

**Attachment A**  
**Boiler Replacement**  
**Snyder County, Selinsgrove Driver's License Center # 035DL01**  
**Project # 11412034**

**I. Base Bidding Requirements**

Contractors are to provide bid for entire project.

**II. Work Included**

The following items are site specific requirements of the project:

- Contractor to repair, replace and install the necessary materials to complete the work identified below per each item identified in the Bid requirements.
- Contractor to supply a new gas line tap at road way and gas line installation to building. The Contractor will coordinate and pay all fees for gas line installation with Utility Company. The Contractor will have account ownership transferred to Department of Transportation upon completion of project. All restoration work from gas line installation will be completed by contractor.
  - Remove and replace an existing oil-fired boiler unit for the Driver License Facility.
  - The new unit shall be sized accordingly to adequately heat the entire building. Design Calculations are required.
  - The new gas-fired boiler will have an efficiency rating greater than 86 percent. The boiler will have a copper, stainless steel, or cast iron heat exchanger.
  - Preferred boilers HB Smith, Weil-McLain or American-Standard with a Webster Burner or Department approved equal.
  - Replacement of burner and pumps
  - Remove ACM insulation and replace upon completion of installation.
  - Install new diaphragm-type expansion tank, air separator and 2 circulation pumps.
  - Install new panic shutoff.

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- Install strobe light in photo center area as an indicator of system malfunction.
- Provide electronic programmable thermostats.
- Install a blow-down pipe routed to the floor drain with a valve.
- Replace hot water heater.
- Provide temporary heat if needed during the project. Must maintain 68 F 24 hours a day.

End of section

- Submittals and final Deliverable items
  - The Department will provide the awarded contractor a complete breakdown of the required submittals based off of the "System" identified, I.E. " Roofing System"
  - Contractor to provide three (3) copies of the entire project documentation in three (3) ring Binders.
  - Binders to include the following items:
    - Bid Documents & Specifications
    - All project meeting minutes (pre-bid, pre-Job, Interim, and Final inspection)
    - Email Correspondence
    - Submittals
    - L&I Building Permits, Inspection Logs, Occupancy Permit, Other correspondence
    - Certifications
    - Waste receipts
    - Photos Before, during and after boiler replacement
      - A sufficient amount of Photos is required for all phases of construction on all buildings, base on award.
    - Operation and Maintenance manuals

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- Contractors Warranty
- Manufactures Warranty

I. SUBMITTAL PROCEDURE

- A. Submit two (2) copies of all items shown on submittal schedule except for "samples" original copies required.
- B. Identify project number, project name and location, and contractor's name and address on all submittals.
- C. Provide space for review stamps of Contractor and Department. Put contractor stamp of approval on each item submitted.
- D. Revise and resubmit submittals as required, identify all changes made since previous submittal.
- E. No work shall be performed until all submittals are approved by the Department. Work performed prior to submittal approval is performed at the Contractor's risk and may be subject to repair, replacement or other corrective measures as deemed necessary by the Department with no additional contract time or money.
- F. Review of shop drawings will be general and for the limited purpose of checking for general conformance with the design; and shall not relieve the Contractor from the responsibility for proper fitting and construction of the work, nor from furnishing materials and work required by the Contract which may not be indicated on the shop drawings when reviewed.
- G. The submittals required by this contract are subject to reproduction for the Department's internal use only. By signature on this bid proposal, both the Contractor and the equipment manufacturer authorize the Department to reproduce any materials including printed literature and training aids, submitted in fulfillment of this contract.

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II. MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification sections, submit manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing, and maintenance, in quantities specified for product data.
- B. Identify conflicts between manufacturer's instructions and contract documents.

III. MANUFACTURER'S CERTIFICATES

- A. When specified in individual specification sections or on submittal schedule, submit manufacturer's certificates to for review.
- B. Indicate that material or product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits and certifications as appropriate.
- III. Certificates may be recent or previous test results on material or product, but in all cases must be acceptable to Department.

SUBMITTAL SCHEDULE

A. Abbreviations:

SoSu - Source of Supply	CoCh - Color Chart
DeDa - Descriptive Data or Catalog Cuts	Cert - Certificates
ShDr - Shop or Installation Drawings	Samp – Samples

- C. Schedule: See next page

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Description of items to be submitted	SoSu	DeDa	ShDr	CoCh	Samp	Cert
1. Cost Breakdown	X	X				
2. Work Schedule	X	X				
3. Equipment, controls, components	X	X	X			
4. Pennsylvania P.E. stamped drawings	X	X	X			X
5. OEM Manuals	X	X	X	X		X
6. Warranties						X
7. Waste receipts	X					
8. Digital Photos	X					
9. PA L&I Permit Documents	X	X				X
10. Final Deliverable Items 3 ring binder	X					

End of Section

Asbestos Abatement

Work Included

- A. The Contractor shall provide and perform all labor, demolition, materials, apparatus, trucking, tools superintendence and services required for completion of the work; abatement of asbestos pipe insulation and wrap.
- B. The work of this project is intended to provide for boiler replacement. The work shall include, but not limited to:
  - 1) Abatement of all asbestos pipe insulation and wrap material in the boiler room.
  - 2) Removal and disposal of material.

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- 3) Furnish and install new insulation on the remaining piping and on all piping as part of the new boiler installation. Piping insulation to have a minimum R-Factor of 3.5
- 4) Provide general clean-up, touch-up and remove debris and material from the job site.
- A. Comply with all Federal and State laws relating to Asbestos Containing Building Material abatement inclusive but not limited to US EPA, Occupational Safety Health Administration (OSHA), National Institute of Occupational Safety and Health (NIOSH) and National Emission Standards for Hazardous Air Pollutants (NESHAP).
- B. Before any abatement begins a background air sample is to be taken in the work area and in each adjacent room. At the end of the abatement portion of the project the contractor is to take a sample in those same areas as additional verification of no release.

End of Section

**NEW BOILER TECHNICAL SPECIFICATIONS**

Install new gas fired boiler(s) sized to comfortably heat the interior building spaces. The contractor shall provide and perform all labor, demolition, materials, apparatus, trucking, superintendence and services required for completion of the work.

