INVITATION for BIDS

Milford School District/SAU 40 invites interested mechanical contractors to bid the installation of hydronic system replacement piping and HVAC upgrades at Milford High School and Milford Middle School located in Milford, NH. The project will include demolition of existing piping networks, associated pumps and other incidentals and replacement with new insulated piping systems and other required specialties. Other HVAC upgrades will include demolition of existing water heaters and installation of new gas fired water heaters at both the Middle School and High School, and kitchen equipment demolition at the Middle School. A contractor walk-thru will be conducted on October 16, 2017 at 10 AM, with bids due November 6, 2017 at or before 2 PM EST. The schedule for installations and other details will be discussed during the contractor walk-thru. To request Bid Documents, or for more information, contact:

Mr. William Cooper – Director of Buildings and Grounds
Milford School District – SAU 40
100 West Street
Milford, NH 03055
Phone: (603) 673-2202
Milford High School and Milford Middle School
Hydronic Piping Replacement and HVAC Upgrades

MILFORD, NEW HAMPSHIRE

Prepared by
Yeaton Associates, Inc.
October 6, 2017
Milford High School and Milford Middle School
Hydronic Piping Replacement and HVAC Upgrades

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INVITATION FOR BIDS

Milford High School Hydronic System Piping Replacement and Upgrades project includes, but is not limited to, the following scope of work and responsibilities:

- The contract includes the removal of existing insulated hydronic piping systems and replacement with new services, including new pumps and all other equipment, specialties and incidentals indicated on the drawings and required to meet the intent of the contract. Removal and replacement of existing ceiling tiles shall be done under a separate contract administered by the Owner.

- The contract includes the removal of existing domestic hot water heaters in the High School and Middle School, and installation of new, natural gas fired heaters and all other equipment, specialties and incidentals indicated on the drawings and required to meet the intent of the contract.

- The contract includes the complete removal of an abandoned kitchen exhaust system inclusive of hood, ductwork and rooftop fans. Minor controls, wiring and fire suppression system work will be included, as well as all cutting, patching and other specialties required to meet the intent of the contract.

- The owner realizes that contract close-out work may extend into “school in session” time. This contractor will be responsible for coordinating work schedules and site impact with the owner’s representatives, plus maintaining as safe work environment including barriers to prevent workplace entry.

- Any asbestos will be abated from existing piping systems under a separate contract administered by the Owner. However, the sequence of abatement will be coordinated with this contractor so piping demolition and new installations may begin in specific areas while abatement procedures continue in other parts of the building.

Drawings MD1.1 thru MD1.5, M1.1 thru M-2.2, P1.1 and P1.2, along with this associated Specification (hereinafter referred to as Contract or Construction Documents) as prepared by Yeaton Associates, Inc., dated October 6, 2017 explains the intent and details associated with the proposed contract entitled Milford High School and Milford Middle School – Hydronic Piping Replacement and HVAC Upgrades. Milford High School and Milford Middle School are both located in Milford, New Hampshire and fall under the jurisdiction of the Milford School District/SAU 40.

These documents have been made available at the request of Milford High School/SAU 40. Please examine the documents carefully and call William R. Gagnon, P.E., at Yeaton Associates, Inc. (603-444-6578) with any questions or concerns.

Yeaton Associates, Inc.
October 6, 2017
Criteria and Information:

1. Contractors may tour and examine the work areas within the subject facility on October 16, 2017 at 10 AM as part of a contractor walk-thru led by the engineer and Mr. William Cooper - Director of Buildings & Grounds. If subsequent visits are desired, Mr. Cooper may be contacted at (603) 673-2202. Bids shall be submitted to:

   Attention: Mr. William Cooper, Director of Buildings & Grounds
   SAU 40 – Milford High School
   100 West Street
   Milford, New Hampshire 03055

   NOTE: Clearly identify on envelope - “Bid for Milford High School and Milford Middle School – Hydronic Piping Replacement and HVAC Upgrades, Milford, New Hampshire”. Note that hard copy, hand delivered or mailed, as well as e-mailed bids are acceptable. E-mail bids must be PDF format, addressed to wcooper@milfordk12.org, and must be complete in all respects.

3. Bids are due November 6, 2017 at, or before 12 PM (EST).

4. Bids shall be opened privately on the date stated above. Submissions must include a completed Bid Form, proof of insurance, acknowledgement of the required construction schedule and detailed explanation of any exclusions and/or exceptions to the proposed scope of work. Contractors will be notified of the results and the contract awarded subject to review and approval by the Milford High School Board. Milford High School Board/SAU 40 reserves the right to waive irregularities in bidding, to reject any and all bids at will and without explanation, and to make the Contract award in the best interest of Milford High School/SAU 40.

5. Work of this contract may be done during normal working hours. The exact start date(s) will be discussed at the contractor walk-thru on October 16, 2017 and coordinated with the successful contractor post bid. Submission of shop drawings for review and approval, ordering of equipment and mobilization may proceed immediately after the award of contract. The exact completion date(s) will be discussed at the contractor walk-thru on October 16, 2017 and coordinated with the successful contractor post bid.

6. All required fees and permits shall be obtained and paid by this Contractor. It is unknown whether the Town of Milford will require a building permit or any other permits for the identified project. Responsibility for contacting the Town of Milford and securing permits as required rests with this Contractor.

7. A Performance Bond is required and shall be identified as a separate line item on the Bid Form. As an alternative to a Performance Bond, an irrevocable letter of credit equal to, or exceeding the amount of the construction contract covering the Contractor may be submitted.

8. The Contractor must maintain insurances in keeping with Milford High School/SAU 40 insurance carrier’s requirements in order to relieve the Owner of any and all liability. The successful Contractor shall submit a standard insurance limit declaration form indicating coverage for record purposes.

9. Milford High School and Milford Middle School are non-smoking construction sites.

Yeaton Associates, Inc.
October 6, 2017
10. The Owner reserves the right of first refusal on all disconnected equipment and specialties associated with this project.

11. Electrical work associated with this project shall be provided by a licensed electrician on a design/build basis working as a sub-contractor to the prime Contractor. All electrical work shall be installed in accordance with prevailing codes, rules and regulations. This Contractor shall be responsible for demolition of existing electrical wiring back to “make safe” locations and coordinating power outages with the owner’s representatives. This Contractor shall be responsible for purchasing and installing all required electrical specialties, VFD’s, disconnects and other necessary electrical components.

12. All associated miscellaneous general construction work, including cutting, patching, painting and the like shall be addressed by owner representatives for the most part, but fire sealing shall be accounted and addressed as part of this Contractor’s bid.

13. Site considerations such as dumpsters, delivery sites/times, staging areas and other general conditions details shall be coordinated with the owner’s representatives.

14. The successful Contractor shall enter a contract with Milford High School/SAU 40. Contract details, requisition timing and other terms shall be established with the successful Contractor as part of the contract award process.

15. The mechanical contractor shall be considered the prime Contractor and carry all required sub-contractors, including electrical, and other project costs in their bid.

End of Invitation for Bids
Company Name (Bidder): ________________________________

Address: __________________________________________

Date: _____________________________________________

Proposal of ________________________________ (hereinafter called “Bidder”) organized and recognized as a legitimate and ongoing service provided under the prevailing laws of the State of ___________________________ doing business as a state registered ___________________________
(Corporation, LLC, Partnership or Individual)

To Milford School District/SAU 40 (hereinafter called “Owner”):

The Bidder, in compliance with the INVITATION FOR BIDS, having examined the plans and specifications for “Milford High School and Milford Middle School – Hydronic Piping Replacement and HVAC Upgrades” in Milford, New Hampshire, and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials, equipment and components as required to construct the project in accordance with the Contract Documents within the timeframe set forth herein for the price stated below. Said price shall cover all expenses incurred in performing the work required by the Contract Documents, of which this proposal is a part.

