

BIDDING DOCUMENTS
FOR
BOILER REPLACEMENT
CALUMET THEATRE
HOUGHTON, MICHIGAN

Prepared by:

U.P. Engineers & Architects, Inc.
100 Portage Street
Houghton, MI 49931



SEPTEMBER 2, 2022

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SECTION 00 11 16 – ADVERTISEMENT FOR BID

Project: Boiler Replacement
Calumet Theatre

Owner: Village of Calumet
340 Sixth Street
Calumet, MI 49913
manager@villageofcalumet.org

Architect/Engineer:
U.P. Engineers & Architects, Inc.
100 Portage Street
Houghton, Michigan 49931
(906) 482-4810
www.upea.com

Date: September 2, 2022

Bids will be accepted under seal to the Owner for replacing the steam boiler and related work at the Calumet Theatre in Calumet, Michigan.

Owner will receive Bids at the office of U.P. Engineers & Architects, Inc., address above, until 2:00 PM local time on the 20th day of September, 2022, at which time and place the Bids will be opened and read aloud. Bids not received by the indicated time will not be opened.

Project Description: Replace cast iron boiler with two (2) cast-iron steam boilers and accessories. Testing of systems.

Bidding Documents for a Stipulated Price contract may be obtained by contacting UPEA, whose contact information is listed above, as pdf documents, at no charge. Bidding Documents are only available to contractors that submit qualifications demonstrating proficiency in the installation and maintenance of steam boiler systems.

Bidders are required to provide a Bid Bond according to the requirements in Section 00 21 13 - Instructions to Bidders. Bidders are required to submit a proposed project schedule with their bid. Submit your Bid on the Bid Form provided. Refer to other Bidding requirements described in Section 00 21 13.

A pre-proposal tour of the project site is available by appointment with the village manager – Amber Goodman.

Bids are required to be submitted under a condition of irrevocability for a period of 30 days after submission.

Owner reserves the right to waive irregularities and to accept or reject any or all Bids.

Village of Calumet

END OF DOCUMENT

SECTION 002113 - INSTRUCTIONS TO BIDDERS

1.1 SUMMARY

A. Document Includes:

1. Bid submission.
2. Intent.
3. Work identified in Contract Documents.
4. Contract Time.
5. Definitions.
6. Contract Documents identification.
7. Availability of documents.
8. Examination of documents.
9. Inquiries and Addenda.
10. Product substitutions.
11. Site examination.
12. Bidder qualifications.
13. Subcontractors.
14. Submission procedure.
15. Bid ineligibility.
16. Bid Security.
17. Performance assurance.
18. Bid Form signature.
19. Duration of offer.
20. Acceptance of offer.

1.2 BID SUBMISSION

- A. Bids signed and sealed, executed, and dated will be received by Owner, located at the office of the Architect/Engineer as noted on the Advertisement for Bids.
- B. Bids submitted after the above time may be returned to Bidder unopened.
- C. Amendments to submitted Bids will be permitted when received in writing prior to Bid closing and when endorsed by the same party or parties who signed and sealed the Bid.
- D. Bidders may withdraw their Bid by written request before the above time.

1.3 INTENT

- A. Intent of this Bid request is to obtain an offer to complete the Work for a fixed fee, plus unit prices for items to be replaced.

1.4 WORK IDENTIFIED IN CONTRACT DOCUMENTS

- A. Work of this proposed Contract as described in the section 01 10 00.

1.5 CONTRACT TIME

- A. Owner requires Work of this Contract to be completed as soon as possible.
 - 1. **Bidder shall submit with their proposal a schedule with milestone dates for each item listed in section 01 10 00.** Contractor's proposed schedule will be a consideration in the award of the contract.

1.6 DEFINITIONS

- A. Bidding Documents: Contract Documents supplemented with Advertisement for Bids, Instructions to Bidders, Bid Form, and Bid securities.
- B. Contract Documents: As defined in AIA A105-2017.
- C. Bid: Executed Bid Form and required attachments submitted according to Instructions to Bidders.
- D. Bid Sum: Monetary sum identified by Bidder in Bid Form.

1.7 CONTRACT DOCUMENTS IDENTIFICATION

- A. Contract Documents are identified as Project Number K09-01574, as prepared by U.P. Engineers and Architects, Inc. and as identified in Project Manual.

1.8 AVAILABILITY OF DOCUMENTS

- A. Bidding Documents may be obtained as indicated in Advertisement for Bids.
- B. Purpose:
 - 1. Bidding Documents are made available only for the purpose of obtaining offers for the Project.
 - 2. Their use does not grant a license for other purposes.

1.9 EXAMINATION OF DOCUMENTS

- A. Upon receipt of Bidding Documents, verify that documents are complete. Notify Architect/Engineer if documents are incomplete.
- B. Immediately notify Architect/Engineer upon finding discrepancies or omissions in Bidding Documents.

1.10 INQUIRIES AND ADDENDA

- A. Requests for Information/ Clarification:
 - 1. Direct questions in writing to spakkala@upea.com.
 - 2. Submit questions not less than seven days before date set for receipt of Bids.

3. Verbal answers are not binding on any party.
4. Replies will be made by Addenda.
5. Responses to inquiries affecting clarity of documents or perceived to affect cost will be addressed by Addenda, to be issued during the Bidding period.

B. Addenda:

1. Addenda will be sent to known Bidders and to those who are known to have received a complete set of Bidding Documents.
2. Addenda become part of Contract Documents.
3. Include resultant costs in Bid Price.

1.11 PRODUCT SUBSTITUTIONS

- A. Where Bidding Documents stipulate particular products, substitution requests will be considered by Architect/Engineer up to 10 days before receipt of Bids.
- B. With each substitution request, provide sufficient information for Architect/Engineer to determine acceptability of proposed products.
- C. Comply with substitution request submittal requirements in Section 016000 - Product Requirements, including use of Substitution Request Form.
- D. Approvals:
 1. When a request to substitute a product is made, Architect/Engineer may approve the substitution.
 2. Approved substitutions will be identified by Addenda.
- E. Changes in the Work:
 1. In submitting substitutions to specified products, Bidders shall include changes required in the Work and changes to Contract Time and Contract Sum to accommodate such approved substitutions in their Bid.
 2. Later claims by the Bidder for an addition to the Contract Time or Contract Sum because of changes in Work necessitated by use of substitutions will not be considered.

1.12 SITE EXAMINATION

- A. It is highly encouraged for the bidder to examine the project site before submitting a bid. Failure to examine existing site conditions does not constitute a Contract Sum increase.

1.13 BIDDER QUALIFICATIONS

- A. To demonstrate qualification for performing the Work of this Contract, Bidders may be requested to submit written evidence of financial position current commitments, and previous experience.

1.14 SUBCONTRACTORS

- A. Owner reserves right to reject a proposed Subcontractor for reasonable cause.

1.15 SUBMISSION PROCEDURE

- A. Bidders shall be solely responsible for delivery of Bids in manner and time prescribed.
- B. Submit two copies of executed offer on provided Bid Forms, signed and sealed in a closed opaque envelope, and clearly identified with Bidder's name and address, Project name, and Owner's name on outside.
- C. Improperly completed information, including irregularities in Bid bond, may be cause not to open Bid Form envelope and to declare Bid invalid or informal.
- D. An abstract summary of submitted Bids will be made available to all Bidders following Bid opening.

1.16 BID INELIGIBILITY

- A. Bids that are unsigned, improperly signed or sealed, conditional, illegible, and obscure, or Bids that contain arithmetical errors, erasures, alterations, or irregularities, may be declared unacceptable at Owner's discretion.
- B. Bid Forms, Appendices, and enclosures that are improperly prepared may be declared unacceptable at Owner's discretion.
- C. Failure to provide security deposit, bonds, or insurance requirements may invalidate Bid at Owner's discretion.

1.17 BID SECURITY

- A. Bids shall be accompanied by Bid security as follows:
 - 1. Bid bond of a sum no less than 5 percent of Bid Sum on AIA A310 - Bid Bond.
- B. Endorse Bid bond in name of Owner as obligee, signed and sealed by principal (Contractor) and surety.
- C. If accepted Bidder fails to execute the Agreement and indicated bonds within 10 days after Notice of Award, Notice of Award may be annulled and Bidder's Bid security will be forfeited.

1.18 BID FORM SIGNATURE

- A. Sign Bid Form as follows:
 - 1. Sole Proprietorship:
 - a. Signature of sole proprietor in presence of a witness who will also sign.
 - b. Include words "Sole Proprietor" under signature.
 - c. Affix seal.

2. Partnership:
 - a. Signature of each partner in presence of a witness who will also sign.
 - b. Include word "Partner" under each signature.
 - c. Affix seal to each signature.
3. Corporation:
 - a. Signature of at least one duly authorized signing officer.
 - b. Include officer's capacity under each signature.
 - c. Affix corporate seal.
 - d. If Bid is signed by officials other than president, secretary, or treasurer of company, submit a copy of bylaws or a resolution of board of directors authorizing them to do so, included with Bid Form in Bid envelope.
4. Joint Venture:
 - a. Signature of each party of joint venture under their respective seals in a manner appropriate to such party as described above, similar to requirements for partnerships.

1.19 DURATION OF OFFER

- A. Bids shall remain open to acceptance and shall be irrevocable for a period of 30 days after Bid closing date.

1.20 ACCEPTANCE OF OFFER

- A. Owner reserves right to waive irregularities and to accept or reject any or all offers.
- B. After acceptance by Owner, Architect/Engineer, on behalf of Owner, will issue to the accepted Bidder a written Notice to Proceed.
- C. Notwithstanding delay in the preparation and execution of the Agreement, accepted Bidder shall be prepared, upon written Notice to Proceed, to commence Work within seven days following receipt of official written order of Owner to proceed, or on date stipulated in such order.
- D. Accepted Bidder shall assist and cooperate with Owner to prepare Agreement, and shall execute Agreement and return it to Owner within seven days following its presentation.

END OF DOCUMENT 002113

CONTRACTOR PROPOSAL FORM

Project: Boiler Replacement
Calumet Theatre

Owner: Village of Calumet
340 Sixth Street
Calumet, MI 49913

Date: _____

Submitted by: _____
(Firm name and address)

(Telephone Number)

(Email)

1. OFFER

1.1 Having examined the Place of The Work and all matters referred to in the Documents prepared by U.P. Engineers and Architects, Inc., Engineer for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Bid Sum of:

\$ _____, (_____ dollars), in lawful money of the United States of America.

- All applicable federal taxes are included and State of Michigan taxes are included in the Bid.

2. ALTERNATES:

Alternate No. 1: Provide a single cast-iron steam boiler, approximately one million BTU capacity in lieu of two boilers. Include piping and valves to allow tandem connection to second boiler in the future.

Impact on Cost (indicate whether to add or deduct):

ADD/DEDUCT: \$ _____

Impact on Schedule (indicate number of weeks added or deducted to the schedule):

ADD/DEDUCT: _____ weeks

3. UNIT PRICES

- 1. Replace steam piping:
\$ _____ per lineal foot.
- 2. Replace steam traps:
\$ _____ per trap.

4. ALLOWANCES

The following Allowance is included in the Base Bid:

A. Provide water treatment system for the boilers: \$10,000

5. ACCEPTANCE

This offer shall be open to acceptance and irrevocable for thirty days from the date of the bid.

If this bid is accepted by the Owner within the time period stated above, we will:

- Execute the Agreement within seven days of receipt of Notice of Award. Form of Agreement shall be AIA Document A105.
- Commence work in conformance with requirements found in Instructions to Bidders.

6. CONTRACT TIME

If this Bid is accepted, we will complete the Work within the time proposed in the Milestone Construction Schedule attached to this bid. BIDDER hereby agrees to commence WORK under this contract on or before a date to be as specified in the NOTICE TO PROCEED. BIDDER agrees to achieve Substantial Completion of the PROJECT **on or before the date indicated in the attached schedule.**

7. ADDENDA

The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum.

Addendum # _____ Dated _____

Addendum # _____ Dated _____

8. SUBCONTRACTORS

The following firms have submitted costs for their portion of the Work, and it is the intent of this Contractor to enter into a Subcontractor agreement if we are awarded the Work:

<u>Work Scope</u>	<u>Subcontractor</u>
_____	: _____
_____	: _____

9. APPENDICES

- Attached Milestone Construction Schedule

10. BID FORM SIGNATURES

(Seal)

The Corporate Seal of: _____

(Bidder - print the full name of your firm)

was hereunto affixed in the presence of:

(Authorized signing officer)

(Title)

END OF DOCUMENT

DRAFT AIA® Document A105™ - 2017

Standard Short Form of Agreement Between Owner and Contractor

AGREEMENT made as of the day of in the year
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

The Village of Calumet
340 Sixth Street
Calumet, Michigan 49913

and the Contractor:
(Name, legal status, address and other information)

for the following Project:
(Name, location and detailed description)

Boiler Replacement Project
The Calumet Theatre

The Engineer:
(Name, legal status, address and other information)

U.P. Engineers & Engineers, Inc.
100 Portage Street
Houghton, MI 49931

The Owner and Contractor agree as follows.

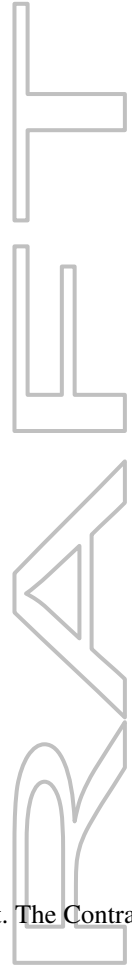
ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

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ARTICLE 1 THE CONTRACT DOCUMENTS

The Contractor shall complete the Work described in the Contract Documents for the Project. The Contract Documents consist of

- .1** this Agreement signed by the Owner and Contractor;
- .2** the Performance-based solicitation documents prepared by the Engineer, dated « », and enumerated as follows:

Specifications:

Section	Title	Pages

- .3** addenda prepared by the Engineer as follows:

Number	Date	Pages

- .4** written orders for changes in the Work, pursuant to Article 10, issued after execution of this Agreement; and
- .5** other documents, if any, identified as follows:

« »

ARTICLE 2 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 2.1 The Contract Time is the number of calendar days available to the Contractor to substantially complete the Work.

§ 2.2 Date of Commencement:

Unless otherwise set forth below, the date of commencement shall be the date of this Agreement.
(Insert the date of commencement if other than the date of this Agreement.)

« »

§ 2.3 Substantial Completion:

Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion, as defined in Section 12.5, of the entire Work:
(Check the appropriate box and complete the necessary information.)

[« »] By the following date: « »

ARTICLE 3 CONTRACT SUM

§ 3.1 The Contract Sum shall include all items and services necessary for the proper execution and completion of the Work. Subject to additions and deductions in accordance with Article 10, the Contract Sum is:

« » (\$ « »)

§ 3.2 For purposes of payment, the Contract Sum includes the following values related to portions of the Work:
(Itemize the Contract Sum among the major portions of the Work.)

Portion of the Work	Value

§ 3.3 The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and hereby accepted by the Owner:
(Identify the accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)

« »

§ 3.4 Allowances, if any, included in the Contract Sum are as follows:
(Identify each allowance.)

Item	Price

§ 3.5 Unit prices, if any, are as follows:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit (\$0.00)

ARTICLE 4 PAYMENTS

§ 4.1 Based on Contractor's Applications for Payment certified by the Engineer, the Owner shall pay the Contractor, in accordance with Article 12, as follows:
(Insert below timing for payments and provisions for withholding retainage, if any.)

« »

§ 4.2 Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the legal rate prevailing at the place of the Project.
(Insert rate of interest agreed upon, if any.)

« » % « »

ARTICLE 5 INSURANCE

§ 5.1 The Contractor shall maintain the following types and limits of insurance until the expiration of the period for correction of Work as set forth in Section 14.2, subject to the terms and conditions set forth in this Section 5.1:

§ 5.1.1 Commercial General Liability insurance for the Project, written on an occurrence form, with policy limits of not less than « » (\$ « ») each occurrence, « » (\$ « ») general aggregate, and « » (\$ « ») aggregate for products-completed operations hazard.

§ 5.1.2 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than « » (\$ « ») per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance, and use of those motor vehicles along with any other statutorily required automobile coverage.

§ 5.1.3 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided that such primary and excess or umbrella insurance policies result in the same or greater coverage as those required under Section 5.1.1 and 5.1.2, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ 5.1.4 Workers' Compensation at statutory limits.