I. Materials and Supplies

- A. Contractor is responsible to supply all parts and labor for a complete and fully operational system including all the installation and connection of all wiring as needed by the system.
- B. Cast iron boiler
- C. The new boiler will replace the existing oil fired boiler.
- D. New diaphragm-type expansion tank
- E. 20 gal hot water heater

II. Existing Boiler

- A. Peerless #EC-04-175WPCT, serial #EC-0186151097
- B. IBR capacity 75DOE Htg capacity gross output BTU/Hr
  1. 209000 water
  2. 20800 steam
  3. Net Sq ft steam 650
  4. IBR BTU/HR steam 15600

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5. IBR BTU/HR water 18200
6. Maw water temp 250f
7. Min relief valve 209Lb/Hr

C. Existing burner and pumps

1. Burner - Honeywell Becket R7184 – installed new Feb 2006
2. Fuel Pump - Webster Marathon FPD 48S17T2907 - installed new Feb 2010
3. Circulation Pump - Bell & Gossett #106109 - installed new Feb 2006

III. General Requirements

A. Reference Standards

1. Refer to the standards of the following organizations in the performance of the work of this section:

- |    |       |  |
|----|-------|--|
| a) | AGA   | American Gas Association                       |
| b) | ASME  | American Society of Mechanical Engineers       |
| c) | FM    | Factory Mutual                                 |
| d) | IRI   | Industrial Risk Insurers                       |
| e) | I=B=R | Institute of Boiler and Radiator Manufacturers |
| f) | NEC   | National Electrical Code                       |
| g) | NFGC  | National Fuel Gas Code                         |
| h) | UL    | Underwriters Laboratories, Inc.                |

2. Code Compliance - Boilers shall comply with all applicable ASME and Pennsylvania standards and regulations. The equipment shall bear all labels required to indicate such compliance.

3. Miscellaneous Components

- a) All items necessary for the safe and proper operation of the equipment of this section shall be considered a part of this contract (whether indicated or not) and shall be provided under this section of the specifications. The items shall be provided new unless otherwise specified or as noted.
- b) Product Data: Provide rated capacities, weights, specialties, accessories, gas train schematic and wiring diagrams.
- c) Design Data: Indicate equipment and pipe sizing.
- d) Submit manufacturer's installation instructions for the boiler and the burner.

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- e) Submit for both the boiler and the burner, manufacturers' descriptive literature, operating instructions and maintenance instructions with a list of spare parts with prices.

4. REGULATORY REQUIREMENTS

- a) Products Requiring Electrical Connections: Listed and classified by Underwriters' Laboratories, Inc., as suitable for the purpose specified and indicated.
- b) Comply with applicable regulations.
- c) Provide UL-labeled burners.

5. DELIVERY, STORAGE AND PROTECTION

- a) Material and Equipment: Transport, handle, store and protect products.
- b) Comply with manufacturer's installations instructions for rigging, unloading and transporting units.
- c) Protect units at site from physical damage.

IV. PRODUCTS

A. Cast Iron Boiler

1. Boiler Construction

- a) Provide a cast-iron, sectional low-pressure hot-water boiler with insulated jacket, capable of developing full gross output capacity at 100% firing rate. The boiler shall be capable of utilizing forced draft venting. The working water pressure shall be the same as that of the existing boiler. The boiler shall be capable of being over-fired or under-fired by 20% providing burner capacity, if adequate and adjustments are made for good combustion at the actual firing rate.
- b) The boiler shall be constructed as per ASME Boiler and Pressure Vessel Code, Section IV and be stamped with the required official ASME symbol. Individual sections hydrostatically pressure-tested at factory.
- c) The boiler shall be I=B=R-tested and approved
- d) The boiler shall be of a compact low silhouette design having a completely water-backed combustion area with water circulated around the entire firebox.



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- e) The boiler sections shall be provided with sufficient tappings to install required controls and with integrally cast legs to provide ample space for natural aeration between the bottom of the boiler and concrete pad. The sections shall be made gas-tight by high-temperature sealing rope in sealing grooves and water-tight by elastomer sealing rings.
- f) Observation ports shall be mounted at the front and back to permit visual inspection of the burner flame.
- g) The boiler shall be provided with cast-in air elimination to separate air from circulating water and with expansion tank tapping to divert separated air to expansion tank.
- h) The boiler shall provide balanced water flow through entire section assembly.
- i) The boiler shall be provided with a refractory-lined access panel into the combustion area for cleaning. The panel shall be provided with an observation port and designed to provide a gas-tight seal against the boiler section.
- j) The boiler shall have cleanout plates for all cleanout openings. Cleanout openings shall be located as required to completely clean the side flueways of the boiler. Extend the blow down pipes to the floor drain
- k) The boiler shall be provided with an insulated heavy-gauge steel jacket with a baked enamel finish. Jacket insulation shall be heavy density fiberglass on the top and all four sides of the boiler, and it shall be designed to permit installation after the connection of the supply and return piping. Flexible refractory blankets shall be attached to the back and to the floor of combustion chamber.
- l) The boiler shall be provided with a flue collar having a built-in adjustable damper which can be securely locked to assure positive pressure in the

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firebox, and with a flanged metal flue collector hood bolted to the top of section assembly.

- m) Boiler Trim - shall be furnished with the following:
  
  - n)
    - Pressure gauge with syphon and shut-off cock.
    - Gauge glass, valves, and petcocks.
    - ASME-certified steam safety valve.
    - Additional tappings required by the boiler manufacturer to install a new McDonnell and Miller 63M Low Water Cut-off and Low Water Cut-off 901M.
    - New 93 pump feeder control.
  
  - o) Acceptable Boiler Manufacturers:
    - Weil McLain Co., Inc., Series 78, Model BG-378,
    - Smith28A Series
    - or Approved equal.
2. Power Burner
  3. Minimum gas pressure required at the burner: 5" w. c.
  4. Acceptable Burner Manufacturers:
    - a) Power-Flame, Model WJR-15
    - b) Gordon-Platt\
    - c) Or Approved equal

**V. EXECUTION**

**A. BOILER INSTALLATION**

1. Boiler Assembly
  - a) The boiler and the burner shall be assembled in accordance with the manufacturer's instructions so as not to invalidate the factory warranty and to comply with all governmental and insurance codes previously specified. All work shall be done in a neat and workmanlike manner.

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- b) The manufacturer shall inspect the entire assembled boiler including the specified trim, etc., for proper installation and compliance with warranty requirements. Any and all modifications required at the direction of the manufacturer's representative shall be made at the Contractor's expense.
- c) Perform all tests specified herein and as recommended by the boiler manufacturer. All labor and equipment required to perform such tests, and all components or repairs required to successfully pass the tests shall be provided at the Contractor's expense.
- d) The boiler shall be connected to the existing piping and equipment. A separate hot water heater shall be installed by the contractor as part of this contract.
- e) Extend existing electrical service to the new boiler using existing methods using a lockable disconnect.
- f) Take into consideration existing piping, conduits, cables, light fixtures, any other equipment etc. before laying out contract work.
- g) Make final fuel and electrical connections to the boiler using flexible, corrosion-proof metal hose, conduit etc.
- h) Verify fuel pressure and voltage at site before bidding
- i) An external strobe light for the system is to be mounted in the hallway near the waiting room area. This light is to be connected so that it is activated when any of the alarms on the boiler are activated.