1. Project Bid: $______________________________.

2. Performance Bond: $______________________________.
Company (Bidder): ____________________________________________________________

3. Addendum Receipt: The Bidder acknowledges receipt of the following addenda, issued during the bidding time, and states that these have been addressed in this proposal:

<table>
<thead>
<tr>
<th>Addendum</th>
<th>Dated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Authorized Signature: _______________________________________________________

Title: ____________________________

Business Name: ____________________________

Business Address: ____________________________

(Seal - if a Corporation)

Name & Title of Authorizing Officer(s):

_________________________________________

_________________________________________

End of Bid Form
SPECIAL CONDITIONS

SC.1 FIRE PROTECTION AND DEBRIS DISPOSAL

a. Provide and maintain adequate fire protection (fire extinguishers or other effective means), ready for instant use, distributed around the project and in and around temporary flammable structures during construction of work.

b. Gasoline and other flammable liquids shall be stored in and dispensed from UL listed safety containers in conformance with National Board of Fire Underwriters' recommendations. Storage shall not be within building.

c. Debris shall not be permitted to accumulate on job. The site shall at all times be kept satisfactorily clean. At the end of each work week, thoroughly clean the premises of rubbish and debris of any nature and remove from the site.

SC.2 REQUIRED INSURANCE

a. Contractor shall procure and maintain during the term of this Contract, and any extension thereof, insurance as hereafter stipulated. Insurance shall be written by companies acceptable to Milford School District/SAU 40, and policies shall include such terms and provisions as may be required by the Owner or their insurance carrier. Limits shall be as follows:

- Commercial General Liability = $2,000,000.
- Commercial Automotive Liability = $1,000,000.
- Commercial Umbrella = $5,000,000.

SC.3 OCCUPATIONAL SAFETY AND HEALTH RULES AND REGULATIONS

a. The Contractor and all Sub-contractors shall comply with applicable provisions of Federal Laws including, but not limited to, the latest amendments of the Occupational Safety and Health Act (OSHA) and Occupational Safety and Health Standards, as well as hiring and employment regulations and requirements.

End of Special Conditions
HOLD HARMLESS AGREEMENT
Milford High School and Milford Middle School/SAU 40

Milford High School and Milford Middle School
Hydronic Piping Replacement and HVAC Upgrades

The Contractor, __________________________, agrees to defend, indemnify and hold harmless Milford School District/SAU 40, its officers, directors, agents and employees from and against any and all claims, lawsuits, judgments, damages, costs, injury to and destruction of tangible property or other harm for which recovery of damages is sought, damages, losses and expenses including attorney fees arising out of, or resulting from, any negligent or liable act or omission of the Contractor, its officers, agents or employees, or that may arise out of, or be occasioned by the Contractor's breach of any of the terms or conditions of this Agreement, and further agrees to protect Milford School District/SAU 40 from all liability losses due to personal injury, including death, or property damage including loss of use of all other damages for services performed for Milford School District/SAU 40 if such injury or damage is actually due to, or claimed to be due to, the contributing negligence of the Contractor.

__________________________________________  _______________________________________
Contractor of Record (Print Name)              Agent for Milford School District/SAU 40

__________________________________________  _______________________________________
Contractor of Record (Signature)               Agent for Milford School District/SAU 40

__________________________________________  _________________________________
Date signed                                    Date signed
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<td>223400</td>
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SECTION 220000 - PLUMBING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Description of Plumbing system(s), quality expectations, materials, installation, performance and general requirements.

B. Refer to the Invitation for Bids for project description and other pertinent information. The Invitation for Bids shall be considered part of these technical specifications.

1.2 PLUMBING DEMOLITION

A. This Contractor shall remove all existing piping, equipment and other plumbing specialties noted on the drawings and/or required to achieve the intent of this contract. No unused equipment, piping or specialties shall be abandoned in place. All removed equipment shall be hauled away from the site and disposed of properly, except where noted to be reused or directed otherwise in the field. Milford School District/SAU 40 reserves the right of first refusal on all removed equipment and specialties.

B. Coordinate the limits of demolition work to be performed by this trade with the Construction Manager, as certain removals will be performed by the Demolition Trade.

C. The Contractor may not engage in the sale of any salvaged mechanical equipment, piping, materials or specialties on School property.

D. This Contractor is required to coordinate all shutdowns through the Construction Manager in order to maintain system continuity and operation during occupied hours as directed.

1.3 SYSTEM(S) DESCRIPTION

A. Plumbing systems of this contract shall include:

1. System of hot and cold water distribution to all fixtures from mains where indicated.
2. Hot water recirculation system.
3. Thermal insulation for all systems.
4. Testing and adjusting of systems.
5. General Conditions.
1.4 REFERENCES

A. 2009 International Building Code with NH amendments
C. New Hampshire State Fire Code
D. 2009 NFPA 1, National Fire Code, as adopted and amended by NH State Fire Code
E. 2009 International Plumbing Code with NH amendments
F. 2009 International Mechanical Code with NH amendments
G. 2009 International Energy Conservation Code with NH amendments
H. 2014 NFPA 70, National Electric Code with NH amendments
I. Town of Milford, New Hampshire ordinances, rules and regulations
J. Milford Fire Department rules and regulations

1.5 SUBMITTALS

A. Provide submittals for review and approval.

END OF SECTION 220000
SECTION 220100 - OPERATION AND MAINTENANCE OF PLUMBING

PART 1 - GENERAL

1.1 INTENT

A. Furnish and install all plumbing work of this contract in accordance with governing codes and in a workmanlike manner.

B. The run and arrangement of all plumbing pipes shall be approximately as shown on the drawings and as directed during installation and shall be as straight and direct as possible, forming right angles or parallel lines with building walls and other pipes, and be neatly spaced.

C. Arrange work to avoid all interference with the work of all other trades. Consult with other contractors, and coordinate the location of their work with that of the others.

D. Provide maintenance manuals and electronic information in accordance with DIVISION 01.

1.2 COLD WATER SYSTEMS

A. Cold water distribution systems shall supply water to all fixtures and other water consuming equipment, as well as domestic water heating equipment. Valved outlets for the use of other trades shall be furnished and installed complete as indicated on the drawings.

1.3 GENERAL INSTALLATION OF PLUMBING PIPING

A. Offsets shall be permitted only where required to permit the pipes to follow walls, where standard fittings shall be used.

B. All risers shall be erected plumb and true and shall be parallel with walls and other pipes and be neatly spaced.

C. All roughing, underground or concealed in floors or wall construction, shall be installed before the construction is closed up.

D. Horizontal runs of piping, except where concealed in partitions, shall be kept as high up as possible and close to walls. Consult with other trades so that grouped lines shall not interfere with each other.

E. The arrangement, positions and connections of pipes, fixtures, drains and valves shown on the drawings shall be followed as closely as possible. However, the right is reserved by the Owner’s representative to change locations of pipes and associated specialties to accommodate any conditions which may arise during the progress of the work, without additional cost. The responsibility for accurately laying out the work rests with the contractor.

F. Piping shall be installed concealed in building construction in all finished areas.
1. Special precaution shall be taken in the installation of piping concealed to see that the piping is properly installed. Should it be necessary to correct piping so installed, this subcontractor shall be held liable for any injury caused to other work and the correction of piping.

G. Pipe shall not be bent, flattened or otherwise injured either before installation or during installation.

H. Connections to fixtures shown to be installed concealed in building construction shall, in general, be carried concealed to a point above floor at wall (near fixtures), where they shall break out and rise exposed to fixtures, all as required. Exposed waste and supplies (including in cabinets) shall be chrome, except for kitchen work sinks. The chrome tailpiece connection to plumbing roughed behind the cabinet shall be a threaded compression fitting with extended escutcheon.

