

City of Auburn, Maine

"Maine's City of Opportunity"

Financial Services



December 2, 2015

Dear Bidder:

The City of Auburn is accepting written proposals for the Engine #5 Fire Station for a **Heating System Upgrades Project**, located at 651 Center Street, Auburn, ME. The City reserves the right to accept or reject any or all proposals in whole or in part and to waive any informality the City may determine necessary. The City also reserves to itself the exclusive right to accept any proposals when it is deemed by the City to be in its best interest. The City of Auburn is governed by Title 1 M.R.S.A. § 401-410, otherwise known as the Freedom of Information Act, which considers bid specifications as public documents. In awarding any proposal, the City may consider, but not be limited to, any of the following factors: Bidder qualifications, price, experience, financial standing with the City, warranties, references, bonding, delivery date, and service of Bidder. Vendors/Contractors shall be current on all amounts due to the City of Auburn prior to the City entering into any contract agreement. All proposals must include FOB to Auburn, Maine unless otherwise specified.

A **mandatory** pre-bid meeting to review the work site is scheduled for Tuesday, December 15, 2015 at 2:00 p.m. at the Engine #5 Fire Station, 651 Center Street, Auburn, ME. Please contact Derek Boulanger at dboulanger@auburnmaine.gov to confirm participation. Proposals will not receive consideration unless submitted in accordance with the following instructions to bidders. Please mark sealed envelopes plainly:

"Engine #5 Fire Station, Heating System Upgrades Project – Bid #2016-011."

Questions regarding this Request for Proposals should be directed to Derek Boulanger, Facilities Manager/Purchasing Agent, at (207) 333-6601, ext. 1135.

Please submit your proposal to the City of Auburn by **2:00 p.m. Thursday, January 14, 2016**. Proposals will be opened at 2:00 p.m. Proposals must be delivered to **Derek Boulanger, Facilities Manager/Purchasing Agent, 60 Court Street, Auburn, ME 04210** on or before the date and time appointed. No proposals will be accepted after the time and date listed above.

Sincerely,

Derek Boulanger
Facilities Manager/
Purchasing Agent

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CONDITIONS AND INSTRUCTIONS TO BIDDERS

1. Bidders shall use the enclosed bid form for quotations. Whenever, in bid forms, an article is defined by using a trade name or catalog number, the term "or approved equal", if not inserted, shall be implied.
2. Submit a separate unit price for each item unless otherwise specified in the bid request. Award will be made on a basis of each item, or as a group, whichever is in the best interest of the City. Prices stated are to be "delivered to destination".
3. Bid proposals must be completed in full, in ink, and must be signed by firm official. Bid proposal **must be notarized** prior to bid being sealed and will be disqualified if not notarized. Bids may be withdrawn prior to the time set for the official opening.
4. Bids will be opened publicly. Bidders or representatives may be present at bid opening.
5. Awards will be made to the lowest responsible bidder, considering the quality of the materials, date of delivery, cost which meets specification and is in the best interest to the City of Auburn.
6. All transportation charges, including expense for freight, transfer express, mail, etc. shall be prepaid and be at the expense of the vendor unless otherwise specified in the bid.
7. The terms and cash discounts shall be specified. Time, in connection with discount offered, will be computed from date of delivery at destination after final inspection and acceptance or from date of correct invoice, whichever is later.
8. The City is exempt from payment of Federal Excise Taxes on the articles not for resale, Federal Transportation Tax on all shipments and Maine Sales Tax and Use Taxes. Please quote less these taxes. Upon application, exemption certificate will be furnished with the Purchase Order when required.
9. Time of delivery shall be stated. If time is of the essence, the earliest date may be a factor in the bid award.
10. No contract may be assigned without the written consent of the Finance Director or her designate. The contract shall not be considered valid until a purchase order has been issued to the successful bidder.
11. Please state **“Engine #5 Fire Station, Heating System Upgrades Project – Bid #2016-011.”** on submitted sealed envelope.
12. The City of Auburn reserves the right to waive any formality and technicality in bids whichever is deemed best for the interest of the City of Auburn.

GENERAL CONDITIONS

1. Equal Employment Opportunity

The City of Auburn is an Equal Opportunity Employer and shall not discriminate against an applicant for employment, and employee or a citizen because of race, color, sex, marital status, physical and/or mental handicap, religion, age, ancestry or natural origin, unless based upon a bona-fide occupation qualification. Vendors and contractor or their agents doing business with the City shall not violate the above clause or the Civil Rights Acts of 1964. Violations by vendors shall be reviewed on a case-by-case basis and may mean an automatic breach of contract or service to the City of Auburn.

2. Save Harmless

The Bidder agrees to protect and save harmless the owner from all costs, expenses or damages that may arise out of alleged infringement of patents of materials used.

3. Subcontracting

The Bidder shall not subcontract any part of the work or materials or assign any monies due it without first obtaining the written consent of the municipality. Neither party shall assign or transfer its interest in the contract without the written consent of the other party.

4. Warranty

The Bidder warrants that all work will be of good quality and free from faults and defects, and in conformance with the specifications. All work not so conforming to these standards may be considered defective. The Bidder agrees to be responsible for the acts and omissions of all of its employees and all subcontractors, their agents and employees, and all other persons performing any of the work under a contract with the Bidder.

5. Retainage and Payments

Retainage in the amount of 10% will be held from each progress payment and shall be released at the discretion of the Project Engineer. Payments shall be made by the City to the Contractor 30 days after receipt of the request for payment.

BID PROPOSAL FORM
Due Thursday, January 14, 2016

To: City of Auburn
Derek Boulanger,
Facilities Manager/Purchasing Agent
60 Court Street
Auburn, ME 04210

The undersigned individual/firm/business guarantees this price for Sixty days (60) from the bid due date. The undersigned submits this proposal without collusion with any other person, individual, firm, or agency. The undersigned ensures the authority to act on behalf of the corporation, partnership, or individual they represent; and has read and agreed to all of the terms, requests, or conditions written herein by the City of Auburn. By signing this bid form, the firm listed below hereby affirms that its bid meets the minimum specifications and standards as listed above.

Signature _____ Name (print) _____

Title _____ Company _____

Address _____

Telephone No. _____ Fax No. _____

Email Address: _____

STATE OF MAINE
_____, SS.

Date: _____

Personally appeared _____ and acknowledged the foregoing instrument to be his/her free act and deed in his/her capacity and the free act and deed of said company.

Notary Public

Print Name

Commission Expires _____

SCHEDULE OF VALUES

PROJECT NAME: **Engine #5 Fire Station, Heating System Upgrades Project – Bid #2016-011**

<u>Item</u>	<u>Description</u>	<u>Value</u>
1.	General Conditions	\$_____ . ____
2.	Bonds (if required) & Insurance	\$_____ . ____
3.	Demolition	\$_____ . ____
4.	Boiler & Accessories	\$_____ . ____
5.	Natural Gas Piping	\$_____ . ____
6.	Hydronic & Condensate Piping	\$_____ . ____
7.	Pumps	\$_____ . ____
8.	Gas Fired Unit Heaters	\$_____ . ____
9.	Indirect Water Heater & Accessories	\$_____ . ____
10.	Unit Ventilator Repairs	\$_____ . ____
11.	Exhaust Fans	\$_____ . ____
12.	Gas Appliance Venting	\$_____ . ____
13.	Heating Controls & Zone Valves	\$_____ . ____
14.	Mechanical Insulation	\$_____ . ____
15.	Painting & Mechanical Identification	\$_____ . ____
16.	Testing, Adjusting & Balancing	\$_____ . ____
17.	Miscellaneous Electrical	\$_____ . ____
18.	Temporary Hot Water	\$_____ . ____
19.	Other (specify) _____	\$_____ . ____
20.	Other (specify) _____	\$_____ . ____
21.	TOTAL (Sum of Items 1 through 20)	\$_____ . ____

TOTAL OF ALL LINE ITEMS IN SCHEDULE OF VALUES MUST EQUAL FINAL BASE BID. THERE MUST BE AMOUNTS IN EACH OF THE SPECIFIED ITEMS ABOVE.

PROJECT SCHEDULE

Estimated Start Date: _____ Estimated Completion Date: _____

FAILURE TO PROPERLY COMPLETE THIS ATTACHEMENT MAY BE CONSIDERED A NON RESPONSIVE PROPOSAL AND MAY BE REJECTED AT THE OWNERS DISCRETION.

SAMPLE AGREEMENT

THIS AGREEMENT is made this ### day of *Month Year*, by and between the CITY OF AUBURN, a municipal corporation existing under the laws of the State of Maine and located in the County of Androscoggin, State of Maine (hereinafter "CITY"), *Company Name, Address, EIN*, (hereinafter "CONTRACTOR"),

WITNESSETH:

In consideration of the mutual covenants and conditions contained herein, the CITY and the CONTRACTOR agree as follows:

SPECIFICATIONS:

1. The CONTRACTOR shall furnish all of the material and perform all of the work shown on the drawings and described in the specifications entitled: *Bid # XXXXX Bid Title* which are attached hereto and made a part hereof, and the CONTRACTOR covenants that it shall do everything required by this Agreement, the Special Provisions of the Agreement, the Invitation to Bid and the Specifications in return for payment as provided herein.

COMPLETION DATE:

2. The work to be performed under this Agreement shall be commenced by *Month day, year* and fully completed on or before *Month day, year*.

CONTRACT PRICE:

3. The CITY shall pay the CONTRACTOR for the performance of the Agreement the sum of \$XXX

PERFORMANCE BOND:

4. If required by the City, the CONTRACTOR shall furnish to the CITY at the time of the execution of this Agreement a performance bond and a labor and material payment bond each in the amount of *\$Dollar amount* or N/A (whichever applies) executed by a surety company satisfactory to the CITY, guaranteeing the performance and payment by the CONTRACTOR. Yes, Required (Initials: ____) No, Waived (Initials ____)

GUARANTEE:

5. The CONTRACTOR shall guarantee his work against any defects in workmanship and materials for a period of one year from the date of the CITY’s written acceptance of the project.

PERMITS AND LICENSES:

6. Permits and licenses necessary for the prosecution of the work shall be secured and paid by the CONTRACTOR.

CITY’S RIGHT TO TERMINATE CONTRACT:

7. If the CONTRACTOR should be adjudged a bankrupt, or if it should make a general assignment for the benefit of creditors, or if a receiver should be appointed on account of its insolvency, or if it should persistently or repeatedly refuse or should fail, except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper materials, or if it should fail to make prompt payment to subcontractors or for material or labor, or persistently disregard laws, and ordinances, or otherwise be guilty of a substantial violation of any provision of the Agreement, then the CITY when sufficient cause exists to justify such action, may, without prejudice to any other right or remedy and after giving the CONTRACTOR, and his surety, seven (7) days written notice, terminate the employment of the CONTRACTOR and take possession of the premises and of all materials, tools and appliances thereon and finish the work by whatever method it may deem expedient. In such case the CONTRACTOR shall not be entitled to receive any further payment until the work is finished. If the unpaid balance of the Agreement price shall exceed the expense of the finishing the work, including compensation for additional architectural, managerial and administrative services, such excess shall be paid to the CONTRACTOR. If such expense shall exceed such unpaid balance, the CONTRACTOR shall pay the difference to the CITY.

CONTRACTOR’S LIABILITY INSURANCE:

8. The CONTRACTOR shall not commence work under this Agreement until he has obtained all insurance required under this paragraph and such insurance has been approved by the CITY, nor shall the CONTRACTOR allow any subcontractor to commence work on his subcontract until all similar insurance required of subcontractor has been so obtained and approved. It is a requirement that the CITY be named as an Additional Insured on the General Liability and Automobile Liability policies.

(a) Commercial General Liability to include products and completed operations, and blanket contractual. The limits of liability shall be as follows:

Bodily Injury and Property Damage	\$1,000,000
Personal Injury and Advertising Injury	\$1,000,000
Per Project Aggregate	\$1,000,000
General Aggregate	\$2,000,000
Products and Completed Operations Aggregate	\$2,000,000
Medical Payments	\$10,000

(b) Business Automobile Liability

The CONTRACTOR shall maintain and cause all sub-contractors and lower tier contractors to maintain business automobile liability insurance covering all owned, non-owned, leased, rented or hired automobiles (symbol 1). The limits of liability shall be as follows:

Bodily Injury and Property Damage	\$1,000,000
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Automobile physical damage coverage shall be at the option of the CONTRACTOR, all sub-contractors and lower tier contractors. The CITY shall not be liable for physical loss or damage to any owned, non-owned, leased, rented or hired automobile.

(c) Workers' Compensation Insurance

The CONTRACTOR shall maintain and cause all sub-contractors and lower tier contractor's to maintain Workers' Compensation and Employers Liability in accordance with the laws and regulations of the State of Maine. The limits of liability provided shall be as follows:

Coverage A:	Statutory
Coverage B:	\$100,000/\$500,000/\$100,000

(d) Professional Liability

If the CONTRACTOR is an Architect, Engineer or Surveyor, they shall maintain a policy of insurance to pay on their behalf whatever amounts that may become legally required to pay on account of an error, omission or negligent act.

Limits of Liability shall be as follows:

\$1,000,000 per occurrence and in the aggregate site specific.

It is a requirement that this policy be maintained for a period of three (3) years following completion of the project.

(e) Certificates of Insurance of the types and in the amounts required shall be delivered to the CITY prior to the commencement of any work by the CONTRACTOR, subcontractor or lower tier contractor or any person or entity working at the direction or under control of the CONTRACTOR. The CONTRACTOR shall assume the obligation and responsibility to confirm insurance coverage for all sub-contractors or lower tier contractors who will participate in the project.

(f) The Certificate of Insurance and the policies of insurance shall include a sixty (60) day notice to the CITY of cancellation, non-renewal or material change in coverage or form.

(g) The CONTRACTOR and his surety shall indemnify and save harmless the CITY, his officers and employees from all suits, actions or claims of any character brought because of any injuries or damage received or sustained by any person, persons or property on account of the operations of the said CONTRACTOR; or on account of or in consequence of any neglect in safeguarding the work; or through use of unacceptable materials in construction of the work; or because of any act or omission, neglect, or misconduct of said CONTRACTOR; or because of any claims or amounts recovered from any infringements or patent trademark, or copyright; or from any claims or amounts arising or recovered under the "Workmen's Compensation Act" or of any other law, ordinance, order or decree; and so much of the money due to the said CONTRACTOR under and by virtue of his/her contract as shall be considered necessary by the CITY for such purpose, may be retained; or in case no money is due, his surety may be held until such suit or suits, action or actions, claim or claims, for injuries or damages as aforesaid shall have been settled and suitable evidence to that effect furnished to the CITY.

(h) Waiver of Subrogation

Payment of any claim or suit including any expenses incurred in connection therewith by the CITY, or any insurance company on behalf of the CITY shall not constitute a waiver of subrogation against the CONTRACTOR, sub-contractors or any lower tier contractor in the event that such claim or suit was caused by or contributed to as a result of the negligent acts of the CONTRACTOR, any sub-contractors or lower tier contractors.

(i) Construction Agreement

The CONTRACTOR shall and does hereby agree to indemnify, save harmless and defend the CITY from the payment of any sum or sums of money to any person whomsoever on account of claims or suits growing out of injuries to persons, including death, or damages to property, caused by the CONTRACTOR, his employees, agents or sub-contractors or in any way attributable to the performance and execution of the work herein contracted for, including (but without limiting the generality of the foregoing), all claims for service, labor performed, materials furnished, provisions and suppliers, injuries to persons or damage to property, liens, garnishments, attachments, claims, suits, costs, attorney's fees, costs of investigation and defense. It is the intention of this paragraph to hold the CONTRACTOR responsible for the payment of any and all claims, suits, or liens, of any nature character in any way attributable to or asserted against the CITY, or the CITY and the CONTRACTOR, which the City may be required to pay. In the event the liability of the CONTRACTOR shall arise by reason of the sole negligence of the CITY and/or the sole negligence of the CITY's agents, servants or employees, then and only then, the CONTRACTOR shall not be liable under the provisions of this paragraph.

DAMAGES:

9. The CONTRACTOR shall defend, indemnify and save harmless the CITY and all persons acting for or in behalf of it against all claims for injuries (including death), loss or damage, arising out of the performance out this contract.

LIENS:

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

ASSIGNMENT:

11. Neither party to the Agreement shall assign the Agreement or sublet it as a whole without the written consent of the other, nor shall the CONTRACTOR assign any moneys due or to become due to it hereunder, without the previous written consent of the CITY.

SUBCONTRACTS:

12. The CONTRACTOR shall not sublet any part of this Agreement without the written permission of the CITY. The CONTRACTOR agrees that it is as fully responsible to the CITY for the acts and omissions of its SUB-CONTRACTORS and of persons either directly or indirectly employed by them, as it is for the acts and omissions of persons directly employed by it.