§ 5.1.5 Employers' Liability with policy limits not less than « » (\$ « ») each accident, « » (\$ « ») each employee, and « » (\$ « ») policy limit.

§ 5.1.6 The Contractor shall provide builder's risk insurance to cover the total value of the entire Project on a replacement cost basis.

§ 5.1.7 Other Insurance Provided by the Contractor

(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	Limits

§ 5.2 The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance and shall provide property insurance to cover the value of the Owner's property. The Contractor is entitled to receive an increase in the Contract Sum equal to the insurance proceeds related to a loss for damage to the Work covered by the Owner's property insurance.

§ 5.3 The Contractor shall obtain an endorsement to its Commercial General Liability insurance policy to provide coverage for the Contractor's obligations under Section 8.12.

§ 5.4 Prior to commencement of the Work, each party shall provide certificates of insurance showing their respective coverages.

§ 5.5 Unless specifically precluded by the Owner's property insurance policy, the Owner and Contractor waive all rights against (1) each other and any of their subcontractors, suppliers, agents, and employees, each of the other; and (2) the Engineer, Engineer's consultants, and any of their agents and employees, for damages caused by fire or other causes of loss to the extent those losses are covered by property insurance or other insurance applicable to the Project, except such rights as they have to the proceeds of such insurance.

ARTICLE 6 GENERAL PROVISIONS

§ 6.1 The Contract

The Contract represents the entire and integrated agreement between the parties and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a written modification in accordance with Article 10.

§ 6.2 The Work

The term "Work" means the construction and services required by the Contract Documents, and includes all other labor, materials, equipment, and services provided, or to be provided, by the Contractor to fulfill the Contractor's obligations.

§ 6.3 Intent

The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all.

§ 6.4 Ownership and Use of Engineer's Drawings, Specifications and Other Documents

Documents prepared by the Engineer are instruments of the Engineer's service for use solely with respect to this Project. The Engineer shall retain all common law, statutory, and other reserved rights, including the copyright. The Contractor, subcontractors, sub-subcontractors, and suppliers are authorized to use and reproduce the instruments of service solely and exclusively for execution of the Work. The instruments of service may not be used for other Projects or for additions to this Project outside the scope of the Work without the specific written consent of the Engineer.

§ 6.5 Electronic Notice

Written notice under this Agreement may be given by one party to the other by email as set forth below. *(Insert requirements for delivering written notice by email such as name, title, and email address of the recipient, and whether and how the system will be required to generate a read receipt for the transmission.)*

<< >>

ARTICLE 7 OWNER

§ 7.1 Information and Services Required of the Owner

§ 7.1.1 If requested by the Contractor, the Owner shall furnish all necessary surveys and a legal description of the site.

§ 7.1.2 Except for permits and fees under Section 8.7.1 that are the responsibility of the Contractor, the Owner shall obtain and pay for other necessary approvals, easements, assessments, and charges.

§ 7.1.3 Prior to commencement of the Work, at the written request of the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence.

§ 7.2 Owner's Right to Stop the Work

If the Contractor fails to correct Work which is not in accordance with the Contract Documents, the Owner may direct the Contractor in writing to stop the Work until the correction is made.

§ 7.3 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies, correct such deficiencies. In such case, the Engineer may withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the cost of correction, provided the actions of the Owner and amounts charged to the Contractor were approved by the Engineer.

§ 7.4 Owner's Right to Perform Construction and to Award Separate Contracts

§ 7.4.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project.

§ 7.4.2 The Contractor shall coordinate and cooperate with the Owner's own forces and separate contractors employed by the Owner.

ARTICLE 8 CONTRACTOR

§ 8.1 Review of Contract Documents and Field Conditions by Contractor

§ 8.1.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 8.1.2 The Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by the Owner. Before commencing activities, the Contractor shall (1) take field measurements and verify field conditions; (2) carefully compare this and other information known to the Contractor with the Contract Documents; and (3) promptly report errors, inconsistencies, or omissions discovered to the Engineer.

§ 8.2 Contractor's Construction Schedule

The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Engineer's information a Contractor's construction schedule for the Work.

§ 8.3 Supervision and Construction Procedures

§ 8.3.1 The Contractor shall supervise and direct the Work using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work.

§ 8.3.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner, through the Engineer, the names of subcontractors or suppliers for each portion of the Work. The Contractor shall not contract with any subcontractor or supplier to whom the Owner or Engineer have made a timely and reasonable objection.

§ 8.4 Labor and Materials

§ 8.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work.

§ 8.4.2 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract Work. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

§ 8.5 Warranty

The Contractor warrants to the Owner and Engineer that: (1) materials and equipment furnished under the Contract will be new and of good quality unless otherwise required or permitted by the Contract Documents; (2) the Work will be free from defects not inherent in the quality required or permitted; and (3) the Work will conform to the requirements of the Contract Documents. Any material or equipment warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 12.5.

§ 8.6 Taxes

The Contractor shall pay sales, consumer, use, and similar taxes that are legally required when the Contract is executed.

§ 8.7 Permits, Fees and Notices

§ 8.7.1 The Contractor shall obtain and pay for the building permit and other permits and governmental fees, licenses, and inspections necessary for proper execution and completion of the Work.

§ 8.7.2 The Contractor shall comply with and give notices required by agencies having jurisdiction over the Work. If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume full responsibility for such Work and shall bear the attributable costs. The Contractor shall promptly notify the Engineer in writing of any known inconsistencies in the Contract Documents with such governmental laws, rules, and regulations.

§ 8.8 Submittals

The Contractor shall promptly review, approve in writing, and submit to the Engineer shop drawings, product data, samples, and similar submittals required by the Contract Documents. Shop drawings, product data, samples, and similar submittals are not Contract Documents.

§ 8.9 Use of Site

The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits, the Contract Documents, and the Owner.

§ 8.10 Cutting and Patching

The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly.

§ 8.11 Cleaning Up

The Contractor shall keep the premises and surrounding area free from accumulation of debris and trash related to the Work. At the completion of the Work, the Contractor shall remove its tools, construction equipment, machinery, and surplus material; and shall properly dispose of waste materials.

§ 8.12 Indemnification

To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Engineer, Engineer's consultants, and agents and employees of any of them, from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder.

ARTICLE 9 ENGINEER

§ 9.1 The Engineer will provide administration of the Contract as described in the Contract Documents. The Engineer will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 9.2 The Engineer will visit the site at intervals appropriate to the stage of construction to become generally familiar with the progress and quality of the Work.

§ 9.3 The Engineer will not have control over or charge of, and will not be responsible for, construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility. The Engineer will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents.

§ 9.4 Based on the Engineer's observations and evaluations of the Contractor's Applications for Payment, the Engineer will review and certify the amounts due the Contractor.

§ 9.5 The Engineer has authority to reject Work that does not conform to the Contract Documents.

§ 9.6 The Engineer will promptly review and approve or take appropriate action upon Contractor's submittals, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 9.7 On written request from either the Owner or Contractor, the Engineer will promptly interpret and decide matters concerning performance under, and requirements of, the Contract Documents.

§ 9.8 Interpretations and decisions of the Engineer will be consistent with the intent of, and reasonably inferable from the Contract Documents, and will be in writing or in the form of drawings. When making such interpretations and decisions, the Engineer will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions rendered in good faith.

§ 9.9 The Engineer's duties, responsibilities, and limits of authority as described in the Contract Documents shall not be changed without written consent of the Owner, Contractor, and Engineer. Consent shall not be unreasonably withheld.

ARTICLE 10 CHANGES IN THE WORK

§ 10.1 The Owner, without invalidating the Contract, may order changes in the Work within the general scope of the Contract, consisting of additions, deletions or other revisions, and the Contract Sum and Contract Time shall be adjusted accordingly, in writing. If the Owner and Contractor cannot agree to a change in the Contract Sum, the Owner shall pay the Contractor its actual cost plus reasonable overhead and profit.

§ 10.2 The Engineer may authorize or order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. Such authorization or order shall be in writing and shall be binding on the Owner and Contractor. The Contractor shall proceed with such minor changes promptly.

§ 10.3 If concealed or unknown physical conditions are encountered at the site that differ materially from those indicated in the Contract Documents or from those conditions ordinarily found to exist, the Contract Sum and Contract Time shall be subject to equitable adjustment.

ARTICLE 11 TIME

§ 11.1 Time limits stated in the Contract Documents are of the essence of the Contract.

§ 11.2 If the Contractor is delayed at any time in progress of the Work by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, or other causes beyond the Contractor's control, the Contract Time shall be subject to equitable adjustment.

§ 11.3 Costs caused by delays or by improperly timed activities or defective construction shall be borne by the responsible party.

ARTICLE 12 PAYMENTS AND COMPLETION

§ 12.1 Contract Sum

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

§ 12.2 Applications for Payment

§ 12.2.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Engineer an itemized Application for Payment for Work completed in accordance with the values stated in this Agreement. The Application shall be supported by data substantiating the Contractor's right to payment as the Owner or Engineer may reasonably require, such as evidence of payments made to, and waivers of liens from, subcontractors and suppliers. Payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment stored, and protected from damage, off the site at a location agreed upon in writing.

§ 12.2.2 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment, all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or other encumbrances adverse to the Owner's interests.

§ 12.3 Certificates for Payment

The Engineer will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the

Contractor; (2) issue to the Owner a Certificate for Payment for such amount as the Engineer determines is properly due, and notify the Contractor and Owner in writing of the Engineer's reasons for withholding certification in part; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Engineer's reason for withholding certification in whole. If certification or notification is not made within such seven day period, the Contractor may, upon seven additional days' written notice to the Owner and Engineer, stop the Work until payment of the amount owing has been received. The Contract Time and the Contract Sum shall be equitably adjusted due to the delay.

§ 12.4 Progress Payments

§ 12.4.1 After the Engineer has issued a Certificate for Payment, the Owner shall make payment in the manner provided in the Contract Documents.

§ 12.4.2 The Contractor shall promptly pay each subcontractor and supplier, upon receipt of payment from the Owner, an amount determined in accordance with the terms of the applicable subcontracts and purchase orders.

§ 12.4.3 Neither the Owner nor the Engineer shall have responsibility for payments to a subcontractor or supplier.

§ 12.4.4 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the requirements of the Contract Documents.

§ 12.5 Substantial Completion

§ 12.5.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use.

§ 12.5.2 When the Contractor believes that the Work or designated portion thereof is substantially complete, it will notify the Engineer and the Engineer will make an inspection to determine whether the Work is substantially complete. When the Engineer determines that the Work is substantially complete, the Engineer shall prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, establish the responsibilities of the Owner and Contractor, and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 12.6 Final Completion and Final Payment

§ 12.6.1 Upon receipt of a final Application for Payment, the Engineer will inspect the Work. When the Engineer finds the Work acceptable and the Contract fully performed, the Engineer will promptly issue a final Certificate for Payment.

§ 12.6.2 Final payment shall not become due until the Contractor submits to the Engineer releases and waivers of liens, and data establishing payment or satisfaction of obligations, such as receipts, claims, security interests, or encumbrances arising out of the Contract.

§ 12.6.3 Acceptance of final payment by the Contractor, a subcontractor or supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 13 PROTECTION OF PERSONS AND PROPERTY

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs, including all those required by law in connection with performance of the Contract. The Contractor shall take reasonable precautions to prevent damage, injury, or loss to employees on the Work and other persons who may be affected thereby, the Work and materials and equipment to be incorporated therein, and other property at the site or adjacent thereto. The Contractor shall promptly remedy damage and loss to property caused in whole or in part by the Contractor, or by anyone for whose acts the Contractor may be liable.

ARTICLE 14 CORRECTION OF WORK

§ 14.1 The Contractor shall promptly correct Work rejected by the Engineer as failing to conform to the requirements of the Contract Documents. The Contractor shall bear the cost of correcting such rejected Work, including the costs of uncovering, replacement, and additional testing.

§ 14.2 In addition to the Contractor's other obligations including warranties under the Contract, the Contractor shall, for a period of one year after Substantial Completion, correct work not conforming to the requirements of the Contract Documents.

§ 14.3 If the Contractor fails to correct nonconforming Work within a reasonable time, the Owner may correct it in accordance with Section 7.3.

ARTICLE 15 MISCELLANEOUS PROVISIONS

§ 15.1 Assignment of Contract

Neither party to the Contract shall assign the Contract as a whole without written consent of the other.

§ 15.2 Tests and Inspections

§ 15.2.1 At the appropriate times, the Contractor shall arrange and bear cost of tests, inspections, and approvals of portions of the Work required by the Contract Documents or by laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities.

§ 15.2.2 If the Engineer requires additional testing, the Contractor shall perform those tests.

§ 15.2.3 The Owner shall bear cost of tests, inspections, or approvals that do not become requirements until after the Contract is executed. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 15.3 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules.

ARTICLE 16 TERMINATION OF THE CONTRACT

§ 16.1 Termination by the Contractor

If the Work is stopped under Section 12.3 for a period of 14 days through no fault of the Contractor, the Contractor may, upon seven additional days' written notice to the Owner and Engineer, terminate the Contract and recover from the Owner payment for Work executed including reasonable overhead and profit, and costs incurred by reason of such termination.

§ 16.2 Termination by the Owner for Cause

§ 16.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the subcontractors;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 is otherwise guilty of substantial breach of a provision of the Contract Documents.

§ 16.2.2 When any of the above reasons exist, the Owner, after consultation with the Engineer, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may

- .1 take possession of the site and of all materials thereon owned by the Contractor, and
- .2 finish the Work by whatever reasonable method the Owner may deem expedient.

§ 16.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 16.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 16.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the Owner. This obligation for payment shall survive termination of the Contract.

§ 16.3 Termination by the Owner for Convenience

The Owner may, at any time, terminate the Contract for the Owner’s convenience and without cause. The Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

ARTICLE 17 OTHER TERMS AND CONDITIONS

(Insert any other terms or conditions below.)

« »

This Agreement entered into as of the day and year first written above.

(If required by law, insert cancellation period, disclosures or other warning statements above the signatures.)

« »

OWNER *(Signature)*

« »« »

(Printed name and title)

CONTRACTOR *(Signature)*

« »« »

(Printed name and title)

LICENSE NO.:

JURISDICTION:

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Contract description.
2. Work by Owner or other Work at the Site.
3. Contractor's use of Site.
4. Work sequence.
5. Owner occupancy.
6. Permits.
7. Specification conventions.

1.2 CONTRACT DESCRIPTION

A. Work of the Project includes the following, listed in order of sequence:

1. Procure two (2) new cast-iron steam boilers at approximately 700 MBH input capacity each.
2. Obtain a steam trap survey/ inspection from a qualified contractor.
3. Replace any defective/ leaking steam traps. (Unit Price)
4. Pressure test all existing steam and condensate piping.
5. Replace any defective or leaking piping and/or fittings. (Unit Price)
6. Insulate all steam and condensate piping.
7. Consult with a water treatment specialist to determine if chemicals are needed for the steam system.
8. Install water treatment system if deemed necessary. (Allowance)
9. Design the replacement of one existing steam boiler with two new steam boilers. Design shall include all accessories, piping, etc. for a complete system.
10. Replace the condensate feed pump/ receiver with a properly sized pump for the proposed boilers.
11. Provide new duct exterior of the building from the combustion air intake to a level above snow level. Provide motorized louver on the combustion air duct (inside building) to prevent boilers from firing until fully open.
12. Install two (2) new boilers and associated accessories. Modify existing piping to accommodate new boiler layout.
13. Test and balance the steam system after installation.
14. Obtain final inspection and approval from Authority Having Jurisdiction (Houghton County) and the state boiler inspector.

B. Work shall include all electrical and controls for a complete operating system.

1.3 WORK BY OWNER OR OTHERS

- A. Coordinate Work with utilities of Owner and public or private agencies.

1.4 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Coordinate times of occupancy (performances) with the owner. No work shall be done during performance times.
- B. Utility Outages and Shutdown:
 - 1. Coordinate and schedule electrical and other utility outages with Owner.

1.5 WORK SEQUENCE

- A. Construct Work in order listed in part 1.2 A.

1.6 OWNER OCCUPANCY

- A. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- B. Schedule the Work to accommodate Owner occupancy.

