Intervals of lined duct preceding unlined duct.
 - c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.
 9. 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.

2.5 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.6 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.7 SEISMIC-RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. [Cooper B-Line, Inc.; a division of Cooper Industries.](#)
2. [Ductmate Industries, Inc.](#)
3. [Mason Industries, Inc.](#)
4. [TOLCO.](#)
5. [Unistrut; an Atkore International company.](#)

B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an evaluation service member of the ICC Evaluation Service.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- C. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.
- D. Hanger Rod Stiffener: Reinforcing steel angle clamped to hanger rod.
- E. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 ADDITIONAL INSTALLATION REQUIREMENTS FOR COMMERCIAL KITCHEN HOOD EXHAUST DUCT

- A. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease, and sloped a minimum of 2 percent to drain grease back to the hood.
- B. Install fire-rated access panel assemblies at each change in direction and at maximum intervals of 20 feet in horizontal ducts, and at every floor for vertical ducts, or as indicated on Drawings.
- C. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

3.4 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Outdoor, Supply-Air Ducts: Seal Class A.
 - 3. Outdoor, Exhaust Ducts: Seal Class C.
 - 4. Outdoor, Return-Air Ducts: Seal Class C.

5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 1. Where practical, install concrete inserts before placing concrete.
 2. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 3. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.6 SEISMIC-RESTRAINT-DEVICE INSTALLATION

- A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
 1. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
 2. Brace a change of direction longer than 12 feet.
- B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.

- C. Install seismic-restraint devices using methods approved by an evaluation service member of the ICC Evaluation Service.
- D. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.
- E. Drilling for and Setting Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Set anchors to manufacturer's recommended torque, using a torque wrench.
 - 5. Install stainless-steel anchors for interior applications and for applications exposed to weather.

3.7 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.8 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- B. Paint exterior of exposed metal ducts. Apply two coats of latex paint, in color selected by the Architect, over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 099123 "Interior Painting."

3.9 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Duct system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.10 START UP

- A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.11 DUCT SCHEDULE

A. Supply Ducts:

1. Ducts Connected to Furnaces and Make-up Air Units:
 - a. Pressure Class: Positive 1-inch wg.

B. Return Ducts:

1. Ducts Connected to Furnaces:
 - a. Pressure Class: Positive or negative 1-inch wg.

C. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
 - a. Pressure Class: Negative 1-inch wg.
2. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.
 - a. Exposed to View: Type 304, stainless-steel sheet, No. 4 finish.
 - b. Concealed: Carbon-steel sheet.
 - c. Welded seams and joints.
 - d. Pressure Class: Positive or negative 2-inch wg.
 - e. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
 - f. SMACNA Leakage Class: 3.
3. Ducts Connected to Dishwasher Hoods:
 - a. Type 304, stainless-steel sheet or aluminum.
 - b. Exposed to View: No. 4 finish.
 - c. Concealed: No. 2D finish.
 - d. Welded seams and joints.
 - e. Pressure Class: Positive or negative 2-inch wg.
 - f. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
 - g. SMACNA Leakage Class: 3.

D. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Furnaces and Make-up Air Units:
 - a. Pressure Class: Positive or negative 1-inch wg.

E. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel or carbon steel coated with zinc-chromate primer.
2. Stainless-Steel Ducts:
 - a. Exposed to Airstream: Match duct material.
 - b. Not Exposed to Airstream: Match duct material.
3. Aluminum Ducts: Aluminum or galvanized sheet steel coated with zinc chromate.

F. Liner:

1. Supply Air Ducts: Fibrous glass, Type I, 1 inch thick.
2. Return- and Exhaust-Fan Plenums: Fibrous glass, Type I, 2 inches thick.
3. Transfer Ducts: Fibrous glass, Type I, 1 inch thick.

G. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm:
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 - c. Velocity 1500 fpm or Higher:
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Radius-to Diameter Ratio: 1.5.
 - b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.
- H. Branch Configuration:
1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
 2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm: Conical tap.
 - c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION

SECTION 233300

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Backdraft and pressure relief dampers.
 - 2. Manual volume dampers.
 - 3. Flange connectors.
 - 4. Turning vanes.
 - 5. Duct-mounted access panel assemblies.
 - 6. Flexible connectors.
 - 7. Flexible ducts.
 - 8. Duct accessory hardware.