USE OF PREMISES:

13. The CONTRACTOR shall confine its apparatus, the storage of materials and operations of its workers to limits indicated by law, ordinance and permits and shall not otherwise unreasonably encumber the premises with its materials. If any part of the project is completed and ready for use, the CITY may, by written and mutual consent, without prejudice to any of its rights or the rights of the CONTRACTOR, enter in and make use of such completed parts of the project. Such use or occupancy shall in no case be construed as an acceptance of any work or materials.

CLEANING UP:

14. The CONTRACTOR shall at all times keep the premises free from accumulation of waste materials or rubbish caused by its employees or work, and at the completion of the work it shall remove all its rubbish from and about the project, and all its tools, scaffolding and surplus materials and shall leave its work "broom-clean" or its equivalent, unless more exactly specified. In case of dispute, the CITY may remove the rubbish and charge the cost to the CONTRACTOR.

CITY OF AUBURN, MAINE

ENGINE #5 FIRE STATION
HEATING SYSTEM UPGRADES PROJECT

651 Center Street, Auburn, Maine

Bid No. 2016-011

Bid Documents

December 2, 2015

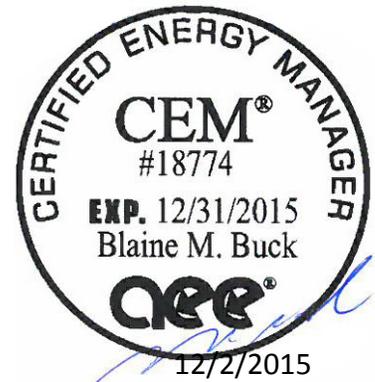
APPENDIX A
TECHNICAL SPECIFICATIONS

City of Auburn, Maine
60 Court Street, Auburn, Maine 04210

**Engine #5 Fire Station
Heating System Upgrades Project**

651 Center Street, Auburn, Maine 04210

Bid #2016-011



TECHNICAL SPECIFICATIONS

DECEMBER 2, 2015



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SECTION 00 01 10

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SECTION 00 01 20

PROJECT INFORMATION

PART 1 GENERAL

1.01 PROJECT IDENTIFICATION

- A. Project Name: Engine #5 Fire Station, Heating System Upgrades Project, located at 651 Center Street, Auburn, Maine.
- B. The Owner, hereinafter referred to as Owner or City: The City of Auburn, Maine.
- C. Owner's Representative: Cordjia Capital Projects Group
 - 1. Contact: Mitch Daigle.
 - 2. Address: 16 Tannery Lane, Suite 23.
 - 3. City, State, Zip: Camden, Maine 04843.
 - 4. Phone/Fax: (207) 236-9970 / (207) 236-9971.
 - 5. E-mail: mdaigle@cordjiacpg.com.

1.02 PROJECT DESCRIPTION

- A. The project consists of demolition of the existing oil fired heating plant, designated unit heaters and other select components and the installation of new gas fired heating equipment and associated components as prescribed in the drawings and specifications.
- B. The project premises is a fully operating fire station that is manned 24/7/365 and must remain heated with hot water available at all times throughout the project duration with the exception of a limited duration for system switchover. Bidders should submit their bids based on a best value construction schedule that may or may not include provisions for temporary heat. Provisions for temporary domestic hot water will be required. The basis of award may take both schedule and cost into account.
- C. The premises at the project site are open for examination by bidders during the Mandatory Pre-Bid Meeting ONLY:
 - 1. Tuesday, December 15, 2015 at 2:00 p.m.

1.03 PROCUREMENT TIMETABLE

- A. Last Request for Information Due: Friday, January 8, 2016 by 2:00 p.m.
- B. Proposal Due Date: Thursday, January 14, 2016, before 2:00 p.m. local time.
- C. Notice of Award: Within 14 days after due date.
- D. Proposals May Not Be Withdrawn Until: 60 days after due date.
- E. Desired Substantial Completion Date: Not later than 120 calendar days from Notice to Proceed.
- G. The Owner reserves the right to change the schedule or terminate the entire procurement process at any time.

1.04 PROCUREMENT DOCUMENTS

- A. Availability of Documents: Complete sets of procurement documents may be obtained:
 - 1. From the Owner's Representative.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 00 01 20

SECTION 02 41 00

DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Selective demolition of building elements and equipment for alteration purposes.

1.2 REFERENCE STANDARDS

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.1 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Provide, erect, and maintain temporary barriers and security devices.
 - 3. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 4. Do not close or obstruct roadways or sidewalks without permit.
 - 5. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Protect existing building elements that are not to be removed.
 - 1. Provide bracing and shoring.
- D. If hazardous materials are discovered during removal operations, stop work and notify owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

3.2 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and available documents only.
 - 1. Verify that construction and utility arrangements are as shown.
 - 2. Report discrepancies to the Engineer before disturbing existing installation.
 - 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove items indicated on drawings.

Engine #5 Fire Station,
Heating System Upgrades Project – Bid #2016-011

- C. Protect existing work to remain.
 - 1. Prevent movement of structure; provide shoring and bracing if necessary.
 - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
 - 4. Patch as specified for patching new work.

3.3 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site and dispose of waste in a legal manner.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 02 41 00

SECTION 22 05 23

VALVES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes valves for building services piping.

1.2 REFERENCES

- A. AGA Z21.22 (American Gas Association) - Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems.
- B. ASME B16.3 (American Society of Mechanical Engineers) - Malleable Iron Threaded Fittings.
- C. AWS (American Welding Society) - Welding and Brazing Qualifications.
- D. MSS SP-67 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Butterfly Valves.
- E. MSS SP-80 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Bronze Gate, Globe, Angle and Check Valves.
- F. MSS SP-85 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends.
- G. MSS SP-110 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.3 SUBMITTALS

- A. Product Data: Submit Manufacturers catalog information with valve data and ratings for each service.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit installation instructions, spare parts lists, exploded assembly views. Provide manufacturer's printed operating procedures to include start-up, break-in, routine and normal operation instruction; regulation control, stopping, shut-down, and emergency instructions; and summer and winter operation instructions. Provide copies of warranties.

1.5 QUALIFICATIONS

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

1.6 PRE-INSTALLATION MEETING

- A. Convene a meeting with the involved parties a minimum of one week prior to commencing the Work of this section.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.

1.8 WARRANTY

- A. Provide owner with a one year warranty on all parts and labor. Provide the owner with any and all standard warranties from the manufacturer.

PART 2 PRODUCTS

2.1 FLOW CONTROLS

- A. Construction: Class 125 Brass or bronze body with union on inlet, temperature and pressure test plug on inlet.
- B. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control.
- C. Calibrated, adjustable orifice with pressure taps on either side of orifice.
- D. Valve position indicator and memory stop.
- E. 2" valves and smaller: bronze body, threaded.
- F. 2- 1/2" valves and larger: cast iron body, flanged.
- G. Size for 3-psig water pressure drops at 100% open with design water flow. (Valve sized for flow, not pipe size.)
- H. All balance valves by same manufacturer with same pressure tap connections and using same differential pressure meter.
- I. Armstrong CBV or CBV1 or equal by Taco or Tour Anderson.
- J. Furnish Owner with (1) new, unused, calibrated, differential pressure meter in case with all required connectors and charts.

2.2 SWING CHECK VALVES (plumbing system)

- A. Up To and Including 2 inches:
 - 1. MSS SP-80, Class 125, bronze body and cap, bronze swing disc with rubber seat, threaded ends.

- B. 2 inches and Larger: Manufacturers:
 - Watts
 - Milwaukee
 - Crane
 - NIBCO
 - 1. MSS SP-71, Class 125 iron body, bronze swing disc, flanged ends.

2.3 SPRING LOADED CHECK VALVES (plumbing system)

- A. Construction: Class 125-iron body, bronze trim, stainless steel springs, bronze disc, seals, wafer style ends.

2.4 WATER PRESSURE REDUCING VALVES (plumbing system)

- A. Up to 2 inches:
 - 1. Construction: MSS SP-80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded and single union ends.

- B. Over 2 inches:
 - 1. Construction: MSS SP-85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.5 RELIEF VALVES (plumbing system)

- A. Pressure Relief:
 - 1. Construction: AGA Z21.22 certified, bronze body, Teflon seat, steel stem and springs, automatic, direct pressure actuated.

- B. Temperature and Pressure Relief:
 - 1. Construction: AGA Z21.22 certified, bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME SEC IV certified and labeled.

2.6 GLOBE OR ANGLE VALVES (heating system)

- A. Up To and Including 2 inches:

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1. Construction: Bronze body, bronze trim, screwed bonnet, rising stem and hand-wheel, inside screw, renewable plug disc and stainless steel seat ring, threaded ends.
 - B. Over 2 inches:
 1. Construction: Iron body, bronze trim, bolted bonnet, rising stem, hand-wheel, outside screw and yoke, rotating plug-type disc with renewable seat ring and disc, flanged ends.
- 2.7 SPRING LOADED CHECK VALVES (heating system)
- A. Construction: Iron body, bronze trim, split plate, hinged with stainless steel spring, resilient seal bonded to body, wafer or threaded lug ends.
- 2.8 FLANGES, UNIONS, AND COUPLINGS (heating system)
- A. Unions for Pipe 2 inches and Under:
 1. Ferrous Piping: 150 psig malleable iron, threaded.
 2. Copper Pipe: Bronze, soldered joints.
 3. All bolts and washers shall be stainless-steel or marine environment protected.
 - B. Flanges for Pipe Over 2 inches:
 1. Ferrous Piping: 150 psig forged steel, slip-on.
 2. Copper Piping: Bronze.
 3. All bolts and washers shall be stainless-steel or marine environment protected.
 - C. Gaskets: 1/16-inch thick preformed neoprene.
 - D. Grooved and Shouldered Pipe End Couplings:
 1. Housing Clamps: Malleable iron to engage and lock designed to permit some angular deflection, contraction, and expansion.
 2. Sealing Gasket: C-shape elastomer composition for operating temperature range from -30 degrees F to 230 degrees F.
 - E. Accessories: Steel bolts, nuts, and washers shall be stainless steel or marine environment protected.
 - F. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end and water impervious isolation barrier.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify Piping System is ready for installation.

3.2 INSTALLATION

- A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- B. Install valves with stems upright or horizontal, not inverted.
- C. Use grooved mechanical couplings and fasteners only in accessible locations.
- D. Install unions downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.
- E. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- F. Install ball valves for throttling, bypass, or manual flow control services.
- G. Provide spring loaded check valves on discharge of water pumps.
- H. Provide flow controls in water re-circulating systems where indicated.
- I. Use ¾ inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.

3.3 INTERFACE WITH OTHER PRODUCTS

- A. Conform to applicable piping specification for hangers and insulation.

END OF SECTION 22 05 23

SECTION 22 05 29

HANGERS AND SUPPORTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes pipe and equipment supports, hangers, anchors, bases sleeves and the sealing of work to adjacent construction.

1.2 REFERENCES

- A. ASME B31.9 (American Society of Mechanical Engineers) - Building Services Piping
- B. ASTM F708 - Design and Installation of Rigid Pipe Hangers.
- C. MSS SP58 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Materials, Design and Manufacturer.
- D. MSS SP69 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Selection and Application.
- E. MSS SP89 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Fabrication and Installation Practices.
- F. NFPA 13 (National Fire Protection Association) - Installation of Sprinkler Systems.
- G. NFPA 14 (National Fire Protection Association) - Installation of Standpipe and Hose Systems

1.3 SUBMITTALS

- A. Product Data: Submit manufacturers catalog data including load capacity.
- B. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.
- C. Manufacturer's Installation Instructions: Submit special procedures and assembly of components.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with code for piping support and in conformance with NFPA 16 for support of standpipes.

- B. Maintain one copy of each document on site.

1.5 QUALIFICATIONS

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

1.6 FIELD MEASUREMENTS

- A. Verify field measurements before fabrication.

1.7 WARRANTY

- A. Provide owner with a one year warranty on all parts and labor. Provide the owner with any and all standard warranties from the manufacturer.

PART 2 PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

- A. Manufacturers:

1. Carpenter & Paterson Inc.
2. Creative Systems Inc.
3. Flex-Weld, Inc.
4. Pipe Hanger Products Inc.
5. Superior Valve Co.
6. Or approved equal.

- B. Plumbing Piping - DWV:

1. Conform to ASME B31.9 and MSS SP58.
2. Hangers for Pipe Sizes ½ to 1-1/2 inch: Malleable iron or Carbon steel, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.
6. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.
7. Vertical Support: Steel riser clamp.
8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Copper-plated, carbon-steel adjustable, ring.
10. All insulated piping: oversized hangers to accommodate continuous insulation.

C. Plumbing Piping - Water:

1. Conform to MSS SP58
2. Hangers for Pipe Sizes ½ to 1-1/2 inch: Malleable iron or Carbon steel, adjustable swivel, split ring.
3. Hangers for Cold Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.
5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
6. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.
7. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.
8. Wall Support for Hot Pipe Sizes 6 inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
9. Vertical Support: Steel riser clamp.
10. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
11. Floor Support for Hot Pipe Sizes to 4 inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
12. Floor Support for Hot Pipe Sizes 6 inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
13. Copper Pipe Support: Copper-plated, Carbon-steel ring.
14. All piping in Attic: oversized hangers to accommodate continuous insulation.

D. Hydronic Piping for Heating/Cooling:

1. Conform to ASME B31.9 and MSS SP58.
2. Hangers for Pipe Sizes ½ to 1-1/2 inch: Malleable iron or Carbon steel, adjustable swivel, split ring.
3. Hangers for Cold Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.
5. Hangers for Hot Pipe Sizes 6 inches and Over: Adjustable steel yoke, cast iron roll, double hanger.
6. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 inches and Over: Steel channels with welded spacers and hanger rods, cast iron roll.
8. Wall Support for Pipe Sizes to 3 inches: Cast iron hooks.
9. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.
10. Wall Support for Hot Pipe Sizes 6 inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
11. Vertical Support: Steel riser clamp.
12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

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13. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
14. Floor Support for Hot Pipe Sizes 6 inches and over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
15. Copper Pipe Support: Copper-plated, carbon steel ring.
16. All piping in Attic: oversized hangers to accommodate continuous insulation.

2.2 ACCESSORIES

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

2.3 INSERTS

1. 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 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 Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed
- D. Sleeves for Round Ductwork: Galvanized steel protected for marine environment.
- E. Sleeves for Rectangular Ductwork: Galvanized steel protected for marine environment.
- F. Stuffing Insulation: Glass fiber type, non-combustible.

PART 3 EXECUTION

3.1 PIPE HANGERS AND SUPPORTS

- A. Support horizontal piping as scheduled.
- B. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.
- C. Place hangers within 12 inches of each horizontal elbow.
- D. Use hangers with 1-1/2 inch minimum vertical adjustment.

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- E. Support horizontal cast iron pipe adjacent to each hub, with 4 feet maximum spacing between hangers.
- F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
- G. Where several pipes can be installed in parallel and at same elevation, provide multiple 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 for marine environment.
- L. Provide oversized hangers and supports for all insulated piping to accommodate continuous seamless insulation.

3.2 EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 6 inches beyond supported equipment.
- B. Provide templates, 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.

3.3 FLASHING

- A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked 1-inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter-flash, and seal.
- C. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms for sound control.
- D. Provide curbs for mechanical roof installations 24 inches minimum high above roofing surface. Flash and counter-flash with sheet metal; seal watertight. Attach counterflashing mechanical equipment and lap base flashing on roof curbs. Flatten and solder joints.

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- E. 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.

3.4 SLEEVES

- A. Set sleeves in position in forms. Provide reinforcing around sleeves.
- B. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.
- C. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with stuffing or fire stopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- D. Install chrome plated steel escutcheons at finished surfaces.

3.5 SCHEDULES

<u>PIPE SIZE</u> Inches	<u>MAX. HANGER SPACING</u> Feet	<u>DIAMETER</u> Inches
1/2 to 1-1/4	6.5	3/8
1-1/2 to 2	10	3/8
2-1/2 to 3	10	1/2
4 to 6	10	5/8
8 to 12	14	7/8
14 and over	20	1
pvc (All Sizes)	6	3/8
C.I. Bell and Spigot (or No-Hub) and at Joints	5	5/8

END OF SECTION 22 05 29

SECTION 22 05 53

MECHANICAL IDENTIFICATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes nameplates, tags, stencils and pipe markers.
- B. Tags for gas piping.
- C. Nameplates for boiler and unit heaters.

1.2 REFERENCES

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

1.3 SUBMITTALS

- A. Product Data: Provide manufacturers catalog literature for each product required.
- B. Shop Drawings: Provide list of wording, symbols, letter size, and color coding for mechanical identification and a valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Samples: Submit two tags, 1-1/2 inches in size. Submit two labels, 1.9 x 0.75 inches in size.
- D. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of tagged valves; include valve tag numbers.

1.5 QUALITY ASSURANCE

- A. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories.
- B. 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 documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.7 FIELD MEASUREMENTS

- A. Verify field measurements before fabrication.