1.7 PERMITS

- A. Furnish all necessary permits for construction of Work including the following:

1.8 SPECIFICATION CONVENTIONS

- A. These Specifications are written in imperative mood and streamlined form. This imperative language is directed to Contractor unless specifically noted otherwise. The words "shall be" are included by inference where a colon (:) is used within sentences or phrases.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 011000

SECTION 012000 - PRICE AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Schedule of Values.
- B. Application for Payment.
- C. Change procedures.
- D. Defect assessment.
- E. Unit prices.
- F. Alternates.

1.2 SCHEDULE OF VALUES

- A. Submit printed schedule on AIA G703 - Continuation Sheet for G702.
- B. Submit Schedule of Values in duplicate within 10 days after receipt of Notice to Proceed.
- C. Format: Use Table of Contents of this Project Manual. Identify each line item with number and title of major Specification Section. Also identify Site mobilization, bonds and insurance,.
- D. Revise schedule to list approved Change Orders with each Application for Payment.

1.3 APPLICATION FOR PAYMENT

- A. Submit three copies of each Application for Payment on AIA G702 - Application and Certificate for Payment and AIA G703 - Continuation Sheet for G702.
- B. Content and Format: Use Schedule of Values for listing items in Application for Payment.
- C. Submit updated construction schedule with each Application for Payment.
- D. Payment Period: Submit on or before
- E. Submit submittals with transmittal letter as specified in Section 013300 - Submittal Procedures.
- F. Substantiating Data: When Architect/Engineer requires substantiating information, submit data justifying dollar amounts in question. Include the following with Application for Payment:
 - 1. Photographs of materials stored in the location of storage. Include photographs to demonstrate materials are stored properly within requirement environment.

2. Bill of sale for stored materials.

1.4 CHANGE PROCEDURES

- A. Submittals: Submit name of individual who is authorized to receive change documents and is responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. Architect/Engineer will advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time by issuing supplemental instructions on AIA G710.
- C. Architect/Engineer may issue Proposal Request including a detailed description of proposed change with supplementary or revised Drawings and Specifications, a change in Contract Time for executing the change. Contractor will prepare and submit estimate within a specified number of days.
- D. Contractor may propose changes by submitting a request for change to Architect/Engineer, describing proposed change and its full effect on the Work. Include a statement describing reason for the change and the effect on Contract Sum/Price and Contract Time with full documentation and a statement describing effect on the Work by separate or other Contractors.
- E. Stipulated Sum/Price Change Order: Architect will prepare a Change Order on AIA Document G701, based on the Architect's Proposal Request and Contractors quotation.
- F. Unit Price Change Order: For Contract unit prices and quantities, the Change Order will be executed on a fixed unit price basis.
- G. Construction Change Directive: Architect/Engineer may issue directive, on AIA G714 - Construction Change Directive signed by Owner, instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute change.
- H. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in Conditions of the Contract. Architect/Engineer will determine change allowable in Contract Sum/Price and Contract Time as provided in Contract Documents.
 1. Maintain detailed records of Work done on time and material basis. Provide full information required for evaluation of proposed changes and to substantiate costs for changes in the Work.
- I. Document each quotation for change in Project Cost or Time with sufficient data to allow evaluation of quotation.
- J. Change Order Forms: AIA G701 - Change Order.
- K. Execution of Change Orders: Architect/Engineer will issue Change Orders for signatures of parties as provided in Conditions of the Contract.
- L. Correlation of Contractor Submittals:

1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum/Price.
2. Promptly revise Progress Schedules to reflect change in Contract Time, revise subschedules to adjust times for other items of Work affected by the change, and resubmit.
3. Promptly enter changes in Record Documents.

1.5 DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of Architect/Engineer, it is not practical to remove and replace the Work, Architect/Engineer will direct appropriate remedy or adjust payment.
- C. Authority of Architect/Engineer to assess defects and identify payment adjustments is final.
- D. Nonpayment for Rejected Products: Payment will not be made for rejected products for any of the following reasons:
 1. Products wasted or disposed of in a manner that is not acceptable.
 2. Products determined as unacceptable before or after placement.
 3. Products not completely unloaded from transporting vehicle.
 4. Products placed beyond lines and levels of the required Work.
 5. Products remaining on hand after completion of the Work.
 6. Loading, hauling, and disposing of rejected products.

1.6 UNIT PRICES

- A. Take measurements and compute quantities. Architect/Engineer may verify measurements and quantities.
- B. Final payment for Work governed by unit prices will be made on basis of actual measurements and quantities accepted by Architect/Engineer multiplied by unit sum/price for Work incorporated in or made necessary by the Work.
- C. Measurement of Quantities:
 1. Linear Measurement: Measured by linear dimension, at item centerline or mean chord.

1.7 ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement. The Owner-Contractor Agreement may identify certain Alternates to remain an Owner option for a stipulated period of time.
- B. Coordinate related Work and modify surrounding Work. Description for each Alternate is recognized to be abbreviated but requires that each change shall be complete for scope of Work affected.
 1. Coordinate related requirements among Specification Sections as required.

2. Include as part of each Alternate: Miscellaneous devices, appurtenances, and similar items incidental to or necessary for complete installation.
3. Coordinate Alternate with adjacent Work and modify or adjust as necessary to ensure integration.

C. Schedule of Alternates:

1. As described on the contractor proposal form.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 012000

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Quality assurance.
- B. Product options.
- C. Product substitution procedures.

1.2 QUALITY ASSURANCE

- A. Contract is based on products and standards established in Contract Documents without consideration of proposed substitutions.
- B. Products specified define standard of quality, type, function, dimension, appearance, and performance required.
- C. Substitution Proposals: Permitted for specified products except where specified otherwise. Do not substitute products unless substitution has been accepted and approved in writing by Owner.

1.3 PRODUCT OPTIONS

- A. See Section 016000 - Product Requirements.

1.4 PRODUCT SUBSTITUTION PROCEDURES

- A. Document - Instructions to Bidders specifies time restrictions for submitting requests for substitutions during Bidding period.
- B. Substitutions will not be considered when a product becomes unavailable through no fault of Contractor.
- C. Document each request with complete data, substantiating compliance of proposed substitution with Contract Documents, including:
 - 1. Manufacturer's name and address, product, trade name, model, or catalog number, performance and test data, and reference standards.
 - 2. Itemized point-by-point comparison of proposed substitution with specified product, listing variations in quality, performance, and other pertinent characteristics.
 - 3. Reference to Article and Paragraph numbers in Specification Section.
 - 4. Cost data comparing proposed substitution with specified product and amount of net change to Contract Sum.
 - 5. Changes required in other Work.

6. Availability of maintenance service and source of replacement parts as applicable.
7. Certified test data to show compliance with performance characteristics specified.
8. Samples when applicable or requested.
9. Other information as necessary to assist Architect/Engineer's evaluation.

D. A request constitutes a representation that Bidder or Contractor:

1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
2. Will provide same warranty for substitution as for specified product.
3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension that may subsequently become apparent.
5. Will coordinate installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.
6. Will reimburse Owner and Architect/Engineer for review or redesign services associated with reapproval by authorities having jurisdiction.

E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals without separate written request or when acceptance will require revision to Contract Documents.

F. Substitution Submittal Procedure:

1. Submit electronic file to Architect/Engineer of Request for Substitution for consideration. Limit each request to one proposed substitution.
2. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
3. Architect/Engineer will notify Contractor in writing of decision to accept or reject request.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 012500

SUBSTITUTION REQUEST FORM

To: U.P. Engineers & Architects, Inc.
100 Portage Street
Houghton, MI 49931

Project: Delta Area Transit Authority – Office Addition and Renovation

Section No. _____ Drawing Reference _____

Specified Product _____ Proposed Substitution _____

- | | | |
|--|-----|----|
| Does the substitution affect dimensions shown on drawings? | Yes | No |
| Does the substitution affect other trades? | Yes | No |
| Does the substitution affect the appearance? | Yes | No |
| Does the substitution differ in the options available from that specified? | Yes | No |
| Does the manufacturer's guarantee differ from that specified? | Yes | No |

If you indicated "Yes" to any of the items above, or if there are any other differences, attach a thorough explanation on company letterhead. If differences are not noted and acknowledged in writing by Architect, product must equal the specification requirements.

The proposed substitution was used within the last 24 months on the following project without failure:

Project Name _____
Location _____
Architect _____ Telephone _____
Owner _____ Telephone _____

The undersigned states that the function, appearance, and quality are equivalent to or superior to the specified item.

Submitted By: _____
Date: _____
Firm Name: _____
Address: _____

Phone: _____
Email: _____

For Architect/Engineer	
<input type="checkbox"/>	Accepted
<input type="checkbox"/>	Accepted as Noted
<input type="checkbox"/>	Rejected: not enough information
<input type="checkbox"/>	Rejected: does not meet specifications
<input type="checkbox"/>	Rejected: not received on time
By	_____
Date	_____
Remarks	_____

SECTION 013000 - ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Coordination and Project conditions.
- B. Preconstruction meeting.
- C. Progress meetings.
- D. Preinstallation meetings.
- E. Closeout meeting.

1.2 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of various Sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Verify that utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate Work of various Sections having interdependent responsibilities for installing, connecting to, and placing operating equipment in service.
- C. Coordinate space requirements, supports, and installation of mechanical and electrical Work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit as closely as practical; place runs parallel with lines of building. Use spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
 - 1. Coordination Drawings: Prepare as required to coordinate all portions of Work. Show relationship and integration of different construction elements that require coordination during fabrication or installation to fit in space provided or to function as intended. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are important.
- D. Coordination Meetings: In addition to other meetings specified in this Section, hold coordination meetings with personnel and Subcontractors to ensure coordination of Work.
- E. In finished areas, conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of Work of separate Sections in preparation for Substantial Completion.

1.3 PRECONSTRUCTION MEETING

- A. Architect/Engineer will schedule and preside over meeting after Notice of Award.
- B. Attendance Required: Architect/Engineer, Owner, Owner's Representative, Contractor's Project Manager, and Contractor's Job Foreman.
- C. Agenda:
 - 1. Review of Owner-Contractor Agreement.
 - 2. Distribution of Contract Documents.
 - 3. Communication procedures.
 - 4. Designation of personnel representing parties in Contract and Architect/Engineer.
 - 5. Procedures and processing of requests for interpretations, field decisions, submittals, substitutions, Applications for Payments, proposal request, Change Orders, and Contract closeout procedures.
 - 6. Scheduling.
- D. Record minutes and distribute copies to participants within two days after meeting, to Architect/Engineer, Owner, and those affected by decisions made.

1.4 PROGRESS MEETINGS

- A. Meetings may be scheduled throughout progress of the Work as determined during the pre-construction meeting.
- B. Architect/Engineer will make arrangements for meetings, prepare agenda with copies for participants, and preside over meetings.
- C. Attendance Required: Job superintendent, and Architect/Engineer, Owner, as appropriate to agenda topics for each meeting.

1.5 CLOSEOUT MEETING

- A. Schedule Project closeout meeting with sufficient time to prepare for requesting Substantial Completion. Preside over meeting and be responsible for minutes.
- B. Attendance Required: Contractor,, Architect/Engineer, Owner, and others appropriate to agenda.
- C. Notify Architect/Engineer four days in advance of meeting date.
- D. Minimum Agenda:
 - 1. Start-up of facilities and systems.
 - 2. Operations and maintenance manuals.
 - 3. Testing, adjusting, and balancing.
 - 4. System demonstration and observation.
 - 5. Operation and maintenance instructions for Owner's personnel.
 - 6. Contractor's inspection of Work.

7. Contractor's preparation of an initial "punch list."
8. Procedure to request Architect/Engineer inspection to determine date of Substantial Completion.
9. Completion time for correcting deficiencies.
10. Inspections by authorities having jurisdiction.
11. Closeout Submittals:
 - a. Project record documents.
 - b. Operating and maintenance documents.
 - c. Operating and maintenance materials.
12. Final Application for Payment.
13. Contractor's demobilization of Site.
14. Maintenance.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION -Not Used

END OF SECTION 013000

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Submittal procedures.
- B. Construction progress schedules.
- C. Proposed product list.
- D. Product data.
- E. Shop Drawings.
- F. Certificates.
- G. Manufacturer's instructions.
- H. Architect/Engineer review.

1.2 SUBMITTAL PROCEDURES

- A. Whenever practical, submittals shall be in PDF files as attachments to email. Subject line of email shall include the project name, submittal number, and specification section.
- B. Transmit each submittal with Architect/Engineer-accepted form.
- C. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.
- D. Identify: Project, Contractor, Subcontractor and supplier, pertinent Drawing and detail number, and Specification Section number appropriate to submittal.
- E. Apply Contractor's stamp, signed or initialed, certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is according to requirements of the Work and Contract Documents.
- F. Schedule submittals to expedite Project and submit electronic submittals via email as PDF electronic files. Coordinate submission of related items.
- G. For each submittal for review, allow 7 days excluding delivery time to and from Contractor.
- H. Identify variations in Contract Documents and product or system limitations that may be detrimental to successful performance of completed Work.
- I. Allow space on submittals for Contractor and Architect/Engineer review stamps.

- J. When revised for resubmission, identify changes made since previous submission.
- K. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.
- L. Submittals not requested will not be recognized nor processed.
- M. Incomplete Submittals: Architect/Engineer will not review. Complete submittals for each item are required. Delays resulting from incomplete submittals are not the responsibility of Architect/Engineer.

1.3 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial schedule within ten days of Notice of Award. After review, resubmit required revised data within ten days.
- B. Submit computer generated schedule.

1.4 PROPOSED PRODUCT LIST

- A. Within 15 days after date of Notice to Award, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, indicate manufacturer, trade name, model or catalog designation, and reference standards.

1.5 PRODUCT DATA

- A. Product Data: Action Submittal: Submit to Architect/Engineer for review for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Submit electronic submittals via email as PDF electronic files.
- C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- E. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 017000 - Execution and Closeout Requirements.

1.6 SHOP DRAWINGS

- A. Shop Drawings: Action Submittal: Submit to Architect/Engineer for assessing conformance with information given and design concept expressed in Contract Documents.

- B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. When required by individual Specification Sections, provide Shop Drawings signed and sealed by a professional Engineer responsible for designing components shown on Shop Drawings.
 - 1. Include signed and sealed calculations to support design.
 - 2. Submit Shop Drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
 - 3. Make revisions and provide additional information when required by authorities having jurisdiction.
- D. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 017000 - Execution and Closeout Requirements.

1.7 TEST REPORTS

- A. Informational Submittal: Submit reports for Architect/Engineer's knowledge as Contract administrator or for Owner.
- B. Submit test reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

1.8 CERTIFICATES

- A. Informational Submittal: Submit certification by manufacturer, installation/application Subcontractor, or Contractor to Architect/Engineer, in quantities specified for Product Data.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or product but must be acceptable to Architect/Engineer.

1.9 MANUFACTURER'S INSTRUCTIONS

- A. Informational Submittal: Submit manufacturer's installation instructions for Architect/Engineer's knowledge as Contract administrator or for Owner.
- B. Submit printed instructions for delivery, storage, assembly, installation, startup, adjusting, and finishing, to Architect/Engineer in quantities specified for Product Data.
- C. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.10 CONTRACTOR REVIEW

- A. Review for compliance with Contract Documents and approve submittals before transmitting to Architect/Engineer.
- B. Contractor: Responsible for:

1. Determination and verification of materials including manufacturer's catalog numbers.
 2. Determination and verification of field measurements and field construction criteria.
 3. Checking and coordinating information in submittal with requirements of Work and of Contract Documents.
 4. Determination of accuracy and completeness of dimensions and quantities.
 5. Confirmation and coordination of dimensions and field conditions at Site.
 6. Construction means, techniques, sequences, and procedures.
 7. Safety precautions.
 8. Coordination and performance of Work of all trades.
- C. Stamp, sign or initial, and date each submittal to certify compliance with requirements of Contract Documents.
- D. Do not fabricate products or begin Work for which submittals are required until approved submittals have been received from Architect/Engineer.

1.11 ARCHITECT/ENGINEER REVIEW

- A. Informational submittals and other similar data are for Architect/Engineer's information, do not require Architect/Engineer's responsive action, and will not be reviewed or returned with comment.
- B. Submittals made by Contractor that are not required by Contract Documents may be returned without action.
- C. Submittal approval does not authorize changes to Contract requirements unless accompanied by Change Order.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Quality control.
- B. Tolerances.
- C. References.
- D. Labeling.
- E. Testing and inspection services.
- F. Manufacturers' field services.