I. Reducing fittings, unless otherwise approved in special cases, shall be used in making reduction in size of pipe. Bushing shall not be allowed unless specifically approved.

1.4 PLUMBING WATER PIPING CONSTRUCTION DETAILS

A. Pipe shall be supported as specified hereinafter and per the pipe manufacturer’s published instructions and recommendations.

B. Pipe lines shall be run parallel and spaced to permit proper covering.

C. Air chambers shall be Wade "Shok-Stop" or approved equal, and shall be installed on top of all hot and cold water risers on the upfeed system, on all individual hot and cold water fixture branch connections. Groups of fixtures may be served by one full branch sized air chamber.

D. Piping, fittings, valves, supports, hangers, etc., exposed to view shall be painted or chrome as directed. This provision shall apply to all piping from the point that it leaves the wall to the point of final connection to the fixture.

E. Any exposed piping and trim showing tool marks shall be removed and replaced with new materials without additional cost.

F. Riser control valves shall be provided on all risers. Drain valves shall be provided at the heel of each riser inside of shut-off valves.

G. Main shut-off valves shall be installed at each water connection at all tanks and other pieces of equipment.

H. Valves shall generally be provided on all main branches from risers to groups of fixtures and access doors shall be provided to all such valves not readily accessible.

I. Piping shall pitch to low points. All low points and any pockets caused by changes in elevation required by structural or other interferences shall be provided with drain valves.

J. Branches to individual fixtures shall be of sizes as shown in the Fixture Schedule on the drawings.
K. Vacuum breakers and backflow preventers shall be installed on all equipment and fixture connections as required by code and/or local ordinances.

L. Connections to equipment such as tanks, pumps, and the like, shall be made with flanged or union connections.

M. Where hot and cold water supply pipes connect to a combination supply fitting with a shut-off valve on its discharge, or the combination supply fitting is equipped with manual or thermostatic mixing valve, each hot and cold water supply pipe shall be equipped with a composition disc swing check valve ahead of the supply fitting.

END OF SECTION 220100
SECTION 220500 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor and materials to complete the installation of the plumbing systems as shown on the drawings, specified herein or both as follows:

1. System of hot and cold water distribution to all fixtures from mains where indicated.
2. Hot water recirculation system.
3. Thermal insulation for all systems.
4. Natural gas distribution system.
5. Testing and adjusting of systems.
6. General Conditions.

END OF SECTION 220500
SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SCOPE

A. Provide shut-off valves to isolate sections of piping, every fixture and equipment. Valves shall be located at the inlet and outlet to permit removal for repairs without interfering with the remainder of the system.

B. Do not locate valves with stems below horizontal. Provide ball, check, balancing cocks, plus air vents and other type of valves as required for complete and proper valving of the entire installation, to control flow, shut-off, prevent backflow, provide drainage and control pressure and temperatures.

PART 2 - PRODUCT

2.1 MATERIAL

A. Valves used for isolation and flow control in domestic water systems shall be classified lead-free, bronze construction, appropriate for potable water applications, equal to Watts LFB-6080.

B. Where applicable, valves and specialties used in CVPC potable water piping systems shall be compatible. Submit product for review and approval.

C. Check valves 2½” and less shall be bronze horizontal swing check, 125 SWP, equal to NIBCO S-413-Y-LF. Check valves 3” and larger shall be iron body, bronze trim, 125 SWP, equal to NIBCO F-918-LF.

D. Drain valves to be installed at low points in piping and as otherwise required to completely drain piping system and equipment. Drain valves shall be ball valves of size as shown or required, in no case smaller than ½” I.P.S., equal to Watts B-6000-CC with ¾” male thread for hose, outlet with cap and chain.

E. Manual Balancing Valves shall be equal to Macon Balancing Valve Model STV Globe Style Manual Balancing Valve, tight shut-off, packed under pressure, sized and installed as recommended by the manufacturer.

F. Approved strainers shall be installed in the inlet connections to equipment and automatic control valves to protect all apparatus or any automatic character whose proper function would be interfered with by dirt on the seat or by scoring of the seat. Strainers shall be equal to Watts series LF777 and 77F-DI-125.

G. Pressure reducing valves for domestic water shall be of anti-siphon check type with built-in strainer for equal to Watts LFU5B and LFN223
H. Valves used in natural gas lines for isolation shall be equal to Watts B-6000-UL-YRPV.

I. All valves shall be “lead free” construction and classified as such.

END OF SECTION 220523
SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE

A. Address seismic restraints and hanging criteria as required by prevailing codes. Secure the services of a professional seismic consultant to review and determine seismic criteria and design accordingly, plus administer construction and specialties installations.

B. Provide suitable and substantial hangers and supports for all horizontal and vertical lines as manufactured by B-Line, Allegheny Industrial, Tolco or ITT Grinnell.

C. Support copper, steel, cast iron and all other material piping in accordance with the pipe manufacturer’s published instructions, or the schedule below, whichever is more stringent.

D. Support piping in accordance with the following schedule:

<table>
<thead>
<tr>
<th>Pipe Material</th>
<th>Max. Horizontal Spacing</th>
<th>Max. Vertical Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper tubing</td>
<td>6’</td>
<td>10’</td>
</tr>
<tr>
<td>1¼” &amp; smaller</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copper tubing</td>
<td>10’</td>
<td>10’</td>
</tr>
<tr>
<td>1½” &amp; larger</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel pipe</td>
<td>12’</td>
<td>15’</td>
</tr>
<tr>
<td>Cast iron</td>
<td>At joint or 10’</td>
<td>At joint</td>
</tr>
<tr>
<td>PVC &amp; CPVC</td>
<td>As recommended by pipe manufacturer.</td>
<td></td>
</tr>
</tbody>
</table>

E. Piping and equipment shall not be hung from the work of other trades.

PART 2 - PRODUCT

2.1 MATERIAL

A. Hangers shall be of heavy construction suitable for the size of pipe to be supported. All materials, except pipe rollers, shall be wrought or malleable iron or steel. Hangers shall be adjustable type.

B. Hangers and pipe clamps used on copper piping shall be solid copper or copper plated. Where tube is in contact with dissimilar metal, protect with shield or plastic cover.
C. The intention is to provide supports which in each case shall be amply strong and rigid for the load, but which shall not weaken or unduly stress the building construction.

D. Hangers for pipes up to and including 4” shall be swivel ring, split ring, wrought pipe clamp, band, or adjustable wrought clevis type.

E. Hangers for pipes above 4” shall be standard clevis or roller.

F. For insulated piping ≥ 3” provide Teflon slide type supports MSS (Manufacturer’s Standardization Society) Type 35 or protective saddles MSS Type 39. Fill interior voids of saddles with segments of insulation to match adjoining pipe insulation.

G. For all insulated piping furnish and install protective insulation shields MSS (Manufacturer’s Standardization Society) Type 40 as follows:

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Length</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>¼” to 3½”</td>
<td>12”</td>
<td>18 ga.</td>
</tr>
<tr>
<td>4”</td>
<td>12”</td>
<td>16 ga.</td>
</tr>
</tbody>
</table>

END OF SECTION 220529
PART 1 - GENERAL

1.1 GENERAL

A. Identification shall be provided on all piping that is exposed, as well as at all concealed locations such as shafts and above removable ceilings in which piping may be viewed.

1. Furnish and affix approved adhesive bands identifying the service and direction of flow of the various piping systems.
2. A set of such bands shall be affixed to each pipe not less than 30’ and there shall be at least one set of identifying bands in every room where piping may be viewed.
3. Each set shall consist of one band on which the name of the service is printed and one band on which is printed a black directional arrow.