1.8 WARRANTY

- A. Provide owner with a one year warranty on all parts and labor. Provide the owner with any and all standard warranties from the manufacturer.

PART 2 PRODUCTS

2.1 NAMEPLATES

- A. Manufacturers:
 - 1. Craftmark Identification Systems.
 - 2. Safety Sign Co.
 - 3. Seton Identification Products
 - 4. Or approved equal.
- B. Product Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

2.2 TAGS

- A. Metal Tags:
 - 1. Craftmark Identification Systems.
 - 2. Safety Sign Co.
 - 3. Seton Identification Products
 - 4. Or approved equal.
- B. Brass with stamped letters; tag size minimum 1-1/2 inches diameter with smooth edges.
- C. Information Tags:
 - 1. Craftmark Identification Systems.
 - 2. Safety Sign Co.
 - 3. Seton Identification Products
 - 4. Or approved equal

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- D. 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.
- E. Tag Chart: Typewritten letter size list of applied tags and location in anodized aluminum frame and plastic laminated.

2.3 STENCILS

- A. Stencils: With clean cut symbols and letters of following size:
 - 1. Up to 2 inches Outside Diameter of Insulation or Pipe: 1/2 inch high letters.
 - 2. 2-1/2 to 6 inches Outside Diameter of Insulation or Pipe: 1-inch high letters.
 - 3. Over 6 inches Outside Diameter of Insulation or Pipe: 1-3/4 inches high letters.
 - 4. Equipment: 1-3/4 inches high letters.
- B. Stencil Paint: Semi-gloss enamel, colors and lettering size conforming to ASME A13.1.

2.4 PIPE MARKERS

- A. Color and Lettering: Conform to ASME A13.1.
- B. Plastic Pipe Markers:
 - 1. Craftmark Identification Systems.
 - 2. Safety Sign Co.
 - 3. Seton Identification Products
 - 4. Or approved equal.
- C. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

- A. Install identifying devices after completion of coverings and painting.
- B. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.
- C. Install labels with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer. For unfinished canvas covering, apply paint primer before applying labels.

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- D. Install tags using corrosion resistant chain. Number tags consecutively by location.
- E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- F. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- G. Identify control panels and major control components outside panels with plastic nameplates.
- H. Identify valves in main and branch piping with tags.
- I. Tag automatic controls, instruments, and relays. Key to control schematic.
- J. 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.
- K. Identify ductwork with plastic nameplates or stenciled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- L. Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 22 05 53

SECTION 22 07 00

MECHANICAL INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes ductwork insulation, equipment insulation, covering and thermal insulation for piping systems including vapor retarders, jackets and accessories.
- B. Related Sections:
 - 1. Section 22 05 59 – Hangers and Supports: Execution requirements for inserts for placement by this section.
 - 2. Section 22 05 53 – Mechanical Identification: Product requirements for mechanical identification for placement by this section.

1.2 REFERENCES

- A. ASTM C610 - Standard Specification for Expanded Perlite Block and Pipe Thermal Insulation.
- B. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- C. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
- D. ASTM C1071 - Standard Specification for Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material).
- E. ASTM C1126- Standard Specification for Preformed Closed Cell Phenolic Foam Pipe and Board Insulation.
- F. ASTM C1136 – Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
- G. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- I. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
- J. NAIMA (North American Insulation Manufacturers Association) - National Insulation Standards.

- K. SMACNA (Sheet Metal and Air Conditioning Contractors' National Association) - HVAC Duct Construction Standards - Metal and Flexible.

1.3 SUBMITTALS

- A. Product Data: Provide product description, thermal characteristics and list of materials and thickness for each service, and locations.
- B. Manufacturer's Installation Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.4 QUALIFICATIONS

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

1.5 PRE-INSTALLATION MEETING

- A. Convene minimum one week before commencing work of this section.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not install insulation outside ambient conditions required by manufacturer of each product.

1.8 FIELD MEASUREMENTS

- A. Verify field measurements before fabrication.

1.9 WARRANTY

- A. Provide owner with a one year warranty on all parts and labor. Provide the owner with any and all standard warranties from the manufacturer.

PART 2 PRODUCTS

2.1 MINERAL FIBER, RIGID

- A. Manufacturers:
 - 1. Knauff.
 - 2. Schuller.
 - 3. Substitutions: See Section Product Requirements.
- B. Insulation: ASTM C612 Mineral Fiber Block and Board Insulation, Type IA
- C. Vapor Retarder Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture vapor transmission: ASTM E96; 0.04 perm.
 - 3. Secure with two coats of vapor barrier mastic and glass tape.
- D. Vapor Retarder Tape.
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- E. Indoor Vapor Retarder Finish:
 - 1. Cloth: Untreated: 9 oz/sq yd weight, glass fabric.
 - 2. Vinyl emulsion type acrylic, compatible with insulation, white color.

2.2 GLASS FIBER, RIGID

- A. Insulation: ASTM C612 or ASTM C592; rigid, noncombustible.
 - 1. 'K' factor: ASTM C177 or ASTM C518, 0.24 at 75 degrees F.
 - 2. Maximum Service Temperature: 450 degrees F.
 - 3. Maximum Moisture Absorption: 0.1 percent by volume.
 - 4. Density: 2.0 lb/cu ft.
- B. Vapor Retarder Jacket: ASTM C1136 Flexible, Low Permeance Vapor Retarders for Thermal Insulation, Type II.
- C. Facing: 1 inch galvanized steel hexagonal wire mesh stitched on one face of insulation with expanded metal lath on other.
- D. Vapor Retarder Lap Adhesive:
 - 1. Compatible with insulation.
- E. Insulating Cement/Mastic:
 - 1. ASTM C195; hydraulic setting on mineral wool.

2.3 PVC Plastic Jacket

- A. Pipe Jacket: ASTM D1784, One piece molded type fitting covers and sheet material, off-white color.
 - 1. Thickness: 15 mil.
 - 2. Connections: Brush on welding adhesive and Pressure sensitive color matching vinyl tape.
- B. PVC Jacket: UL listed.
 - 1. Fabric: 6 oz/sq yd, plain PVC.
 - 2. Fire retardant lagging adhesive. Composite of insulation, jacket and lagging adhesive shall have a flame spread index not greater than 25 and a smoke developed index not greater than 50 per ASTM E84.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that piping, equipment and ductwork has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

- A. Install in accordance with NAIMA National Insulation Standards.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- D. Man made mineral fiber insulated pipes conveying fluids below ambient temperature:
 - 1. Provide 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 all staple penetrations with vapor retarder mastic.
 - 2. 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.
- E. Man made mineral fiber insulated pipes conveying fluids above ambient temperature:

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1. Provide factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or the 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.
- F. Inserts and Shields:
1. Application: Piping or Equipment 1-1/2 inches diameter or larger.
 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 3. Insert location: Between support shield and piping and under the finish jacket.
 4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 5. Insert material: Compression resistant insulating material suitable for the planned temperature range and service.
- G. Continue insulation through penetrations of building assemblies or portions of assemblies having a fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Coordinate with Architectural section for penetrations of assemblies with a fire resistance rating greater than one hour.
- H. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.
- I. Factory Insulated Equipment: Do not insulate.
- J. Exposed Equipment: Locate insulation and cover seams in least visible locations.
- K. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
- L. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
- M. Insulated equipment that contains fluids below ambient temperature: Insulate entire system.
- N. Mineral fiber insulated equipment that contains fluids below ambient temperature: Provide vapor retarder jackets, factory-applied or field-applied. Finish with glass-cloth and vapor barrier adhesive.
- O. Mineral fiber insulated equipment that contains fluids above ambient temperature: Provide standard jackets, with or without vapor retarder, factory-applied or field-applied. Finish with glass cloth and adhesive.
- P. Finish insulation at supports, protrusions, and interruptions.

- Q. Equipment in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.
- R. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.
- S. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed and replaced without damage.
- T. Insulated ductwork conveying air below ambient temperature:
 - 1. Provide insulation with vapor retarder jackets.
 - 2. Finish with tape and vapor retarder jacket.
 - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 - 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- U. Insulated ductwork conveying air above ambient temperature:
 - 1. Provide with or without standard vapor retarder jacket.
 - 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- V. Duct and Plenum Liner Application:
 - 1. Adhere insulation with adhesive for 90 percent coverage.
 - 2. Secure insulation with mechanical liner fasteners. SMACNA Standards for spacing.
 - 3. Seal and smooth joints. Seal and coat transverse joints.
 - 4. Seal liner surface penetrations with adhesive.
 - 5. Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for insulation thickness.

3.3 SCHEDULES

- A. Plumbing Systems:
 - 1. Domestic Hot Water Supply:
 - a. Glass Fiber Rigid:
 - 1) Pipe Size Range: all.
 - 2) Thickness: 1 inch.
 - 3) Surface jacket: PVC jacket (PVC finish) for exposed piping.
 - 2. Domestic Hot Water Re-circulation:
 - a. Glass Fiber Rigid:
 - 1) Pipe Size Range: All sizes.
 - 2) Thickness: 1 inch.
 - 3) Surface jacket: PVC jacket (PVC finish) for exposed piping.

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3. Domestic Cold Water:
 - a. Glass Fiber Rigid:
 - 1) Pipe sizing: All sizes.
 - 2) Thickness: .5 inch.
 - 3) Surface jacket: PVC jacket (PVC finish) for exposed piping.

B. Heating Systems:

1. Heating System Supply and Return:
 - a. Glass Fiber Rigid:
 - 1) Pipe Size Range: All sizes.
 - 2) Thickness: 2 inch.
 - 3) Surface jacket: PVC jacket (PVC finish) for all piping visible and boiler room.

C. Plumbing Equipment:

1. Heating/ Cooling Systems:
 - a. Mineral Fiber Rigid:
 - 1) Expansion Tanks: 2 inches (in Mechanical and Pumps Room).
 - 2) Surface jacket: Canvas or PVC for all equipment.

END OF SECTION 22 07 00

SECTION 22 13 16

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.2 SUMMARY

- A. This Section includes the following for soil, waste, and vent piping inside the building:
 - 1. Pipe, tube, and fittings.
 - 2. Special pipe fittings.

1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. EPDM: Ethylene-propylene-diene terpolymer rubber.
- C. LLDPE: Linear, low-density polyethylene plastic.
- D. NBR: Acrylonitrile-butadiene rubber.
- E. PE: Polyethylene plastic.
- F. PVC: Polyvinyl chloride plastic.
- G. TPE: Thermoplastic elastomer.

1.4 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Shop Drawings:
 - 1. Drainage System: Include plans, elevations, sections, and details.
- C. Field quality-control inspection and test reports.

1.5 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of installed drainage systems.

1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

1.7 WARRANTY

- A. Provide owner with a one year warranty on all parts and labor. Provide the owner with any and all standard warranties from the manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
 - 1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.
- B. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.
 - 1. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

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- C. Cellular-Core, Sewer and Drain Series, PVC Pipe: ASTM F 891, Series PS 100.
 - 1. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Series PS 100 sewer and drain pipe.
- D. Solvent Cement and Adhesive Primer:
 - 1. Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 SPECIAL PIPE FITTINGS

- A. Flexible, Non-pressure Pipe Couplings: Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition pattern. Include shear ring, ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - 1. Manufacturers:
 - a. Dallas Specialty & Mfg. Co.
 - b. Fernco, Inc.
 - c. Logan Clay Products Company (The).
 - d. Mission Rubber Co.
 - e. NDS, Inc.
 - f. Plastic Oddities, Inc.
 - 2. Sleeve Materials:
 - a. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
- B. Wall-Penetration Fittings: Compound, ductile-iron coupling fitting with sleeve and flexing sections for up to 20-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.
- B. Aboveground sanitary-sewage force mains NPS 2-1/2 to NPS 6 shall be any of the following:
 - 1. Cellular-core, Solid-wall, Schedule 40, PVC pipe; PVC socket fittings; and solvent-cemented joints.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
 - 2. NPS 3: 48 inches with 1/2-inch rod.
- B. Install supports for vertical PVC piping every 48 inches.
- C. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.3 PIPING INSTALLATION

- A. Connect drainage and vent piping to the following:
 - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

3.4 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

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2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.5 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.6 PROTECTION

- A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION 22 13 16

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Sleeves.
5. Escutcheons.
6. Grout.
7. HVAC demolition.
8. Equipment installation requirements common to equipment sections.
9. Painting and finishing.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
 1. CPVC: Chlorinated polyvinyl chloride plastic.

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2. PE: Polyethylene plastic.
3. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene monomer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.
5. As listed in the individual specification sections.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

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- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- G. Solvent Cements for Joining Plastic Piping:
 - 1. CPVC Piping: ASTM F 493.
 - 2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
- H. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.4 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
 - 1. Manufacturers:
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Company.
 - c. Eclipse, Inc.
 - d. Epco Sales, Inc.
 - e. Hart Industries, International, Inc.
 - f. Watts Industries, Inc.; Water Products Div.
 - g. Zurn Industries, Inc.; Wilkins Div.
- D. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
 - 1. Manufacturers:
 - a. Calpico, Inc.
 - b. Lochinvar Corp.

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- E. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.
 - 1. Manufacturers:
 - a. Perfection Corp.
 - b. Precision Plumbing Products, Inc.
 - c. Sioux Chief Manufacturing Co., Inc.
 - d. Victaulic Co. of America.

2.5 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
 - 1. Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
 - 2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 3. Pressure Plates: Plastic or Carbon steel. Include two for each sealing element.
 - 4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.6 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with set screws.
- C. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- D. PVC Pipe: ASTM D 1785, Schedule 40.
- E. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.7 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
 - 1. Finish: Polished chrome-plated.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
 - 1. Finish: Polished chrome-plated.

2.8 GROUT

- A. Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 HVAC DEMOLITION

- A. Disconnect, demolish, and remove HVAC systems, equipment, and components indicated to be removed.
 - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
 - 3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - 4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
 - 5. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - 6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - 7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

- B. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
 - 1. New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - 2. Existing Piping: Use the following:
 - a. Chrome-Plated Piping: Split-casting, cast-brass type with chrome-plated finish.

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- b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge and spring clips.
 - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
- L. Sleeves are not required for core-drilled holes.
- M. Permanent sleeves are not required for holes formed by removable PE sleeves.
- N. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
- O. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
- 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 - 1) Seal space outside of sleeve fittings with grout.
- P. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
 - 2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
 - 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- Q. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.
- R. Verify final equipment locations for roughing-in.
- S. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- 3.3 PIPING JOINT CONSTRUCTION
- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
 - B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

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- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
 - D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
 - E. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
 - F. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 - 3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - 4. PVC Non-pressure Piping: Join according to ASTM D 2855.
 - G. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
 - H. Plastic Non-pressure Piping Gasketed Joints: Join according to ASTM D 3212.
 - I. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
 - 1. Plain-End Pipe and Fittings: Use butt fusion.
 - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.
 - J. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.
- 3.4 PIPING CONNECTIONS
- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.6 PAINTING

- A. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 GROUTING

- A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Avoid air entrapment during placement of grout.
- D. Place grout, completely filling equipment bases.
- E. Place grout around anchors.

END OF SECTION 23 05 00

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes testing, adjusting, and balancing of air systems, testing, adjusting, and balancing of hydronic systems, measurement of final operating condition of HVAC systems, sound measurement of equipment operating conditions, vibration measurement of equipment operating conditions.

1.2 REFERENCES

- A. AABC (Associated Air Balance Council) - National Standards for Total System Balance.
- B. ASHRAE 111 (American Society of Heating, Refrigerating and Air-Conditioning Engineers) - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems.
- C. NEBB (National Environmental Balancing Bureau) - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

1.3 SUBMITTALS

- A. Test Reports: Indicate data on AABC National Standards for Total System Balance forms, forms prepared following ASHRAE 111, or NEBB Report forms.
- B. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
- C. Prior to commencing Work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.
- D. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Engineer and for inclusion in operating and maintenance manuals.
- E. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index 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.
- F. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty or Copy of NEBB Certificate of Conformance Certification.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit final testing, adjusting, and balancing report.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance, ASHRAE 111 or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems
- B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

- A. Agency: Company specializing in the testing, adjusting, and balancing of systems specified in this section with minimum three years documented experience certified by AABC or Certified by NEBB.
- B. Perform Work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor, or registered professional engineer experienced in performance of this Work and licensed in the State of Maine.

1.7 SEQUENCING

- A. Sequence balancing between completion of systems tested and Date of Substantial Completion.

1.8 SCHEDULING

- A. Schedule and provide assistance in final adjustment and test of life safety system with Fire Authority.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.

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5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Smoke and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.
12. Hydronic systems are flushed, filled, and vented.
13. Pumps are rotating correctly.
14. Proper strainer baskets are clean and in place or in normal position.
15. Service and balance valves are open.

- B. Submit field reports. Report defects and deficiencies noted during performance of services, which prevent system balance.