1.2 QUALITY CONTROL

- A. Monitor quality control over suppliers, manufacturers, products, services, Site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with specified standards as the minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- C. Perform Work using persons qualified to produce required and specified quality.
- D. Products, materials, and equipment may be subject to inspection by Architect/Engineer at place of manufacture or fabrication. Such inspections shall not relieve Contractor of complying with requirements of Contract Documents.
- E. Supervise performance of Work in such manner and by such means to ensure that Work, whether completed or in progress, will not be subjected to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.

1.3 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' recommended tolerances and tolerance requirements in reference standards. When such tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

1.4 REFERENCES

- A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date of Contract Documents except where specific date is established by code.
- C. Obtain copies of standards and maintain on Site when required by product Specification Sections.
- D. When requirements of indicated reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- E. Neither contractual relationships, duties, or responsibilities of parties in Contract nor those of Architect/Engineer shall be altered from Contract Documents by mention or inference in reference documents.

1.5 LABELING

- A. Attach label from agency approved by authorities having jurisdiction for products, assemblies, and systems required to be labeled by applicable code.
- B. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label:
 - 1. Model number.
 - 2. Serial number.
 - 3. Performance characteristics.

1.6 TESTING AND INSPECTION SERVICES

- A. Obtain services to test the water system supplying the boilers. Provide report with recommendations to Architect/Engineer and Owner.

1.7 MANUFACTURER'S FIELD SERVICES

- A. When specified in individual Specification Sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe Site conditions, conditions of surfaces and installation, quality of workmanship, startup of equipment, testing, adjusting, and balancing of equipment, and commissioning as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Architect/Engineer 30 days in advance of required observations.
- C. Report observations and Site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written instructions.
- D. Refer to Section 013300 - Submittal Procedures, "Manufacturer's Field Reports" Article.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 014000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Products.
- B. Product delivery requirements.
- C. Product storage and handling requirements.
- D. Product options.
- E. Equipment electrical characteristics and components.

1.2 PRODUCTS

- A. Furnish products of qualified manufacturers that are suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise. Confirm that manufacturer's production capacity can provide sufficient product, on time, to meet Project requirements.
- B. Do not use materials and equipment removed from existing premises except as specifically permitted by Contract Documents.

1.3 PRODUCT DELIVERY REQUIREMENTS

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

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products according to manufacturer's instructions.
- B. Store products with seals and labels intact and legible.
- C. Store sensitive products in weathertight, climate-controlled enclosures in an environment suitable to product.
- D. For exterior storage of fabricated products, place products on sloped supports aboveground.

- E. Provide bonded off-Site storage and protection when Site does not permit on-Site storage or protection.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.
- H. Provide equipment and personnel to store products; use methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.5 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Products complying with specified reference standards or description.
- B. Products Specified by Naming One or More Manufacturers: Products of one of manufacturers named and complying with Specifications; no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit Request for Substitution for any manufacturer not named, according to Section 012500 - Substitution Procedures.

PART 2 - PRODUCTS

2.1 EQUIPMENT ELECTRICAL CHARACTERISTICS AND COMPONENTS

- A. Wiring Terminations: Furnish terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Include lugs for terminal box.
- B. Cord and Plug: Furnish minimum 6-foot long cord and plug including grounding connector for connection to electric wiring system. Cord of longer length may be specified in individual Specification Sections.

PART 3 - EXECUTION - Not Used

END OF SECTION 016000

SECTION 017000 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Closeout procedures.
- B. Starting of systems.
- C. Demonstration and instructions.
- D. Testing, adjusting, and balancing.
- E. Project record documents.
- F. Operation and maintenance data.
- G. Manual for materials and finishes.
- H. Manual for equipment and systems.
- I. Spare parts and maintenance products.
- J. Product warranties and product bonds.
- K. Protecting installed construction.
- L. Final cleaning.

1.2 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Owner's Representative and Architect's/Engineer's review.
- B. Provide submittals to Architect required by authorities having jurisdiction. Architect will review documents and forward to Owner.
 - 1. Final Inspection certificates
- C. Punchlist: Prepare punchlist of items to be completed or corrected with Architect/Engineer.
- D. After Owner has accepted that the punchlist is complete, submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum retaining due. Retainage amount will be released as the Final Payment.
- E. Guarantee: Provide a one-year warranty on their Work, effective on the date of Owner's Final Acceptance that the Contract is Complete.

1.3 STARTING OF SYSTEMS

- A. Coordinate schedule for startup of various equipment and systems.
- B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- C. Verify that tests, meter readings, and electrical characteristics agree with those required by equipment or system manufacturer.
- D. Verify that wiring and support components for equipment are complete and tested.
- E. Execute startup under supervision of manufacturer's representative or Contractors' personnel according to manufacturer's instructions.
- F. When specified in individual Specification Sections, require manufacturer to provide authorized representative who will be present at Site to inspect, check, and approve equipment or system installation prior to startup and will supervise placing equipment or system in operation.

1.4 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of products to Owner's personnel prior to Owner's acceptance of Final Completion.
- B. Demonstrate Project equipment and instructed by qualified personnel who is knowledgeable about the Project.
- C. Use operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- D. Demonstrate startup, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment location.
- E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- F. Required instruction time for each item of equipment and system is specified in individual Specification Sections.

1.5 TESTING, ADJUSTING, AND BALANCING

- A. Contractor shall employ and pay for services of independent firm to perform testing, adjusting, and balancing.
- B. Reports will be submitted by independent firm to Architect/Engineer indicating observations and results of tests and indicating compliance or noncompliance with requirements of Contract Documents.

1.6 PROJECT RECORD DOCUMENTS

- A. Maintain on Site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed Shop Drawings, product data, and Samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress, not less than weekly.
- E. Specifications: Legibly mark and record, at each product Section, description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates used.
 - 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction as follows:
 - 1. Field changes of dimension and detail.
 - 2. Details not on original Drawings.
- G. Submit marked-up paper copy documents to Architect/Engineer with claim for final Application for Payment.

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit in PDF composite electronic indexed file.
- B. Submit data bound in 8-1/2 x 11-inch text pages, three D side ring binders with durable covers.
- C. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," title of Project.
- D. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- E. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- F. Contents: Prepare table of contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
 - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.
 - 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by Specification Section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Include the following:

- a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.
 - d. Operating instructions.
 - e. Maintenance instructions for equipment and systems.
 - f. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
 - g. Safety precautions to be taken when operating and maintaining or working near equipment.
3. Part 3: Project documents and certificates, including the following:
- a. Shop Drawings and product data.
 - b. Air and water balance reports.
 - c. Certificates.
 - d. Originals of warranties and bonds.

1.8 MANUAL FOR MATERIALS AND FINISHES

- A. Submit one printed copy of preliminary draft or proposed formats and outlines of contents before start of Work. Architect/Engineer will review draft and return one copy with comments.
- B. For equipment or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
- C. Submit one copy of completed volumes at Substantial Completion. Draft copy be reviewed and returned after final inspection, with Architect/Engineer comments. Revise content of document sets as required prior to final submission.
- D. Submit one printed and bound set of revised final volumes within ten days after final inspection.
- E. Submit in PDF composite electronic indexed file of final manual.
- F. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Include information for re-ordering custom-manufactured products.
- G. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- H. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Include recommendations for inspections, maintenance, and repair.
- I. Additional Requirements: As specified in individual product Specification Sections.
- J. Include listing in table of contents for design data, with tabbed fly sheet and space for insertion of data.

1.9 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit one printed copy of preliminary draft or proposed formats and outlines of contents before start of Work. Architect/Engineer will review draft and return one copy with comments.
- B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
- C. Submit one copy of completed volumes at Substantial Completion. Draft copy will be reviewed and returned after final inspection, with Architect/Engineer comments. Revise content of document sets as required prior to final submission.
- D. Submit one set of revised final volumes within ten days after final inspection.
- E. Submit in PDF composite electronic indexed file of final manual.
- F. Each Item of Equipment and Each System: Include description of unit or system and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.
- G. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- H. Include color-coded wiring diagrams as installed.
- I. Operating Procedures: Include startup, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and special operating instructions.
- J. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- K. Include servicing and lubrication schedule and list of lubricants required.
- L. Include manufacturer's printed operation and maintenance instructions.
- M. Include sequence of operation by controls manufacturer.
- N. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- O. Include control diagrams by controls manufacturer as installed.
- P. Include Contractor's coordination drawings with color-coded piping diagrams as installed.
- Q. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- R. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

- S. Include test and balancing reports as specified in Section 014000 - Quality Requirements.
- T. Additional Requirements: As specified in individual product Specification Sections.
- U. Include listing in table of contents for design data with tabbed dividers and space for insertion of data.

1.10 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Furnish spare parts, maintenance, and extra products in quantities specified in individual Specification Sections.
- B. Deliver to Project Site place in location as directed by Owner; obtain receipt prior to final payment.

1.11 PRODUCT WARRANTIES AND PRODUCT BONDS

- A. Obtain warranties and bonds executed in duplicate by responsible Subcontractors, suppliers, and manufacturers within ten days after completion of applicable item of Work.
- B. Execute and assemble transferable warranty documents and bonds from Subcontractors, suppliers, and manufacturers.
- C. Verify documents are in proper form, contain full information, and are notarized.
- D. Co-execute submittals when required.
- E. Include table of contents and assemble in three D side ring binder with durable cover.
- F. Submit prior to final Application for Payment.
- G. Time of Submittals:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
 - 2. Make other submittals within ten days after date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Substantial Completion, submit within ten days after acceptance, listing date of acceptance as beginning of warranty or bond period.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that existing Site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

- B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual Specification Sections.
- D. Verify that utility services are available with correct characteristics and in correct locations.

3.2 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance according to manufacturer's instructions.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer-required or -recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

3.3 EXECUTION

- A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.
- B. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- C. Verify that field measurements are as indicated on approved Shop Drawings or as instructed by manufacturer.
- D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
 - 1. Secure Work true to line and level and within specified tolerances, or if not specified, industry-recognized tolerances.
 - 2. Physically separate products in place, provide electrical insulation, or provide protective coatings to prevent galvanic action or corrosion between dissimilar metals.
 - 3. Exposed Joints: Provide uniform joint width and arrange to obtain best visual effect. Refer questionable visual-effect choices to Architect/Engineer for final decision.
- E. Allow for expansion of materials and building movement.
- F. Climatic Conditions and Project Status: Install each unit of Work under conditions to ensure best possible results in coordination with entire Project.
 - 1. Isolate each unit of Work from incompatible Work as necessary to prevent deterioration.
 - 2. Coordinate enclosure of Work with required inspections and tests to minimize necessity of uncovering Work for those purposes.
- G. Mounting Heights: Where not indicated, mount individual units of Work at industry recognized standard mounting heights for particular application indicated.

1. Refer questionable mounting heights choices to Architect/Engineer for final decision.
2. Elements Identified as Accessible to Handicapped: Comply with applicable codes and regulations.

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

I. Clean and perform maintenance on installed Work as frequently as necessary through remainder of construction period. Lubricate operable components as recommended by manufacturer.

3.4 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual Specification Sections.

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

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

D. Use durable sheet materials to protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects.

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

F. Prohibit traffic from landscaped areas.

3.5 FINAL CLEANING

A. Execute final cleaning prior to final Project assessment.

B. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains, and foreign substances; polish transparent and glossy surfaces.

C. Clean equipment and fixtures to sanitary condition with appropriate cleaning materials.

D. Replace filters of operating equipment.

E. Remove waste and surplus materials, rubbish, and construction facilities from Site.

END OF SECTION 017000

SECTION 22 11 00

FACILITY WATER DISTRIBUTION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Domestic water piping, above grade.
 - 2. Unions and flanges.
 - 3. Valves.

1.2 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - 2. ASME B31.9 - Building Services Piping.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data:
 - 1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturer's catalog information.

1.4 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

1.5 QUALIFICATIONS

- A. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Accept valves and equipment on site in shipping containers with labeling in place. Inspect for damage.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements.
- B. Do not install underground piping when bedding is wet or frozen.

1.8 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.9 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 PRODUCTS

2.1 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Tubing: ASTM B88, Type L, drawn.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Joints: ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, solder AWS A5.8 Classification BCuP-3 or BCuP-4 silver braze.
- B. Copper Tubing: ASTM B88, Type L drawn, with Press Fittings.
 - 1. Press Fitting: Copper and Copper Alloy press fittings shall conform to the material and sizing requirements of ASME A312 or ASTM A554. O-rings for press fittings shall be EPDM, or FKM, depending on the application.
 - 2. Press Connections: Copper and Copper Alloy press fittings shall be made in accordance with the manufacturer's installation instructions. The pipe shall be fully inserted into the fitting and the pipe marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the pipe to assure the pipe is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.
 - 3. Threaded Fittings: Pipe Threads shall conform to ASME B1.20.1.
 - 4. Threaded Joints: Threaded joints shall have pipe joint compound or teflon tape applied to the male threads only. Tighten joint with a wrench and backup wrench as required.

2.2 UNIONS AND FLANGES

- A. Unions for Pipe 2 inches and Smaller:
 - 1. Ferrous Piping: Class 150, malleable iron, threaded.
 - 2. Copper Piping: Class 150, bronze unions with soldered.
 - 3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
- B. Flanges for Pipe 2-1/2 inches and Larger:
 - 1. Ferrous Piping: Class 150, forged steel, slip-on flanges.
 - 2. Copper Piping: Class 150, slip-on bronze flanges.

3. Gaskets: 1/16 inch thick preformed neoprene gaskets.

2.3 GATE VALVES

- A. Manufacturers:
 1. Milwaukee Valve Company
 2. NIBCO, Inc.
 3. Substitutions: Section 01 60 00 - Product Requirements.
- B. 2 inches and Smaller: MSS SP 80, Class 125, bronze body, bronze trim, threaded bonnet, rising stem, inside screw with back-seating stem, solid wedge disc, alloy seat rings, solder or threaded ends.
- C. 2-1/2 inches and Larger: MSS SP 70, Class 125, cast iron body, bronze trim, bolted bonnet, rising stem, hand-wheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged ends. Furnish chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

2.4 GLOBE VALVES

- A. Manufacturers:
 1. Milwaukee Valve Company
 2. NIBCO, Inc.
 3. Substitutions: Section 01 60 00 - Product Requirements.
- B. 2 inches and Smaller: MSS SP 80, Class 125, bronze body, bronze trim, threaded bonnet, hand wheel, Buna-N composition disc, solder or threaded ends.
- C. 2-1/2 inches and Larger: MSS SP 85, Class 125, cast iron body, bronze trim, hand wheel, outside screw and yoke, flanged ends. Furnish chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

2.5 BALL VALVES

- A. Manufacturers:
 1. Milwaukee Valve Company
 2. NIBCO, Inc.
 3. Substitutions: Section 01 60 00 - Product Requirements.
- B. 2 inches and Smaller: MSS SP 110, Class 150, bronze, three piece body, chrome plated bronze ball, regular port, teflon seats, blow-out proof stem, solder or threaded ends, lever handle.

2.6 PLUG VALVES

- A. Manufacturers:
 1. DeZURIK, Unit of SPX Corp.
 2. Flow Control Equipment, Inc
 3. Homestead Valve
 4. Substitutions: Section 01 60 00 - Product Requirements.

- B. 2 inches and Smaller: MSS SP 78, Class 150, semi-steel construction, round port, full pipe area, pressure lubricated, teflon packing, threaded ends. Furnish one plug valve wrench for every ten plug-valves with minimum of one wrench.
- C. 2-1/2 inches and Larger: MSS SP 78, Class 150, semi-steel construction, round port, regular opening, pressure lubricated, teflon packing, flanged ends. Furnish wrench-operated.

2.7 CHECK VALVES

- A. Horizontal Swing Check Valves:
 - 1. Manufacturers; Horizontal Swing Check Valves:
 - a. NIBCO INC.
 - b. Substitutions: Section 01 60 00 - Product Requirements.
 - 2. 2 inches and Smaller: MSS SP 80, Class 150, bronze body and cap, bronze seat, Buna-N disc, solder or threaded ends.
 - 3. 2-1/2 inches and Larger: MSS SP 71, Class 125, cast iron body, bolted cap, bronze or cast iron disc, renewable disc seal and seat, flanged ends.
- B. Spring Loaded Check Valves:
 - 1. Manufacturers; Spring Loaded Check Valves:
 - a. NIBCO INC.
 - b. Substitutions: Section 01 60 00 - Product Requirements.
 - 2. 2 inches and Smaller: MSS SP 80, Class 250, bronze body, in-line spring lift check, silent closing, Buna-N disc, integral seat, solder or threaded ends.
 - 3. 2-1/2 inches and Larger: MSS SP 71, Class 125, wafer style, cast iron body, bronze seat, center guided bronze disc, stainless steel spring and screws, flanged ends.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.