**B. Boiler testing**

**1. Hydrostatic Testing**

- a) Perform a hydrostatic test on the boiler as recommended by the manufacturer and as specified herein.
- b) Provide drainage and treated boiler water supply connections. Install a water pressure gauge and plug all boiler taps to receive safety valves, gauge glass, controls, etc, and all apparatus which may be damaged by test pressures.
- c) Fill the boiler with cold water and completely purge all entrapped air. Test boiler at 45psig for approximately 20 minutes unless otherwise directed by the Hartford Inspector.
- d) Thoroughly inspect the entire boiler for water leaks. Repair any and all leaks found and repeat the test until approved by the Hartford Insurance Inspector. DO NOT install safety valves, low water cut-off, controls, boiler jacket, etc., until the test is approved by the inspector.
- e) All repairs and replacements shall be at the contractor's expense.

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2. Gas – Tight – Testing
  - a) Perform a gas test of the boiler observing all sealing points and mark any that are not gas tight. Seal off leaks with boiler manufacturer's recommended silicon sealant. Repeat test until the assembly is proven gas-tight and approved by Department mechanical Inspector.
  
3. Cleaning
  - a) Clean and flush the boiler in accordance with the manufacturer's recommendations following the Hydrostatic test.
  - b) Clean site, remove waste and surplus materials, rubbish and construction facilities from site, sweep paved areas, rake clean landscaped surfaces before final inspection.
  - c) Clean site daily, remove waste, surplus materials and rubbish from site.
  
4. Certificate
  - a) The Contractor shall obtain the boiler operating certificate and mount it within a frame on the boiler room wall where indicated by the Department at no increase in the contract price.
  - b) **Provide the minimum of seven-calendar days notice to the Hartford Insurance Inspector prior to the performance of the hydrostatic test. The hydrostatic test shall be performed in the presence of the Insurance Inspector and Department personnel. All repairs required from the test shall meet the approval of the Inspector. The hydrostatic test shall be repeated to the satisfaction of the Hartford insurance Inspector, and all inspection fees paid for by the Contractor, at no increase in cost to the Department.**
  - c) Contractor shall furnish a Certificate of Operation from PA Department of Labor and Industry, Boiler division, at no additional cost to the Department.
  - d) **Contractor shall provide temporary heat as needed to maintain 68 F 24 hours a day if needed during boiler replacement and warranty period.**

**WARRANTY**

1. Contractor project warranty is for 1 year which begins 30 days after final inspection. System warranty includes but is not limited to all parts, labor and shipping for:
  - a) Routine maintenance and inspection twice during warranty period.

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b) Complete heating system inspection twice during the warranty period. This is for the entire system in the building not just those installed with this project. The contractor is to provide a written report of the inspection to the site contact.

c) 24 hour emergency response for loss of heating below 68 F for more than 2 hours, including after normal business hours, weekends and holidays.

2. Boiler

- a) 10 year on the cast iron sections – manufacturer
- b) 5 year on the burners - manufacturer

MECHANICAL

PIPE IDENTIFICATION SYSTEMS

PART I - GENERAL

1.01 QUALITY ASSURANCE STANDARDS

A. Reference

- 1. ANSI Standard A 13.1.
- 2. ANSI Z 53.1.

1.02 DESCRIPTION

A. Method of Identification: Positive identification of piping systems and their content shall be by lettered legend giving the name of the content in full or abbreviated form. Arrows must be used to indicate the direction of content flow. When necessary to give supplementary information such as hazard or use of the piping system contents, additional legends and/or colors, and/or color brands may be used. Legends may be placed on colored bands.

- 1. Colors: Colors listed below must be used to identify the pipe content characteristics. Colors must be displayed on the piping by any physical means, but its use shall be with a legend. Colors may be continuous or intermittent.

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2. Legends: Legends are the explicit identification of contents. Positive identification of the contents shall be by the lettered name of the contents in full or abbreviated form.
3. Content Classification - Colors and Legends:

<u>Classification</u>	<u>Field</u>	Color	Letters
<u>Materials Inherently Hazardous</u>			
Natural and Propane Gas	Yellow		Black
Fuel Oil & Waste Oil	Yellow		Black
Steam, Condensate & Boiler Feed			Yellow Black
Hot Water Supply	Yellow		Black
Hot Water Return	Yellow		Black
Compressed Air	Blue		White

Color of

<u>Classification</u>	<u>Field</u>	Color	Letters
<u>Materials of Inherently Low Hazard</u>			
Refrigerant (Freon)	Green		White
Potable Water	Green		White
Sanitary and Vent	Green		White

Fire Quenching Materials

Water, Foam, CO2, etc.	Red	White
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These colors shall be readily distinguishable one from another under normal conditions of illumination.

4. Sizes - Pipes, Color Fields and Letters:

Outside Diameter of Pipe or Covering		Length of Color Field		Size of Letters	
inches	mm	in	mm	in	mm
3/4 to 1-1/4	19 to 32	8	200	3/8	13
1-1/2 to 2	38 to 51	8	200	3/4	19
2-1/2 to 6	64 to 150	12	300	1-1/4	32
8 to 10	200 to 250	24	600	2-1/2	64
Over 10	Over 25	32	800	3-1/2	89

5. The use of standard sizes ranging in height from 3/8 inch to 3- 3/8 inches is recommended. For identification of pipe less than 3/4 inch in diameter, the use of a tag is recommended. The lettering and background should be the colors and sizes listed above.

6. If the entire pipe is painted, the color and letters stenciled on the piping for identification of the contents must conform to the colors and sizes listed above.

B. Locations and Visibility

1. Colors and legends shall be applied adjacent to valves, changes in direction, branches and walls or floor penetrations and at intervals along straight pipe runs, sufficient for identification. Identification may be accomplished by stenciling, the use of tape or markers. The number and location of colors and legends shall be sufficient to identify and trace out the piping system.

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2. Color band shall designate which of the classifications listed above are contained. Bands on straight pipe runs shall be sufficient to identify and trace; close to all valves, change-in-directions and wall and floor penetrations. Decals or plastic bands may be used. The entire piping system may be painted with the various classification colors.
3. On pipes located above the normal line of vision, the lettering shall be placed below the horizontal centerline of the pipe and should be easily readable from the floor level.

END OF SECTION

MECHANICAL

SUPPORTS, ANCHORS AND SEALS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Pipe, duct, equipment hangers, supports and associated anchors.
- B. Equipment bases and supports.
- C. Sleeves and seals.
- D. Flashing and sealing equipment and pipe stacks.

1.02 QUALITY ASSURANCE

- A. Design Criteria
  1. Pipe Support Systems: Provide adequate pipe support systems designed in accordance with recognized engineering practices using, where possible, standard, commercially accepted pipe hangers and accessories.
    - a. Pipe hangers and supports shall conform to the latest requirements of American National Standards Institute Standard ANSI B31.1. Code for Pressure Piping, Manufacturers' Standardization Society Standard Practice MSS SP-58 Pipe Hangers and Supports - Materials, Design and Manufacturer and MSS SP-69 Pipe Hangers and Supports - Selection and Application.



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2. Equipment Support Systems: Provide adequate equipment suspension systems and base supports designed in accordance with recognized engineering practices using, where possible, standard commercially accepted products and systems.
  - a. Design and size equipment suspension systems and base supports units based on installation instruction or information as obtained from equipment manufacturers.
  