1.3 ACTION SUBMITTALS

- A. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
 - 1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
 - a. Special fittings.
 - b. Manual volume damper installations.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60.
 - 2. Exposed-Surface Finish: Mill phosphatized.
- B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and No. 4 finish for exposed ducts.
- C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.
- E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel 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 BACKDRAFT AND PRESSURE RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. [Greenheck Fan Corporation](#).
 - 2. [Nailor Industries Inc.](#)
 - 3. [Pottorff](#).
 - 4. [Ruskin Company](#).
- B. Description: Gravity balanced.
- C. Maximum Air Velocity: 1000 fpm.
- D. Maximum System Pressure: 1-inch wg.
- E. Blades: Multiple single-piece blades, center pivoted, maximum 6-inch width, 0.050-inch- thick aluminum sheet with sealed edges.
- F. Blade Action: Parallel.
- G. Blade Seals: Neoprene, mechanically locked.
- H. Blade Axles:
 - 1. Material: Nonferrous metal.
 - 2. Diameter: 0.20 inch.
- I. Return Spring: Adjustable tension.
- J. Bearings: Steel ball or synthetic pivot bushings.
- K. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Screen Material: Galvanized steel.
4. Screen Type: Bird.
5. 90-degree stops.

2.4 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Flexmaster U.S.A., Inc.](#)
 - b. [McGill AirFlow LLC.](#)
 - c. [Nailor Industries Inc.](#)
 - d. [Pottorff.](#)
 - e. [Ruskin Company.](#)
 2. Standard leakage rating.
 3. Suitable for horizontal or vertical applications.
- B. Jackshaft:
1. Size: 0.5-inch diameter.
 2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
 3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.
- C. Damper Hardware:
1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
 2. Include center hole to suit damper operating-rod size.
 3. Include elevated platform for insulated duct mounting.

2.5 FLANGE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. [Ductmate Industries, Inc.](#)
 2. [Ward Industries, Inc.; a division of Hart & Cooley, Inc.](#)
- B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- C. Material: Galvanized steel.
- D. Gage and Shape: Match connecting ductwork.

2.6 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. [Ductmate Industries, Inc.](#)
2. [METALAIRE, Inc.](#)
3. [SEMCO Incorporated.](#)
4. [Ward Industries, Inc.; a division of Hart & Cooley, Inc.](#)

- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."
- D. Vane Construction: Single wall.

2.7 DUCT ACCESS PANEL ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. [3M.](#)
- B. Labeled according to UL 1978 by an NRTL.
- C. Panel and Frame: Minimum thickness 0.0528-inch carbon steel.
- D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.
- E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.
- F. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.8 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. [Ductmate Industries, Inc.](#)
 2. [Duro Dyne Inc.](#)
 3. [Ward Industries, Inc.; a division of Hart & Cooley, Inc.](#)
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Metal-Edged Connectors: Factory fabricated with a fabric strip **[3-1/2 inches]** **[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. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
1. Minimum Weight: 26 oz./sq. yd..
 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 3. Service Temperature: Minus 40 to plus 200 deg F.

2.9 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. [Flexmaster U.S.A., Inc.](#)
 2. [McGill AirFlow LLC.](#)
 3. [Ward Industries, Inc.; a division of Hart & Cooley, Inc.](#)
- B. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.
1. Pressure Rating: 4-inch wg positive and 0.5-inch wg negative.
 2. Maximum Air Velocity: 4000 fpm.
 3. Temperature Range: Minus 20 to plus 175 deg F.
 4. Insulation R-Value: Comply with ASHRAE/IESNA 90.1.
- C. Flexible Duct Connectors:
1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.
 2. Non-Clamp Connectors: Adhesive.

2.10 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 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
1. Install steel volume dampers in steel ducts.

2. Install aluminum volume dampers in aluminum ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- H. Install flexible connectors to connect ducts to equipment.
- I. Connect diffusers to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.
- J. Connect flexible ducts to metal ducts with adhesive.
- K. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 1. Operate dampers to verify full range of movement.
 2. Inspect locations of access panel assemblies and verify that purpose of access panel can be performed.

END OF SECTION

SECTION 233713

DIFFUSERS, REGISTERS, AND GRILLES

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. Rectangular and square ceiling diffusers.
 - 2. Fixed face grilles.
- B. Related Sections:
 - 1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, include the following:
 - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
 - 2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

- A. Rectangular and Square Ceiling Diffusers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carnes Company.
 - b. Krueger.
 - c. Nailor Industries Inc.
 - d. Price Industries.
 - e. Titus.
 - 2. Devices shall be specifically designed for variable-air-volume flows.
 - 3. Material: Steel.
 - 4. Finish: Baked enamel, white.

2.2 REGISTERS AND GRILLES

A. Fixed Face Grille:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carnes Company.
 - b. Krueger.
 - c. Nailor Industries Inc.
 - d. Price Industries.
 - e. Titus.
2. Material: Steel.
3. Finish: Baked enamel, white.