3.3 INSTALLATION - ABOVE GROUND PIPING

- A. Install non-conducting dielectric connections wherever jointing dissimilar metals.
- B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- C. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.

- D. Group piping whenever practical at common elevations.
- E. Slope piping and arrange systems to drain at low points.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not accessible.
- I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- J. Provide support for utility meters in accordance with requirements of utility companies.
- K. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
- L. Install domestic water piping in accordance with ASME B31.9.
- M. Install unions downstream of valves and at equipment or apparatus connections.
- N. Install valves with stems upright or horizontal, not inverted.
- O. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- P. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- Q. Install ball valves for throttling, bypass, or manual flow control services.
- R. Provide lug end butterfly valves adjacent to equipment when functioning to isolate equipment.
- S. Install potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibs.
- T. Pipe relief from valves, back-flow preventers and drains to nearest floor drain.
- U. Test backflow preventers in accordance with ASSE 5013.

3.4 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Test domestic water piping system in accordance with local authority having jurisdiction.

3.5 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

END OF SECTION

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pipe hangers and supports.
 - 2. Hanger rods.
 - 3. Inserts.
 - 4. Flashing.
 - 5. Sleeves.
 - 6. Mechanical sleeve seals.
 - 7. Equipment bases and supports.

- B. Related Sections:
 - 1. Section 23 11 23 - Facility Natural-Gas Piping: Execution requirements for placement of hangers and supports specified by this section.
 - 2. Section 23 22 13 - Steam and Condensate Heating Piping: Execution requirements for placement of hangers and supports specified by this section.

1.2 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME B31.9 - Building Services Piping.

- B. ASTM International:
 - 1. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 2. ASTM E814 - Standard Test Method for Fire Tests of Through Penetration Fire Stops.
 - 3. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

- C. American Welding Society:
 - 1. AWS D1.1 - Structural Welding Code - Steel.

- D. Manufacturers Standardization Society of the Valve and Fittings Industry:
 - 1. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

- B. Product Data:
 - 1. Hangers and Supports: Submit manufacturers catalog data including load capacity.

- C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years experience.
- B. Installer: Company specializing in performing Work of this section with minimum 3 years experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- C. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Provide ventilation in areas to receive solvent cured materials.

1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.8 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for pipe hangers and supports.

PART 2 PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

- A. Manufacturers:
 - 1. ERICO International Corporation.
 - 2. Hilti, Inc.
 - 3. NIBCO INC.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Steam and Steam Condensate Piping:
 - 1. Conform to ASME B31.1.
 - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
 - 3. Hangers for Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.
 - 4. Hangers for Pipe Sizes 6 inches and Larger: Adjustable steel yoke, cast iron roll, double hanger.

5. Multiple or Trapeze Hangers for Pipe Sizes 4 inches and Smaller: Steel channels with welded spacers and hanger rods.
6. Multiple or Trapeze Hangers for Pipe Sizes 6 inches and Larger: Steel channels with welded spacers and hanger rods; cast-iron roll and stand.
7. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hooks.
8. Wall Support for Pipe Sizes 4 to 5 inches: Welded steel bracket and wrought steel clamp.
9. Wall Support for Pipe Sizes 6 inches and Larger: Welded steel bracket and wrought steel clamp; adjustable steel yoke and cast iron roll.
10. Vertical Support: Steel riser clamp.
11. Floor Support for Pipe Sizes 4 inches and Smaller: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
12. Floor Support for Pipe Sizes 6 inches and Larger: Adjustable cast iron roll and stand steel screws, and concrete pier or steel support.
13. Copper Pipe Support: Copper-plated carbon-steel ring.

2.2 ACCESSORIES

- A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.3 INSERTS

- A. Manufacturers:
 1. ERICO International Corporation.
 2. Hilti, Inc.
 3. Substitutions: Section 01 60 00 - Product Requirements.
- B. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.4 FLASHING

- A. Metal Flashing: 26 gage thick galvanized steel.
- B. Metal Counterflashing: 22 gage thick galvanized steel.
- C. Lead Flashing:
 1. Waterproofing: 5 lb./sq. ft sheet lead.
 2. Soundproofing: 1 lb./sq. ft sheet lead.
- D. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.
- E. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

2.5 SLEEVES

- A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage thick galvanized steel.

- B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.
- C. Sleeves for Round Ductwork: Galvanized steel.
- D. Sleeves for Rectangular Ductwork: Galvanized steel or wood.
- E. Sealant: Acrylic.

2.6 MECHANICAL SLEEVE SEALS

- A. Manufacturers:
 - 1. Linkseal-EnPro Industries.
 - 2. Metraflex Company.
 - 3. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

PART 3 EXECUTION

3.1 INSTALLATION - INSERTS

- A. Install inserts for placement in concrete forms.
- B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.
- D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

3.2 INSTALLATION - PIPE HANGERS AND SUPPORTS

- A. Install in accordance with ASME B31.1.
- B. Support horizontal piping as scheduled.
- C. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.
- D. Place hangers within 12 inches of each horizontal elbow.

- E. Use hangers with 1-1/2 inch minimum vertical adjustment.
- F. Support vertical piping at every floor.
- G. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.
- H. Support riser piping independently of connected horizontal piping.
- I. Provide copper plated hangers and supports for copper piping.
- J. Design hangers for pipe movement without disengagement of supported pipe.
- K. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- L. Provide clearance in hangers and from structure and other equipment for installation of insulation. Refer to Section 22 07 00.

3.3 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 6 inches beyond supported equipment.
- B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct supports of steel members. Brace and fasten with flanges bolted to structure.
- D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.4 INSTALLATION - FLASHING

- A. Provide flexible flashing and metal Counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms for sound control.
- C. Provide curbs for roof installations 14 inches minimum high above roofing surface. Flash and counter-flash with sheet metal; seal watertight. Attach Counterflashing to equipment and lap base flashing on roof curbs. Flatten and solder joints.
- D. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.5 INSTALLATION - SLEEVES

- A. Exterior watertight entries: Seal with mechanical sleeve seals.

- B. Set sleeves in position in forms. Provide reinforcing around sleeves.
- C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- D. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.
- E. Install chrome plated steel escutcheons at finished surfaces.

3.6 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for inspecting, testing.

3.7 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect adjacent surfaces from damage by material installation.

3.8 SCHEDULES

- A. Copper and Steel Pipe Hanger Spacing: per applicable code.

END OF SECTION

SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Nameplates.
 - 2. Tags.
 - 3. Stencils.
 - 4. Pipe markers.
 - 5. Labels.

1.2 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME A13.1 - Scheme for the Identification of Piping Systems.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit manufacturers catalog literature for each product required.
- C. Shop Drawings: Submit list of wording, symbols, letter size, and color coding for mechanical identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of tagged valves; include valve tag numbers.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years experience.

PART 2 PRODUCTS

2.1 NAMEPLATES

- A. Manufacturers; Name Plates:
 - 1. Seton Identification Products
 - 2. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

2.2 TAGS

- A. Manufacturers; Plastic Tags:
 - 1. Seton Identification Products
 - 2. Substitutions: Section 01 60 00 - Product Requirements.
 - 3. Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inches diameter.
- B. Manufacturers; Metal Tags:
 - 1. Seton Identification Products
 - 2. Substitutions: Section 01 60 00 - Product Requirements.
 - 3. Brass with stamped letters; tag size minimum 1-1/2 inches diameter with finished edges.
- C. Manufacturers; Information Tags:
 - 1. Seton Identification Products
 - 2. Substitutions: Section 01 60 00 - Product Requirements.
 - 3. Clear plastic with printed "Danger," "Caution," or "Warning" and message; size 3-1/4 x 5-5/8 inches with grommet and self-locking nylon ties.
- D. Tag Chart: Typewritten letter size list of applied tags and location in anodized aluminum frame.

2.3 PIPE MARKERS

- A. Color and Lettering: Conform to ASME A13.1.
- B. Manufacturers; Pipe Marker:
 - 1. Seton Identification Products
 - 2. Substitutions: Section 01 60 00 - Product Requirements.
 - 3. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.
- C. Manufacturers; Plastic Tape Pipe Marker:
 - 1. Seton Identification Products
 - 2. Substitutions: Section 01 60 00 - Product Requirements.
 - 3. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.4 UNDERGROUND WARNING TAPE

- A. Manufacturers; Underground Warning Tape:
 - 1. Seton Identification Products
 - 2. Substitutions: Section 01 60 00 - Product Requirements.
- B. Description: Polyethylene tape with metallic core for detection and location of piping with metal detector resistant to acids, alkalis and other soil components.
 - 1. Size: 0.004 inch6 inches
 - 2. Printed text as selected by Architect/Engineer in black color and repeated at maximum 40 inchintervals.

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces for stencil painting.

3.2 INSTALLATION

- A. Apply stencil painting.
- B. Install identifying devices after completion of coverings and painting.
- C. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.
- D. Install labels with sufficient adhesive for permanent adhesion and seal with clear lacquer. For unfinished canvas covering, apply paint primer before applying labels.
- E. Install tags using corrosion resistant chain. Number tags consecutively by location.
- F. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- G. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Identify in-line pumps and other small devices with tags.
- H. Identify control panels and major control components outside panels with plastic nameplates.
- I. Identify valves in main and branch piping with tags.
- J. Identify air terminal units and radiator valves with numbered tags.
- K. Tag automatic controls, instruments, and relays. Key to control schematic.

- L. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.
- M. For exposed natural gas lines, attach yellow pipe labels with "GAS" in black lettering, at maximum 5 foot spacing.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Testing adjusting, and balancing of steam systems.
 - 2. Measurement of final operating condition of HVAC systems.

1.2 REFERENCES

- A. Testing Adjusting and Balancing Bureau:
 - 1. TABB - International Standards for Environmental Systems Balance.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Prior to commencing Work, submit proof of latest calibration date of each instrument.
- C. Test Reports: Indicate data on forms prepared following ASHRAE 111. Submit data in S.I. units.
- D. Field Reports: Indicate deficiencies preventing proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
- E. Submit draft copies of report for review prior to final acceptance of Project.
- F. Furnish reports in soft cover, letter size, 3-ring binder manuals, complete with table of contents page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

1.4 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of balancing valves and rough setting.
- C. Operation and Maintenance Data: Furnish final copy of testing, adjusting, and balancing report inclusion in operating and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with ASHRAE 111.

- B. Maintain one copy of each document on site.
- C. Prior to commencing Work, calibrate each instrument to be used.

1.6 QUALIFICATIONS

- A. Agency: Company specializing in testing, adjusting, and balancing of systems specified in this section with minimum three years experience certified by TABB.

1.7 SEQUENCING

- A. Section 01 10 00 - Summary: Work sequence.
- B. Sequence balancing between completion of systems tested and Date of Substantial Completion.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify systems are complete and operable before commencing work. Verify the following:
 1. Systems are started and operating in safe and normal condition.
 2. HVAC control systems are installed complete and operable.
 3. Proper thermal overload protection is in place for electrical equipment.
 4. Duct systems are clean of debris.
 5. Duct system leakage is minimized.
 6. Pumps are rotating correctly.
 7. Proper strainer baskets are clean and in place or in normal position.
 8. Service and balancing valves are open.

3.2 PREPARATION

- A. Furnish instruments required for testing, adjusting, and balancing operations.
- B. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

3.3 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.
- B. Verify recorded data represents actual measured or observed conditions.

- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. After adjustment, take measurements to verify balance has not been disrupted. If disrupted, verify correcting adjustments have been made.
- E. Report defects and deficiencies noted during performance of services, preventing system balance.
- F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.4 STEAM SYSTEM PROCEDURE

- A. Do not use service or shut-off valves for balancing unless designed for balancing and shut-off functions. Where available pump capacity is less than total flow requirements or individual system parts, simulate full flow in one part by temporary restriction of flow to other parts.

3.5 SCHEDULES

- A. Partial list of Equipment Requiring Testing, Adjusting, and Balancing:
 - 1. Steam Condensate Pumps.
- B. Report Forms
 - 1. Title Page:
 - a. Name of Testing, Adjusting, and Balancing Agency
 - b. Address of Testing, Adjusting, and Balancing Agency
 - c. Telephone and facsimile numbers of Testing, Adjusting, and Balancing Agency
 - d. Project name
 - e. Project location
 - f. Project Architect
 - g. Project Engineer
 - h. Project Contractor
 - i. Project altitude
 - j. Report date
 - 2. Summary Comments:
 - a. Design versus final performance
 - b. Notable characteristics of system
 - c. Description of systems operation sequence
 - d. Summary of outdoor and exhaust flows to indicate building pressurization
 - e. Nomenclature used throughout report
 - f. Test conditions
 - 3. Instrument List:
 - a. Instrument
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Range
 - f. Calibration date
 - 4. Pump Data:

- a. Identification/number
 - b. Manufacturer
 - c. Size/model
 - d. Impeller
 - e. Service
 - f. Design flow rate, pressure drop, BHP and kW
 - g. Actual flow rate, pressure drop, BHP and kW
 - h. Discharge pressure
 - i. Suction pressure
 - j. Total operating head pressure
 - k. Shut off, discharge and suction pressures
 - l. Shut off, total head pressure
5. Combustion Test:
- a. Manufacturer
 - b. Model number
 - c. Serial number
 - d. Firing rate
 - e. Overfire draft
 - f. Gas meter timing dial size
 - g. Gas meter time per revolution
 - h. Gas pressure at meter outlet
 - i. Gas flow rate
 - j. Heat input
 - k. Burner manifold gas pressure
 - l. Percent carbon monoxide (CO)
 - m. Percent carbon dioxide (CO₂)
 - n. Percent oxygen (O₂)
 - o. Percent excess air
 - p. Flue gas temperature at outlet
 - q. Ambient temperature
 - r. Net stack temperature
 - s. Percent stack loss
 - t. Percent combustion efficiency
 - u. Heat output

END OF SECTION

SECTION 23 07 00
HVAC INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. HVAC piping insulation, jackets and accessories.

1.2 REFERENCES

- A. ASTM International:
1. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 2. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
 3. ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.
- C. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 450 in accordance with ASTM E84.
- B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.
- C. Factory fabricated fitting covers manufactured in accordance with ASTM C450.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

- B. Applicator: Company specializing in performing Work of this section with minimum three years experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- C. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.
- C. Maintain temperature before, during, and after installation for minimum period of 24 hours.

1.8 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.9 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish standard manufacturer warranty for man made fiber.

PART 2 PRODUCTS

2.1 PIPE INSULATION

- A. TYPE P-1: (Low pressure steam supply up to 15 psi and low pressure condensate return) ASTM C547, molded glass fiber pipe insulation.
 - 1. Thermal Conductivity: 0.23 at 75 degrees F.
 - 2. Operating Temperature Range: 0 to 850 degrees F.
 - 3. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied reinforced foil kraft with self-sealing adhesive joints.
 - 4. Jacket Temperature Limit: minus 20 to 150 degrees F.

2.2 PIPE INSULATION JACKETS

- A. Vapor Retarder Jacket:

1. ASTM C921, white Kraft paper with glass fiber yarn, bonded to aluminized film.
 2. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.
- B. PVC Plastic Pipe Jacket:
1. Product Description: ASTM D1785, One piece molded type fitting covers and sheet material, off-white color.
 2. Thickness: 10 mil.
 3. Connections: Brush on welding adhesive.
- C. ABS Plastic Pipe Jacket:
1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 2. Minimum service temperature: -40degrees F.
 3. Maximum service temperature of 180 degrees F.
 4. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.
 5. Thickness: 30 mil.
 6. Connections: Brush on welding adhesive.
- D. Aluminum Pipe Jacket:
1. ASTM B209.
 2. Thickness: 0.016 inch thick sheet.
 3. Finish: Smooth.
 4. Joining: Longitudinal slip joints and 2 inch laps.
 5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
 6. Metal Jacket Bands: 3/8 inch wide;
- E. Stainless Steel Pipe Jacket:
1. ASTM ASTM A240/A240M OR ASTM 666 Type 302 stainless steel.
 2. Thickness: 0.010inch thick.
 3. Finish: Smooth.
 4. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.
- F. Field Applied Glass Fiber Fabric Jacket System:
1. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
 2. Glass Fiber Fabric:
 - a. Cloth: Untreated; 9 oz/sq yd weight.
 - b. Blanket: 1.0 lb/cu ft density.
 - c. Weave: 5 x 5.
 3. Indoor Vapor Retarder Finish:
 - a. Cloth: Untreated; 9 oz/sq yd weight.
 - b. Vinyl emulsion type acrylic, compatible with insulation, white color.