3.2 PREPARATION

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

3.3 INSTALLATION TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 10 percent of design.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
- C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.4 ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

3.5 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.
- B. Make air quantity measurements in main ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts.
- E. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide sheave drive changes as required to vary fan speed. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- I. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- J. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure.

3.6 WATER SYSTEM PROCEDURE

- A. Adjust water systems, after air balancing, to provide design quantities.
- B. Use calibrated fittings and pressure gauges to determine flow rates for system balance. Where flow-metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- D. Effect system balance with automatic control valves fully open or in normal position to heat transfer elements.

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- E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.
- F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.7 SCHEDULES

- A. Equipment Requiring Testing, Adjusting, and Balancing
 - 1. HVAC Pumps
 - 2. Fans
- 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 amount of 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

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4. Electric Motors:
 - a. Manufacturer
 - b. Model/Frame
 - c. HP/BHP and kW
 - d. Phase, voltage, amperage; nameplate, actual, no load
 - e. RPM
 - f. Service factor
 - g. Starter size, rating, heater elements
 - h. Sheave Make/Size/Bore

5. V-Belt Drive:
 - a. Identification/location
 - b. Required driven RPM
 - c. Driven sheave, diameter and RPM
 - d. Belt, size and quantity
 - e. Motor sheave diameter and RPM
 - f. Center to center distance, maximum, minimum, and actual

6. 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

7. Exhaust Fan Data:
 - a. Location
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Air flow, specified and actual
 - f. Total static pressure (total external), specified and actual
 - g. Inlet pressure
 - h. Discharge pressure
 - i. Sheave Make/Size/Bore
 - j. Number of Belts/Make/Size
 - k. Fan RPM

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8. Duct Leak Test:
 - a. Description of ductwork under test
 - b. Duct design operating pressure
 - c. Duct design test static pressure
 - d. Duct capacity, air flow
 - e. Maximum allowable leakage duct capacity times leak factor
 - f. Test apparatus
 - 1) Blower
 - 2) Orifice, tube size
 - 3) Orifice size
 - 4) Calibrated
 - g. Test static pressure
 - h. Test orifice differential pressure
 - i. Leakage
9. Normally acceptable readings, velocity and acceleration

END OF SECTION 23 05 93

SECTION 23 11 23

NATURAL GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipes, tubes, and fittings.
 - 2. Piping specialties.
 - 3. Piping and tubing joining materials.
 - 4. Valves.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4 PERFORMANCE REQUIREMENTS

- A. Minimum Operating-Pressure Ratings:
 - 1. Piping and Valves: 100 psig minimum unless otherwise indicated.
 - 2. Service Regulators: 65 psig minimum unless otherwise indicated.
 - 3. Minimum Operating Pressure of Service Meter: 5 psig.
- B. Natural Gas System Pressure within Buildings: Not more than 2 psig.
- C. Delegated Design: Design restraints and anchors for natural-gas piping and equipment, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.5 SUBMITTALS

- A. Product Data: For each type of the following:
 - 1. Piping specialties.
 - 2. Corrugated, stainless-steel tubing with associated components.
 - 3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
 - 4. Dielectric fittings.
 - 5. Mechanical sleeve seals.
 - 6. Escutcheons.

- B. Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.
 - 1. Shop Drawing Scale: 1/4 inch per foot.

- C. Delegated-Design Submittal: For natural-gas piping and equipment indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Detail fabrication and assembly of seismic restraints.
 - 2. Design Calculations: Calculate requirements for selecting seismic restraints.

- D. Coordination Drawings: Plans and details, drawn to scale, on which natural -gas piping is shown and coordinated with other installations, using input from installers of the items involved.

- E. Site Survey: Plans, drawn to scale, on which natural-gas piping is shown and coordinated with other services and utilities.

- F. Qualification Data: For qualified professional engineer.

- G. Welding certificates.

- H. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of installed natural gas distribution systems.

1.7 QUALITY ASSURANCE

- A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

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- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.
- B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.
- D. Protect stored PE pipes and valves from direct sunlight.

1.9 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

1.10 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.
- B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces.

1.11 WARRANTY

- A. Provide owner with a one year warranty on all parts and labor. Provide the owner with any and all standard warranties from the manufacturer.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
 - 1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
 - 2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
 - 3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.

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4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - a. Material Group: 1.1.
 - b. End Connections: Threaded or butt welding to match pipe.
 - c. Lapped Face: Not permitted underground.
 - d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
 - e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.
5. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
 - a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.
6. Mechanical Couplings:
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Dresser Piping Specialties; Division of Dresser, Inc.
 - 2) Smith-Blair, Inc.
 - 3) Or equivalent.
 - b. Steel flanges and tube with epoxy finish.
 - c. Buna-nitrile seals.
 - d. Steel bolts, washers, and nuts.
 - e. Coupling shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
 - f. Steel body couplings installed underground on plastic pipe shall be factory equipped with anode.

2.2 PIPING SPECIALTIES

- A. Quick-Disconnect Devices: Comply with ANSI Z21.41.
 1. Copper-alloy convenience outlet and matching plug connector.
 2. Nitrile seals.
 3. Hand operated with automatic shutoff when disconnected.
 4. For indoor or outdoor applications.
 5. Adjustable, retractable restraining cable.
- B. Basket Strainers:
 1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.

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2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
 3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
 4. CWP Rating: 125 psig.
- C. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

- A. Joint Compound and Tape: Suitable for natural gas.
- B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 MANUAL GAS SHUTOFF VALVES

- A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.
- B. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.
 1. CWP Rating: 125 psig.
 2. Threaded Ends: Comply with ASME B1.20.1.
 3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
 4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
 6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.
- C. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BrassCraft Manufacturing Company; a Masco company.
 - b. Conbraco Industries, Inc.; Apollo Div.
 - c. Lyall, R. W. & Company, Inc.
 - d. McDonald, A. Y. Mfg. Co.
 - e. Perfection Corporation; a subsidiary of American Meter Company.
 2. Body: Bronze, complying with ASTM B 584.

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3. Ball: Chrome-plated brass.
 4. Stem: Bronze; blowout proof.
 5. Seats: Reinforced TFE; blowout proof.
 6. Packing: Separate packnut with adjustable-stem packing threaded ends.
 7. Ends: Threaded, flared, or socket as indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 8. CWP Rating: 600 psig .
 9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
 10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.
- D. Two-Piece, Regular-Port Bronze Ball Valves with Bronze Trim: MSS SP-110.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BrassCraft Manufacturing Company; a Masco company.
 - b. Conbraco Industries, Inc.; Apollo Div.
 - c. Lyall, R. W. & Company, Inc.
 - d. McDonald, A. Y. Mfg. Co.
 - e. Perfection Corporation; a subsidiary of American Meter Company.
 2. Body: Bronze, complying with ASTM B 584.
 3. Ball: Chrome-plated bronze.
 4. Stem: Bronze; blowout proof.
 5. Seats: Reinforced TFE.
 6. Packing: Threaded-body packnut design with adjustable-stem packing.
 7. Ends: Threaded, flared, or socket as indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 8. CWP Rating: 600 psig.
 9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
 10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.
- E. Bronze Plug Valves: MSS SP-78.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Lee Brass Company.
 - b. McDonald, A. Y. Mfg. Co.
 2. Body: Bronze, complying with ASTM B 584.
 3. Plug: Bronze.
 4. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 5. Operator: Square head or lug type with tamperproof feature where indicated.
 6. Pressure Class: 125 psig.

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7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.5 DIELECTRIC FITTINGS

A. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. Hart Industries International, Inc.
 - d. McDonald, A. Y. Mfg. Co.
 - e. Watts Regulator Co.; Division of Watts Water Technologies, Inc.
 - f. Wilkins; Zurn Plumbing Products Group.
2. Minimum Operating-Pressure Rating: 150 psig.
3. Combination fitting of copper alloy and ferrous materials.
4. Insulating materials suitable for natural-gas.
5. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

B. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. Watts Regulator Co.; Division of Watts Water Technologies, Inc.
 - d. Wilkins; Zurn Plumbing Products Group.
2. Minimum Operating-Pressure Rating: 150 psig.
3. Combination fitting of copper alloy and ferrous materials.
4. Insulating materials suitable for natural-gas.
5. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

C. Dielectric-Flange Kits:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico Inc.

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- c. Central Plastics Company.
 - d. Pipeline Seal and Insulator, Inc.
2. Minimum Operating-Pressure Rating: 150 psig.
 3. Companion-flange assembly for field assembly.
 4. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or PE bolt sleeves, phenolic washers, and steel backing washers.
 5. Insulating materials suitable for natural-gas.
 6. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

2.6 SLEEVES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.7 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.
 2. Sealing Elements: EPDM, NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe and sleeve.
 3. Pressure Plates: Carbon steel.
 4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one nut and bolt for each sealing element.

2.8 ESCUTCHEONS

- A. General Requirements for Escutcheons: Manufactured wall and ceiling escutcheons and floor plates, with ID to fit around pipe or tube, and OD that completely covers opening.
- B. One-Piece, Deep-Pattern Escutcheons: Deep-drawn, box-shaped brass with polished chrome-plated finish.

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- C. One-Piece, Cast-Brass Escutcheons: With set screw.
 - 1. Finish: Polished chrome-plated.
- D. One-Piece, Floor-Plate Escutcheons: Cast-iron floor plate.
- E. Split-Casting, Floor-Plate Escutcheons: Cast brass with concealed hinge and set screw.

2.9 GROUT

- A. Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

2.10 LABELING IDENTIFYING

- A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying aboveground piping, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility; colored yellow.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Close equipment shutoff valves before turning off natural gas to premises or piping section.
- B. Inspect natural-gas piping according to NFPA 54 and the International Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.
- C. Comply with NFPA 54 and the International Fuel Gas Code requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.

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- B. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

- 1. Install steel pipe for sleeves smaller than 6 inches in diameter.

- C. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 INDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.

- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

- C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

- G. Locate valves for easy access.

- H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

- I. Install piping free of sags and bends.

- J. Install fittings for changes in direction and branch connections.

- K. Install escutcheons at penetrations of interior walls, ceilings, and floors.

- 1. New Piping:

- a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.

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- c. Piping at Ceiling Penetrations in Finished Spaces: One-piece cast-brass type with polished chrome-plated finish.
 - d. Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - e. Piping in Equipment Rooms: One-piece, stamped-steel type with set screw or spring clips.
 - f. Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
 - g. All screws shall be stainless steel.
- L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. All firestop materials shall be marine environment tested.
- M. Verify final equipment locations for roughing-in.
- N. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
- O. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
- 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
- P. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
- 1. Prohibited Locations:
 - a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
 - b. Do not install natural-gas piping in solid walls or partitions.
- Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- R. Connect branch piping from top or side of horizontal piping.
- S. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.
- T. Do not use natural-gas piping as grounding electrode.

3.5 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.
- B. Install underground valves with valve boxes.
- C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.
- D. Install earthquake valves aboveground outside buildings according to listing.
- E. Install anode for metallic valves in underground PE piping.

3.6 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints:
 - 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
 - 2. Cut threads full and clean using sharp dies.
 - 3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
 - 4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
 - 5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. Welded Joints:
 - 1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
 - 2. Bevel plain ends of steel pipe.
 - 3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

3.7 HANGER AND SUPPORT INSTALLATION

- A. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices.
- B. Comply with requirements for pipe hangers and supports.
- C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.

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2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.

3.8 CONNECTIONS

- A. Connect to utility's gas main according to utility's procedures and requirements.
- B. Install piping adjacent to appliances to allow service and maintenance of appliances.
- C. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.
- D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.9 PAINTING

- A. Paint exposed, exterior metal piping with factory-applied paint or protective coating. Coating shall be also marine environment tested.
 1. Alkyd System: MPI EXT 5.1D.
 - a. Prime Coat: Alkyd anticorrosive metal primer.
 - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
 - c. Topcoat: Exterior alkyd enamel flat.
 - d. Color: Gray.
- B. Paint exposed, interior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.
 1. Latex Over Alkyd Primer System: MPI INT 5.1Q.
 - a. Prime Coat: Quick-drying alkyd metal primer.
 - b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex flat.
 - d. Color: Gray.
- C. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.10 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:

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1. Test, inspect, and purge natural gas according to NFPA 54 and the International Fuel Gas Code and authorities having jurisdiction.
 - C. Natural-gas piping will be considered defective if it does not pass tests and inspections.
 - D. Prepare test and inspection reports.
- 3.11 OUTDOOR PIPING SCHEDULE
- A. Aboveground natural-gas piping shall be the following:
 1. Steel pipe with malleable-iron fittings and threaded joints.
 2. Steel pipe with wrought-steel fittings and welded joints.
- 3.12 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN 0.5 PSIG AND LESS THAN 5 PSIG
- A. Aboveground, distribution piping shall be one of the following:
 1. Steel pipe with malleable-iron fittings and threaded joints.
 2. Steel pipe with steel welding fittings and welded joints.
- 3.13 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE
- A. Valves for pipe sizes NPS 2 and smaller at service meter shall be the following:
 1. One-piece, bronze ball valve with bronze trim.
 2. Bronze plug valve.
 - B. Distribution piping valves for pipe sizes NPS 2 and smaller shall be one of the following:
 1. One-piece, bronze ball valve with bronze trim.
 2. Two-piece, full, regular-port, bronze ball valves with bronze trim.
 3. Bronze plug valve.

END OF SECTION 23 11 23

SECTION 23 21 13

HEATING PIPING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes systems, accessories, valves, pipe and pipe fitting for: heating system.
- B. Related Sections:
 - 1. Section 22 07 00 Mechanical Insulation: Product requirements for Piping Insulation for placement by this section.

1.2 REFERENCES

- A. ASME (American Society of Mechanical Engineers) - Boiler and Pressure Vessel Codes, SEC IX - Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators.
- B. ASME B16.22 (American Society of Mechanical Engineers) - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- C. ASME SEC VIII-D (American Society of Mechanical Engineers) - Boilers and Pressure Vessels Code, Rules for Construction of Pressure Vessels.
- D. ASME B16.18 (American Society of Mechanical Engineers) - Cast Copper Alloy Solder Joint Pressure Fittings.
- E. ASME B16.22 (American Society of Mechanical Engineers) - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- F. ASME B31.9 (American Society of Mechanical Engineers) - Building Services Piping.
- G. ASTM B88 - Seamless Copper Water Tube.
- H. ASTM B280 - Seamless Copper Tube for Air Conditioning and Refrigeration
- I. ASTM D2310 - Machine-Made Reinforced Thermosetting Resin Pipe.
- J. ASTM F708 - Design and Installation of Rigid Pipe Hangers.
- K. AWS A5.8 (American Welding Society) - Brazing Filler Metal.
- L. AWS D1.1 (American Welding Society) - Structural Welding Code.

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- M. MSS SP58 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Materials, Design and Manufacture.
- N. MSS SP69 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Selection and Application.

1.3 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- B. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Use non-conducting dielectric connections whenever jointing dissimilar metals in open systems. Do not use direct welded or threaded connections to valves, equipment or other apparatus.
- C. Provide pipe hangers and supports in accordance with ASTM B31.9 and MSS SP69 unless indicated otherwise.
- D. Use ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Use globe valves for throttling, bypass, or manual flow control services.
- F. Use spring loaded check valves on discharge of pumps.
- G. Use plug cocks for throttling service. Use non-lubricated plug cocks only when shut-off or isolating valves are also provided.
- H. Use ¾-inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.
- I. Strainers:
 - 1. Use line size strainer upstream of each automatic valve.
 - 2. Where multiple expansion valves with integral strainers are used, use single main liquid-line strainer.
- J. Pressure Relief Valves: pipe to floor
- K. Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

1.4 SUBMITTALS

- A. Product Data: Submit data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

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- B. Welders' Certificate: Include welders' certification of compliance with ASME/SEC 9.
- 1.5 CLOSEOUT SUBMITTALS
- A. Project Record Documents: Record actual locations of installed drainage systems.
 - B. Operation and Maintenance Data: Submit instructions for installation and changing components, spare parts lists, exploded assembly views. Provide manufacturer's printed operating procedures to include start-up, break-in, routine and normal operation instruction; regulation control, stopping, shut-down, and emergency instructions; and summer and winter operation instructions. Provide copies of warranties.
- 1.6 QUALITY ASSURANCE
- A. Perform Work in accordance with ASME B31.9 code for installation of piping systems and ASME SEC IX for welding materials and procedures.
 - B. Maintain one copy of each document on site.
- 1.7 QUALIFICATIONS
- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- 1.8 PRE-INSTALLATION MEETING
- A. Convene minimum one week prior to commencing Work of this section.
- 1.9 DELIVERY, STORAGE, AND HANDLING
- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
 - B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
 - C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system Protect
- 1.10 FIELD MEASUREMENTS
- A. Verify field measurements prior to fabrication.
- 1.11 WARRANTY
- A. Provide owner with a one year warranty on all parts and labor. Provide the owner with any and all standard warranties from the manufacturer.