2.3 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 235400

FURNACES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Gas-fired, noncondensing furnaces and accessories complete with controls.
 - 2. Air filters.
 - 3. Refrigeration components.

1.3 ACTION SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each of the following:
 - 1. Furnace.
 - 2. Thermostat.
 - 3. Air filter.
 - 4. Refrigeration components.
- 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. Wiring Diagrams: Power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Special warranty specified in this Section.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each furnace to include in emergency, operation, and maintenance manuals for each of the following:
 - 1. Furnace and accessories complete with controls.
 - 2. Air filter.
 - 3. Refrigeration components.

1.6 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. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- D. Comply with NFPA 70.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace the following components of furnaces that fail in materials or workmanship within specified warranty period:
 - 1. Warranty Period, Commencing on Date of Substantial Completion:
 - a. Furnace Heat Exchanger: 10 years.
 - b. Integrated Ignition and Blower Control Circuit Board: Five years.
 - c. Draft-Inducer Motor: Five years.
 - d. Refrigeration Compressors: 10 years.
 - e. Evaporator and Condenser Coils: Five years.

PART 2 - PRODUCTS

2.1 GAS-FIRED FURNACES, NONCONDENSING

- A. **Basis-of-Design Product:** Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - 1. [Bryant Heating & Cooling Systems; Div. of United Technologies Corp.](#)
 - 2. [Carrier Corporation; Div. of United Technologies Corp.](#)
 - 3. [Lennox Industries Inc.](#)
 - 4. [York International Corp.; a division of Unitary Products Group.](#)
- B. General Requirements for Gas-Fired, Noncondensing Furnaces: Factory assembled, piped, wired, and tested; complying with ANSI Z21.47/CSA 2.3, "Gas-Fired Central Furnaces," and with NFPA 54.
- C. Cabinet: Steel.
 - 1. Cabinet interior around heat exchanger shall be factory-installed insulation.
 - 2. Lift-out panels shall expose burners and all other items requiring access for maintenance.
 - 3. Factory paint external cabinets in manufacturer's standard color.
- D. Fan: Centrifugal, factory balanced, resilient mounted, drive type indicated on Drawings.
 - 1. Fan Motors: Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

2. Special Motor Features: Single speed, Premium (TM) efficiency, as defined in Section 230513 "Common Motor Requirements for HVAC Equipment," and with internal thermal protection and permanent lubrication.
3. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.

E. Type of Gas: Natural.

F. Heat Exchanger: Aluminized steel.

G. Burner:

1. Gas Valve: 100 percent safety modulating main gas valve, main shutoff valve, pressure regulator, safety pilot with electronic flame sensor, limit control, transformer, and combination ignition/fan timer control board.
2. Ignition: Electric pilot ignition, with hot-surface igniter or electric spark ignition.

H. Gas-Burner Safety Controls:

1. Electronic Flame Sensor: Prevents gas valve from opening until pilot flame is proven; stops gas flow on ignition failure.
2. Flame Rollout Switch: Installed on burner box; prevents burner operation.
3. Limit Control: Fixed stop at maximum permissible setting; de-energizes burner on excessive bonnet temperature; automatic reset.

I. Combustion-Air Inducer: Centrifugal fan with thermally protected motor and sleeve bearings prepurges heat exchanger and vents combustion products; pressure switch prevents furnace operation if combustion-air inlet or flue outlet is blocked.

J. Furnace Controls: Solid-state board integrates ignition, heat, cooling, and fan speeds; and adjustable fan-on and fan-off timing; terminals for connection to accessories.