2.3 PIPE INSULATION ACCESSORIES

- A. Vapor Retarder Lap Adhesive: Compatible with insulation.
- B. Covering Adhesive Mastic: Compatible with insulation.
- C. Piping 1-1/2 inches diameter and smaller: Galvanized steel insulation protection shield. MSS SP-69, Type 40. Length: Based on pipe size and insulation thickness.

- D. Piping 2 inches diameter and larger: Wood insulation saddle, hard maple. Inserts length: not less than 6 inches long, matching thickness and contour of adjoining insulation.
- E. Closed Cell Elastomeric Insulation Pipe Hanger: Polyurethane insert with aluminum single piece construction with self-adhesive closure. Thickness to match pipe insulation.
- F. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- G. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449/C449M.
- H. Insulating Cement: ASTM C195; hydraulic setting on mineral wool.
- I. Adhesives: Compatible with insulation.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify piping has been tested before applying insulation materials.
- C. Verify surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION - PIPING SYSTEMS

- A. Piping Exposed to View in Finished Spaces: Locate insulation and cover seams in least visible locations.
- B. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Refer to Section 07 84 00 for penetrations of assemblies with fire resistance rating greater than one hour.
- C. Piping Systems Conveying Fluids Below Ambient Temperature:
 - 1. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
 - 2. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
 - 3. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.
- D. Glass Fiber Board Insulation:
 - 1. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

2. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
 3. Cover wire mesh or bands with cement to a thickness to remove surface irregularities.
- E. Extruded Polystyrene Insulation:
1. Wrap elbows and fitting with vapor retarder tape.
 2. Seal butt joints with vapor retarder tape.
- F. Hot Piping Systems less than 140 degrees F:
1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
 3. Do not insulate unions and flanges at equipment, but bevel and seal ends of insulation at such locations.
- G. Hot Piping Systems greater than 140 degrees F:
1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
 3. Insulate flanges and unions at equipment.
- H. Inserts and Shields:
1. Piping 1-1/2 inches Diameter and Smaller: Install galvanized steel shield between pipe hanger and insulation.
 2. Piping 2 inches Diameter and Larger: Install insert between support shield and piping and under finish jacket.
 - a. Insert Configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.
 - b. Insert Material: Compression resistant insulating material suitable for planned temperature range and service.
 3. Piping Supported by Roller Type Pipe Hangers: Install galvanized steel shield between roller and inserts.
- I. Insulation Terminating Points:
1. Coil Branch Piping 1 inch and Smaller: Terminate hot water piping at union upstream of the coil control valve.
 2. Chilled Water Coil Branch Piping: Insulate chilled water piping and associated components up to coil connection.
 3. Condensate Piping: Insulate entire piping system and components to prevent condensation.
- J. Closed Cell Elastomeric Insulation:
1. Push insulation on to piping.
 2. Miter joints at elbows.
 3. Seal seams and butt joints with manufacturer's recommended adhesive.
 4. When application requires multiple layers, apply with joints staggered.

5. Insulate fittings and valves with insulation of like material and thickness as adjacent pipe.
- K. High Temperature Pipe Insulation:
1. Install in multiple layers to meet thickness scheduled.
 2. Attach each layer with bands. Secure first layer with bands before installing next layer.
 3. Stagger joints between layers.
 4. Finish with canvas jacket.
- L. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.

END OF SECTION

SECTION 23 11 23

FACILITY NATURAL-GAS PIPING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Natural gas piping above grade.
 - 2. Unions and flanges.
 - 3. Valves.
 - 4. Pipe hangers and supports.
 - 5. Strainers.
 - 6. Natural gas pressure regulators.
 - 7. Natural gas pressure relief valves.

- B. Related Sections:
 - 1. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment: Product requirements for pipe hangers and supports [and firestopping] for placement by this section.
 - 2. Section 23 05 53 - Identification for HVAC Piping and Equipment: Product requirements for valve and pipe identification for placement by this section.

1.2 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME B16.3 - Malleable Iron Threaded Fittings.
 - 2. ASME B31.9 - Building Services Piping.
 - 3. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

- B. ASTM International:
 - 1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 2. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
 - 3. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

- C. American Welding Society:
 - 1. AWS D1.1 - Structural Welding Code - Steel.

- D. Manufacturers Standardization Society of the Valve and Fittings Industry:
 - 1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
 - 2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
 - 3. MSS SP 78 - Cast Iron Plug Valves, Flanged and Threaded Ends.
 - 4. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
 - 5. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

- E. National Fire Protection Association:
 - 1. NFPA 54 - National Fuel Gas Code.
- F. Underwriters Laboratories Inc.:
 - 1. UL 842 - Valves for Flammable Fluids.

1.3 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections when joining dissimilar metals in systems.
- B. Provide flanges, unions, or couplings at locations requiring servicing. Use unions, flanges, or couplings downstream of valves and at equipment connections. Do not use direct welded or threaded connections to valves, equipment.
- C. Provide pipe hangers and supports in accordance with ASME B31.9.
- D. Use plug, or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data:
 - 1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
 - 2. Piping Specialties: Submit manufacturers catalog information including capacity, rough-in requirements, and service sizes for the following:
 - a. Strainers.
 - b. Natural gas pressure regulators.
 - c. Natural gas pressure relief valves.
- C. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit for gas pressure regulators installation instructions, spare parts lists, and exploded assembly views.

1.6 QUALITY ASSURANCE

- A. Perform natural gas Work in accordance with NFPA 54.
- B. Perform Work in accordance with ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.

- C. Furnish shutoff valves complying with ASME B16.33 or ANSI Z21.15.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- C. Protect piping and fittings from soil and debris with temporary end caps and closures. Maintain in place until installation. Furnish temporary protective coating on cast iron and steel valves.

1.9 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.10 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

PART 2 PRODUCTS

2.1 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M forged steel welding type.
 - 2. Joints: Threaded for pipe 2 inch and smaller; welded for pipe 2-1/2 inches and larger.

2.2 REGULATOR VENT PIPING, ABOVE GRADE

- A. Indoors: Same as natural gas piping, above grade.
- B. Outdoors: PVC pipe, tubing, and fittings, UL 651.

2.3 UNIONS AND FLANGES

- A. Unions for Pipe 2 inches and Smaller:
 - 1. Ferrous Piping: Class 150, malleable iron, threaded.
 - 2. Copper Piping: Class 150, bronze unions with soldered.
 - 3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

- B. Flanges for Pipe 2-1/2 inches and Larger:
 - 1. Ferrous Piping: Class 150, forged steel, slip-on flanges.
 - 2. Copper Piping: Class 150, slip-on bronze flanges.
 - 3. Gaskets: 1/16 inch thick preformed neoprene gaskets.

2.4 BALL VALVES

- A. Manufacturers:
 - 1. Milwaukee Valve Company Model.
 - 2. NIBCO, Inc. Model.
 - 3. Substitutions: Section 01 60 00 - Product Requirements.
- B. 1/4 inch to 1 inch: MSS SP 110, Class 125, two piece, threaded ends, bronze body, chrome plated bronze ball, reinforced teflon seats, blow-out proof stem, lever handle, UL 842 listed for flammable liquids and LPG, full port.
- C. 1-1/4 inch to 3 inch: MSS SP 110, Class 125, two piece, threaded ends, bronze body, chrome plated bronze ball, reinforced teflon seats, blow-out proof stem, lever handle, UL 842 listed for flammable liquids and LPG, conventional port.

2.5 PLUG VALVES

- A. Manufacturers:
 - 1. DeZURIK, Unit of SPX Corp. Model.
 - 2. Homestead Valve Model.
 - 3. Substitutions: Section 01 60 00 - Product Requirements
- B. 2 inches and Smaller: MSS SP 78, Class 150, semi-steel construction, round port, regular opening, pressure lubricated, teflon packing, threaded ends. Furnish one plug valve wrench for every ten plug-valves with minimum of one wrench.
- C. 2-1/2 inches and Larger: MSS SP 78, Class 150, semi-steel construction, round port, regular opening, pressure lubricated, teflon packing, flanged ends. Furnish wrench-operated.

2.6 PIPE HANGERS AND SUPPORTS

- A. Manufacturers:
 - 1. Glope Pipe Hanger Products Inc. Model.
 - 2. Michigan Hanger Co. Model.
 - 3. Superior Valve Co. Model.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Conform to NFPA 54,.
- C. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
- D. Hangers for Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.

- E. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- F. Wall Support for Pipe 3 inches and Smaller: Cast iron hook.
- G. Vertical Support: Steel riser clamp.
- H. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- I. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- J. Sheet Lead: ASTM B749, 2.5 lb/sq ft inch thick.

2.7 STRAINERS

- A. Manufacturers:
 - 1. Spirax Sarco, Inc. Model.
 - 2. Substitutions: Section 01 60 00 - Product Requirements.
- B. 2 inch and Smaller: Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.
- C. 2-1/2 inch to 4 inch: Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.
- D. 5 inch and Larger: Flanged iron body for 175 psig working pressure, basket pattern with 1/8 inch stainless steel perforated screen.

PART 3 EXECUTION

3.1 EXAMINATION

- A. 01300 - Administrative Requirements: Coordination and project conditions.
- B. Verify excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION - INSERTS

- A. Provide inserts for placement in concrete forms.

- B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.
- D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

3.4 INSTALLATION - PIPE HANGERS AND SUPPORTS

- A. Install hangers and supports in accordance with ASME B31.9.
- B. Support horizontal piping hangers as scheduled.
- C. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
- D. Place hangers within 12 inches of each horizontal elbow.
- E. Install hangers to allow 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
- F. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
- G. Where installing several pipes in parallel and at same elevation, provide multiple pipe hangers or trapeze hangers.
- H. Install pipe hangers and supports in accordance with Section 23 05 29.

3.5 INSTALLATION - ABOVE GROUND PIPING SYSTEMS

- A. Install natural gas piping in accordance with NFPA 54.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient.
- D. Where required, bend pipe with pipe bending tools in accordance with procedures intended for that purpose.
- E. Install piping to conserve building space and not interfere with use of space.
- F. Size and install gas piping to provide sufficient gas to supply maximum appliance demand at pressure higher than appliance minimum inlet pressure.
- G. Group piping whenever practical at common elevations.

- H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- I. Sleeve pipe passing through partitions, walls and floors. Refer to Section 23 05 29.
- J. Provide clearance for installation of insulation and access to valves and fittings.
- K. Provide access where valves and fittings are not exposed.
- L. Provide support for utility meters in accordance with requirements of utility company.
- M. Install vent piping from gas pressure reducing valves to outdoors and terminate in weatherproof hood. Protect vent against entry of insects and foreign material.
 - 1. Minimum Vent Size: Connection size at regulator vent connection.
 - 2. Run individual vent line from each relief device, independent of breather vents.
- N. Breather vents may be manifolded together with piping sized for combined appliance vent requirements.
- O. Install identification on piping systems. Refer to Section 23 05 53.
- P. Install valves with stems upright or horizontal, not inverted.
- Q. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

3.6 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Where gas appliance will be damaged by test pressure, disconnect appliance and cap piping during pressure test. Reconnect appliance after pressure test and leak test connection.
- C. Where gas appliance is designed for operating pressures equal to or greater than piping test pressure, provide gas valve to isolate appliance or equipment from gas test pressure.
- D. Pressure test natural gas piping in accordance with NFPA 54.
- E. Where new branch piping is extended from existing system, pressure test new branch piping only. Leak test joint between new and existing piping with noncorrosive leak detection fluid or other approved method.
- F. When pressure tests do not meet specified requirements, remove defective work, replace and retest.
- G. Immediately after gas is applied to a new system, or a system has been restored after gas service interruption, check pipe for leakage.
 - 1. Where leakage is detected, shut off gas supply until necessary repairs are complete.

H. Do not place appliances in service until leak testing and repairs are complete.

3.7 SCHEDULES

A. Pipe Hanger Spacing:

PIPE SIZE Inches	STEEL PIPE MAXIMUM HANGER SPACING Feet	STEEL PIPE MINIMUM HANGER ROD DIAMETER Inches
1/2	6	3/8
3/4	7	3/8
1	7	3/8
1-1/4	7	3/8
1-1/2	9	3/8
2	10	3/8
2-1/2	10	1/2
3	10	1/2

END OF SECTION

SECTION 23 22 13

STEAM AND CONDENSATE HEATING PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Low pressure steam piping.
2. Low pressure steam condensate piping.
3. Equipment drains and over flows.
4. Unions and flanges.
5. Pipe hangers and supports.
6. Valves.

B. Related Sections:

1. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment: Product requirements for pipe hangers and supports, sleeves, and firestopping for placement by this section.
2. Section 23 05 53 - Identification for HVAC Piping and Equipment: Product requirements for pipe identification for placement by this section.
3. Section 23 07 00 - HVAC Insulation: Product requirements for Piping Insulation for placement by this section.
4. Section 23 22 16 - Steam and Condensate Piping Specialties: Product and execution requirements for piping specialties used in steam piping systems.
5. Section 23 22 23 - Steam Condensate Pumps: Product and execution requirements for pumps used in steam piping systems.

1.2 REFERENCES

A. American Society of Mechanical Engineers:

1. ASME B16.3 - Malleable Iron Threaded Fittings.
2. ASME B16.4 - Gray Iron Threaded Fittings.
3. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
4. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
5. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.
6. ASME 31.9 - Building Services Piping

B. ASTM International:

1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. ASTM A216/A216M - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High- Temperature Service.
3. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
4. ASTM B32 - Standard Specification for Solder Metal.
5. ASTM B88 - Standard Specification for Seamless Copper Water Tube.

- 6.
- 7. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

C. American Welding Society:

- 1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
- 2. AWS D1.1 - Structural Welding Code - Steel.

D. Manufacturers Standardization Society of the Valve and Fittings Industry:

- 1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
- 2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
- 3. MSS SP 70 - Cast Iron Gate Valves, Flanged and Threaded Ends.
- 4. MSS SP 71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.
- 5. MSS SP 80 - Bronze Gate, Globe, Angle and Check Valves.
- 6. MSS SP 85 - Cast Iron Globe & Angle Valves, Flanged and Threaded.
- 7. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
- 8. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.3 SYSTEM DESCRIPTION

Use this article carefully; restrict statements to describe components used to assemble system. Do not repeat statements made in SUMMARY article; "Section includes" paragraph.

The following are performance type statements. Retain when Drawings do not indicate these items. Suggest adding a paragraph to describe type of system and design system temperatures. The following paragraph is given as an example. Use carefully and edit to meet project requirements.

- A. Use non-conducting dielectric connections whenever jointing dissimilar metals in open systems.
- B. Provide flanges, union, and couplings at locations requiring servicing. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.
- C. Provide pipe hangers and supports in accordance with MSS SP 58, and ASME B31.9.
- D. Use gate for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Use globe valves for throttling or services.
- F. Use spring loaded check valves on discharge of condensate pumps.
- G. Use horizontal swing check valves discharge of steam traps.
- H. Use 3/4 inch gate valves with cap for blow downs at strainers.
- I. Use 3/4 inch gate valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.

- J. Flexible Connectors: Use at or near pumps where piping configuration does not absorb vibration.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data:
 - 1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
 - 2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
 - 3. Hangers and Supports: Submit manufacturers catalog information including load capacity.
- C. Test Reports: Indicate results of steam and condensate piping system pressure test.
- D. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures and isolation.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- F. Welders' Certificate: Include welders' certification of compliance with ASME Section IX.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of valves, equipment and accessories.
- C. Operation and Maintenance Data: Submit instructions for installation and changing components, spare parts lists, exploded assembly views.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.
- B. Perform Work in accordance with AWS D1.1 for welding hanger and support attachments to building structure.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
- B. Fabricator or Installer: Company specializing in performing Work of this section with minimum three years experience.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.9 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.10 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for valves excluding packing.