PART 2 PRODUCTS

2.1 HEATING WATER

- A. Steel Pipe: ASTM A53, Schedule 40 black.
- B. Copper Tubing: ASTM B88, Type M hard drawn.
 - 1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.
 - 2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.

2.2 EQUIPMENT DRAINS AND OVERFLOWS

- A. Copper Tubing: ASTM B88, Type M hard drawn.
 - 1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.

2.3 UNIONS, FLANGES, AND COUPLINGS

- A. Unions for Pipe 2 inches and Under:
 - 1. Ferrous Piping: 150 psig malleable iron, threaded.
 - 2. Copper Pipe: Bronze, soldered joints.
- B. Flanges for Pipe Over 2 inches:
 - 1. Ferrous Piping: 150 psig forged steel, slip-on.
 - 2. Copper Piping: Bronze.
 - 3. Gaskets: 1/16-inch thick preformed neoprene.
- C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, and water impervious isolation barrier.

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.

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- E. After completion, fill, clean, and treat systems.
- 3.2 INSTALLATION
- A. Install heating water piping in conformance 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.
 - F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
 - G. Provide access where valves and fittings are not exposed
 - H. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
 - I. Install valves with stems upright or horizontal, not inverted.

END OF SECTION 23 21 13

SECTION 23 21 23

PUMPS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes in-line circulators.
- B. Section includes motor controls for supplied equipment.

1.2 REFERENCES

- A. ASME (American Society of Mechanical Engineers) - Boiler and Pressure Vessel Codes, SEC VIII-D - Rules for Construction of Pressure Vessels.

1.3 PERFORMANCE REQUIREMENTS

- A. Ensure pumps 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.

1.4 SUBMITTALS

- A. 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.
- B. Manufacturer's Installation Instructions: Submit application, selection, and hookup configuration with pipe and accessory elevations. Submit hanging and support requirements and recommendations.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit installation instructions, servicing requirements, assembly views, lubrication instructions, and replacement parts list. Provide manufacturer's printed operating procedures to include start-up, break-in, routine and normal operation instruction; regulation control, stopping, shut-down, and emergency instructions; and summer and winter operation instructions. Provide copies of warranties.

1.6 QUALIFICATIONS

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

1.7 DELIVERY, STORAGE, AND HANDLING

- A. 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 before fabrication.

1.9 WARRANTY

- A. Provide owner with a one year warranty on all parts and labor. Provide the owner with any and all standard warranties from the manufacturer.

PART 2 PRODUCTS

2.1 IN-LINE PUMPS

- A. Type: Vertical, single stage, close coupled, radial or horizontally split casing, for in-line mounting, for 175 psig working pressure.
- B. Casing: Cast iron, Cast steel, with suction and discharge gage port, casing wear ring, seal flush connection, drain plug, flanged suction and discharge.
- C. Impeller: Bronze, fully enclosed, keyed directly to motor shaft or extension.
- D. Shaft: Carbon steel with stainless steel impeller cap screw or nut.
- E. Shaft Sleeve: Aluminum bronze.
- F. Seal: Carbon rotating against a stationary ceramic seat, 225 degrees F maximum continuous operating temperature.

2.2 MOTOR CONTROLS

- A. Motor starters furnished shall have a 3-pole type, non-overload device and shall have “ON-AUTO-OFF” switches in cover plate. They shall be general purpose NEMA rated for connected HP and shall have control power with fused transformers as required. Coordinate control voltage with Controls Contractor. Provide auxiliary contacts for interlocking of electrical equipment and direct digital control of motors.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install long radius reducing elbows or reducers between pump and piping. Support piping adjacent to pump such that no weight is carried on pump casings. For close coupled or base mounted pumps, provide supports under elbows on pump suction and discharge line sizes 4 inches and over.
- B. Provide line sized shut-off valve and strainer and pump suction fitting on pump suction, and line sized soft seat check valve and balancing valve or combination pump discharge valve on pump discharge.
- C. Provide air cock and drain connection on horizontal pump casings.
- D. Provide drains for bases and seals.
- E. Provide flexible connections and pressure gauges.
- F. Check, align, and certify alignment of base mounted pumps before start-up.
- G. Lubricate pumps before start-up.
- H. All bolts for pump flanges shall be stainless steel.

3.2 DEMONSTRATION AND TRAINING

- A. Demonstrate operation and maintenance procedures.
- B. Train Owner's maintenance personnel to adjust, operate, and maintain the pumps.

END OF SECTION 23 21 23

SECTION 23 52 23

HEATING BOILERS AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes boilers, controls and boiler trim, hot water connections, fuel burning system and connections.
- B. Boiler B-1 for Natural Gas.

1.2 REFERENCES

- A. ASME SEC I (American Society of Mechanical Engineers) - Boiler and Pressure Vessels Code - Rules for Construction of Power Boilers.
- B. ASME SEC IV (American Society of Mechanical Engineers) - Boiler and Pressure Vessels Code - Rules for Construction of Heating Boilers.
- C. ASME SEC VIII DIV 1 (American Society of Mechanical Engineers) - Boilers and Pressure Vessels Code - Rules for Construction of Pressure Vessels.
- D. HI (Hydronics Institute) - Testing and Rating Standard for Cast Iron and Steel Heating Boilers.
- E. NFPA 31 (National Fire Protection Association) - Installation of Oil Burning Equipment.
- F. NFPA 54 (AGA Z223.1) (National Fire Protection Association) - National Fuel Gas Code.

1.3 SUBMITTALS

- A. Product Data: Submit general layout and dimensions. Include size and location of water, fuel, electric and vent connections, electrical characteristics, weight and mounting loads.
- B. Manufacturer's Installation Instructions: Submit assembly, support details, connection requirements, and include start-up instructions.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Manufacturers Field Reports: Indicate condition of equipment after start-up including control settings and performance chart of control system.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data. Provide manufacturer's printed operating procedures to include start-up, break-in, routine and normal operation instruction; regulation control, stopping, shut-

down, and emergency instructions; and summer and winter operation instructions.
Provide copies of warranties.

1.5 QUALITY ASSURANCE

- A. Conform to ASME SEC I and SEC IV for construction of boilers. The boiler shall be registered with the National Board Of Boiler And Pressure Vessel Inspectors
- B. Perform Work in accordance with State of Maine boiler rules.
- C. Maintain one copy of each document on site.

1.6 PRE-INSTALLATION MEETING

- A. Convene minimum one week prior to commencing Work of this section.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Accept boilers and accessories on site in factory shipping packaging. Inspect for damage.
- B. 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. Provide owner with a one year warranty on all parts and labor. Provide the owner with any and all standard warranties from the manufacturer.

PART 2 PRODUCTS

A Manufacturers:

- 1. Viessmann.
- 2. Or approved equivalent.

B. GENERAL DESCRIPTION:

- 1. Furnish and install as herein specified, shown and scheduled on the Contract Drawings, 1 new Boiler/Burner unit for low-pressure water heating service and arranged for completely automatic operation firing of natural gas.

C. BOILER CONSTRUCTION/INSTALLATION:

- 1. The boiler shall be constructed in compliance with section IV A.S.M.E. Code. Boiler ratings shall be certified by Hydronics Institute and shall carry I=B=R symbol of approval.

2. The Boiler shall be titanium heat exchanger, external header type.
3. Boiler shall be furnished as a knocked down unit for field assembly, erection and connection on site and it shall be furnished with all castings, fittings and appurtenances necessary for the assembly, connection and operation of the boiler as specified. Boiler installation shall be accomplished within acceptable A.S.M.E. piping practices and requirements and in strict accordance with the boiler manufacturer's recommendations and instructions.

D. PERFORMANCE:

1. Boiler draft loss at rating shall not exceed 0.32 inches W.C.
2. Boiler shall be furnished for 80-PSI Working Pressure.
3. The boiler is full modulation with up to 95% A.F.U.E.
4. Boiler with Viessman Vitotronic on-board multi-function outdoor reset boiler and system control for multi-temperature space and Domestic Hot Water heating.

E. COMBUSTION CHAMBER AND INSULATION:

1. The boiler shall be provided with a complete insulated combustion chamber with Inox-Radial heat exchanger.

F. WATER BOILERS:

1. The boiler shall be furnished with pre-cut ferrous piping with all necessary fittings for connecting low water cutoff and with blow-down valve. In addition, two drain valves shall be furnished for installation on return drums. Blow-down and drain valves shall be brass, lever operated ball type.

G. JACKET:

1. Heavy duty insulated jacket consisting of modular 20 gauge steel panels insulated with 1" thick 1 ½ lb. density fiberglass pre-formed and cemented in place.

H. INSTALLATION:

1. Boiler(s) shall be assembled in accordance with the manufacturer's instructions.
2. All Boiler discharge shall be piped to the low loss header. Blow-down valves shall be Brass, ball type and not less than one inch IPS and they shall discharge to a floor drain or away from the boiler. Pipe ends shall be cut at a 45 Degree to prevent a cap or plug from being installed. All such discharge piping shall be supported by hangers or stand-offs to prevent the valve body from undue stress or strain.
3. Boiler drain valves shall be connected to the lowest water space available and shall be installed with pipe and fittings to connect the bottom blow off full size to drain.
4. Stop valves shall be provided in the supply and return pipe connections to the boiler. Provisions shall be made for the expansion and contraction of the heating mains connected to the boiler by providing substantial anchorage at suitable

points and assisted by the use of swing joints to allow the piping to expand and contract without imposing excessive forces on the boiler piping.

I. TESTS:

1. All pressure parts of the boiler have been subjected to hydrostatic tests according to A.S.M.E. Code for low-pressure boilers. Field tests shall be limited to the maximum working pressure for which the boiler is intended. The contractor shall furnish all equipment piping, water and labor necessary to perform such tests as may be required by the boiler inspector or as directed by the architect or his representative. Tests shall be of such duration as necessary to satisfy the boiler inspector and contracting officer.

J. CLEANING:

1. Before the boilers are turned over for operation, they shall be thoroughly cleaned internally using an approved boiler compound. The cleaning operation shall include boiling out, surface blow-off, bottom blow-down and wash all as described in the manufacturer's instructions.

K. COMBUSTION

1. Burner shall have been tested and listed by Underwriters Laboratories.
2. All boiler room wiring from the main disconnect switch to the burner control system, limits, oil valves, switches and control devices shall be furnished and installed under this section of the work.
3. Burner controls shall comply with the following control and device requirements:
 - a. Electronic flame safeguard.
 - b. Pilot gas pressure test plug.
 - c. Pilot and Main gas pressure regulators.
 - d. Leakage test cock and Pilot gas solenoid valve.
 - e. 1/4" inch plugged tappings shall be provided, one of which shall be located upstream of the Main oil pressure regulator and another to be located near the burner head to permit gas pressure readings with a Manometer.
4. Installing Contractor shall furnish and install an electrical junction box complete with a single pole, single throw switch marked "ON/OFF", to be wired into the limit circuit to function as the burner service switch. Switch box shall be mounted on the boiler jacket panel within arms reach of the burner.

L. BURNER OPTIONS:

1. The burner unit(s) are to be provided with the following items:
 - a. Control Transformer
 - b. Alarm
 - c. Silencing Switch

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- d. Pilot Lights
- e. Low Fire Hold Switch
- f. Firing Rate Potentiometer

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install Work in accordance with State standards.
- B. Install new boiler and accessories in accordance with the manufacturer's recommendations and instructions.
- C. Provide piping connections and accessories as indicated.
- D. Pipe relief valves and drain valves to nearest floor drain.
- E. Provide for connection to electrical service.

3.2 DEMONSTRATION AND TRAINING

- A. Demonstrate operation and maintenance procedures.
- B. Train Owner's maintenance personnel to adjust, operate, and maintain fuel-fired boilers.

END OF SECTION 23 52 23

SECTION 23 55 33

FUEL-FIRED UNIT HEATERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes natural gas-fired unit heaters.

1.2 SUBMITTALS

- A. Product Data: For each type of fuel-fired unit heater indicated. Include rated capacities, operating characteristics, and accessories.
- B. Shop Drawings: For fuel-fired unit heaters. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of fuel-fired unit heaters, as well as procedures and diagrams.
 - 2. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
 - 3. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 4. Wiring Diagrams: Power, signal, and control wiring.
- C. Coordination Drawings: Plans, elevations, and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Structural members to which equipment will be attached.
 - 2. Items penetrating roof and the following:
 - a. Vent and gas piping rough-ins and connections.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For fuel-fired unit heaters to include in emergency, operation, and maintenance manuals.
- F. Warranty: Special warranty specified in this Section.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit installation instructions, spare parts lists, exploded assembly views. Provide manufacturer's printed operating procedures to include start-up,

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break-in, routine and normal operation instruction; regulation control, stopping, shut-down, and emergency instructions; and summer and winter operation instructions. Provide copies of warranties.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace heat exchanger of fuel-fired unit heater that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Provide owner with a one year warranty on all parts and labor. Provide the owner with any and all special and standard warranties from the manufacturer.

PART 2 - PRODUCTS

2.1 GAS-FIRED UNIT HEATERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - 1. Modine Manufacturing Company.
 - 2. Reznor/Thomas & Betts Corporation.
 - 3. Sterling HVAC Products; Div. of Mestek Technology Inc.
- D. Description: Factory assembled, piped, and wired, and complying with ANSI Z83.8/CSA 2.6.
- E. Fuel Type: Design burner for natural gas having characteristics same as those of gas available at Project site.
- F. Type of Venting: Gravity vented.

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- G. Housing: Steel, with integral draft hood and inserts for suspension mounting rods.
 - 1. External Casings and Cabinets: Baked enamel over corrosion-resistant-treated surface.
 - 2. Suspension Attachments: Reinforce suspension attachments at connection to fuel-fired unit heaters.
 - a. Seismic Fabrication Requirements: Fabricate suspension attachments of fuel-fired unit heaters, accessories mountings, and components with reinforcement strong enough to withstand seismic forces.
- H. Heat Exchanger: Aluminized steel.
- I. Burner Material: Aluminized steel with stainless-steel inserts or Stainless steel.
- J. Unit Fan: Aluminum propeller blades riveted to heavy-gage steel spider bolted to cast-iron hub, dynamically balanced, and resiliently mounted.
 - 1. Fan-Blade Guard: Galvanized steel, complying with OSHA specifications, removable for maintenance.
- K. Unit Fan: Steel, centrifugal fan dynamically balanced and resiliently mounted.
 - 1. Belt-Driven Drive Assembly: Resiliently mounted to housing, with the following features:
 - a. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
 - b. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
 - c. Pulleys: Cast-iron, adjustable-pitch motor pulley.
- L. Controls: Regulated redundant gas valve containing pilot solenoid valve, electric gas valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff all in one body.
 - 1. Gas Control Valve: Single stage.
 - 2. Ignition: Electronically controlled electric spark with flame sensor.
 - 3. Fan Thermal Switch: Operates fan on heat-exchanger temperature.
 - 4. Vent Flow Verification: Differential pressure switch to verify open vent.
 - 5. Control transformer.
 - 6. High Limit: Thermal switch or fuse to stop burner.
 - 7. Thermostat: Single-stage, wall-mounting type with 50 to 90 deg F operating range and fan on switch.
- M. Capacities and Characteristics: See mechanical drawing schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install and connect gas-fired unit heaters and associated fuel and vent features and systems according to NFPA 54, applicable local codes and regulations, and manufacturer's written installation instructions.
- B. Suspended Units: Suspend from substrate using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.
 - 1. Restrain the unit to resist code-required horizontal acceleration.
- C. Substrate-Mounted Units: Provide supports connected to substrate. Secure units to supports.
 - 1. Spring hangers connected to the building structure.
 - 2. Anchor the unit to resist code-required horizontal acceleration.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to fuel-fired unit heater to allow service and maintenance.
- C. Gas Piping: Connect gas piping to gas train inlet; provide union with enough clearance for burner removal and service.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
- B. Perform tests and inspections and prepare test reports.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
 - 1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 2. Verify bearing lubrication.
 - 3. Verify proper motor rotation.
 - 4. Test Reports: Prepare a written report to record the following:

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- a. Test procedures used.
 - b. Test results that comply with requirements.
 - c. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- D. Remove and replace malfunctioning units and retest as specified above.

3.4 ADJUSTING

- A. Adjust initial temperature set points.
- B. Adjust burner and other unit components for optimum heating performance and efficiency.

3.5 DEMONSTRATION AND TRAINING

- A. Demonstrate operation and maintenance procedures.
- B. Train Owner's maintenance personnel to adjust, operate, and maintain fuel-fired unit heaters.

END OF SECTION 23 55 33

SECTION 26 05 00

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Existing work
 - 2. Grounding and bonding
 - 3. Connection of utilization equipment
 - 4. Supports
 - 5. Identification
 - 6. Conduit and fittings
 - 7. Wire and cable
 - 8. Electrical tape
 - 9. Terminations
 - 10. Firestopping

1.2 REFERENCES

- A. Conform to requirements of the latest adopted version of the National Electrical Code (NEC) ANSI-C1/NFPA 70-2005.