- B. Anchor and Fastener Design Requirements
  1. Sizing: Provide anchors and fasteners for product installation of such diameters and lengths as recommended by the particular product manufacturer involved.
    - a. When sizing recommendations are not obtainable, size fasteners in the largest diameter that will pass through bolt holes as provided in the products for anchoring and fastening purposes.
  2. Safety Factor: Determine the lengths of anchors and fasteners based on substrate materials at points of anchor installation and to provide a safety factor of four to one.
  
- C. Materials Compatibility: Where pipe supports contact bare piping or in-line devices, provide supports of compatible materials so that neither will have a deteriorating action on the other.

1.04 REFERENCES

- A. American National Standards Institute (ANSI)
  1. ANSI B31.1, Code for Pressure Piping.
  2. ANSI B31.1, Code for Power Piping.
  3. ANSI B31.9, Code for Building Service Piping.
  
- B. American Society for Testing and Materials (ASTM)
  1. ASTM A 36: Specification for Structural Steel.

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2. ASTM A 47: Specification for Ferritic Malleable Iron Castings.
  3. ASTM A 48: Specification for Gray Iron Castings.
  4. ASTM A 53: Specification for Pipe, Steel, Black and Hot-Dipped Zinc-Coated, Welded and Seamless.
  5. ASTM A 153: Specification for Zinc Coating (Hot-Dipped) on Iron and Steel Hardware.
  6. ASTM A 167: Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
  7. ASTM A 181: Specification for Forgings, Carbon Steel, for General-Purpose Piping.
  8. ASTM A 307: Specification for Carbon Steel Externally Threaded Standard Fasteners.
  9. ASTM A 320: Specification for Alloy Steel Bolting Materials for Low-Temperature Service.
  10. ASTM A 563: Specification for Carbon and Alloy Steel Nuts.
  11. ASTM A 576: Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.
  12. ASTM B 695: Specification for Coatings of Cadmium Mechanically Deposited on Iron and Steel.
  13. ASTM B 696: Specification for Coatings of Cadmium Mechanically Deposited on Iron and Steel.
- C. American Welding Society (AWS): AWS D1.1 Structural Welding Code.
- D. Federal Specifications (Fed. Spec.)
1. Federal Specification FF-B-561, Bolts (Screw) Lag.
  2. Federal Specification FF-S-107C(2), Screws, Tapping and Drive.

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3. Federal Specification FF-S-325, Shield, Expansion; Nail, Expansion and Nail Drive Screw (Devices, Anchoring, Masonry) Group II (Shield Expansion Bolt Anchor) Type 4 (Wedge Expansion Anchors) Class 1 (One-Piece Steel Expander with Cone Taper Integral with Stud).
  4. Federal Specification HH-I-521E, Type I, Type II, and Type III Insulation Blankets, Thermal (Mineral Fiber, for Ambient Temperatures).
- E. Manufacturer's Standardization Society (MSS) of the Valve and Fittings Industry
1. MSS SP-58, Pipe Hangers and Supports - Materials, Design and Manufacturer.
  2. MSS SP-69, Pipe Hangers and Supports - Selection and Application.

**PART 1 – PRODUCTS**

**2.01 MATERIALS**

- A. Beam Clamps: For upper attachments on structural steel provide beam clamps of carbon steel ASTM A 36 or forged steel ASTM A 181.
1. Holes drilled in structural steel cup-point set screw and lock nut for anchoring in place.
  2. Provide clamps with hardened steel cup-point set screw and lock nut for anchoring in place.
  3. Base clamp size selection on required load being supported.
- B. Hanger Rods: Carbon steel conforming to ASTM A 576.
1. Diameter of rods for piping system support shall conform to ANSI B31.1.
    - a. Refer to Paragraph 3.01., B. Spacing of Hangers and Supports.
    - b. Threaded both ends, threaded one end and continuous threaded.

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- C. Auxiliary Steel: Provide auxiliary steel where support of piping systems and equipment is required between building structural elements. Provide light gauge and structural steel shapes conform to requirements of ASTM A 36.
1. Contractor shall have the option to use pre-engineered support systems of electro-galvanized steel products such as Kindorf, UniStrut or B-Line. MIXTURE OF SUPPORT SYSTEM MANUFACTURER'S PRODUCTS NOT PERMITTED.
    1. Where auxiliary steel is indicated as stainless steel, provide AISI Type 304 stainless steel conforming to ASTM A 167 in No. 1 Finish.

2.02 PIPE SUPPORTS

- A. Wall Supports
1. For pipe sizes 3" and below: Cast iron hook.
  2. For pipe sizes 4" and above: Welded steel bracket and wrought steel clamp.
  3. For hot pipe sizes 6 inches and above: Welded steel bracket and wrought steel clamp; adjustable steel yoke and cast iron roll.
  4. Vertical Support: Steel riser clamp.
- B. Base Supports: Where base supports are indicated for valves and pipe fittings provide saddles supported by pipe columns.
1. For pipe sizes to 4" and all cold pipe sizes: Cast iron adjustable pipe saddle, with lock-nut nipple and floor flange and concrete pier or steel support. Consisting of devices similar to ITT Grinnel Figure 258 Cast Iron Pipe Saddle Support; and pipe column designed to adequately support the applied loads with a steel base anchored to floor.
  2. For hot pipe sizes 6" and above: Adjustable cast iron roll and standard steel screws and concrete pier or steel support.
  3. For copper pipes: Carbon steel ring, adjustable, copper plated.
  4. Pipe Column: Pipe nipple of Schedule 80 galvanized steel pipe ASTM A 53.

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- C. Riser Clamps: Support vertical runs of piping at each floor, or closer where required, with carbon steel clamps ASTM A 36 bolted around pipes and attached to the building construction.
1. Provide copper plated clamps for copper tubing support.
  2. Provide two-bolt type clamps designed for installation under insulation on insulated pipe runs.
- D. Offset Pipe Clamp: Where pipes are indicated as offset from wall surfaces, provide double-leg design two-piece pipe clamp similar to Figure 366 by Fee & Mason. Clamp material as indicated on the drawings.
- E. Hangers: Fabricated of malleable iron ASTM A 47, or carbon steel ASTM A 36.
1. For pipe sizes 1/2" to 1-1/2": Malleable iron/carbon steel, adjustable swivel, split ring.
  2. For pipe sizes 2" to 4" and cold pipe sizes 6" and above: Carbon steel, adjustable, clevis.
  3. For hot pipe sizes 6" and above: Adjustable steel yoke, cast iron roll, double hanger.
  4. Multiple or Trapez Hangers: Steel channels with welded spacers and hanger rods. Cast iron roll and stand for hot pipe sizes 6" and above.
  5. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe. Copper-plated hangers or supports for copper piping.
  6. Hangers for pipe sizes 2-1/2 inches or larger shall incorporate a means of vertical adjustment after erection while supporting the load.
  7. Adjustable Band Hangers: Carbon steel band type hangers designed for suspension on hanger rods with provisions for vertical adjustments and locking-in position using supporting and locknuts. Provide band hangers to support non-insulated pipe.
  8. Clevis Hangers for Non-Insulated Pipe: Carbon steel yoke and U-strap type hanger designed for installation with cross bolt over the pipe.