B. Identification bands shall have adhesive backing. Submit same for approval.

1. The name of the service shall be printed in black letters not less than 2” high for 3” pipe and larger; 1” high for pipe 2½” and smaller.
2. Bands shall be applied where they can be read with their long dimension parallel to the axis of the pipe or duct. Bands shall be applied only after finish painting is completed.

1.2 SCOPE

A. Attach to each valve a 2” brass tag on which shall be stamped designating letters and numbers ½” high filled with black enamel. Letters designate service.

1. The tags shall be securely fastened to the handle or spindle of the valve by a brass chain.
2. Cross reference valve tags on the “As-Built” drawings and include schedules in the Operation & Maintenance (O&M) manuals.
3. One (1) copy of the valve schedule shall be provided in the O&M Manual. Review numbering with the Owner’s representative prior to installation and honor any existing numbering systems in force today.

B. Provide nameplates for all equipment, motor starters, push button stations, pilot light stations or control points, and any other points in the building deemed necessary by the Owner’s representative.

1. Nameplates shall be fabricated from black bakelite with white recessed letters permanently secured with screws.
2. Nameplate schedule and sample shall be submitted for approval.
3. Coordinate identification of exhaust fan switches provided by the Electrical Contractor.

C. Provide permanent labels on all pieces of mechanical equipment designating the unit tag as it is shown on mechanical drawings, or as instructed by the owner’s representative.
D. As part of the Owner Instruction session, review the location of valves and other specialties concealed above ceilings. Furnish and install adhesive dots, or another form of identification, on ceiling tiles (in the corner) for access reference.

<table>
<thead>
<tr>
<th>Dot Color</th>
<th>Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td>Domestic water</td>
</tr>
</tbody>
</table>

PART 2 - PRODUCT

2.1 MATERIAL

A. Identification bands, tags, charts and dots shall be as manufactured by Seton or Carlton.

END OF SECTION 220523
PART 1 - GENERAL

1.1 MATERIALS - GENERAL

A. Steel pipe shall be lap welded or seamless with maker’s name rolled on each length equal to ASTM-A-53 of weight specified.

B. Copper tube shall be seamless, hard or soft equal to ASTM-B88 of type specified.

C. Cast iron soil pipe shall be standard weight coated cast iron soil pipe. Each length shall bear the maker’s name, weight per foot and size cast thereon. Fittings and traps shall be similarly marked. Cast iron pipe and fittings shall meet or exceed the requirements of CISPI 301 and 310.

D. PVC pipe and fittings shall meet or exceed the requirements of ASTM D-1784 and 1785, and CPVC ASTM D 2486.

E. Pumps used in potable water systems shall be bronze construction of manufacturer scheduled, or equal.

PART 2 - PRODUCT

2.1 SCHEDULE OF PLUMBING PIPE MATERIALS

<table>
<thead>
<tr>
<th>Service</th>
<th>Location</th>
<th>Size</th>
<th>Material</th>
<th>Type</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic C.W.,</td>
<td>Building</td>
<td>All</td>
<td>CTS CPVC or</td>
<td>Tube</td>
<td>ASTM D 2486</td>
</tr>
<tr>
<td>HW &amp; RHW</td>
<td></td>
<td></td>
<td>Copper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment</td>
<td>All</td>
<td>All</td>
<td>PVC</td>
<td>DWV</td>
<td>Sch. 40</td>
</tr>
<tr>
<td>Condensate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>All</td>
<td>All</td>
<td>Steel</td>
<td>Screwed or Welded</td>
<td>Sch. 40</td>
</tr>
</tbody>
</table>

SCHEDULES FOR PLUMBING PIPING AND PUMPS
2.2 SCHEDULE OF PLUMBING PIPE FITTINGS

<table>
<thead>
<tr>
<th>Service</th>
<th>Location</th>
<th>Size</th>
<th>Material</th>
<th>Type</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic C.W., H.W. &amp; R.H.W.</td>
<td>Building</td>
<td>All</td>
<td>CTS CPVC or Copper</td>
<td>Glued</td>
<td>ASTM D 2486</td>
</tr>
<tr>
<td>Equipment Condensate</td>
<td>All</td>
<td>All</td>
<td>PVC</td>
<td>DMV</td>
<td>ASTM 2665</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>All</td>
<td>All</td>
<td>Steel</td>
<td>Malleable or Welded</td>
<td>150 #</td>
</tr>
</tbody>
</table>

Piping Notes:

1. No solder containing lead shall be used or present on site.
2. “ProPress” Fittings, Viega or Victaulic copper couplings and joining systems may be used in lieu of soldered connections in piping systems at this contractor’s option.

2.3 TRAPS

A. Traps shall be of material and type conforming to the piping system in which installed. Traps shall be of plain pattern, having a seal of not less than 2½”, not greater than 4” except as noted on the drawings. All concealed 2” and larger traps shall be of the material specified for the piping system to which they are connected. All exposed fixture traps are to be as specified under the fixture schedule and or to match equipment tailpieces supplied by others.

2.4 CLEANOUTS

A. Cleanouts shall be of material and type conforming to the piping system in which installed, appropriate for installation in the applicable surface, i.e., carpet, concrete, gypsum board, etc. Cleanout plugs shall comply with the plumbing code and have American Standard pipe threads. Cleanouts turning out through wall and floors shall be made by long sweep ells or “Wye” fittings and 1/8 inch bends with dandy cleanouts.
2.5 PUMPS

A. Pumps used in potable water systems shall be as manufactured by Bell & Gossett, Armstrong, Taco or equal of type and capacity indicated on the drawings.

PART 3 - EXECUTION

3.1 SOLDERING PIPE

A. Fittings in copper tubing shall be wrought copper for sweat solder joints. Joints in copper water piping shall be made with solder, per schedule, and shall meet ASTM-B32-96AM. Flux shall be equal to Canfield’s SOLDER-MATE and COPPER-MATE. No borax or alcohol mixtures or resin or similar paste fluxes shall be used. Care should be taken to see that no surplus flux is on the inside of the pipe when the joint is completed.

3.2 FIRE SEALANT

A. Fire sealing at all penetrations through rated general construction shall be in accordance with SECTIONS 078000 AND 079000.

B. Pipes passing through all masonry and fire rated gypsum board walls shall pass through clean cut holes fitted with steel pipe sleeves, the inside diameter of which shall be at least 1” greater than the outside of the pipe passing through it. Pipes passing through non-rated gypsum board walls do not require sleeves, but the void between wall opening and pipe must be sealed and taped. Pipe insulation shall be continuous through sleeve/hole and all space between pipe and sleeve/hole shall be caulked full with product per SECTIONS 078000 AND 079000. Installation details shall be in accordance with the sealant manufacturer’s published instructions in order to bear the UL Classification Marking.

C. Exposed pipes passing through walls, floors, partitions or ceilings shall be fitted with chromium plated heavy gauge wrought brass escutcheons, fit snugly and securely held in place.

D. Pipes passing through fire rated floors shall be sealed in keeping with paragraphs A, B and C.

E. Sanitary vent pipes passing through roofs shall be provided with a manufactured "boot" for installation by the C.M.

F. PVC and CPVC pipe penetrations through fire rated general construction shall be firestopped with UL listed sleeve assemblies.

G. Submit firestopping product and details for review and approval. Coordinate product with the C.M. to assure project consistency. Provide a shop drawing by the fire sealant manufacturer that clearly identifies all products and the applicable UL classification or listing.

END OF SECTION 220610
SECTION 220700 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 REQUIREMENTS

A. Provide all insulating materials required for piping, mechanical equipment and sheet metal work. The execution of the work shall be by an experienced Insulation Contractor in strict accordance with the best practice of the trade and the intent of the specifications.

B. Insulation thermal properties and thickness shall comply with the INTERNATIONAL ENERGY CONSERVATION CODE 2009 - CHAPTER 5.