K. Vent Materials: Comply with requirements in Section 235100 "Breechings, Chimneys, and Stacks" for Type B metal vents.

2.2 THERMOSTATS

A. Controls shall comply with requirements shown on the drawings.

B. Control Wiring: Unshielded twisted-pair cabling.

1. No. 24 AWG, 100 ohm, four pair.

2.3 AIR FILTERS

A. Disposable Filters: 1-inch- thick fiberglass media with ASHRAE 52.2 MERV rating of 8 or higher, in sheet metal frame.

2.4 REFRIGERATION COMPONENTS

A. General Refrigeration Component Requirements:

1. Refrigeration compressor, coils, and specialties shall be designed to operate with CFC-free refrigerants.
 2. Energy Efficiency: Equal to or greater than prescribed by ASHRAE/IESNA 90.1, "Energy Standard for Buildings except Low-Rise Residential Buildings."
- B. Refrigerant Coil: Copper tubes mechanically expanded into aluminum fins. Comply with ARI 210/240, "Unitary Air-Conditioning and Air-Source Heat Pump Equipment." Match size with furnace. Include condensate drain pan with accessible drain outlet complying with ASHRAE 62.1.
1. Refrigerant Coil Enclosure: Steel, matching furnace and evaporator coil, with access panel and flanges for integral mounting at or on furnace cabinet and galvanized sheet metal drain pan coated with black asphaltic base paint.
- C. Refrigerant Line Kits: Annealed-copper suction and liquid lines factory cleaned, dried, pressurized with nitrogen, sealed, and with suction line insulated. Provide in standard lengths for installation without joints, except at equipment connections.
1. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I, 1/2 inch thick.
- D. Refrigerant Piping: Comply with requirements in Section 232300 "Refrigerant Piping."
- E. Air-Cooled, Compressor-Condenser Unit:
1. Casing: Steel, finished with baked enamel, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
 2. Compressor: Hermetically sealed scroll type.
 - a. Crankcase heater.
 - b. Restrained vibration isolation mounts for compressor.
 - c. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
 - d. Two-speed compressor motors shall have manual-reset high-pressure switch and automatic-reset low-pressure switch.
 - e. Refrigerant Charge: R-410A.
 3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.
 4. Fan: Aluminum-propeller type, directly connected to motor, horizontal discharge.
 5. Motor: Permanently lubricated, with integral thermal-overload protection.
 6. Low Ambient Kit: Permits operation down to 45 deg F.

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 factory-installed insulation before furnace installation. Reject units that are wet, moisture damaged, or mold damaged.
- C. Examine roughing-in for gas and refrigerant piping systems to verify actual locations of piping connections before equipment installation.

- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install gas-fired furnaces and associated fuel and vent features and systems according to NFPA 54.
- B. Base-Mounted Units: Secure units to substrate. Provide optional bottom closure base if required by installation conditions.
- C. Controls: Install thermostats and humidistats at mounting height of 60 inches above floor.
- D. Wiring Method: Install control wiring in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal control wiring except in unfinished spaces.

3.3 CONNECTIONS

- A. Gas piping installation requirements are specified in Section 231123 "Facility Natural-Gas Piping." Drawings indicate general arrangement of piping, fittings, and specialties. Connect gas piping with union or flange and appliance connector valve.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Vent Connection, Noncondensing, Gas-Fired Furnaces: Connect Type B vents to furnace vent connection and extend outdoors. Type B vents and their installation requirements are specified in Section 235100 "Breechings, Chimneys, and Stacks"
- D. Connect ducts to furnace with flexible connector. Comply with requirements in Section 233300 "Air Duct Accessories."
- E. Connect refrigerant tubing kits to refrigerant coil in furnace and to air-cooled, compressor-condenser unit.
 - 1. Flared Joints: Use ASME B16.26 fitting and flared ends, following procedures in CDA's "Copper Tube Handbook."
 - 2. 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.
 - 3. 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. Comply with requirements in Section 232300 "Refrigerant Piping" for installation and joint construction of refrigerant piping.

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Perform electrical test and visual and mechanical inspection.

2. Leak Test: After installation, charge systems with refrigerant and oil and test for leaks. Repair leaks, replace lost refrigerant and oil, and retest until no leaks exist.
 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
 4. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
 5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

3.5 STARTUP SERVICE

- A. Complete installation and startup checks according to manufacturer's written instructions and perform the following:
1. Inspect for physical damage to unit casings.
 2. Verify that access doors move freely and are weathertight.
 3. Clean units and inspect for construction debris.
 4. Verify that all bolts and screws are tight.
 5. Adjust vibration isolation and flexible connections.
 6. Verify that controls are connected and operational.
- B. Adjust fan belts to proper alignment and tension.
- C. Start unit according to manufacturer's written instructions and complete manufacturer's operational checklist.
- D. Measure and record airflows.
- E. Verify proper operation of capacity control device.
- F. After startup and performance test, lubricate bearings and adjust belt tension.

3.6 ADJUSTING

- A. Adjust initial temperature and humidity set points.
- B. Set controls, burner, and other adjustments for optimum heating performance and efficiency. Adjust heat-distribution features, including shutters, dampers, and relays, to provide optimum heating performance and system efficiency.

3.7 CLEANING

- A. After completing installation, clean furnaces internally according to manufacturer's written instructions.
- B. Install new filters in each furnace within 14 days after Substantial Completion.

3.8 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain condensing units. Refer to Section 017900 "Demonstration and Training."

END OF SECTION