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9. Clevis Hangers for Insulated Pipe: Carbon steel yoke and U-strap type hanger designed for installation under insulation with cross bolt outside the insulation.
  10. UL and NFPA Approved Hangers: Clevis type, adjustable swivel type, or adjustable flat-iron type. Where adjustable flat iron hangers cannot be used, hangers may be universal channel-type or C-type with retaining strap.
- F. Brackets: Where piping is run adjacent to walls or steel columns, provided welded steel brackets ASTM A 36 and pre-punched with a minimum of two fastener holes.
- G. Racks: Multiple pipe racks or trapeze hangers fabricated from steel ASTM A 36, and designed to suit conditions at points of installation.
1. Keep pipes in their relative positions to each other by the use of clamps or clips. Lines subject to thermal expansion must be free to slide or roll.
- H. Shields
1. For insulated piping 2 inches and smaller: 18 gauge galvanized steel shield over insulation in 180° segments, minimum 12 inches long at pipe support.
  2. For insulated piping 2-1/2 inches and above (except cold water piping): Pipe covering protective saddles.
  3. For insulated cold water piping 2-1/2 inches and above: Hard block non-conducting saddles in 90° segments, 12 inches minimum length, block thickness the same as insulation thickness.
  4. For vertical copper pipe risers: Sheet lead.

2.03 ANCHORS AND FASTENERS

- A. Anchor Bolts (Pre-Set): Where anchor bolts are indicated or required as pre-set in cast-in-place concrete, provide anchor bolts of lug or bent shape design.

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1. Galvanized Bolts: ASTM A 307 for bolts, nuts and washers; and ASTM B 695 or A 153 for galvanizing.
  2. Stainless Steel Bolts: ASTM A 320, Grade B8, AISC Type 303 or 304.
- B. Drilled-In Expansion Anchors and Fasteners:
1. Applications in Masonry (and Precast Concrete Hollow-Core Structural Elements):
    - a. Anchors: Provide anchors designed to accept both machine bolts and/or threaded rods. Such anchors shall consist of an expansion shield and expander nut contained inside the shield. Expander nut fabricated and designed to climb the bolt or rod thread and simultaneously expand the shield as soon as the threaded item, while being tightened, reaches and bears against the shield bottom.
      - (1) Shield Body: Consisting of four legs, the inside of each tapered toward shield bottom (or nut end). The end of one leg is elongated and turned across shield bottom. Outer surface of shield body ribbed for grip-action.
      - (2) Expander Nut: Square design with sides tapered inward from bottom to top.
      - (3) Material: Die cast Zamac No. 3-zinc alloy of 43,000 psi minimum tensile strength. Shield and nut made in conformance with S.A.E. 90 3 ASTM XI.
    - b. Fasteners: Machine bolts conforming to S.A.E. Grade 2, for use with above anchors; nuts and washers conforming to ASTM A 563.
    - c. Acceptable Manufacturers:
      - (1) U.S.E. Diamond, Inc.; FORWAY System.
      - (2) or approved equal.

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2. Applications in Horizontal (Floor Mounted) for Adhesive Anchors: Composed of an anchor rod assembly and an anchor rod adhesive cartridge.
  - a. Anchor Rod Assembly: Chamfered and threaded stud rod of ASTM A 307 steel with nut and washer of ASTM A 563 steel.
  - b. Stainless Steel Anchor Rod Assembly: Chamfered and threaded stud rod of AISI Type 304 stainless with nut and washer of AISI Type 316 stainless.
  - c. Adhesive Cartridge: Sealed capsule containing premeasured amounts of resin, quartz sand aggregate and a hardener contained in a separate vial within the capsule. Capsule ingredients activated by the insertion procedure of the anchor rod assembly.
  - d. Acceptable Manufacturers:
    - (1) U.S.E. Diamond, Inc.; SUP-R-SET.
    - (2) Hilti Fastening Systems: HVA.
    - (3) Molly Fastener Group; PARABOND.
    - (4) or approved equal.
4. Note: Hammer drive-type and explosive charge drive-type anchors and fastener systems not acceptable. Lead shields, plastic-inserts, fiber-inserts and drilled-in plastic sleeve/nail drive systems also not acceptable.

2.04 SLEEVES AND SEALS

A. Pipe Sleeve Sizing:

1. Size sleeves large enough, minimum clearance 1/4 inch all around, to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.



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2. Uninsulated Pipes: Size sleeves two pipe sizes larger than pipe passing through, or size sleeves for a minimum of 2-inch clearance between inside of sleeve and outside diameter of pipe passing through.
  3. Wall Seal Sleeve: Size sleeves to accommodate the pipe plus the hydrostatic wall seal.
  4. Insulated Pipes: Size sleeves for a minimum of 2-inch clearance between inside of sleeve and outside diameter of insulation covering on pipes passing through.
  5. Sleeve Length
    - a. Wall and Partitions: Equal to total thickness of wall or partitions and terminated flush with finished surfaces.
    - b. Floors: Equal to total depth of floor construction including finish and extending a minimum of one inch above floor level. Caulk sleeves full depth and provide floor plate.
- B. Sleeve Materials
1. Pipe Sleeves in Masonry: No. 18-gauge galvanized sheet steel.
  2. Pipe Sleeves in Wallboard Partitions: No. 18-gauge galvanized sheet steel with anchoring flanges or tabs.
  3. Sleeves for Pipes through non-fired-rated beams, walls, footings and potentially wet floors: Steel pipe or 18 gauge galvanized steel.
  4. Sleeves for Pipes through fire-rated and fire-resistive floors and walls and fire proofing: Prefabricated fire-rated sleeves including seals, UL-listed.
  5. Sleeves for round ductwork: Form with galvanized steel.
  6. Sleeves for rectangular ductwork: Form with galvanized steel or wood.
- C. Seals and Plates
1. Wall Seal: Hydrostatic modular compression link seal designed to seal opening between pipes and a through structure opening. Provide Link-

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Seal by Thunderline Corp., Calpico, Inc., or approved equal. Caulking, mastic sealants, lead/oakum, continuous (solid) gaskets are not acceptable as equal.

2. Wall and Ceiling Plates: Cast metal with integral set screw or similar anchoring screw. Hinged or split design plates may be provided.
- D. Fire Seals: Provide approved fire seals where piping penetrates fire-rated and fire-resistive walls, floors, partitions and ceilings to ensure that the fire rating is maintained.

Stuffing/Fire-stopping insulation: Glass fiber type, non-combustible.

Caulk/Sealant: Acrylic.