1.3 COORDINATION

- A. Obtain and review shop drawings, product data, and manufacturer's instructions for equipment furnished under other sections to determine connection locations and requirements.
- B. Sequence rough-in of electrical connections to coordinate with installation and start up of equipment furnished under other sections.

PART 2 - PRODUCTS

2.1 BASIC MATERIALS

- A. Steel Channel: Galvanized or painted steel.
- B. Anchors:
 - 1. Masonry Anchors: Rawl-Stud, Lok-Bolt, Saber-Tooth, or equal by Arro, Diamond, or Redhead.
 - 2. Hollow-Wall Anchors: Toggle bolt by Rawl or equal by Arro, Diamond, or Redhead.
 - 3. Anchors shall have sufficient holding power for intended use.
 - 4. Plastic anchors and powder actuated anchors are not permitted.

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- C. Miscellaneous Hardware: Treat for corrosion resistance.

2.2 METAL CONDUIT

- A. Acceptable Manufacturers:

1. Allied Tube and Conduit
2. Wheatland Tube Company
3. Jones and Laughlin
4. Republic Steel
5. Triangle PWC

- B. Conduit:

1. Metal Conduit and Tubing: Hot dipped galvanized or sheradized steel.
2. Flexible Conduit: Galvanized steel.
3. Liquidtight Flexible Metallic Conduit: Flexible conduit with PVC jacket.

2.3 PLASTIC CONDUIT

- A. Acceptable Manufacturers:

1. Carlon
2. National
3. American Pipe & Plastics, Inc.

- B. Plastic Conduit:

1. Plastic Conduit: NEMA TC 2; PVC. Use Schedule 40 conduit.

2.4 FITTINGS

- A. Manufacturers:

1. Appleton
2. Bridgeport
3. O-Z/Gedney
4. Raco
5. Steel City
6. Thomas and Betts
7. Carlon
8. American Pipe & Plastics, Inc.

- B. Conduit Fittings:

1. Metal Fittings and Conduit Bodies: NEMA FB 1.
2. Plastic Fittings and Conduit Bodies: NEMA TC 3.
3. Fittings and Conduit Bodies for RSC: Galvanized steel or malleable iron, couplings and fittings threaded.

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4. Fittings for EMT: Watertight compression or set screw type as appropriate for the application.
5. Conduit Bodies for EMT: Cast aluminum, galvanized iron or malleable iron bodies.
6. Insulated Bushings: Appleton "BBU".
7. Grounding Bushings: O-Z/Gedney "BLG".
8. Conduit Sealing Bushings: OZ Gedney Type CSB, or approved equal.
9. Fittings for Liquidtight Flexible Metallic Conduit: Galvanized steel or malleable iron, couplings and fittings threaded.
10. Conduit Clamps: Galvanized malleable iron equivalent to O-Z/Gedney 14-G and 15-G Series with clamp back spacer for RSC, and single hole #15-75G malleable or #15-75S galvanized steel clips for EMT.

2.5 ELECTRICAL BOXES

A. Manufacturers:

1. Appleton
2. Crouse Hinds
3. Hoffman
4. Killark
5. Lee Products
6. Raco
7. Square D
8. Steel City

B. Boxes:

1. Sheet Metal: NEMA OS 1; galvanized steel, 4" x 4" x 2" with raised plaster ring and non-gangable 3" H x 3 1/2" D x 2" W per section masonry boxes. Gangable or sectionalizing boxes are not permitted.
2. Cast Metal: Aluminum or cast alloy, deep type "FD", gasket cover, threaded hubs, "Bell" boxes not permitted.

C. Mounting Brackets and Adjustable Ceiling Channels: Galvanized steel of substantial construction to support boxes by bridging between hollow wall studs or ceiling channels, like Caddy #SGB24 screw gun bracket, Caddy #H4 mounting bracket, and B-Line #BA-12 box hanger, or approved equal.

D. Pull Boxes: Code gauge galvanized steel, no prepunched knockouts.

E. Hinged Cover Enclosures: NEMA 250, Type 1, steel enclosure with manufacturer's standard enamel finish and continuous hinge cover, held closed by flush latch operable by screwdriver.

2.6 WIRE AND CABLE

A. Manufacturers:

1. Anaconda
2. Rome Cable
3. General Cable
4. Okonite
5. Phelps Dodge Cable
6. Southwire
7. Triangle PWC

B. Building Wire:

1. Feeders and Branch Circuits 6 AWG and Smaller: Annealed copper conductor, 600 volt insulation, THHN/THWN or XHHW, stranded conductor; use compression set terminals.
2. Control Circuits: Copper, stranded conductor, 600 volt insulation, THHN/THWN.

C. Metal Clad Cable:

1. Metal Clad Cable, Size 12 through 10 AWG: Interlocked galvanized steel armor, stranded annealed copper conductor, 600 volt insulation, rated 60E C, with separate green ground wire, NEC Type MC.

2.7 TAPE AND TERMINATIONS

A. Manufacturers, Tape:

1. 3M Co., Scotch #33 and #88

B. Manufacturers, Terminations:

1. Dossert
2. Ideal
3. 3M Co.
4. Thomas and Betts

C. Wire Connection Devices/Terminations: Compression set or twist-on type with integral molded insulation and internal metallic compression ring or spiral screw-on connecting device. Twist-on type shall be like Ideal "Wing Nut" series. Push-on type wire terminals are not acceptable.

D. Wire Terminals, Butt Splices: Crimp set with integral insulated sleeve, electro tin plated, fully annealed copper.

2.8 WIRING DEVICES AND WALL PLATES

- A. Manufacturers:
 - 1. Bryant
 - 2. Hubbell
 - 3. Arrow-Hart
 - 4. Pass and Seymour
 - 5. General Electric
 - 6. Leviton
- B. Wall Switch: AC general use, specification grade, quiet operating snap switch rated 20 amperes and 120/277 volts AC, with plastic toggle handle, ivory color, Hubbell Model 1221.
- C. Decorative Cover Plate: Ivory color, smooth rigid nylon or high impact plastic.
- D. Weatherproof Covers: Die cast aluminum, gasketed, duplex receptacle cover, weatherproof when attachment plug is inserted.

2.9 FIRESTOPPING MATERIALS

- A. Use only through-penetration firestop products that have been tested for specific fire resistance rated conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire rating required for the application:
 - 1. Latex Sealants: Single component latex formulations that when cured do not re-emulsify during exposure to moisture.
 - 2. Firestop Devices: Factory assembles steel collars lined with intumescent material sized to fit a specific outside diameter of penetrating item.
 - 3. Firestop Putty: Intumescent, non-hardening, water resistant putties containing no solvents, inorganic fibers or silicone compounds.
 - 4. Silicone Sealants: Moisture curing, single component, silicone elastomeric sealant for horizontal surfaces (pourable or non-sag) or vertical surface (non-sag).
 - 5. Silicone Foam: Multi-component, silicone based, liquid elastomers that when mixed expand and cure in place to produce a flexible, non-shrinking foam.
- B. Firestop systems shall be UL classified and rated for the type of construction where it is applied.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Verify that the interior of the building has been physically protected from weather.
- B. Verify that supporting surfaces are ready to receive work.
- C. Electrical boxes are shown on drawings, locations are approximate unless dimensioned.
- D. Make electrical connections to utilization equipment in accordance with equipment manufacturer's instructions.

1. Verify that wiring and outlet rough-in work is complete and that utilization equipment is ready for electrical connection, wiring, and energization.
2. Make wiring connections in control panel or in wiring compartment of prewired equipment. Provide interconnecting wiring where indicated.

3.2 GROUNDING

- A. Maintain isolation between neutral and ground conductors in accordance with NEC.
- B. Install grounding system so all conductive materials operate at ground potential and there is a low impedance path to ground in the event of a fault.
- C. Test grounding system for resistance to earth using fall-to-potential method in accordance with IEEE Std. 81. Maximum ground to earth resistance shall not exceed 25 ohms.

3.3 SUPPORT SYSTEMS

- A. Install support systems sized and fastened to accommodate weight of equipment and conduit, including wiring, which they carry.
 1. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors, beam clamps, and spring steel clips as appropriate for the application.
 2. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.
 3. Do not fasten supports to piping, ceiling support wires, ductwork, mechanical equipment, or conduit.
 4. Do not use powder actuated anchors.
 5. Do not drill structural wood or steel members.
 6. Fabricate supports from structural steel or steel channel.

3.4 CONDUIT

- A. Size raceways for conductor type installed or for type THW conductors, whichever is larger.
 1. Minimum Size Conduit: 3/4".
- B. Install all conduit concealed in walls or above finished ceilings except where specifically indicated to be surface mounted. Arrange conduit to maintain headroom and to present neat appearance. Install conduit in accordance with the following:
 1. Route exposed raceway parallel and perpendicular to walls and adjacent piping.
 2. Maintain minimum 6" clearance to piping and 12" clearance from parallel runs of flues, steam pipes, and heating appliances. Install horizontal raceway runs above water and steam piping.
 3. Complete raceway installation before installing conductors.

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4. Maintain required fire, acoustic, and vapor barrier rating when penetrating walls, floors, and ceilings. Where indicated on drawings, sleeve penetrations through concrete walls, floors, and ceilings.
5. Group in parallel runs where practical and install on steel channel support system. Maintain spacing between raceways or derate circuit ampacities to NFPA 70 requirements.
6. Use conduit hangers and clamps; do not fasten with wire or perforated pipe straps.
7. Use conduit bodies to make sharp changes in direction.
8. Terminate conduit stubs and box connections with insulated bushings.
9. Steel conduit joints shall be threaded; clamp on or set screw fittings are not permitted.
10. Use suitable caps to protect installed raceway against entrance of dirt and moisture.
11. Provide No. 12 AWG insulated conductor or suitable pull string in empty raceways, except sleeves and nipples.
12. Install expansion joints where raceway crosses building expansion joints, and where necessary to compensate for thermal expansion.
13. Use flexible or liquidtight conduit, short as possible, maximum 72 inches, for motor and equipment hookup; always include a separate green ground wire.
14. Use liquidtight conduit for flexible connections in damp or wet locations.
15. Install conduit so condensation will drain and not be trapped.
16. Prevent lodgement of dirt, trash, and mortar; swab all raceways prior to installation of wire and cable.

3.5 BOXES

A. General:

1. Install electrical boxes where shown on the drawings, and as required for splices, taps, wire pulling, equipment connections, and regulatory requirements.
2. Locate and install electrical boxes to maintain headroom and to present neat mechanical appearance.
3. Align wall mounted outlet boxes for switches, thermostats, and similar devices.
4. Coordinate mounting heights and locations of outlets above counters, benches, and back splashes.
5. Use expansion anchors, shields, or toggle bolts to fasten boxes in place. Do not use explosive powder driven anchors, except where specifically permitted by Engineer. Do not use nails or wire for permanent support.
6. Secure boxes to interior wall and partition studs, accurately positioned to allow for surface finish thickness; select raised cover depth to assure proper fit.
7. Do not install boxes back-to-back in walls; provide 6" separation, minimum; except provide 24" separation, minimum in acoustic rated walls.
8. Use hinged cover enclosure for interior pull and junction boxes larger than 12 inches in any dimension. Install in an accessible location that will allow easy access.
9. Field punch openings in pull boxes using punch/dies of appropriate size. Provide knockout closures for unused openings.

B. Surface mounted applications:

1. Use cast "FD" outlet boxes for all surface mounted applications to 10 feet above finished floor.

3.6 INSTALLATION OF WIRES AND CABLES

- A. Verify that interior of building has been physically protected from weather, that mechanical work which is likely to injure conductors has been completed and completely and thoroughly swab raceway system before installing conductors.
- B. Use wire not smaller than 12 AWG for power and lighting circuits, and not smaller than 14 AWG for control wiring.
 - 1. Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75 feet; and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet.
- C. Neatly train and secure wiring inside boxes, equipment, and panelboards.
- D. Use UL listed wire pulling lubricant for pulling 4 AWG and larger wires.
- E. Install wiring according to the Wiring Standard. Protect and support exposed cables (where allowed) above accessible ceilings to keep them from resting on ceiling tiles. Use channel, or running boards as necessary to provide support. Do not support wiring on ceiling support wires, unless ceiling installer has provided certification that ceiling support system is rated to carry the additional load of the cables. Install cables to run parallel and perpendicular to building lines; do not run diagonally, leave ample slack cable at turns.
- F. Make splices, taps, and terminations to carry full ampacity of conductors without perceptible temperature rise.
- G. Terminate spare conductors with electrical tape.
- H. Color code all service, feeder, branch, control, and signalling circuit conductors. Color shall be green for grounding conductors and white for neutrals, except where neutrals of more than one system are installed in same raceway or box, the other neutral shall be white with a colored (not green) stripe. Color code ungrounded conductors operating at 120 volts to ground black, red, and blue for Phases A, B, and C and at 277 volts, brown, orange, and yellow respectively.
- I. Terminate all wire joints #10 AWG or smaller with crimp set or twist-on wire terminating device. Use crimp set or bolted "Burndy" or suitable alternate bolted or crimp set device for conductors larger than #10 AWG.
- J. Cover all joints made with non-insulated connecting devices with electrical tape; use Type #88 at any time or #33 whenever the temperature of the joint or the room is above 60 F. Triple wrap joints, each wrap having a 50% overlay.

3.7 FIRESTOPPING

- A. Install through penetration firestop systems in accordance with firestop system manufacturer's written installation instructions for products and applications indicated.
- B. Engage an experienced installer who is trained, certified, licensed, or otherwise qualified by the firestop system manufacturer to install the firestop products.

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- C. Coordinate construction of openings and penetrating items to ensure that firestop systems are installed according to specified requirements.
- D. Provide firestop systems that are compatible with one another, with the substrates forming openings, with the items penetrating the firestop system, and under the conditions of service for the application being considered.
- E. Provide components for each firestop system that are needed to install fill materials. Use only components specified by the firestop system manufacturer and approved by the qualified testing agency for the designated system.
- F. Keep areas of work accessible until inspection by the AHJ has been completed.
- G. Where deficiencies are found, repair or replace the firestop systems so that they comply with requirements. Proceed with enclosing firestop systems with other construction only after inspection reports are issued and the firestop installations comply with requirements.
- H. Protect the firestop system during and after installation to insure that the systems do not deteriorate and are not damaged during the remaining period of construction. In the event damage or deterioration occurs, remove affected firestop system and replace with new materials in compliance with this specification.

3.8 IDENTIFICATION

- A. Identify electrical distribution and control equipment, and loads served, to meet regulatory requirements and as scheduled.
 - 1. Degrease and clean surfaces to receive nameplates and tape labels.
 - 2. Secure nameplates to equipment fronts using screws, rivets, or adhesive, with edges parallel to equipment lines. Secure nameplate to inside face of recessed panelboard doors in finished locations.
 - 3. Use embossed tape nameplates with 3/16" lettering to identify individual switches and circuit breakers, wall switches, receptacle circuits, and loads served.
 - 4. Use lamoid nameplates with minimum 1/4" lettering to identify distribution and control equipment.
 - 5. Nameplate information shall suitably identify the device or circuit. Any nameplate that is not suitably descriptive in the opinion of the Engineer shall be replaced as directed.
- B. Install wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connections.
 - 1. Use branch circuit or feeder number to identify power and lighting circuits.
 - 2. Use control wire number as indicated on schematic and interconnection diagrams and equipment manufacturer's shop drawings to identify control wiring.

3.9 FIELD QUALITY CONTROL

- A. Perform field inspection and testing of wiring as follows:
 - 1. Inspect wire and cables for physical damage and proper connection.

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2. Torque test conductor connections and terminations to manufacturers recommended values.
 3. Perform continuity and insulation resistance (megger) test on all power and equipment feeder and branch circuit conductors. Submit test report tabulating the test performed and the results.
 4. Verify proper phasing connections; check rotation of all motors.
- B. Perform field inspection and testing of devices as follows:
1. Test for proper polarity and ground continuity.
 2. Test GFCI operation according to manufacturer's written instructions.
 3. Replace defective units and retest.

