

MILFORD SCHOOL DISTRICT

SAU 40
100 West Street
Milford, NH 03055
603-673-2202
Fax 603-673-2237

Michael Tenters

Director of Curriculum & Instruction

Robert Marquis

Superintendent of Schools

Jennifer Burk

Business Administrator

March 21, 2017

Dear Potential Proposer:

Enclosed is a Request for Proposals/Invitation to Bid on the Milford High School Piping Project for 2017/18. When submitted, proposals must include completed Cost Statement, Good Faith Statement, the Experience/Performance Statement, and evidence of insurability capability.

Please email William Cooper, Director of Buildings & Grounds at wcooper@milfordk12.org if you require further information about the needs of the District or our general requirements.

Sincerely,

Jennifer Burk
Business Administrator
Milford School District

**MILFORD HIGH SCHOOL
HYDRONIC SYSTEM PIPING REPLACEMENT AND UPGRADES**

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INVITATION FOR BIDS

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

- The contract includes the removal of existing insulated 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.
- The Owner realizes that the 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.
- Asbestos was abated in the summer of 2016. Should there be any encountered, please notify the owner’s representative so the material may be removed safely and with minimal obstruction to the work in progress.
- Drawings MD-1.1 thru MD-1.6, M-1.1 thru M-1.6 and M5.1, along with this associated Specification (herein referred to as Contract or Construction Documents) as prepared by Yeaton Associates, Inc. Dated March 18, 2016 explains the intent and details associated with the proposed contract entitled Milford High School - Hydronic System Piping Replacement and Upgrades. Milford High School is Located at 100 West Street, Milford, New Hampshire.

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Criteria and Information:

Contractors may tour and examine the work areas within the subject facility on **April 3, 2017 at 9:00 AM** as part of a contractor walk-thru led by the Director of Buildings and Grounds. If subsequent visits are required, The Director of Buildings and Grounds may be contacted at 603-673-2202 extension 3175.

Bids shall be submitted to:

Attention: Mr. William Cooper, Director of Buildings and Grounds
SAU - 40 Milford School District
100 West Street, Milford, New Hampshire 03055

NOTE: Clearly identify on envelope - "Bid for Milford High School Hydronic System Piping Replacement and Upgrades". Note that hard copy, hand delivered or mailed as well as emailed bids are acceptable. Email bids must be PDF format, addressed to wcooper@milfordk12.org, and must be complete in all respects. **Bids are due April 17, 2017 at 11:00 AM.**

Bids will be opened 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 before April 21, 2017.** This is subject to review and approval of the Milford School Board. The School Board reserves the right to waive irregularities in the bidding, to reject any and all bids at will and without explanation, and to make the Contract award in the best interest of the Milford School District.

Work on this contract may be done during normal working hours starting on or around June 26, 2017. The exact date will be coordinated with successful contractor post bid. Submission of shop drawings for review and approval, ordering of equipment and mobilization may proceed immediately after the award of the contract. The contract must be completed no later than October 27, 2017. All work in the hallways will be completed by August 25, 2017.

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 rest with this contractor.

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.

The Contractor must maintain insurances in keeping with the Milford School Districts 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.

Milford High School is designated a non-smoking construction site.

The Owner reserves the right of first refusal on all disconnected equipment and specialities associated with this project.

All Electrical work associated with this project shall be provided by a licensed electrician on a design/build basis

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working as a subcontractor to the prime contractor. All electrical work shall be installed in accordance with prevailing codes, rules and regulations. This contractor shall be responsible for the demolition of existing electrical wiring back to the “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 any other necessary electrical components.

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

Site considerations such as dumpsters, delivery sites/times, staging areas and other general conditions details shall be coordinated with the owner’s representative. All ceiling tile and grid removal and re-installation will be the responsibility of the contractor.

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

The mechanical contractor shall be considered the prime contractor and carry all required subcontractors, including electrical and other project costs in their bid.