1. For fire rating 2 hours or less, provide fire seal compound or mechanical seals.
2. For fire rating greater than 2 hours, provide mechanical seals.
3. For multiple pipe penetrations, provide approved through-wall barriers.
4. Acceptable Manufacturers:
  - a. Compound - Dow Corning, or equal.
  - b. Mechanical Seal - Thunderline Corporation, or equal.
  - c. Through-Wall Barrier - Crouse-Hinds, or equal.

**PART 3 – EXECUTION**

**3.01 PIPING SYSTEM SUPPORT INSTALLATION**

- A. General
1. Install as per manufacturer's instructions.
  2. Install pipe supports and anchors to hold piping straight and true to line both vertically and horizontally.

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3. Install hangers to provide minimum 2 inch wide space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with minimum 1-1/2 inches of vertical adjustment.
6. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.
7. Support riser piping independently of connected horizontal piping.
8. Where thermal movement in piping systems will occur, provide piping system supports capable of supporting the line in all operating conditions without disengagement of supported pipe.
9. The supporting force at each hanger shall prevent excessive stress in the pipe and connected equipment.
10. Install pipe supports anchored directly to or suspended directly from structural members. Provide auxiliary steel supports to carry pipe hangers.
11. Do not support piping from metal decks.
12. Provide copper-plated hangers and supports for copper piping and sheet lead packing between hanger or support and piping.

**B. Spacing of Hangers and Supports**

1. General
  - a. Space hangers and supports as stated herein and in ANSI B31.1, MSS SP 58 and SP 69, and as indicated on the drawings.
  - b. Give special consideration to spacing of hangers and supports where components such as fittings and valves impose concentrated loads.
3. Space hangers on horizontal runs of pipes as follows:

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	Pipe Size	Hanger Spacing	Hanger Rod Diameter	
	inch (mm)		foot (m)	on center
maximum	inch (mm) minimum			
-----				
<u>Steel</u>				
	1-1/4 and below		6-1/2	(2)
3/8	(9)			
	1-1/2 to 2		10	(3) 3/8
(9)				
	2-1/2 to 3		10	(3) 2
(13)				
	4 to 6		10	(3) 5/8
(15)				
	8 to 12	14	(4.25)	7/8 (22)
	14 and above		20	(6) 1
(25)				
-----				
<u>Copper Tubing</u>				
	3/8 to 3/4		5	(1.5)
	1		6	(1.8)
	1-1/4		7	(2.1)
	1-1/2 to 2		8	(2.5)
	2-1/2		9	(2.75)
	3		10	(3)
	3-1/2 to 4		12	(3.7)
-----				

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Plastic/PVC

All sizes            6            (1.8)                            3/8

C. Pipe Sleeve Installation

1. Set pipe sleeves in position in concrete formwork, walls, partitions, floors and ceilings as construction work progresses. Provide sleeve for each pipe individually.
2. Provide and set sleeves to avoid delaying construction activities of other trades. Perform any additional cutting and boring required due to improperly located or omitted openings without cost to the owner and perform such additional work under the observation of the Engineer.
3. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk seal airtight full length. Provide floor plates for sleeves through floors. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

D. Equipment Bases and Supports

1. Provide equipment/bases of concrete.
2. Provide housekeeping pads of concrete minimum 4 inches thick and extending 6 inches beyond supported equipment.
3. Provide templates, anchor bolts and accessories for mounting and anchoring equipment.
4. Construct supports of steel members/steel pipes and fittings. Brace and fasten with flanges bolted to structure.
5. Provide rigid anchors for pipes after vibration isolation components are installed.

E. Equipment Supports and Penetrations Seals for Materials and Equipment Exposed to Weather: Provide stainless steel fasteners for both exposed and concealed attachments in exterior locations.

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F. Seals and Plates Installation

1. Following pipe installation through sleeves in exterior walls below grade, install wall seal to render installation leak-free. Wall seal not required in interior walls, partitions, floor and ceilings.
2. Install wall seal as close to outside surface of wall as possible to provide a watertight seal below grade. Apply a coating of coal tar paint or other type approved coating on bolt heads and other metal parts on below grade wall seals prior to backfilling.
3. Install wall and ceiling plates to close pipe sleeve openings.

G. Fire Seals Installation

1. Following pipe installation through sleeves in fire-rated walls or partitions and floors install either compound or mechanical seal, as prior approved.
2. Install seal materials in accordance with manufacturer's installation instructions.
3. Install escutcheons on pipes passing through sleeves in finished locations.

H. Foundation Sleeve Installation

1. Provide foundation sleeves for those piping installations where piping is designed to pass through a foundation wall and does not form an integral part of the wall.
2. Provide the proper gland and gasket to make a watertight seal on piping passing through the foundation sleeve.

I. Finish

1. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts and suspended ceiling spaces are not considered exposed.

3.02 ANCHOR AND FASTENER INSTALLATIONS

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- A. Auxiliary Steel Fabrication: Insofar as possible, fit and shop assemble steel fabrications and make ready for field installation.
1. Drill or punch holes as required for attachment of work and for bolted connections. Burned holes are not acceptable.
  2. Perform welding of assemblies in accordance with AWS D1.1. Dress welds smooth and free of sharp edges and corners.
  3. Perform shop painting of auxiliary steel .
- B. Threaded Bolts: Draw threaded bolted connections up tight using lock washers to prevent bolt or nut loosening.
- C. Drilled-In Expansion Anchor and Fastener Installation
1. General: In general, install expansion anchors in strict accordance with manufacturer's instructions and in accordance with the following.
  2. Drilling Holes: Use rotary hammer-type drill and make drill holes to the required diameter and depth as consistent with anchor manufacturer's instructions for size of anchors being installed.
  3. Minimum Embedment: Embed expansion anchors to four and one-half bolt diameters, unless otherwise indicated on drawings.
- D. Drilled-In Adhesive Anchor Installation
1. General: In general, install adhesive anchors in strict accordance with manufacturer's instructions and in accordance with the following.
  2. Drilling Holes: Use rotary hammer-type drill and make drill holes to the required diameter and depth as consistent with anchor manufacturer's instructions for size of anchors being installed.
    - a. Prior to setting cartridge and anchor stud, clean drilled holes free of loose material by vacuum process, finishing with a blast of compressed air, and cover hole until actual use.
  3. Anchor Rod Installation: Following cartridge installation in prepared drill holes, set anchor rod to the required depth. Set anchor rods truly perpendicular (normal) to the base plate of item being anchored.

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4. Minimum Embedment Table:

Adhesive

Anchor

Diameter	3/8"	7/8"	5/8"	3/4"	7/8"	1"
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Embedment Depth	3-1/2"	4-1/4"	5"	6-5/8"	6-5/8"	8-1/4"
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END OF SECTION

PLUMBING PIPING

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. Pipe and pipe fittings.
- B. Valves.
- C. Domestic water piping system.