END OF SECTION 26 05 00

CITY OF AUBURN, MAINE

ENGINE #5 FIRE STATION
HEATING SYSTEM UPGRADES PROJECT

651 Center Street, Auburn, Maine

Bid No. 2016-011

Bid Documents

December 2, 2015

APPENDIX B

DRAWINGS

CITY OF AUBURN, MAINE

ENGINE NO. 5 FIRE STATION HEATING SYSTEM UPGRADES PROJECT

651 Center Street, Auburn, Maine
Bid No. 2016-011

Bid Documents

December 2, 2015



Camden, ME | Portland, ME | York, ME | Wilmington, DE
207.236.9970 | www.cordjiacapitalprojects.com

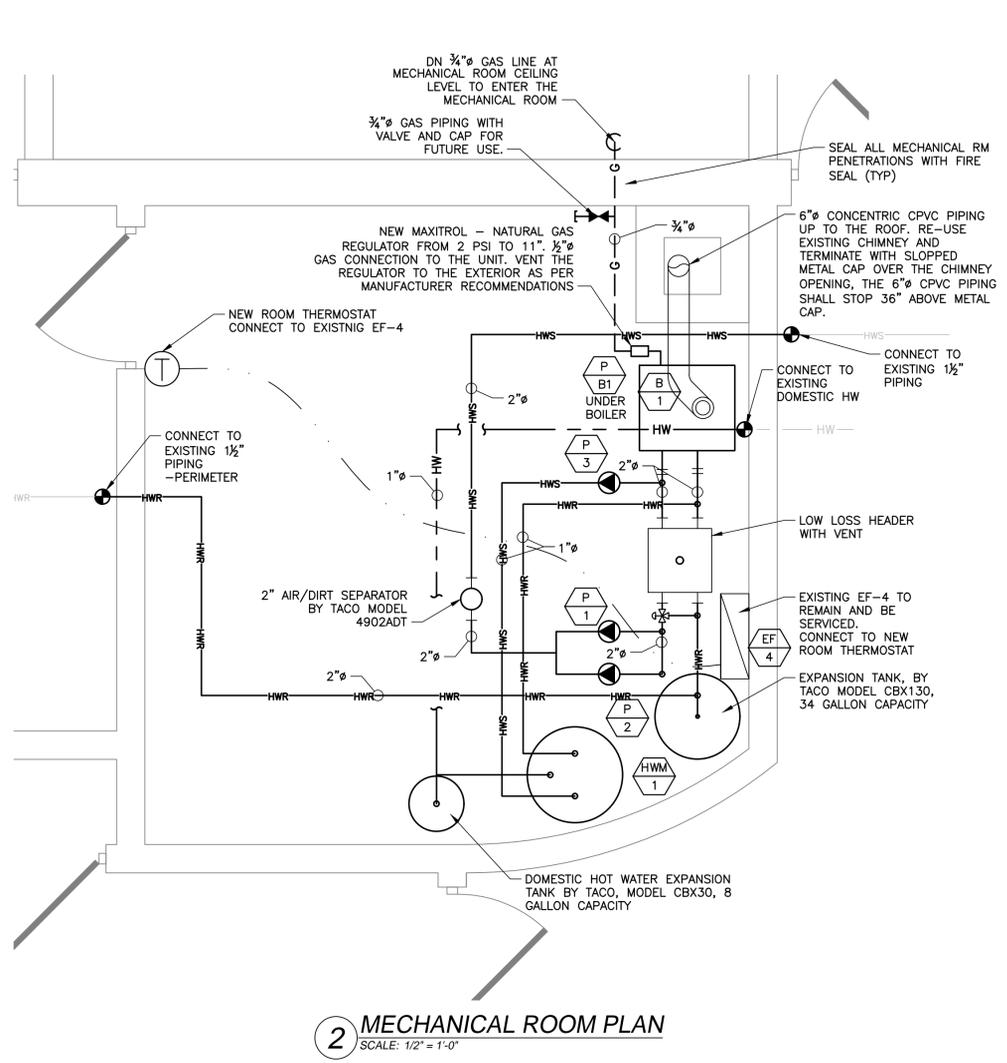
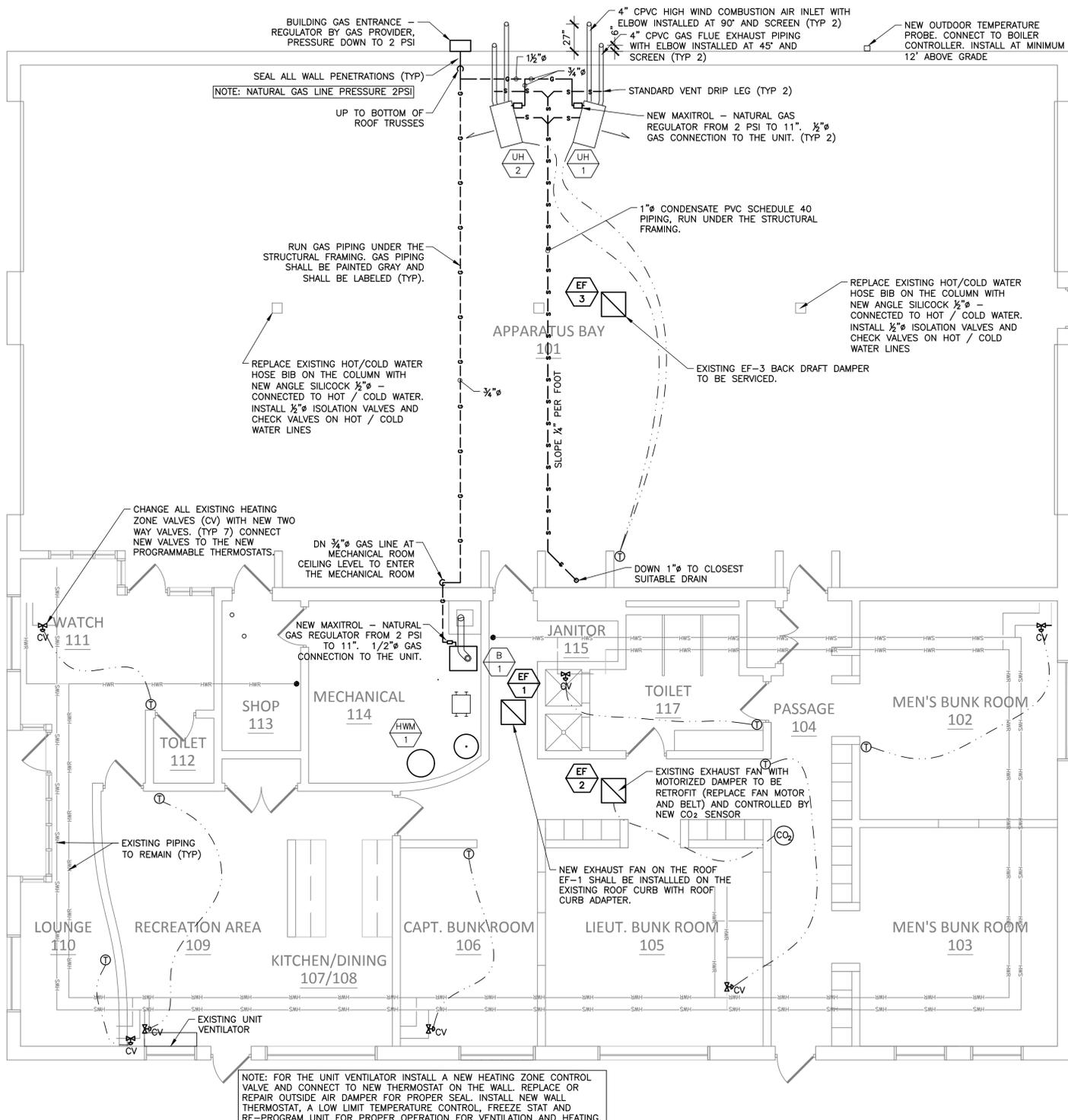
Drawing List

--	COVER SHEET
M-1	DEMOLITION PLAN
M-2	NEW MECHANICAL PLAN
M-3	MECHANICAL SCHEDULES, DETAILS AND CONTROLS
E-1	NEW ELECTRICAL PLAN

Location Map

No Scale





CONSTRUCTION NOTES

- THE MECHANICAL CONTRACTOR IS RESPONSIBLE TO INSTALL THE FOLLOWING:
- SUPPLY AND INSTALL THE NEW NATURAL GAS BOILER AS PER BOILER SCHEDULE.
 - SUPPLY AND INSTALL ALL NEW EQUIPMENT ADJACENT TO THE GAS BOILER AS DESCRIBED IN THE BOILER SCHEDULE. THE BOILER WILL BE SUPPLIED WITH THE ASSOCIATED ISOLATION VALVES, PRESSURE/TEMPERATURE GAUGES, VENT, BOILER CIRCULATOR LOOP, LOW LOSS HEADER. ALL THIS EQUIPMENT SHALL BE SUPPLIED BY THE BOILER MANUFACTURER AND INSTALLED BY THE CONTRACTOR.
 - INSTALL THE FLUE GAS EXHAUST AND COMBUSTION AIR PIPING - 6" CONCENTRIC CPVC FROM THE BOILER TO THE ROOF AS SHOWN AND DESCRIBED ON THE DRAWING.
 - SUPPLY AND INSTALL THE NEW PIPING BETWEEN THE BOILER AND RELATED EQUIPMENT. ALL NEW PIPING SHALL BE THE SIZE SHOWN ON THE DRAWING AND SHALL BE BLACK IRON SCHEDULE 40. ALL PIPING SHALL BE INSULATED WITH MINIMUM 2" THICK THERMAL INSULATION WITH PVC JACKET AND LABELED.
 - SUPPLY AND INSTALL ALL PIPING FROM THE LOW LOSS HEADER TO THE EXISTING SUPPLY/RETURN HOT WATER EXISTING PIPING.
 - SUPPLY AND INSTALL THE TWO NEW HEATING PUMPS P-1 AND P-2 AND 3-WAY VALVE AS SHOWN ON DRAWINGS.
 - THE CONTRACTOR SHALL INTEGRATE IN THE BOILER CONTROLLER, THE 3-WAY VALVE, HEATING PUMPS P-1 AND P-2, AND HOT WATER MAKER PUMP P-3
 - SUPPLY AND INSTALL A NEW 60 GALLON HOT WATER MAKER AND CONNECT TO THE NEW BOILER. CONNECT THE HOT WATER MAKER TO EXISTING DOMESTIC HOT WATER PIPING WITH NEW EXPANSION TANK. INSULATE NEW DOMESTIC HOT WATER PIPING WITH 1" THERMAL INSULATION WITH PVC JACKET AND LABEL.
 - INSTALL TWO NEW GAS UNIT HEATERS IN THE APPARATUS BAY, WITH RELATED VENTING AND CONDENSATE DRAINAGE.
 - ALL NEW NATURAL GAS LINES SHALL BE BLACK IRON SCHEDULE 40, PAINTED GRAY AND LABELED.
 - ALL NEW CONDENSATE DRAINAGE SHALL BE PVC SCHEDULE 40 AND LABELED.
 - INSTALL NEW ROOF EXHAUST FAN EF-1 FOR THE TOILETS AND JANITOR, CONTROL EF-1 BY THE LIGHT SWITCH IN ROOMS 112, 115 AND 117.
 - RETROFIT EXHAUST FAN EF-2 FOR THE LIVING AREA AS DESCRIBED ON THE DRAWING. CONNECT EXISTING EF-2 TO THE NEW CO2 SENSOR AND THE EXISTING LIGHT SWITCH CONTROL.
 - RETROFIT EXISTING WALL UNIT VENTILATOR AS DESCRIBED ON THE DRAWING.
 - SERVICE THE EXISTING BACK DRAFT DAMPER FOR EF-3 IN THE APPARATUS BAY.
 - REPLACE EXISTING PERIMETER HEATING CONTROL VALVES (CV) WITH NEW AND CONNECT TO TO THE NEW PROGRAMMABLE THERMOSTATS AS SHOWN ON THE DRAWING.
 - REPLACE EXISTING THERMOSTATS WITH NEW PROGRAMMABLE THERMOSTATS AND PROGRAM THE THERMOSTATS WITH THE OWNER SUPPLIED SCHEDULE.
 - SERVICE EXISTING MECHANICAL ROOM EXHAUST FAN EF-4 AND CONNECT TO NEW ROOM THERMOSTAT.
 - THE CONTRACTOR IS RESPONSIBLE TO CONNECT POWER TO ALL NEW EQUIPMENT.
 - THE CONTRACTOR IS RESPONSIBLE TO START AND COMMISSION THE NEW SYSTEM, PROVIDE OWNER TRAINING, AND O&M MANUALS.

Project: ENGINE #5 FIRE STATION HEATING SYSTEM UPGRADES
651 CENTER STREET, AUBURN, ME
BID #2016-011

Client: City of Auburn, Maine
60 Court Street
Auburn, Maine 04210

Legend:

Consultant Name and Address: **ilina engineering PA**
DESIGN FOR A BETTER LIFE
61 MAIN STREET, SUITE 305 BANGOR, MAINE 04401
PHONE/FAX: 207.992.9181 E-MAIL: ilinaengineering@midmaine.com

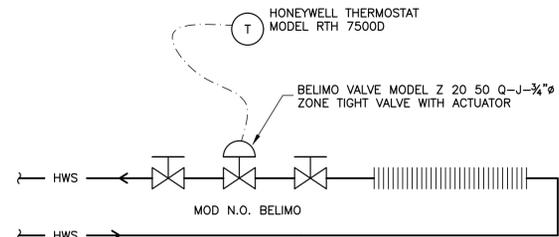
Firm Name and Address: **CORDJIA**
CAPITAL PROJECTS GROUP
Camden, ME | Portland, ME | York, ME | Wilmington, DE
207.236.9970 | www.cordjia.com

Sheet Title: **NEW MECHANICAL PLAN**

No.	Revision/Issue	Date

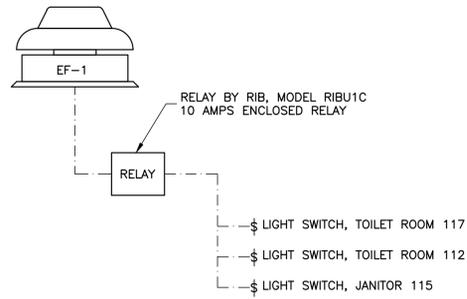
Design by: RR	Checked by: MTI
Drawn by: RR	Approved by: MAD
Project: 941	Date: 12/2/15

Sheet: **M-2**



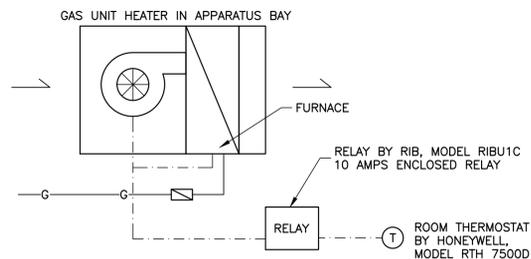
THE HEATING HOT WATER CONTROL VALVE WILL MODULATE TO MAINTAIN ROOM TEMPERATURE. ON A DROP IN ROOM TEMPERATURE BELOW SET POINT, THE VALVE IS MODULATED OPEN. AS ROOM TEMPERATURE REACHES SET POINT, THE VALVE IS MODULATED CLOSED

FINTUBE RADIATOR SEQUENCE OF CONTROL
SCALE: NONE



EF-1 IS ENGAGED BY ANY OF THE THREE LIGHT SWITCHES IN ROOMS 112, 115 OR 117.

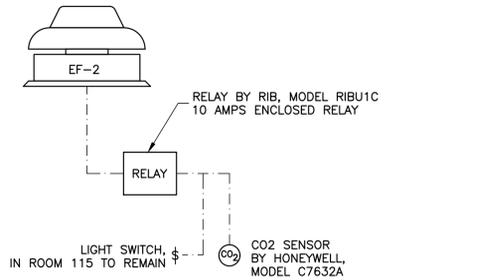
EF-1 SEQUENCE OF CONTROL
SCALE: NONE



THE GAS UNIT HEATER FAN AND FURNACE WILL START / STOP TO MAINTAIN ROOM TEMPERATURE SET POINT.

THE ROOM THERMOSTAT WILL SHUT-DOWN THE UNIT HEATER IF THE ROOM TEMPERATURE REACHES 60°F (USER ADJUSTED)

GAS UNIT HEATER SEQUENCE OF CONTROL
SCALE: NONE

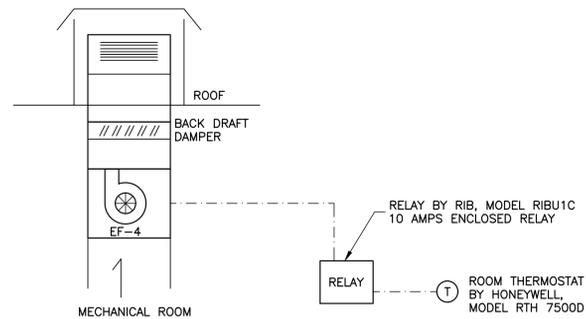


EF-2 IS ENERGIZED IF THE CO2 HIGH LIMIT OF 800PPM (USER ADJUSTABLE) IS DETECTED IN THE BUNK ROOM AREAS.

EF-2 IS DE-ENERGIZED IF THE CO2 LEVEL DROPS UNDER THE HIGH LIMIT CO2 LEVEL.