End of Invitations for Bids

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BID FORM

Company Name(Bidder) _____

Address _____

Date _____

Proposal of _____ (herein called the "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 The Milford School District SAU 40 (hereinafter called the Owner):

The Bidder, in compliance with the INVITATIONS FOR BIDS, having examined the plans and specifications for the "Milford High School - Hydronic System Piping Replacement and Upgrades" in Milford, New Hampshire, and the site of proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of the 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 stated price 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 Bid: \$ _____

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:

Addendum _____ Dated _____

Addendum _____ Dated _____

Authorized Signature _____

Title _____

Business Name _____

Business Address _____

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(Seal - if a corporation)

Name and Title of Authorizing Officer(s):

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GOOD FAITH STATEMENT

The undersigned represents that this proposal is made in good faith, without fraud, collusion or connection of any kind with any other proposer for the same work; that he has informed himself fully in regard to the Specifications for the Milford High School Hydronic System Piping Replacement and Upgrade project for the Milford School District of Milford, New Hampshire, and has made his own examinations and estimates and from them makes this proposal.

The undersigned understand that the Milford School District reserves the right to waive any formalities in, to reject any and all proposals or any part thereof, and/or accept any proposal or part thereof, or to select a proposer whose proposal is not the lowest, which it considers to be for the best interest of the Milford School District.

With the above understanding, the undersigned proposes to provide Hydronic System Piping Replacement and Upgrade services for the Milford School District and to comply in all respects with said specifications for the sum or sums stated.

COMPANY: _____

ADDRESS: _____

NAME (typed or printed): _____

SIGNATURE: _____

TITLE: _____

DATE: _____

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SPECIAL CONDITIONS

1. FIRE PROTECTION AND DISPOSAL:

- 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 the construction of work.
- 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 the building.
- 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 site.

2. REQUIRED INSURANCE:

- Contractor shall produce and maintain during the term of this contract, and any extension thereof, insurance as hereafter stipulated. Insurance shall be written by companies acceptable to the 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

3. OCCUPATIONAL SAFETY AND HEALTH RULES AND REGULATIONS:

- The contractor and all subcontractors 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 the Occupational Safety and Health Standards, as well as hiring and employment regulations and requirements.

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HOLD HARMLESS AGREEMENT

The Contractor, _____, agrees to defend, indemnify and hold harmless the Milford School District SAU 40, its officers, directors, agents and employees from and against any and all claims, lawsuits, judgements, 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 terms or conditions of this agreement, and further agrees to protect the 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 the 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

Contractor of record (signature)

Agent for Milford School District

Date Signed

Date Signed

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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, & 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

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SECTION 230000 – HEATING SYSTEM DEMOLITION AND NEW WORK

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.
 - 6. Labeling and tagging.
 - 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
- B. 2009 NFPA 101, Life Safety Code
- 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

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J. Milford Fire Department rules and regulations

1.4 SUBMITTALS

A. Provide submittals for review and approval.

END OF SECTION 230000

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SECTION 230100 - OPERATION AND MAINTENANCE OF HEATING SYSTEMS

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

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SECTION 230523 - GENERAL-DUTY VALVES FOR HEATING 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.
- 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

SECTION 230529 - HANGERS AND SUPPORTS FOR HEATING PIPING AND EQUIPMENT

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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:

<u>Pipe Material</u>	<u>Max. Horizontal Spacing</u>	<u>Max. Vertical Spacing</u>
Copper tubing 1¼" & smaller	6'	10'
Copper tubing 1½" & larger	10'	10'
Steel pipe	12'	15'

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.

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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 $\geq 3''$ 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:

<u>Pipe Size</u>	<u>Length</u>	<u>Thickness</u>
1/4" to 3 1/2"	12"	18 ga.
4"	12"	16 ga.

END OF SECTION 230529

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SECTION 230553 - IDENTIFICATION FOR HEATING PIPING AND EQUIPMENT

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.

END OF SECTION 230553

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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

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SECTION 230620 - SCHEDULES FOR HEATING PIPING AND PUMPS

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

<u>Service</u>	<u>Location</u>	<u>Size</u>	<u>Material</u>	<u>Type</u>	<u>Weight</u>
HWS&R	All	All	Steel or Hard Copper	Screwed Tube	Sch. 40 Type L

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

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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.

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- 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

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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

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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.

<u>Service</u>	<u>Pipe Size</u>	<u>Insulation Thickness</u>
HWS&R	up to 1½"	1½"
HWS&R	2" & larger	2"

END OF SECTION 230700

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SECTION 230800 - COMMISSIONING OF HEATING

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

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reinstalled.

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

END OF SECTION 230800

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SECTION 230900 - INSTRUMENTATION AND CONTROL FOR HEATING

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

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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 1/4" 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

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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