1.02 REFERENCES

- A. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings Class 150 NS 300.
- B. ANSI/ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.
- C. ANSI/ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
- D. ANSI/ASME Section 9 - Welding and Brazing Qualifications.
- E. ANSI/ASTM B32 - Solder Metal.
- F. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
- G. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless for Ordinary Uses.



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- H. ASTM B88 - Seamless Copper Water Tube.
- I. ASTM B306 - Copper Drainage Tube (DWV).
- J. ASTM D2235 - Solvent Cement for Acrylonitrile - Butadiene - Styrene (ABS) Plastic Pipe and Fittings.
- K. ASTM D2665 - Standard for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent Pipe and Fittings.
- L. ASTM D2683 - Socket-Type Polyethylene Fillings for Outside Diameter - Controlled Polyethylene Pipe.
- M. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- N. AWWA C500 - Standard for Gate Valves for Water and Sewerage Systems.
- O. AWWA C651 - Disinfecting Water Mains.

1.03 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.
- C. Welders Certification: In accordance with ANSI/ASME Section 9.

PART 2 - PRODUCTS

2.01 SANITARY SEWER AND VENT PIPING, ABOVE GRADE

- A. PVC Pipe: ASTM D2665. Fittings: PVC. Joints: ASTM D2855, solvent weld.

2.02 WATER PIPING, ABOVE GRADE

- A. Copper Tubing: ASTM B88, Type L hard drawn. Fittings: ANSI/ASME B16.23, cast brass, or ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA.
- B. Galvanized Steel Pipe: ASTM A53 or A120, Schedule 40. Fittings: Cast iron. Joints: Grooved mechanical couplings.

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2.03 FLANGES, UNIONS AND COUPLINGS

A. Pipe Size 2 Inches and Under:

1. Ferrous Pipe: 150 psig malleable iron threaded unions.
2. Copper Tube and Pipe: 150 psig bronze unions with soldered joints.

B. Pipe Size Over 2 Inches:

1. Ferrous Pipe: 150 psig forged steel slip-on flanges; 1/16 inch thick preformed neoprene gaskets.
2. Copper Tube and Pipe: 150 psig slip-on bronze flanges; 1/16 inch thick preformed neoprene gaskets.

C. Grooved and Shouldered Pipe End Couplings:

1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
2. Sealing Gasket: "C" shape composition sealing gasket.

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

2.04 ACCEPTABLE MANUFACTURERS - GATE VALVES

- A. Crane Company; Model 1334, 465 ☐.
- B. Nibco, Inc.; Model S-113, F-617-0.
- C. Stockham; Model B-104, G-623.
- D. Substitutions: Under provisions of Section 01300.

2.05 GATE VALVES

- A. Up to 2 Inches: Bronze body, non-rising stem and hand wheel, inside screw, single wedge or disc, solder ends.

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- B. Over 2 Inches: Iron body, bronze trim, rising stem and hand wheel, OS&Y, single wedge, flanged ends.

2.06 ACCEPTABLE MANUFACTURERS - GLOBE VALVES

- A. Crane Company; Model 1310, 351.
- B. Nibco Inc.; Model S-211, F-718-B.
- C. Stockham Valves and Fittings; Model G-623, B-17.

2.07 GLOBE VALVES

- A. Up to 2 Inches: Bronze body, rising stem and hand wheel, inside screw, renewable composition disc, solder ends, with back seating capacity.
- B. Over 2 Inches: Iron body, bronze trim, rising stem and hand wheel, OS&Y, plug-type disc, flanged ends.

2.08 ACCEPTABLE MANUFACTURERS - SWING CHECK VALVES

- A. Crane Company; Model 1342, 373.
- B. Nibco Inc.; Model S-433, F-918.
- C. Stockham Valves and Fittings; Model B-309, F-947.

2.09 SWING CHECK VALVES

- A. Up to 2 Inches: Bronze swing disc, solder ends.
- B. Over 2 Inches: Iron body, bronze trim, swing disc, renewable disc and seat, flanged ends.

PART 3 – EXECUTION

3.01 PREPARATION

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

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3.02 INSTALLATION

- A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- B. Route piping in orderly manner and maintain gradient.
- C. Install piping to conserve building space and not interfere with use of space. In no case shall horizontal piping runs be installed lower than 7 feet above the finished floor.
- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Provide clearance for installation of insulation and access to valves and fittings.
- G. Provide access where valves and fittings are not exposed.
- H. Slope water piping and arrange to drain at low points.
- I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- J. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting.
- K. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum. Maintain gradients.
- L. Install valves with stems upright or horizontal, not inverted.
- M. Extend vent pipes not less than 10 inches nor more than 18 inches above the roof line.
- N. Provide a trap at the connection of each plumbing fixture, drain, and piece of equipment requiring connection to soil or waste piping. Install traps as close as possible to the fixture, drain, or piece of equipment.

3.03 APPLICATION

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- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.
- C. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Install globe valves for throttling, bypass, or manual flow control services.

END OF SECTION

BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.01 QUALIFICATIONS

- A. Manufacturers: Only companies specializing in manufacturing the products with a minimum three years documented experience shall be provided.
- B. Contractor: Contractors must have a minimum of three years documented experience in the installation of the products specified.

1.03 SUBMITTALS

- A. Proposed Products List: Include shop drawings for all products specified.
- B. Submit shop drawings and product data grouped to include complete submittals of related systems, products and accessories in a single submittal.
- C. Mark dimensions and values in units to match those specified.

1.04 REGULATORY REQUIREMENTS

- A. Reference standards and regulatory requirements.
  - 1. Follow the codes, standards and regulatory requirements of the standards and trade organizations including but not limited to the following in the performance of the work of this section.
    - a. AABC American Air Balance Council.

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- b. ACI American Concrete Institute.
- c. ADC American Diffusion Council.
- d. AGA American Gas Association.
- e. AISC American Institute of Steel Construction.
- f. AMCA Air Movement & Control Association.
- g. ANSI American National Standards Institute.
- h. ARI Air Conditioning and Refrigeration Institute.
- i. ASHRAE American Society of Heating, Refrigeration and Heating Engineers
- j. ASME American Society of Mechanical Engineers.
- k. ASTM American Society of Testing Materials.
- l. AWPA American Wood Preservers' Association.
- m. AWS American Welding Society.
- n. BOCA Building Officials & Code Administrators International, Inc.
- o. CISPI Cast Iron Soil Pipe Institute.
- p. FM Factory Mutual.
- q. IRI Industrial Risk Insurers.
- r. I=B=R Institute of Boilers and Radiator Manufacturers.
- s. L&I PA Dept. of Labor & Industry Regulations.
- t. MSS Manufacturers Standardization Society.
- u. NEC National Electrical Code of NFPA.
- v. NEMA National Electrical Manufacturers' Association.