PART 2 PRODUCTS

2.1 LOW PRESSURE STEAM PIPING, ABOVE GROUND (15 PSIG MAXIMUM)

- A. Steel Pipe: ASTM A53/A53M, Schedule 40, 0.375 inch wall for sizes 12 inch and larger, black.
 - 1. Fittings: ASME B16.3 malleable iron Class 125, or ASTM A234/A234M forged steel Class 125.
 - 2. Joints: Threaded for pipe 2 inch and smaller; welded for pipe 2-1/2 inches and larger.

2.2 LOW PRESSURE STEAM CONDENSATE PIPING, ABOVE GROUND

- A. Steel Pipe: ASTM A53/A53M, Schedule 80, 0.375 inch wall for sizes 12 inch and larger, black.
 - 1. Fittings: ASME B16.3 malleable iron Class 125, or ASTM A234/A234M forged steel Class 125.
 - 2. Joints: Threaded for pipe 2 inch and smaller; welded for pipe 2-1/2 inches and larger.

2.3 EQUIPMENT DRAINS AND OVERFLOWS

- A. Steel Pipe: ASTM A53/A53M Schedule 40, galvanized.
 - 1. Fittings: ASME B16.3, malleable iron or ASME B16.4, cast iron.
 - 2. Joints: Threaded for pipe 2 inch and smaller; flanged for pipe 2-1/2 inches and larger.

2.4 UNIONS AND FLANGES

- A. Unions for Pipe 2 inches and Smaller:
 - 1. Ferrous Piping: Class 150, malleable iron, threaded.

2. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

- B. Flanges for Pipe 2-1/2 inches and Larger:
 1. Ferrous Piping: Class 150, forged steel, slip-on flanges.
 2. Gaskets: 1/16 inch thick preformed neoprene gaskets.

2.5 GATE VALVES

- A. Manufacturers:
 1. Apollo Flow Controls
 2. Crane
 3. DeZURIK
 4. Milwaukee Valve Company
 5. NIBCO, Inc.
 6. Zurn Industries
 7. Substitutions: Section 01 60 00 – Product Requirements
- B. 2 inches and Smaller: MSS SP 80, Class 125, bronze body, bronze trim, threaded bonnet, non-rising stem, hand-wheel, inside screw with back-seating stem, solid wedge disc, threaded ends.
- C. 2-1/2 inches and Larger: MSS SP 70, Class 125, cast iron body, bronze trim, bolted bonnet, rising stem, hand-wheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged ends. Furnish chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

2.6 GLOBE VALVES

- A. Manufacturers:
 1. Apollo Flow Controls
 2. Crane
 3. DeZURIK
 4. Milwaukee Valve Company
 5. NIBCO, Inc.
 6. Zurn Industries
 7. Substitutions: Section 01 60 00 – Product Requirements
- B. 2 inches and Smaller: MSS SP 80, Class 125, bronze body, bronze trim, threaded bonnet, hand wheel, teflon composition disc, threaded ends.
- C. 2-1/2 inches and Larger: MSS SP 85, Class 125, cast iron body, bronze trim, hand wheel, outside screw and yoke, flanged ends. Furnish chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

2.7 BALL VALVES

- A. Manufacturers:
 1. Apollo Flow Controls
 2. Crane
 3. DeZURIK

4. Milwaukee Valve Company
5. NIBCO, Inc.
6. Zurn Industries
7. Substitutions: Section 01 60 00 – Product Requirements

- B. 2 inches and Smaller: MSS SP 110, Class 150, bronze, two piece body, type 316 stainless steel ball with vent hole, full port, reinforced teflon seats, stainless steel stem, threaded ends, extended lever handle with balancing stops.

2.8 CHECK VALVES

A. Horizontal Swing Check Valves:

1. Manufacturers:
 - a. Crane
 - b. Milwaukee Valve Company
 - c. NIBCO, Inc.
 - d. Substitutions: Section 01 60 00 - Product Requirements.
2. 2 inches and Smaller: MSS SP 80, Class 150, bronze body and cap, bronze seat, teflon disc, threaded ends.
3. 2-1/2 inches and Larger: MSS SP 71, Class 125, cast iron body, bolted cap, bronze or cast iron disc, flanged ends.

B. Spring Loaded Check Valves:

1. Manufacturers:
 - a. Crane
 - b. Milwaukee Valve Company
 - c. NIBCO, Inc.
 - d. Substitutions: Section 01 60 00 - Product Requirements.
2. 2 inches and Smaller: MSS SP 80, Class 250, bronze body, in-line spring lift check, silent closing, teflon disc, integral seat, threaded ends.
3. 2-1/2 inches and Larger: MSS SP 71, Class 125, wafer style, cast iron body, bronze seat, center guided bronze disc, stainless steel spring and screws, flanged ends.

2.9 PIPE HANGERS AND SUPPORTS

A. Manufacturers:

1. Hilti, Inc.
2. NIBCO Inc.
3. nVent – Caddy
4. Globe Pipe Hanger Products
5. Substitutions: Section 01 60 00 - Product Requirements.

- B. Conform to ASME B31.9, MSS SP 69, and MSS SP 89.

- C. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.

- D. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.

- E. Hangers for Hot Pipe Sizes 6 inches and Larger: Adjustable steel yoke, cast iron roll, double hanger.
- F. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- G. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 inches and Larger: Steel channels with welded spacers and hanger rods, cast iron roll.
- H. Vertical Support: Steel riser clamp.
- I. Floor Support for Hot Pipe 4 inches and Smaller: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- J. Floor Support for Hot Pipe Sizes 6 inches and Larger: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
- K. Copper Pipe Support: Carbon steel rings, adjustable, copper plated.
- L. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
- M. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

PART 3 EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.2 INSTALLATION - INSERTS

- A. Provide inserts for placement in concrete forms.
- B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.
- D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

- E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

3.3 INSTALLATION - PIPE HANGERS AND SUPPORTS

- A. Install in accordance with ASME B31.9 and MSS SP 89.
- B. Support horizontal piping as scheduled.
- C. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
- D. Place hangers within 12 inches of each horizontal elbow.
- E. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
- F. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
- G. Where installing several pipes in parallel and at same elevation, provide multiple pipe hangers or trapeze hangers.
- H. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- I. Install pipe hangers and supports in accordance with Section 23 05 29.

3.4 INSTALLATION - ABOVE GROUND PIPING SYSTEMS

- A. Install steam supply and steam condensate return piping in accordance with ASME B31.9.
- B. Route piping parallel to building structure and maintain gradient.
- C. Install piping to conserve building space, and not interfere with use of space.
- D. Group piping whenever practical at common elevations.
- E. Sleeve pipe passing through partitions, walls and floors. Refer to Section 23 05 29.
- F. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping.
- G. Install pipe identification in accordance with Section 23 05 53.
- H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- I. Provide access where valves and fittings are not exposed.

- J. Slope steam supply piping one inch in 40 feet in direction of flow. Use eccentric reducers to maintain bottom of pipe aligned.
- K. Slope steam condensate piping one inch in 40 feet. Use eccentric reducers to maintain bottom of pipe aligned.
- L. Provide drip trap assembly at low points, risers, changes in elevation and before control valves.
- M. Run condensate lines from trap to nearest condensate receiver. Provide loop vents over trapped sections.
- N. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- O. Install valves with stems upright or horizontal, not inverted.
- P. Insulate piping; refer to Section 23 07 00.

3.5 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Test low pressure steam supply piping and low pressure steam condensate piping in accordance with ASME B31.9.

3.6 SCHEDULES

- A. Pipe Hanger Spacing:

PIPE SIZE Inches	COPPER TUBING MAXIMUM HANGER SPACING Feet	STEEL PIPE MAXIMUM HANGER SPACING Feet	COPPER TUBING HANGER ROD DIAMETER Inches	STEEL PIPE HANGER ROD DIAMETER Inches
1/2	5	7	3/8	3/8
3/4	5	7	3/8	3/8
1	6	7	3/8	3/8
1-1/4	7	7	3/8	3/8
1-1/2	8	9	3/8	3/8
2	8	10	3/8	3/8
2-1/2 (Note 1)	9	11	1/2	1/2
3	10	12	1/2	1/2

4	12	14	1/2	5/8
5	13	16	1/2	5/8
6	14	17	5/8	3/4
8	16	19	3/4	3/4
10	18	22	3/4	7/8
12	19	23	3/4	7/8
14	22	25	7/8	1
16	23	27	7/8	1
18	25	28	1	1
20	27	30	1	1-1/4
24	28	32	1-1/4	1-1/4

B. Note 1: Refer to manufacturer's recommendations for grooved end piping systems.

END OF SECTION

SECTION 23 22 16 - STEAM AND CONDENSATE PIPING SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Flexible connectors.
2. Heat consumption meters.
3. Pressure gages.
4. Pressure gage taps.
5. Strainers.
6. Steam traps.
7. Steam air vents.
8. Flash tanks.
9. Pressure-reducing valves.
10. Steam safety valves.
11. Steam condensate meters.

B. Related Sections:

1. Section 23 22 13 - Steam and Condensate Heating Piping: Execution requirements for piping connections to products specified by this section.
2. Section 23 22 23 - Steam Condensate Pumps: Execution requirements for piping connections to products specified by this section.

1.2 REFERENCES

A. American Society of Mechanical Engineers:

1. ASME B40.1 - Gauges - Pressure Indicating Dial Type - Elastic Element.
2. ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.

B. ASTM International:

1. ASTM A105/A105M - Standard Specification for Carbon Steel Forgings for Piping Applications.
2. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
3. ASTM A216/A216M - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service.
4. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.

C. Underwriters Laboratories Inc.:

1. UL 393 - Indicating Pressure Gauges for Fire-Protection Service.
2. UL 404 - Gauges, Indicating Pressure, for Compressed Gas Service.

1.3 PERFORMANCE REQUIREMENTS

- A. Steam Traps:
 - 1. Select to handle minimum of two times maximum condensate load of apparatus served.
 - 2. Pressure Differentials:
 - a. Low Pressure Systems (15 psi maximum): 2 psi.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit for manufactured products and assemblies used in this Project.
 - 1. Manufacturer's data and list indicating use, operating range, total range, accuracy, and location for manufactured components.
 - 2. Submit product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes.
 - 3. Submit schedule indicating manufacturer, model number, size, location, rated capacity, load served, and features for each piping specialty.
 - 4. Submit electrical characteristics and connection requirements.
- C. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures, application, selection, and hookup configuration. Include pipe and accessory elevations.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of components and instrumentation.
- C. Operation and Maintenance Data: Submit instructions for calibrating instruments, installation instructions, assembly views, servicing requirements, lubrication instruction, and replacement parts list.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Accept piping specialties on site in shipping containers with labeling in place. Inspect for damage.

- C. Provide temporary protective coating on cast iron and steel valves.
- D. Protect systems from entry of foreign materials by temporary covers, caps and closures, completing sections of the work, and isolating parts of completed system until installation.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements.
- B. Do not install instruments when areas are under construction, except rough in, taps, supports and test plugs.

1.9 FIELD MEASUREMENTS

- A. Verify field measurements before fabrication.

1.10 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for piping specialties.

PART 2 PRODUCTS

2.1 FLEXIBLE CONNECTORS

- A. Manufacturers:
 - 1. Flex-Hose Co.
 - 2. Flex-Weld, Inc.
 - 3. Substitutions: Section 01 60 00 - Product Requirements.
- B. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure 500 psig.

2.2 PRESSURE GAGES

- A. Manufacturers:
 - 1. Watts
 - 2. Zurn Industries
 - 3. Substitutions: Section 01 60 00 - Product Requirements.
- B. Gage: ASME B40.1, UL 393 with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.
 - 1. Case: Steel.
 - 2. Bourdon Tube: Brass.
 - 3. Dial Size: 2 inch diameter.
 - 4. Mid-Scale Accuracy: One percent.
 - 5. Scale: Both psi and kPa.

2.3 PRESSURE GAGE TAPS

- A. Manufacturers:
 1. Hayward Flow Control
 2. Substitutions: Section 01 60 00 - Product Requirements
- B. Needle Valve: Brass, 1/4 inch NPT for minimum 300 psi.
- C. Ball Valve: Brass, 1/8 inch NPT for 250 psi.
- D. Pulsation Damper: Pressure snubber, brass with 1/4 inch NPT connections.
- E. Siphon: Brass, 1/4 inch NPT angle or straight pattern.

2.4 STRAINERS

- A. Manufacturers:
 1. Hayward Flow Control
 2. Substitutions: Section 01 60 00 - Product Requirements.
- B. Size 2 inch and Smaller:
 1. Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.
- C. Size 2-1/2 inch to 4 inch:
 1. Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.
- D. Size 5 inch and Larger:
 1. Flanged iron body for 175 psig working pressure, basket pattern with 1/8 inch stainless steel perforated screen.

2.5 INVERTED BUCKET TRAPS

- A. Manufacturers:
 1. Armstrong International
 2. Sterling
 3. Watts
 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Trap:
 1. Construction: ASTM A126, Cast iron or semi-steel body with bolted cover, brass or stainless steel bucket, stainless steel seats and plungers, and stainless steel lever mechanism with knife edge operating surfaces.
 2. Rating: 60 psig WSP.
 3. Features: Access to internal parts without disturbing piping, top test plug, bottom drain plugs.
 4. Accessories: Integral inlet strainer of brass or stainless steel, integral inlet check valve, integral bimetal air vent.

2.6 FLOAT AND THERMOSTATIC TRAPS

A. Manufacturers:

1. Armstrong International
2. Sterling
3. Watts
4. Substitutions: Section 01 60 00 - Product Requirements.

B. Trap:

1. Construction: ASTM A126, cast iron or semi-steel body and bolted cover, stainless steel or bronze bellows type air vent, stainless steel or copper float, stainless steel lever and valve assembly
2. Rating: 15 psig WSP.
3. Features: Access to internal parts without disturbing piping, bottom drain plug.
4. Accessories: Gage glass with shut-off cocks.

2.7 THERMOSTATIC TRAPS

A. Manufacturers:

1. Armstrong International
2. Sterling
3. Watts
4. Substitutions: Section 01 60 00 - Product Requirements.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers above.

Bodies of ASTM A126 cast iron and brass are limited to 225 psig service. ASTM A395/A395M cast iron and ASTM A216/A216M cast steel are rated above 225 psig. Use phosphor bronze to 225 psig, Monel to 300 psig, and stainless steel for higher pressures. Radiator traps with internal ball joint union are commonly brass bodies with phosphor bronze bellows, and are limited to 125-psig WSP range.

B. Pressure Balanced:

1. Trap: ASTM A395/A395M cast iron body and bolted or screwed cover and integral ball joint union for 125 psig WSP. Phosphor bronze bellows, stainless steel valve and seat; integral stainless steel strainer.

C. Freeze Proof:

1. Trap: Cast iron body for 300 psig WSP, bronze bellows, stainless steel valve and seat, external adjustment.

D. Bimetallic:

1. Trap: ASTM A105/A105M forged steel body and cover, for 300 psig WSP, bimetal element with stainless steel components, integral Type 304 stainless steel strainer screen, 1/4 inch blow down valve.

2.8 STEAM AIR VENTS

- A. Manufacturers:
 - 1. Armstrong International
 - 2. Watts
 - 3. Spirax Sarco Limited
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. 125 psig WSP:
 - 1. Balanced Pressure Type: Cast brass body and cover; access to internal parts without disturbing piping; stainless steel bellows, stainless steel valve and seat.
- C. 225 psig WSP:
 - 1. Balanced Pressure Type: ASTM A126 cast iron body and cover; access to internal parts without disturbing piping; phosphor bronze bellows, stainless steel valve and seat.

2.9 PRESSURE REDUCING VALVES

- A. Manufacturers:
 - 1. Armstrong International
 - 2. Spirax Sarco Limited
 - 3. Substitutions: Section 01 60 00 - Product Requirements.
- B. Bronze or cast iron body, stainless or chrome steel valve spring, stem, and trim, phosphor bronze diaphragm, direct acting, threaded 2 inches and smaller, flanged 2 inches and larger.