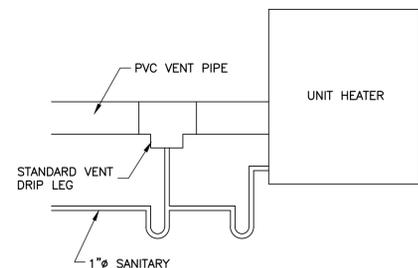
EF-2 WILL HAVE MANUAL OVERRIDE CONTROL VIA THE EXISTING LIGHT SWITCH

EF-2 SEQUENCE OF CONTROL
SCALE: NONE

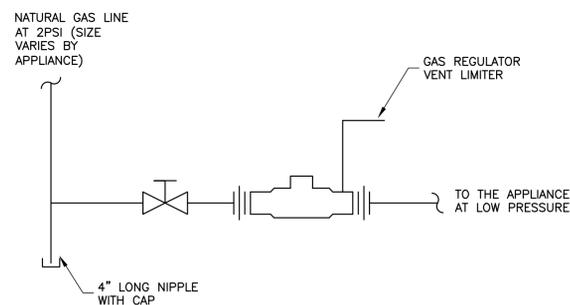


EXHAUST FAN EF-4 IS ENGAGED IF THE MECHANICAL ROOM TEMPERATURE INCREASES OVER THE ROOM TEMP SETPOINT OF 85°F (USER ADJUSTABLE)

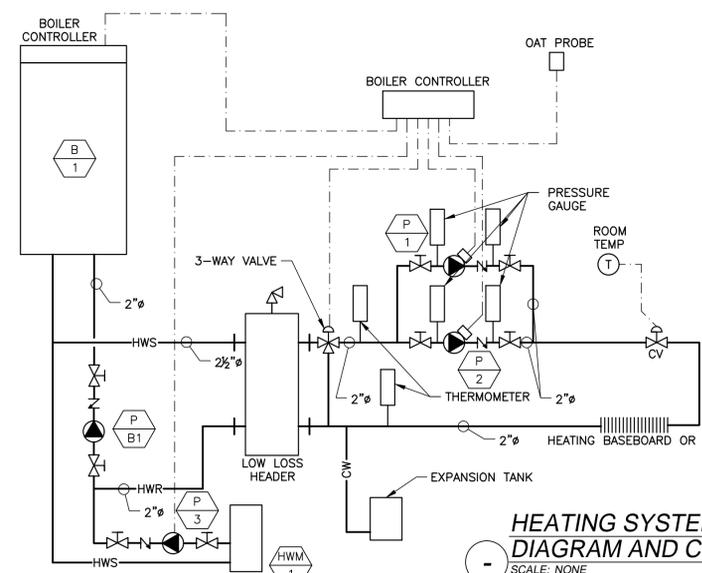
EF-4 SEQUENCE OF CONTROL
SCALE: NONE



VENTING SYSTEM DRIP LEG DETAIL
SCALE: NONE



GAS REGULATOR DETAIL
SCALE: NONE



HEATING SYSTEM SEQUENCE OF CONTROLS

BOILER CONTROLLER (SUPPLIED WITH THE UNIT) WILL OPERATE THE BOILER SECONDARY HEATING LOOP. LOOP TEMPERATURE WILL BE RESET ON OUTSIDE AIR TEMPERATURE (OAT). WHEN OAT IS 30°F OR LOWER THE HOT WATER TEMPERATURE IS MAXIMUM 150°F. IF OAT IS 50°F OR HIGHER, THE HEATING WATER TEMPERATURE SHOULD NOT BE LOWER THAN 120°F. IF OUTSIDE AIR TEMPERATURE IS OVER 60°F THE HEATING LOOP SHOULD BE SHUT DOWN ON WARM WEATHER SHUT DOWN.

THE BOILER AND BOILER PUMP PB-1 RUNS TO MAINTAIN THE PRIMARY HEATING LOOP TEMPERATURE AT THE MINIMUM 140°F YEAR ROUND FOR THE HOT WATER MAKER (HWM-1).

PUMP P-1 OR P-2 IS ENGAGED IF ONE OF THE UNIT VENTILATOR COIL OR FINTUBE IS CALLING. PUMP HAS A VARIABLE FREQUENCY DRIVE AND WILL MODULATE SPEED TO MAINTAIN THE WATER FLOW FOR THE HEATING LOAD. PUMP SHOULD BE SELF ADJUSTED.

PUMP P-3 WILL BE ENGAGED WHEN THE HWM LOAD IS CALLING FOR HEAT. THE HOT WATER MAKER IS PRIORITIZED BY THE HEATING SYSTEM.

THE CONTRACTOR SHALL PROVIDE AND INSTALL ALL CONTROL COMPONENTS AND WIRING TO COMPLY WITH THE SEQUENCE OF CONTROLS.

HEATING SYSTEM PIPING DIAGRAM AND CONTROLS
SCALE: NONE

BOILER SCHEDULE									
TAG	MANUFACTURER	MODEL	INPUT (MBH)	GROSS OUTPUT (MBH)	EFFICIENCY (AFUE)	ELEC. DATA			NOTES
						AMPS	V	PH	
B-1	VISSMANN	200-W B2HA 150	530	495	93.5%	12	120	1	① ② ③ ④ ⑤ ⑥ ⑦

PUMP SCHEDULE											
TAG	MANUFACTURER	MODEL	TYPE	SIZE	GPM	HEAD (FEET)	MOTOR DATA			NOTES	
							HP	V	PH	RPM	
PB-1	GRUNDFOSS	UPS 26-150F	IN-LINE		-	-	3/4	208	1	-	①
P-1	TACO	VRIDIAN 15-30	IN-LINE	VR20	25	35	1	208	3	-	② ③
P-2	TACO	VRIDIAN 15-30	IN-LINE	VR20	25	35	1	208	3	-	② ③
P-3	TACO	1911	IN-LINE	1"φ	20	20	1/3	208	1	-	④

UNIT HEATER SCHEDULE													
TAG	MANUFACTURER	MODEL	SIZE	LOCATION	CFM	EWT	LWT	MBH	MOTOR DATA			NOTES	
									HP	V	PH	RPM	
UH-1	MODINE	PTC	180	APPARATUS BAY	3020	-	-	167.4	1/3	208	1	1075	①
UH-2	MODINE	PTC	180	APPARATUS BAY	3020	-	-	167.4	1/3	208	1	1075	①

DOMESTIC HOT WATER MAKER							
TAG	MANUFACTURER	MODEL	TANK CAPACITY (GAL)	INPUT RATE (BTU/HR)	FIRST-HOUR RATING (90°F RISE)	CONTINUOUS FLOW (70°F RISE STEADY STATE)	NOTES
HWM-1	SUPERSTOR ULTRA	SSU-60	60	200,000	266	370	① ② ③

FAN SCHEDULE														
TAG	MANUFACTURER	MODEL	TYPE	LOCATION	CFM	S.P. (IN. W.G.)	FAN RPM	MOTOR DATA			DRIVE TYPE	NC	NOTES	
								HP	V	PH	RPM			
EF-1	GREENHECK	GB-081	ROOF	ROOF	450	.75	1490	1/4	208	1	-	BELT	8.5	① ② ③ ④ ⑤

- SUPPLY WITH BACKDRAFT DAMPERS
- SUPPLY WITH CURB ADAPTOR
- INTERLOCK WITH LIGHT SWITCH FROM TOILETS AND JANITOR ROOM
- SUPPLY WITH STATORS
- CONNECT TO EXISTING DUCTED EXHAUST
- EXISTING ROOF CURB FOR 14"x14" DUCT SHALL BE RE-USED. CONTRACTOR TO VERIFY EXISTING CURB SIZE

Project:
ENGINE #5 FIRE STATION HEATING SYSTEM UPGRADES
651 CENTER STREET, AUBURN, ME
BID #2016-011

Client:
City of Auburn, Maine
60 Court Street
Auburn, Maine 04210

Legend:

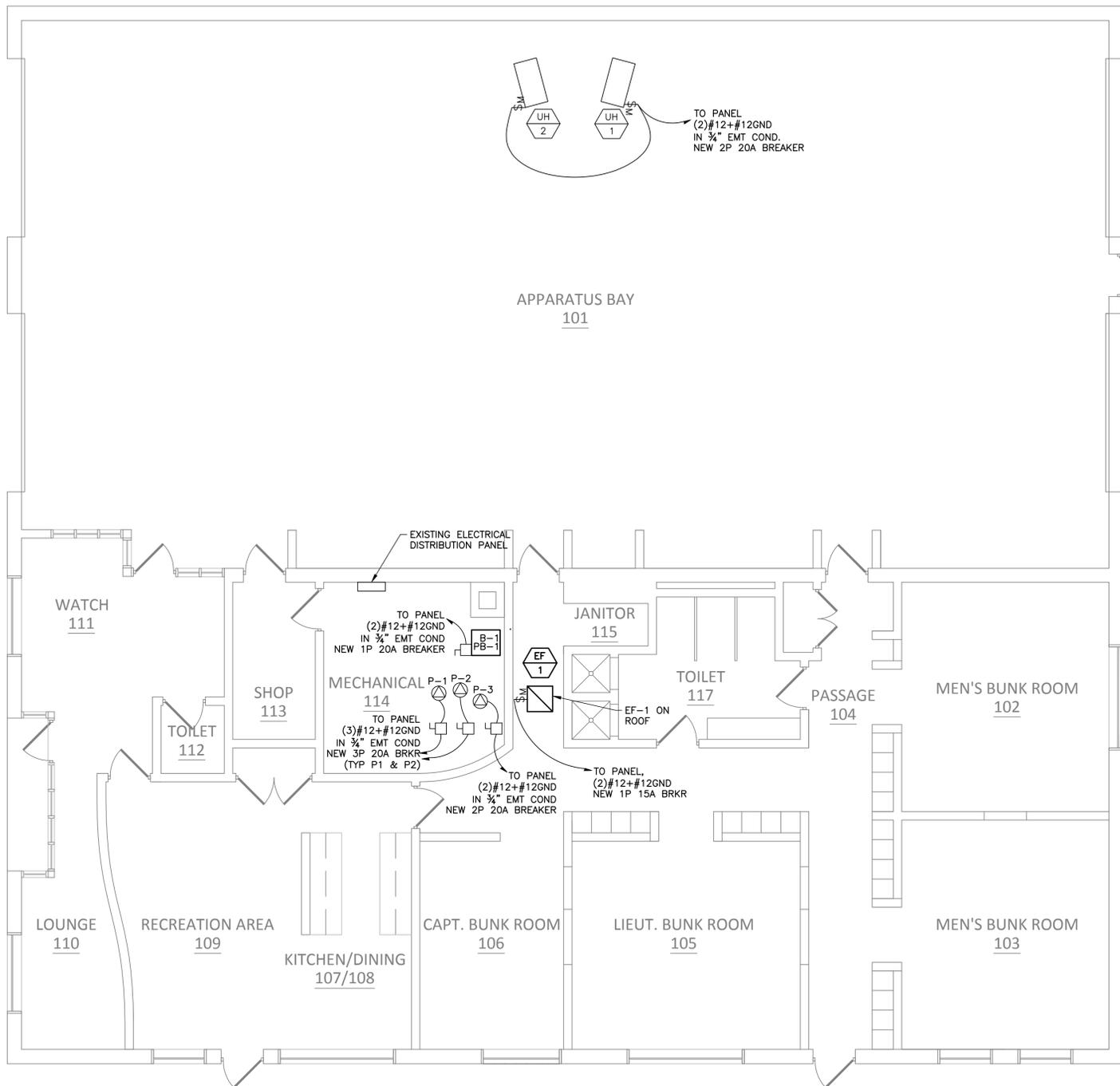
Consultant Name and Address:
ilina engineering PA
DESIGN FOR A BETTER LIFE
61 MAIN STREET, SUITE 58 BANGOR, MAINE 04401
PHONE/FAX: 207.992.9181 E-MAIL: ilinaengineering@maine.com

Firm Name and Address:
CORDJIA
CAPITAL PROJECTS GROUP
Camden, ME | Portland, ME | York, ME | Wilmington, DE
207.236.9970 | www.cordjia.com

MECHANICAL SCHEDULE, DETAILS AND CONTROLS

No.	Revision/Issue	Date

Design by: RR
Checked by: MTI
Drawn by: RR
Approved by: MAD
Project: 941
Date: 12/2/15
Sheet:



1 FIRST FLOOR PLAN
SCALE: 3/16" = 1'-0"

CONSTRUCTION NOTES

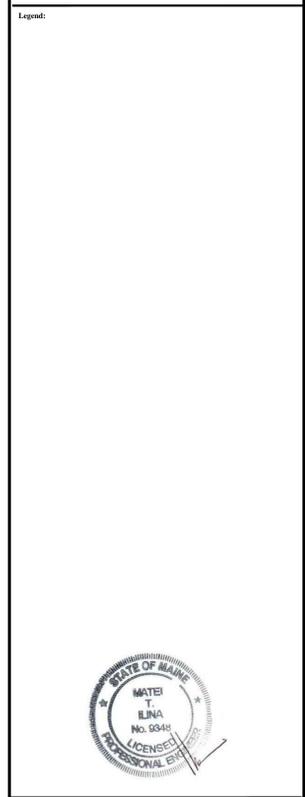
- THE CONTRACTOR IS RESPONSIBLE TO INSTALL THE FOLLOWING:
1. IT IS THE INTENT OF THESE DRAWINGS TO SHOW A COMPLETE AND OPERABLE ELECTRICAL SYSTEM IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE.
 2. ALL ITEMS NOT SHOWN ON THE DRAWING, OR CALLED FOR IN THE NOTES OR SPECIFICATIONS, BUT WHICH ARE NECESSARY TO MAKE A COMPLETE ELECTRICAL INSTALLATION, SHALL BE FURNISHED AND INSTALLED AT NO ADDITIONAL COST TO THE OWNER.
 3. VERIFY EXACT LOCATION OF DEVICES RELATIVE TO MECHANICAL DRAWINGS.
 4. CONTRACTOR SHALL COORDINATE AND SUPPLY MECHANICAL AND PLUMBING EQUIPMENT WITH DISCONNECTS AS NECESSARY.
 5. SUPPLY AND INSTALL NEW DISCONNECTS, CONDUIT, AND CONDUCTORS TO UNIT HEATERS IN APPARATUS BAY. FEED CIRCUITS FROM EXISTING PANEL AND CIRCUIT WHERE EXISTING UNIT HEATERS WERE REMOVED.
 6. SUPPLY AND INSTALL NEW DISCONNECTS, CONDUIT, AND CONDUCTORS TO BOILER IN MECHANICAL ROOM. FEED CIRCUITS FROM EXISTING PANEL AND CIRCUIT WHERE EXISTING BOILER WAS REMOVED.
 7. SUPPLY AND INSTALL NEW DISCONNECTS, CONDUIT, AND CONDUCTORS TO EACH PUMP IN MECHANICAL ROOM. FEED CIRCUITS FROM EXISTING PANEL AND CIRCUIT WHERE EXISTING BOILER PUMPS WERE REMOVED.
 8. SUPPLY AND INSTALL NEW DISCONNECTS, CONDUIT, AND CONDUCTORS TO NEW EXHAUST FAN EF-1. FEED CIRCUITS FROM EXISTING PANEL AND CIRCUIT WHERE EXISTING EXHAUST FAN WAS REMOVED.
 9. THE CONTRACTOR IS RESPONSIBLE TO DOCUMENT AND UPDATE THE ELECTRICAL PANEL PLACARD AT THE COMPLETION OF THE WORK. ANY CIRCUITS MADE SPARE AS A RESULT OF THE WORK SHALL BE MARKED "SPARE" IN PENCIL.
 10. REMOVE ALL ABANDONED CIRCUITS BACK TO THE PANEL.
 11. THIS PROJECT INTENDS TO PURSUE EFFICIENCY MAINE PRESCRIPTIVE AND/OR CUSTOM INCENTIVES WHERE APPLICABLE. THE CONTRACTOR SHALL COORDINATE THE ACTIVITIES ASSOCIATED WITH EFFICIENCY MAINE INCENTIVE APPROVAL PROCESS INCLUDING BUT NOT LIMITED TO; PREPARATION AND SUBMISSION OF ALL APPLICABLE INCENTIVE APPLICATIONS, RECEIVING PRE-APPROVAL WHEN APPLICABLE, THE TRACKING AND SUBMISSION OF MEASURE SPECIFIC INVOICES TO EFFICIENCY MAINE WITHIN THE PRESCRIBED TIMEFRAME AFTER THE COMPLETION OF THE WORK, AND FOLLOW-UP AS NECESSARY UNTIL THE CITY OF AUBURN RECEIVES THE INCENTIVES.

LEGEND

- DISCONNECT SWITCHED SIZED FOR EQUIPMENT
- MOTOR RATED SNAP SERVICE SWITCH
- HOME RUN ARROW WITH CONDUCTOR AND CONDUIT SHOWN

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Sheet Title:
NEW ELECTRICAL PLAN

No.	Revision/Issue	Date

Design by: RR	Checked by: MTI
Drawn by: RR	Approved by: MAD
Project: 941	Date: 12/2/15

Sheet:
E-1