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- w. NFGC National Fuel Gas Code.
  - x. NFPA National Fire Protection Association.
  - y. NPC National Plumbing Code.
  - z. NSPC National Standard Plumbing Code.
  - aa. OSHA Occupational Safety and Health Administration.
  - bb. PADOT PA Dept. of Transportation.
  - cc. SMACNA Sheet Metal and Air Conditioning Contractors' National Assn.
  - dd. SSPC Steel Structure Painting Council.
  - ee. UL Underwriters Laboratories.
  - ff. Local Gas Utility Company.
  - gg. State and Local Codes.
- B. Conform to all applicable building codes including BOCA Mechanical Code.
- C. Fire Protection: Conform to National Fire Protection Association.
- D. Plumbing: Conform to the National Standard Plumbing Code and National Fuel Gas Code.
- E. Obtain permits and request inspections from authority having jurisdiction. Contractor is responsible for all permit and connection fees associated with his portion of construction.
- F All electrical wiring shall be done in accordance with National Electrical Code.
- G. Provide lockable disconnect for boiler electrical connection.
- H. All control wiring shall be done by Mechanical Contractor.
- I. All personnel of the Contractor(s) shall wear safety gear such as hard hats, safety glasses, safety boots, gloves, masks, safety harness, etc., when working in areas designated as Commonwealth premises.

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1.05 PROJECT CONDITIONS

- A. Examine project/site conditions prior to submission of bid.
- B. Make allowances for difficulties and contingencies to be encountered. Prior to ordering any equipment, check all site dimensions to insure there are adequate clearances for proper installation of the equipment and all accessories including space required for service.
- C. Install work in locations shown on drawings, unless prevented by project conditions.
- D. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections. Obtain permission of the Department before proceeding.

1.06 CONTRACT DRAWINGS

- A. Contract drawings are diagrammatic and indicate the relation of piping, ductwork, connections and equipment. The drawings do not indicate all offsets, elbows and fittings that may be required. Therefore, the Contractor shall carefully investigate the structural and finish conditions affecting the work and actual equipment provided. The Contractor shall furnish all offsets, elbows, fittings, hangers and accessories as may be required to meet these conditions at no additional cost to the Department.
- B. The first name listed in the acceptable manufacturer list is the basis of design. If other listed equipment is substituted, the Contractor shall be responsible for reconfiguring the piping and ductwork and bearing the expense of change required by other trades including electrical, structural and architectural. No additional cost to the Department shall be permitted due to a substitution by the Contractor.
- C. Do not scale the drawings. Contractor shall check conditions at the site for dimensions and sizes pertaining to the structures, piping and equipment.
- D. Do not deviate from the drawings without prior approval from the Department.



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1.07 SEQUENCING AND SCHEDULING

- A. Trades that have work connected with the mechanical work and trades that do preparatory work for mechanical shall be notified for installation requirements and scheduling.
- B. The Department shall be informed of the installation schedule to allow sufficient time for inspection without any work delay.
- C. All work shall be coordinated to avoid cutting of work in place and interfering with other work and ongoing building operations.

1.08 CLEANING

- A. After construction is completed, including painting, clean exposed surfaces of equipment. Vacuum clean the coils and inside of cabinets.
- B. Touch-up marred or scratched surfaces of factory-finished equipment, using finish materials furnished by equipment manufacturer.

1.09 EQUIPMENT HOUSEKEEPING PADS

- A. Unless otherwise noted, provide all concrete bases, reinforcing, etc., and masonry work required to install the respective contract work
- B. Furnish all materials, labor, equipment and tools necessary to complete concrete and cement work. .
- C. Welded wire fabrics shall conform to A.S.T.M.A. 185; reinforcing bars shall conform to A.S.T.M.A. 15 and A.S.T.M.A. 305. Bars shall be die formed billet steel with fiber stress value of 20,000 psi.
- D. Conform to the standard specifications of the American Concrete Institute for all concrete and cement work.

1.10 COORDINATION

- A. Coordinate scheduling, submittals and work of the various sections of specifications to assure efficient and orderly sequence of installation of interdependent construction elements with provisions for accommodating items installed later.

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- B. Coordinate space requirements and installation of mechanical work, which are indicated diagrammatically on drawings. Follow routing shown for piping as closely as practicable. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance and for repairs. Field verify all dimensions. Field verify clearance requirements for piping and equipment locations.

PLUMBING IDENTIFICATION

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Identification of plumbing products .

1.02 REFERENCES

- A. ANSI/ASME A13.1 - Scheme for the Identification of Piping Systems.

1.03 SUBMITTALS

- A. Submit list of wording, symbols, letter size and color coding for plumbing identification.
- B. Submit valve chart and schedule, including valve tag number, location, function and valve manufacturer's name and model number.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Seton Name Plate Company.
- B. Emed Company, Inc.
- C. Carlton Industries, Inc.

2.02 MATERIALS

- A. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.
- B. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light contrasting background color.

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- C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- D. Stencils: With clean cut symbols and letters of following size:
- E. Stencil Paint: Use, semi-gloss enamel.
- F. Plastic Pipe Markers: Factory-fabricated, flexible, semi-rigid plastic preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and fluid being conveyed.
- G. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.
- H. Underground Plastic Pipe Markers: Bright-colored, continuously-printed, plastic ribbon tape of not less than 6-inch wide by 4-mil thick manufactured for direct burial service.

Identification and Color

<u>Pipe System</u>	<u>Designation</u>	<u>Color</u>	<u>Band Color</u>	<u>Letter Color</u>
Domestic	CW	Green	Green & White	White
	Cold Water			
White	Domestic	HW	Green	Green & White
	Hot Water			
White	Tempered	THW	Green	Green & White
	Hot Water			

PART 3 - EXECUTION

3.01 PREPARATION

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

3.02 INSTALLATION

- A. Plastic Nameplates: Install with corrosive-resistant mechanical fasteners or adhesive.
- B. Metal Tags: Install with corrosive-resistant chain.
- C. Stencil Painting: Apply in accordance with good engineering practice.
- D. Equipment: Identify pumps, tanks and water treatment devices with stencil painting. Small devices such as in-line pump may be identified with metal tags.
- E. Controls: Identify control panels and major control components outside panels with plastic nameplates.
- F. Valves: Identify all valves in main and branch piping with tags. Each tag shall be stamped showing valve identification number and function or position (N.O., N.C., Balancing, Modulating, etc.).
- G. Piping: Identify piping, concealed or exposed, with stenciled painting. Identify service, flow direction and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve, at each side of penetration of structure or enclosure and at each obstruction.
- H. Plastic Pipe Markers: Install in accordance with manufacturer's instructions.
- I. Plastic Tape Pipe Markers: Install complete around pipe in accordance with manufacturer's instructions.
- J. Underground Plastic Pipe Markers: Install 6 to 8 inches below finished grade, directly above buried pipe.

3.03 VALVE CHART

- A. Provide a typed or printed valve list segregated by systems and showing valve number, equipment served or system function and location in building by room and nearest column. The list should be on 8-1/2 x 11" paper bound in plastic

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binder and three copies submitted to the Department or his representative for approval and after approval six copies of final information.