PART 2 - PRODUCT

2.1 MATERIAL

A. Insulation shall be as manufactured by Owens-Corning Fiberglass Corp., Knauf, Johns-Manville Co., or approved equal.

B. Insulating materials, jackets, adhesives, accessories and applications shall develop a system having a UL rating with a flame spread of not over 25, a fuel contributed rating of not over 50 and a smoke developed rating of not over 50.

C. Domestic Hot and Cold Water and Hot Water Recirculation piping: Cover new and disturbed existing with molded, heavy density fiberglass pipe insulation with ASJ/SSL. Adhere and seal end joint strips and overlap seams with proper mastic to provide continuous vapor barrier jacket. All fittings shall be insulated with precut fiberglass formed fittings with premolded PVC jacket mechanically fastened.

<table>
<thead>
<tr>
<th>Service</th>
<th>Pipe Size</th>
<th>Insulation Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW, HW&amp;RHW</td>
<td>ALL</td>
<td>1”</td>
</tr>
</tbody>
</table>

END OF SECTION 220700
SECTION 220800 - COMMISSIONING OF PLUMBING

PART 1 - GENERAL

1.1 COMMISSIONING OF SYSTEM(S)

A. The Plumbing Contractor shall be responsible for self-commissioning the installed Plumbing system(s) and demonstrating proper operation and functions at conclusion of the contract.

1.2 WATER SYSTEMS STERILIZATION

A. Chlorination Method:

1. Fill the system or any part thereof with a water solution containing 50 parts per million (PPM) available chlorine and let it stand for 24 hours before flushing and returning to service.
2. During the chlorination process, all valves and accessories shall be operated.
3. After chlorination, the water shall be flushed from the line at its ends until the replacement water when tested shall be found equal chemically and bacteriologically to tests of the permanent source of supply. Submit to the Owner’s representative written verification that all procedures and tests, here specified, have been performed and that water at the building outlets on test will be found identical to the source water.
4. Chlorination treatment shall not be performed where isolation from the existing domestic water piping system is not possible. In said case, thorough flushing shall be done.

1.3 PRESSURE TESTS

A. All piping shall be pressure tested before being covered or concealed. This contractor shall provide all equipment necessary for said test. All tests shall be recorded on a log sheet noting piping section being tested, initial and final pressures, duration of test and date of test.

B. All tests shall be made in the presence of and to the satisfaction of the Owner’s representative. Provide a copy of all test log sheets to the Owner’s representative upon completion of testing.

C. The piping systems may be tested in sections as the work progresses, but no joint or portion of the system shall be left untested.

D. All elements within the system that may be damaged by the testing operation shall be removed or otherwise protected during the operation.

E. All defects and leaks observed during the tests shall be corrected and made tight in an approved manner and the tests repeated until the system is proven tight.

F. Repair all damage done to existing or adjacent work or materials due to or on account of the tests.
G. All pressure piping shall be tested hydrostatically at a pressure of at least 1½ times the maximum operating pressure, but not less than 80 psi, for a two (2) hour duration with no drop in pressure.

H. Soil, waste and vent and roof drainage systems shall be tested by filling systems with water from lowest point to highest point. Water shall be allowed to stand for four (4) hours during which time there shall be no loss or leakage.

END OF SECTION 220800
SECTION 221100 - FACILITY WATER DISTRIBUTION

PART 1 - GENERAL

1.1 SCOPE

A. All potable water system installations shall be done in accordance with prevailing codes, AHJ requirements and best trade practices.

END OF SECTION 221100
SECTION 223400 - DOMESTIC HOT WATER HEATER

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install domestic hot water generating equipment as scheduled on the Plumbing drawings, or equal.

B. Install the water generating equipment in strict accordance with the manufacturer’s published instructions and all prevailing pressure vessel and plumbing codes.

END OF SECTION 223400
DIVISION 23 – HEATING

SECTION 230000  Heating System Demolition and New Work
SECTION 230100  Operation and Maintenance of Heating Systems
SECTION 230523  General-Duty Valves for Heating Piping
SECTION 230529  Hangers and Supports for Heating Piping and Equipment
SECTION 230553  Identification for Heating Piping and Equipment
SECTION 230593  Testing, Adjusting, and Balancing
SECTION 230620  Schedules for Heating Piping and Pumps
SECTION 230700  Pipe Insulation
SECTION 230800  Commissioning of Heating
SECTION 230900  Instrumentation and Control for Heating
SECTION 232000  Heating Piping, Pumps and Specialties
SECTION 232500  Glycol
SECTION 235123  Gas Venting
PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Description of Heating system(s), quality expectations, materials and general requirements.
B. Refer to the Invitation for Bids for project description and other pertinent information. The Invitation for Bids shall be considered part of these technical specifications.

1.2 SYSTEM(S) DESCRIPTION

A. Heating system(s) of this contract shall include:
   1. Demolition of the existing hot water heating (hydronic) system.
   2. Installation of new hydronic piping systems.
   3. Hot water pumps, piping, valves and specialties.
   4. Thermal insulation.
   5. Testing and adjusting of all systems.
   7. Electrical work.

   Note that the intent is to connect to existing heating terminals branch piping ahead of existing control valves and/or isolation valves, plus where lines are exposed before disappearing into general construction. The intent is not to replace existing control valves and/or isolation valves, or to disrupt existing general construction, primarily walls, in order to gain access to existing piping; those sections of existing piping will remain as is.

1.3 REFERENCES

A. 2009 International Building Code with NH amendments
C. New Hampshire State Fire Code
D. 2009 NFPA 1, National Fire Code, as adopted and amended by NH State Fire Code
E. 2009 International Plumbing Code with NH amendments
F. 2009 International Mechanical Code with NH amendments
G. 2009 International Energy Conservation Code with NH amendments
H. 2014 NFPA 70, National Electric Code with NH amendments
I. Town of Milford, New Hampshire ordinances, rules and regulations
J. Milford Fire Department rules and regulations
1.4 SUBMITTALS

   A. Provide submittals for review and approval.

END OF SECTION 230000
PART 1 - GENERAL

1.1 OPERATING AND MAINTENANCE MANUAL

A. Manufacturer’s printed operating and maintenance instructions for each piece of equipment furnished under DIVISION 23 shall be provided at conclusion of the contract.

B. Each manual shall be suitably and neatly marked to identify the particular equipment furnished and shall include lubricating charts.

C. All instructions and charts shall be bound in appropriate cover binders properly indexed, identified, and titled to provide three (3) complete manuals. Electronic (PDF) version is acceptable.

D. Completed manuals shall be submitted for review. After approval, the manuals shall become property of the Owner.

1.2 OWNER INSTRUCTION

A. The contractor and suppliers, if necessary, shall thoroughly instruct the Owner’s representative and maintenance personnel in the proper maintenance and operation of materials and systems installed under this Division.

1. Sessions shall be held at the completed facility to instruct the Owner in the proper operation, cleaning, lubricating and maintenance of all mechanical systems, as well as water systems and glycol and/or chemical treatment.

END OF SECTION 230100
PART 1 - GENERAL

1.1 SCOPE

A. Provide shut-off valves to isolate sections of piping, every fixture and equipment. Valves shall be located at the inlet and outlet to permit removal for repairs without interfering with the remainder of the system.

B. Do not locate valves with stems below horizontal. Provide ball, check, balancing cocks, plus air vents and other type of valves as required for complete and proper valving of the entire installation, to control flow, shut-off, prevent backflow, provide drainage and control pressure and temperatures.

C. Valves shall be as manufactured by Watts, Apollo, Nibco or equal.

D. Install new isolation valves in mains and branch mains as indicated on the drawings, plus on all branch lines serving more than three (3) terminals.

PART 2 - PRODUCT

2.1 MATERIAL

A. HWS&R 2” and smaller - Ball valves for flow control and/or tight shut-off shall be all bronze construction, full port brass ball with hard chrome plating, 150 SWP, with blow-out-proof stem design, equal to Watts B-6080.