2.10 SAFETY RELIEF VALVES

- A. Valve: Bronze body, stainless steel valve spring, stem, and trim, direct pressure actuated, capacities ASME certified and labeled.
- B. Accessories: Drip-pan elbow.

PART 3 EXECUTION

3.1 INSTALLATION - GAGES

- A. Install pressure gages with pulsation dampers. Provide needle valve or ball valve to isolate each gage. Extend nipples to allow clearance from insulation.
- B. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- C. Install gages in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- D. Adjust gages to final angle, clean windows and lenses, and calibrate to zero.

3.2 INSTALLATION - STEAM SYSTEM SPECIALTIES

- A. Steam Traps:
 - 1. Provide minimum 3/4 inch size on steam mains and branches.
 - 2. Install with union or flanged connections at both ends.
 - 3. Provide gate valve and strainer at inlet, and gate valve and check valve at discharge.
 - 4. Provide minimum 10 inch long, line size dirt pocket between apparatus and trap.

- B. Install thermostatic steam traps on the following pieces of equipment:
 - 1. Steam radiation units.
 - 2. Convectors.
 - 3. Unit ventilators.
 - 4. Other similar terminal heating units.

- C. Install float and thermostatic steam traps on the following pieces of equipment:
 - 1. Unit heaters.
 - 2. Unit ventilators.
 - 3. Heat exchangers.
 - 4. Heating coils.
 - 5. Steam separators.
 - 6. Flash tanks.
 - 7. Steam jacketed equipment.
 - 8. Direct steam injected equipment.
 - 9. De-aerators.
 - 10. Absorption chillers.
 - 11. Process equipment.
 - 12. Main headers.
 - 13. Branch lines.

- D. Install inverted bucket steam traps on the following pieces of equipment:
 - 1. Main headers.
 - 2. Branch lines.
 - 3. Steam jacketed equipment.
 - 4. Direct steam injected equipment.
 - 5. De-aerators.
 - 6. Absorption chillers.

- E. In high pressure and medium pressure mains, install 3/4 inch nipple in bottom of main, extending 3/4 inch into and above bottom of pipe. Provide dirt pocket with 1/2 inch high pressure thermostatic trap.

- F. Install pressure-reducing stations with pressure reducing valve, bypass with valve, strainer and pressure gage on upstream side, relief valve and pressure gage on downstream side of pressure reducing valve.

- G. Provide one stage pressure-reducing station producing flat reduced pressure curve over range of capacity.

- H. Rate relief valves for pressure upstream of pressure reducing station, for full operating capacity. Set relief at maximum 20 percent above reduced pressure.
- I. Terminate relief valves to outdoors. Provide drip pan elbow with drain connection to nearest floor drain.

3.3 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting installed construction.
- B. Remove thermostatic elements from steam traps during temporary and trial usage, and until system has been operated and dirt pockets cleaned of sediment and scale.
- C. Do not install steam pressure gauges until after systems are pressure tested.

END OF SECTION

SECTION 23 22 23 - STEAM CONDENSATE PUMPS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Low pressure condensate pumping unit
- B. Related Sections:
 - 1. Section 23 22 13 - Steam and Condensate Heating Piping: Execution requirements for connection to pumps specified by this section.
 - 2. Section 23 22 16 - Steam and Condensate Piping Specialties: Product and execution requirements for piping specialties installed in steam systems.

1.2 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.
- B. Underwriters Laboratories Inc.:
 - 1. UL 778 - Motor Operated Water Pumps.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide pumps to operate at system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures:
- B. Product Data: Submit certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements. Submit also, manufacturer model number, dimensions, service sizes, and finishes.
- C. Manufacturer's Installation Instructions: Submit application, selection, and hookup configuration with pipe and accessory elevations. Submit hanging and support requirements and recommendations.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

- B. Operation and Maintenance Data: Submit installation instructions, servicing requirements, assembly views, lubrication instructions, and replacement parts list.
- C. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Protect systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.8 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.9 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for pumps.

1.10 EXTRA MATERIALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish one set of mechanical seals for each pump.

PART 2 PRODUCTS

2.1 LOW PRESSURE CONDENSATE PUMPING UNITS

- A. Manufacturers:
 - 1. Bell & Gossett Hoffman Specialty Watchman
 - 2. Substitutions: Section 01 60 00 - Product Requirements
- B. Components:
 - 1. Cast Iron Receiver
 - a. The condensate receiver shall be closed grain cast iron construction warranted for 20 years from date of shipment against failure due to corrosion.

- b. Receiver shall be equipped with:
 - 1) Receiver shall be sized for 1-minute net storage based upon system return rate.
 - 2) Receiver shall have overflow opening to provide a means of secondary venting all on a common side of the receiver.
 - 3) Pump Control:
 - a) Simplex Unit – (1) Externally adjustable 2-pole float switch.
 - b) Duplex Unit – (1) Externally adjustable mechanical alternator to automatically alternate operation of the two pumps and provide simultaneous operation of both pumps to deliver double capacity under peak conditions.
- 2. Pump(s)
 - a. The centrifugal pumps shall be flanged mounted on the receivers.
 - b. Pump(s) shall be so constructed to permit access to the impeller and other interior parts without break in the discharge pipe connections.
 - c. Pumps shall be:
 - 1) Close coupled vertical design
 - 2) Bronze fitted.
 - 3) Permanently aligned
 - 4) Stainless steel shaft
 - 5) Enclosed bronze impeller
 - 6) Renewable bronze wear ring
 - 7) Carbon/ceramic mechanical shaft seal shall be rated for 250°F.
- 3. Motor(s)
 - a. Each pump shall be close coupled to a vertical drip proof motor.
 - b. Motor(s) shall be:
 - 1) 3500 RPM single phase
 - 2) 115/230 volt
 - 3) Factory wired for 115 volts
 - 4) Field convertible to 230 volts
 - 5) Motor shall have internal thermal overload protection.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Provide pumps to operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
- B. Install long radius reducing elbows or reducers between pump and piping. Support piping adjacent to pump so no weight is carried on pump casings.
- C. Install flexible connectors at or near pumps where piping configuration does not absorb vibration.
- D. Provide line sized shut-off valve and strainer on pump suction, and line sized [soft seat] check valve, and shut-off valve on pump discharge.

- E. Provide drains for bases and seals.
- F. Check, align, and certify alignment of base mounted pumps prior to start-up.
- G. Lubricate pumps before start-up.

3.2 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect for alignment of pumps.

END OF SECTION

SECTION 23 31 00
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Duct Materials.
 - 2. Ductwork fabrication.
- B. Related Sections:
 - 1. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment: Product requirements for hangers, supports and sleeves for placement by this section.

1.2 REFERENCES

- A. National Fire Protection Association:
 - 1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
- B. Sheet Metal and Air Conditioning Contractors:
 - 1. SMACNA - HVAC Air Duct Leakage Test Manual.
 - 2. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.
- C. Underwriters Laboratories Inc.:
 - 1. UL 181 - Factory-Made Air Ducts and Connectors.

1.3 PERFORMANCE REQUIREMENTS

- A. Variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is not permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and flexible.
- B. Construct ductwork to NFPA 90A and NFPA 90B and NFPA 96 standards.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years of experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years of experience.

1.6 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 DUCT MATERIALS

- A. Aluminum Ducts: ASTM B209; aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T6 or of equivalent strength.
- B. Stainless Steel Ducts: ASTM A240/A240M or ASTM A666, Type 304.
- C. Fasteners: Rivets, bolts, or sheet metal screws.
- D. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.2 DUCTWORK FABRICATION

- A. Fabricate and support rectangular ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Construct T's, bends, and elbows with minimum radius 1-1/2 times centerline duct width. Where not possible and where rectangular elbows are used, provide airfoil turning vanes. Where acoustical lining is indicated, furnish turning vanes of perforated metal with glass fiber insulation.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Provide standard 45-degree lateral wye takeoffs. When space does not allow 45-degree lateral wye takeoff, use 90-degree conical tee connections.
- E. Seal joints between duct sections and duct seams with welds, gaskets, mastic adhesives, mastic plus embedded fabric systems, or tape.
 - 1. Sealants, Mastics and Tapes: Conform to UL 181A. Provide products bearing appropriate UL 181A markings.
 - 2. Do not provide sealing products not bearing UL approval markings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

- B. Verify sizes of equipment connections before fabricating transitions.

3.2 INSTALLATION

- A. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. During construction, install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- C. Use crimp joints with or without bead or beaded sleeve couplings for joining round duct sizes 8 inch and smaller.
- D. Install duct hangers and supports in accordance with Section 23 05 29.
- E. Use double nuts and lock washers on threaded rod supports.

END OF SECTION

SECTION 23 52 23 - CAST-IRON BOILERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cast-iron boilers.
 - 2. Boiler controls.
 - 3. Steam boiler trim.

- B. Related Sections:
 - 1. Section 23 11 23 - Facility Natural-Gas Piping: Execution requirements for natural gas piping connections to boilers specified in this section.
 - 2. Section 23 22 13 - Steam and Condensate Heating Piping: Execution requirements for steam piping for piping connections to boilers specified in this section.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI Z21.13 - Gas-fired Low Pressure Steam and Hot Water Boilers.

- B. American Society of Mechanical Engineers:
 - 1. ASME Section IV - Boiler and Pressure Vessel Code - Heating Boilers.

- C. National Fire Protection Association:
 - 1. NFPA 54 - National Fuel Gas Code.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

- B. Product Data: Submit capacities and accessories included with boiler.

- C. Test Reports: Submit results of combustion test.

- D. Manufacturer's Installation Instructions: Submit assembly, support details, connection requirements, and include start-up instructions.

- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

- F. Manufacturers Field Reports: Indicate condition of equipment after start-up including control settings and performance chart of control system.

1.4 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

- B. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data.

1.5 QUALITY ASSURANCE

- A. Conform to ASME Section IV for construction of boilers. Provide boilers registered with National Board of Boiler and Pressure Vessel Inspectors.
- B. Boiler Performance Requirements: Conform to minimum efficiency prescribed by ASHRAE 90.1 when tested in accordance with H.I. Heating Boiler Standard.
- C. Gas Train and Safety Controls: Conform to requirements of Factory Mutual (FM).
- D. Unit Certification: AGA certified.
- E. Conform to applicable code for internal wiring of factory wired equipment.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Accept boilers and accessories on site in factory shipping packaging. Inspect for damage.
- C. Protect boilers from damage by leaving packing in place until installation.

1.8 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.9 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer's warranty for boilers.

PART 2 PRODUCTS

2.1 CAST-IRON BOILERS

- A. Manufacturers:
 - 1. Weil McLain

2. Burnham
 3. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Steam boilers with natural draft, insulated jacket, sectional cast-iron heat exchanger, gas burning system, refractory, controls, and boiler trim.
- C. Boiler Fabrication:
1. Assembly: Cast iron sections with 15 psig steam ASME Section IV rating, assembled with draw rods and sealed watertight.
 2. Furnish access for flue passages for cleaning and flame observation ports.
 3. Provide with sufficient tapings to install required controls.
- D. Hot Water Boiler Trim:
1. High Pressure limit control (15 PSI maximum allowable steam pressure).
 2. Additional high pressure limit control with manual reset. (15 PSI maximum allowable steam pressure)
 3. Operating pressure limit control.
 4. Low water cut-off (LWCO). LWCO shall be float-mechanism type capable of shutting down the boiler in event of a low water situation.
 5. Additional low water cut-off (LWCO) with manual reset. LWCO shall be electrode type capable of shutting down the boiler in event of a low water situation.
 6. Steam compound pressure-vacuum gauge. Dial clearly marked and easy to read.
 7. A.S.M.E. certified pressure relief valve, set to relieve at 15 PSIG. Side outlet discharge type; installer to pipe outlet to floor drain or near floor.
 8. Gauge glass with gauge cocks and guards.
 9. Transformer rated for 75VA.
 10. Forced condensate return boiler(s) only: Low water cut-off (LWCO) and pump control.
 - a. LWCO with pump control must be specified when order is placed
 - b. LWCO with pump control shall be float mechanism type capable of shutting down the boiler in event of a low water situation.
 - c. LWCO with pump control shall have a minimum full load pump circuit rating of 7 amperes at 120 VAC.
 - d. LWCO with pump control shall have a set of alarm contacts with a minimum rating of 1 ampere at 120 VAC.
- E. Boiler Fuel Burning System:
1. Controls: Pre-wired, factory assembled electronic controls in control cabinet with flame scanner or detector, programming control, relays, and switches. Furnish pre-purge and post-purge ignition and shut down of burner in event of ignition pilot and main flame failure with manual reset.
- F. Electronic Control System – ASME CSD-1:
1. The boilers shall be furnished with electronic control systems with factory pre-wired control panel for each base assembly.
 2. The electronic control systems shall incorporate pilot proving and main flame proving control modules to provide intermittent electronic pilot ignition with proven low-fire-start, high-fire-run mode of operation.
 3. The electronic control systems shall provide nominal fifteen 15 second flame response timing. The electronic control systems shall incorporate a manual reset lockout function in

the event of either two (2) consecutive pilot flame failures or a single main flame failure. In the event of a lockout condition, the electronic control systems shall illuminate a red indicator light.

4. The electronic control systems shall include contacts rated for 15 amps at 250 VAC for a remote alarm.
5. The electronic control systems safety pilot burner for each boiler-base assembly shall be intermittent burning and electrically ignited. The safety pilot burner and main burner flames shall be electronically supervised by flame rectification.

G. Boiler Performance:

1. Capacity: (2) at 700 MBH input.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Assemble boiler from knockdown configuration after transporting into boiler room. Perform pressure test on boiler after assembly in accordance with the following:
 1. Pressure test before connecting natural gas piping, electrical connections, and controls.
 2. Install boiler drain and pressure gage.
 3. Plug remaining openings.
 4. Fill boiler with water and vent air.
 5. Pressure test to 45 to 55 psi for steam boilers for 10 minutes with no leaks.
 6. Repair leaks and retest.
 7. After successful test, drain and remove plugs from openings to be used for piping connections and controls.
- B. Install boilers plumb and level, to plus or minus 1/16 inch over boiler base.
- C. Maintain manufacturer's recommended clearances around and over boilers.
- D. Install boiler on concrete housekeeping pad, minimum 3-1/2 inches high and 6 inches larger than boiler base on each side.
- E. Install boiler on vibration isolators.
- F. Connect natural gas piping in accordance with NFPA 54.
- G. Connect natural gas piping to boiler, full size of boiler gas train inlet. Arrange piping with clearances for burner removal and service.
- H. Connect steam piping to supply and return boiler connections.
- I. Install the following piping accessories on natural gas piping connections.
 1. Strainer.
 2. Pressure gage.
 3. Shutoff valve.
 4. Check valve.

5. Pressure reducing valve.

- J. Install discharge piping from relief valves and drain valves to nearest floor drain.
- K. Install circulator and diaphragm expansion tank on boiler.
- L. Install boiler trim and accessories furnished loose for field mounting.
- M. Install electrical devices furnished loose for field mounting.
- N. Install control wiring between boiler control panel and field mounted control devices.
- O. Connect flue to boiler outlet, full size of outlet.

3.2 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Perform combustion test including boiler firing rate, over fire draft, gas flow rate, heat input, burner manifold gas pressure, percent carbon monoxide, percent oxygen, percent excess air, flue gas temperature at outlet, ambient temperature, net stack temperature, percent stack loss, percent combustion efficiency, and heat output. Perform test at minimum, mid-range, and high fire.
- C. Arrange with local authorities having jurisdiction for inspection of boiler, piping, and for certificate of operation.

3.3 MANUFACTURER'S FIELD SERVICES

- A. Section 01 40 00 - Quality Requirements: Requirements for manufacturer's field services.
- B. Start-up boilers according to manufacturer's start-up instructions and in presence of boiler manufacturer's representative. Test controls and demonstrate compliance with requirements. Adjust burner for maximum burning efficiency. Replace damaged or malfunctioning controls and equipment.

3.4 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for starting and adjusting.

3.5 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Flush and clean boilers upon completion of installation, in accordance with manufacturer's start-up instructions.

3.6 DEMONSTRATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for demonstration and training.
- B. Demonstrate operation and maintenance procedures.
- C. Furnish services for manufacturer's technical representative for one 8 hour day to instruct Owner's personnel in operation and maintenance of boilers. Schedule training with Owner, provide at least 7 days notice to Architect/Engineer of training date.

END OF SECTION