B. HWS&R 2½” and larger - Butterfly valves for flow control and/or tight shut-off shall be 200 psi, C.I. body, S.S. stem, equal to Watts DBF.

C. Check valves 2½” and less shall be bronze horizontal swing check, 125 SWP, equal to NIBCO T-413-B. Check valves 3” and larger shall be iron body, bronze trim, 125 SWP, equal to NIBCO F-918-B.

D. Drain valves to be installed at low points in piping and as otherwise required to completely drain piping system and equipment. Drain valves shall be ball valves of size as shown or required, in no case smaller than ½” I.P.S., equal to Watts Series B-6000-CC with ¾” male thread for hose, end outlet with cap and chain.

E. Where manual balancing valves are indicated, furnish and install Tour & Andersson Model STAD, STAF or Macon Balancing Model STV, Taco or B&G manual balancing valves, tight shut-off, packed under pressure, sized and installed as recommended by the manufacturer.

F. Approved strainers shall be installed in the inlet connections to equipment and automatic control valves to protect all apparatus or any automatic character whose proper function would be interfered with by dirt on the seat or by scoring of the seat. Strainers shall be equal to Watts series 777 and 77F-D.
END OF SECTION 230523
MILFORD HIGH SCHOOL & MILFORD MIDDLE SCHOOL
HYDRONIC PIPING REPLACEMENT AND HVAC UPGRADES

SECTION 230529 - HANGERS AND SUPPORTS FOR HEATING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE

A. Provide suitable and substantial hangers and supports for all horizontal and vertical lines as manufactured by B-Line, Allegheny Industrial or equal.

B. Support copper and steel piping in accordance with the pipe manufacturer’s published instructions, or the schedule below, whichever is more stringent.

C. Support piping in accordance with the following schedule:

<table>
<thead>
<tr>
<th>Pipe Material</th>
<th>Max. Horizontal Spacing</th>
<th>Max. Vertical Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper tubing</td>
<td>6’</td>
<td>10’</td>
</tr>
<tr>
<td>1 1/4” &amp; smaller</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copper tubing</td>
<td>10’</td>
<td>10’</td>
</tr>
<tr>
<td>1 1/2” &amp; larger</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel pipe</td>
<td>12’</td>
<td>15’</td>
</tr>
</tbody>
</table>

PART 2 - PRODUCT

2.1 MATERIAL

A. Hangers shall be of heavy construction suitable for the size of pipe to be supported. All materials, except pipe rollers, shall be wrought or malleable iron or steel. Hangers shall be adjustable type.

B. Hangers and pipe clamps used on copper piping shall be solid copper or copper plated. Where tube is in contact with dissimilar metal, protect with shield or plastic cover.

C. The intention is to provide supports which in each case shall be amply strong and rigid for the load, but which shall not weaken or unduly stress the building construction.

D. Hangers for pipes up to and including 4” shall be swivel ring, split ring, wrought pipe clamp, band or adjustable wrought clevis type.

E. Hangers for pipes above 4” shall be standard clevis or roller.

F. Corrosion protection for vibration isolators for outdoor applications shall be as follows:
   1. Hardware shall be cadmium or zinc plated, all other metal parts shall be hot dipped galvanized or zinc electroplated.
2. All hangers shall be capable of withstanding three times the rated load without failure.

G. Furnish and install shields and blocks to protect insulation and maintain thickness integrity at hanger rest points.

H. For piping ≥ 3” provide Teflon slide type supports MSS (Manufacturer’s Standardization Society) Type 35 or protective saddles MSS Type 39. For insulated piping, fill interior voids of saddles with segments of insulation to match adjoining pipe insulation.

I. For all insulated piping install protective insulation shields MSS (Manufacturer’s Standardization Society) Type 40 as follows:

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Length</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>¼” to 3½”</td>
<td>12”</td>
<td>18 ga.</td>
</tr>
<tr>
<td>4”</td>
<td>12”</td>
<td>16 ga.</td>
</tr>
</tbody>
</table>

END OF SECTION 230529
PART 1 - GENERAL

1.1 SCOPE

A. Identification shall be provided on all piping that is exposed.
   1. Furnish and affix approved adhesive bands identifying the service and direction of flow of the various piping systems.
   2. A set of such bands shall be affixed to each pipe not less than 8’ apart.
   3. Each set shall consist of one band on which the name of the service is printed and one band on which is printed a black directional arrow.

B. Identification bands shall have adhesive backing. Submit same for approval.
   1. The name of the service shall be printed in black letters not less than 2” high for 3” pipe and larger; 1” high for pipe 2½” and smaller.
   2. Bands shall be applied where they can be read with their long dimension parallel to the axis of the pipe or duct.
   3. Bands shall be applied only after finish painting is completed.

C. Attach to each valve a 2” brass tag on which shall be stamped designating letters and numbers ½” high filled with black enamel. Letters designate service.
   1. The tags shall be securely fastened to the handle or spindle of the valve by a brass chain.
   2. Furnish a copy in the Operation & Maintenance (O&M) manuals.

D. Provide nameplates for all equipment, motor starters, push button stations, pilot light stations or control points, and any other points in the building deemed necessary by the Owner’s representative.
   1. Nameplates shall be fabricated from black plastic with white recessed letters permanently secured with screws.

E. Provide permanent labels on all pieces of mechanical equipment designating the unit tag as it is shown on mechanical drawings.

PART 2 - PRODUCT

2.1 MATERIAL

A. Identification bands and tags shall be as manufactured by Seton, Carlton or Brimar.
SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HEATING

PART 1 - GENERAL

1.1 TESTING AND BALANCING

A. Procure the service of an independent Testing and Balancing Agency that specializes in the testing and balancing of heating systems.

B. The intent is that new circuit setters (approximately 8) be read and flow proportioned; it is not the intent that every terminal be read and/or balanced, but rather that all are checked for heat emission to assure there are not closed or fouled circuits. The balancing sub-contractor shall issue a statement that indicates all heat terminals and states that heat was present at the time of testing. Work shall not begin until the agency has been notified by the prime contractor that all systems, or completed zones, are reading for testing.

C. Test, balance and adjust water to provide scheduled flows at identified valves and pumps.

D. At completion of all testing and balancing, leave all equipment systems, components, etc., adjusted within the limits of installed equipment and to within 10% of design requirements. Mark all setpoints of all dampers and valves with distinguishing marks. If requested, conduct tests in the presence of the Owner’s representative.

E. Within 15 days after completion of testing and balancing, submit for review six (6) copies of the testing and balancing results on industry recognized forms. Include a warranty period of 90 days during which time the Owner’s representative may request recheck or re-adjustment of any part of the job.

F. All reports shall clearly indicate the following minimum information:

1. Water - Pump full flow and no-flow suction and discharge pressures, rated and actual amperage, HP, BHP, motor nameplate efficiency, voltage and total dynamic head. Calibrated balancing device readings shall indicate location, size, setting, differential pressure, and rated and actual GPM.

END OF SECTION 230593
PART 1 - GENERAL

1.1 MATERIALS - GENERAL

A. Steel pipe shall be lap welded or seamless with maker's name rolled on each length equal to ASTM-A-53 of weight specified.

B. Copper tube shall be seamless, hard or soft equal to ASTM-B88 of type specified.

C. Pumps shall be of capacity and manufacturer scheduled on the drawings and as specified hereinafter.

PART 2 - PRODUCT

2.1 SCHEDULE OF HEATING RELATED PIPE MATERIALS

<table>
<thead>
<tr>
<th>Service</th>
<th>Location</th>
<th>Size</th>
<th>Material</th>
<th>Type</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>HWS&amp;R</td>
<td>All</td>
<td>All</td>
<td>Steel or Screwed</td>
<td>Sch. 40</td>
<td>Tube</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hard Copper</td>
<td>Tube</td>
<td>Type L</td>
</tr>
</tbody>
</table>

Fittings shall be mechanical coupling type as manufactured by Victaulic, or approved equal, along with welded or threaded fittings for steel pipe. Soldered and/or ProPress fittings shall be used for copper pipe. Use of PEX tubing for smaller pipe sizes will be allowed where necessary to address tight physical conditions, but must be reviewed in advance with the owner’s representative and not installed without permission of same.

2.2 PUMPS

A. Base mounted pumps as scheduled on the drawings of variable speed capability shall be used to replace existing pumps. Proposed pumps shall be equal to those scheduled and submitted for review and approval.

B. Acceptable manufacturers shall be Taco, Bell and Gossett, Grundfos or equal. Efficiency at operating point as scheduled on the drawings shall be met within 5%.

PART 3 - EXECUTION

3.1 INTENT

A. Furnish and install all mechanical work of this contract in accordance with governing codes and in a workmanlike manner.
B. The run and arrangement of all heating related pipes shall be approximately as shown on the drawings and as directed during installation and shall be as straight and direct as possible, forming right angles or parallel lines with building walls and other pipes, and be neatly spaced.

C. Arrange work to avoid all interference with the work of all other trades. Consult with other contractors, and coordinate the location of their work with that of the others.

3.2 GENERAL INSTALLATION OF HEATING RELATED PIPING

A. All piping shall be properly supported or suspended on stands, clamps, hangers and the like, in accordance with sections 230529.

1. Supports shall be designed to permit free expansion and contraction while minimizing vibration.

B. Screw threads shall be cut clean and true. Bushings shall not be used.

1. All reductions shall be made with eccentric reducers or eccentric fittings.
2. All pipe two inch (2") or less shall be reamed after cutting to remove all burrs.

C. The drawings indicate generally the size and location of piping, and while sizes must not be decreased, the right is reserved for Owner’s representative to change runs and sizes of pipes in order to accommodate conditions on the job.

1. Any pipes not indicated on the drawings shall be sized as directed and run where directed by the Owner’s representative.

D. Piping shall be properly graded to insure easy circulating and prevent noise and water hammer. Water piping shall pitch upward in the direction of flow, except the water piping located above finished ceilings which may be run level.

1. Proper provision shall be made for expansion and contraction in all portions of pipe work to prevent undue strain on piping, fixtures or apparatus connected therewith.

E. Vent all high points and drain all low points in water systems as required to achieve perfect water circulation.

F. Take runouts off top of mains at 45° or 90° angle with at least one swing joint between riser or stub and main.

G. For change in horizontal piping size use eccentric reducer coupling with bottom of coupling horizontal.

3.3 HEATING RELATED PIPE JOINTS AND FITTINGS

A. Fittings for use on steel pipe shall be screwed iron or welded fittings of type and weight as scheduled. For hot water services noted in the Schedule, mechanical fittings as manufactured
by Victaulic, or equal, may be used. Gaskets used in the mechanical couplings must be compatible and rated for intended service with respect to pressure and water system inhibitors.

B. Flanges on steel pipe shall be screwed cast iron or welded type of weight to match the piping on which installed. For hot water services noted in the Schedule, mechanical fittings as manufactured by Victaulic, or equal may be used.

1. Flange gaskets shall be ring type 1/16” thick of compressed fiber and sealant suitable for service intended, factory cut for actual flange size and service pressure.

C. Dissimilar pipe materials (copper to steel, etc.) shall be joined with an approved dielectric fitting or brass coupling.

D. Flexible metal hose connectors shall be as manufactured by NAI, Southeastern Hose, Inc., Keflex, Proco Products, Inc., Victaulic or equal.

3.4 WELDING AND SOLDERING PIPE

A. Welded joints, outlets and flanges shall be used as shown on drawings, specified or directed. Welded joints may also be provided elsewhere at this Contractor's option except on piping smaller than 2½”, or at points where it may be explicitly specified or directed to leave flanged joints in order to facilitate future changes.

B. All welded joints (except pipe welded end to end) shall be made by use of forged one-piece welding flanges caps, nozzles, elbows, branch outlets and tees, equal to WELDBEND.

1. All such fittings shall be of a type which maintains full wall thickness at all points, ample radius and fillets, and proper bevels or shoulders at ends.
2. Wel-o-lets or Thread-o-lets may be used where standard fittings or required sizes are not available and elsewhere approved.

C. All job welding shall be done by the electric arc welding process.

1. All welding shall be done in accordance with the welding procedures of the National Certified Pipe Welding Bureau or other approved procedure, conforming to the requirements of the ASME Boiler and Pressure Vessel Code or the ASA Code for Pressure Piping.

D. All piping 2½" size and larger shall be butt welded with welded fittings. Stub welding shall not be permitted.

E. Fittings in copper tubing shall be wrought copper for sweat solder joints. Joints in copper water piping shall be made with solder, per schedule, and shall meet ASTM-B32-96AM. Flux shall be equal to Canfield’s SOLDER-MATE and COPPER-MATE. No borax or alcohol mixtures or resin or similar paste fluxes shall be used. Care should be taken to see that no surplus flux is on the inside of the pipe when the joint is completed.
3.5  FIRE SEALANT

A. Pipes passing through all masonry and fire rated gypsum board walls shall pass through clean cut holes fitted with steel pipe sleeves, the inside diameter of which shall be at least 1” greater than the outside of the pipe passing through it. Pipes passing through non-rated gypsum board walls do not require sleeves, but the void between wall opening and pipe must be sealed and taped. Where UL approved for the application, pipe insulation shall be continuous through sleeve/hole, and all space between pipe and sleeve/hole shall be caulked full with product. Installation details shall be in accordance with the sealant manufacturer’s published instructions in order to bear the UL Classification Marking.

B. Exposed pipes passing through walls, floors, partitions or ceilings shall be fitted with chromium plated heavy gauge wrought brass escutcheons, fit snugly and securely held in place.

C. Submit fire-stopping product and details for review and approval. Provide a shop drawing by the fire sealant manufacturer that clearly identifies all products and the applicable UL classification or listing for penetrations applicable to the project.

END OF SECTION 230620
MILFORD HIGH SCHOOL & MILFORD MIDDLE SCHOOL
HYDRONIC PIPING REPLACEMENT AND HVAC UPGRADES

SECTION 230700 - PIPE INSULATION

PART 1 - GENERAL

1.1 SCOPE

A. Provide all insulating materials required for piping and mechanical equipment. The execution of the work shall be by an experienced Insulation Contractor in strict accordance with the best practice of the trade and the intent of the specifications.

B. Insulation thermal properties and thickness shall comply with the INTERNATIONAL ENERGY CONSERVATION CODE 2009 - CHAPTER 5.

PART 2 - PRODUCT

2.1 MATERIAL

A. Insulation shall be as manufactured by Owens-Corning Fiberglass Corp., Knauf, Johns-Manville Co., or approved equal.

B. Insulating materials, jackets, adhesives, accessories and applications shall develop a system having a UL rating with a flame spread of not over 25, a fuel contributed rating of not over 50 and a smoke developed rating of not over 50.

C. Hot Water Supply & Return piping: Cover with molded, heavy density fiberglass pipe insulation with ASJ/SSL. Adhere and seal end joint strips and overlap seams with proper mastic to provide continuous vapor barrier jacket. All fittings shall be insulated with precut fiberglass formed fittings with pre-molded PVC jacket mechanically fastened, including unions, couplings, flanges and air separators where applicable.

<table>
<thead>
<tr>
<th>Service</th>
<th>Pipe Size</th>
<th>Insulation Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>HWS&amp;R</td>
<td>up to 1½”</td>
<td>1½”</td>
</tr>
<tr>
<td>HWS&amp;R</td>
<td>2” &amp; larger</td>
<td>2”</td>
</tr>
</tbody>
</table>

END OF SECTION 230700
PART 1 - GENERAL

1.1 COMMISSIONING OF SYSTEM(S)

A. The Mechanical Contractor shall be responsible for commissioning the installed heating system(s) and demonstrating proper operation and functions at conclusion of the contract.

1.2 PRESSURE TESTS

A. All piping shall be pressure tested before being covered or concealed. This contractor shall provide all equipment necessary for said test. All tests shall be recorded on a log sheet, noting piping section tested, initial and final pressures, duration of test and date of test.

B. All tests shall be made in the presence of and to the satisfaction of the Owner's representative. Provide a copy of all test log sheets to the Owner's representative upon completion of testing.

C. The piping systems may be tested in sections as the work progresses, but no joint or portion of the system shall be left untested.

D. All elements within the system that may be damaged by the testing operation shall be removed or otherwise protected during the operation.

E. All defects and leaks observed during the tests shall be corrected and made tight in an approved manner and the tests repeated until the system is proven tight.

F. Repair all damage done to existing or adjacent work or materials due to or on account of the tests.

G. All pressure piping shall be tested hydrostatically at a pressure of at least 1½ times the maximum operating pressure, but not less than 80 psi, for two (2) hour duration with no drop in pressure.

1.3 SYSTEM FLUSHING

A. For the hot water system, extreme caution shall be exercised by contractor to prevent dirt and other foreign matter from entering pipes or components of system during construction. Pipe stored on project shall have open ends capped and equipment shall have all openings fully protected. Before erection, each piece of pipe, fitting or valve shall be visually examined and all dirt removed.

B. With the system filled with clean water, circulation established and trapped air vented, the boiler plant shall be energized. Any leaks in piping shall be repaired before proceeding with further test procedures. Low point drains in the system shall be opened for initial flush and blowdown, with town water fill valves set to make up water at an equal rate. Check pressure gauge at pump suction and manually adjust make-up water to maintain steady positive pressure before and after opening drain valves. Flushing shall continue until clean water is evident
leaving open drains. In no case shall the flushing period be less than two hours. Upon completion of flushing, all strainers shall be removed, cleaned and reinstalled.

C. Glycol dilution shall be discussed with the Owner’s representative and the system charged accordingly.

END OF SECTION 230800
PART 1 - GENERAL

1.1 AUTOMATIC TEMPERATURE CONTROL

A. This contractor shall secure a control sub-contractor to address the new pumps and reactivate proper operation of the four (4) existing pneumatic 3-way mixing valves, including installation of a new HWS temperature sensor in the new HWS main to control valves modulation based on an outside air reset schedule.

B. The new pumps shall be variable speed type with compatible VFD’s. Pump speed shall be varied based on differential pressure sensing out in the system. Two (2) sensing stations are called for on the drawings.

C. Variable Frequency Drives as manufactured by ABB or equal shall be furnished and installed for the new pumps. VFD’s shall be UL Listed and have integral disconnect and bypass features.

D. Submit information on the proposed control work and equipment, including proposed VFD’s, along with wiring diagrams for review and approval.

END OF SECTION 230900
SECTION 232000 - HEATING PIPING, PUMPS AND SPECIALTIES

PART 1 - GENERAL

1.1 DESCRIPTION
   A. HEATING piping shall be as scheduled in SECTION 230620.
   B. Pumps shall be as scheduled on the drawings.

1.2 SCOPE
   A. Furnish all hot water equipment and specialties of configuration, model and manufacturer indicated on the drawings or as specified hereinafter.

PART 2 - PRODUCT

2.1 SPECIALTIES
   A. Manual Air Venting Devices:
      1. For hot water terminals (unless otherwise shown on drawings), provide manual air vents. Air vents shall be quarter turn open ¼” ball cocks with extended drain line, located to permit easy use.
   B. Pressure relief valves shall be ASME rated for pressure and duty intended.

END OF SECTION 232000
SECTION 232500 - GLYCOL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish and install a 20% mixture (by volume) of propylene glycol in the hydronic piping system. Submit proposed glycol manufacturer and details for review and approval.

END OF SECTION 232500
SECTION 235123 - GAS VENTING

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install a complete venting system as specified on drawings for all natural gas fired equipment.

B. Venting material shall be Schedule 80 CPVC or AL29C stainless steel in accordance with the appliance manufacturer’s instructions.

C. Combustion air material for the gas fired water heaters shall be schedule 40 PVC, or as instructed in the manufacturer’s installation literature.

D. All venting systems shall be adequately braced with angle frames and supported per the manufacturer’s recommendations.

E. Submit complete shop drawings detailing all components, materials, sizes, lengths and other pertinent information for review and approval.

END OF SECTION 235123
# Drawing List

<table>
<thead>
<tr>
<th>Drawing No.</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>MD1.1</td>
<td>Boiler Room Part Plan - Mechanical Demolition - High School</td>
</tr>
<tr>
<td>MD1.2</td>
<td>First Floor Part Plan - Mechanical Demolition - High School</td>
</tr>
<tr>
<td>MD1.3</td>
<td>First Floor Part Plan - Mechanical Demolition - High School</td>
</tr>
<tr>
<td>MD1.4</td>
<td>First Floor Part Plan - Mechanical Demolition - High School</td>
</tr>
<tr>
<td>MD1.5</td>
<td>First Floor Part Plan - Mechanical Demolition - High School</td>
</tr>
<tr>
<td>M1.1</td>
<td>Boiler Room Part Plan - Mechanical - High School</td>
</tr>
<tr>
<td>M1.2</td>
<td>First Floor Part Plan - Mechanical - High School</td>
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<td>First Floor Part Plan - Mechanical - High School</td>
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<tr>
<td>M1.5</td>
<td>First Floor Part Plan - Mechanical - High School</td>
</tr>
<tr>
<td>M1.6</td>
<td>Mechanical Schedules and Details - High School</td>
</tr>
<tr>
<td>P1.1</td>
<td>First Floor Part Plan - Plumbing - High School</td>
</tr>
<tr>
<td>M2.1</td>
<td>First Floor Part Plan - Mechanical - Middle School</td>
</tr>
<tr>
<td>M2.2</td>
<td>Roof Plan - Mechanical - Middle School</td>
</tr>
<tr>
<td>P2.1</td>
<td>First Floor Part Plan - Plumbing - Middle School</td>
</tr>
</tbody>
</table>

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**High School - Key Plan**

**Middle School - Key Plan**
MECHANICAL SCHEDULES AND DETAILS - HIGH SCHOOL
DOMESTIC HOT WATER PIPING DIAGRAM

MILFORD HIGH SCHOOL - ALT 1
BOILER PART PLAN - DEMOLITION - PLUMBING

MILFORD HIGH SCHOOL - BASE BID
BOILER ROOM PLAN - DEMOLITION - PLUMBING

MILFORD HIGH SCHOOL - ALT 1
BOILER PART PLAN - NEW WORK - PLUMBING

MILFORD HIGH SCHOOL - BASE BID
BOILER ROOM PLAN - NEW WORK - PLUMBING

TYPICAL PIPE R等于

REFERENCE

1. General
2. System Description
3. System Components
4. System Installation
5. System Operation
6. System Maintenance
7. System Troubleshooting
8. System Replacement
9. System Retrofit
10. System Compliance

KEY PLAN

- Legend
- Dimensions
- Materials
- Connections
- Valves
- Pumps
- Controls

MILFORD HIGH SCHOOL & MIDDLE SCHOOL BOILER REPLACEMENT AND HVAC UPGRADES

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ROOF PLAN
MECHANICAL NEW WORK – MIDDLE SCHOOL