

SECTION 23 22 00

STEAM AND STEAM CONDENSATE PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Steam (0 - 15 psig) piping
- B. Steam (16 - 125 psig) piping
- C. Condensate return piping

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Steam (126 - 250 psig) piping

1.2 RELATED SECTIONS

- A. Section 23 05 00: Common Work Results for HVAC
- B. Section 23 05 10: Supports, Anchors and Seals
- C. Section 23 05 23: Valves
- D. Section 23 05 53: Painting and Identification
- E. Section 23 05 48: Vibration Isolation and Seismic Restraints
- F. Section 23 07 10: Mechanical Insulation
- G. Section 23 22 16: Steam and Steam Condensate Specialties

Deleted: <#> Underground insulated piping¶
<#> Pan type humidifier steam piping¶
<#> Pan type humidifier condensate drain piping¶

1.3 QUALITY ASSURANCE

- A. Welding materials and labor shall conform to ASME Code and applicable State labor regulations.
- B. Use welders fully qualified and licensed by State authorities. Welders shall be certified for ASME procedures for high pressure where applicable.
- C. The manufacturer's mark or name shall be attached to each length of pipe, fitting, or device employed in the piping system.

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Deleted: <#> Section 23 84 13: Humidifiers¶

1.4 REFERENCE STANDARDS

- A. ANSI (American National Standards Institute).
- B. ASME (The American Society of Mechanical Engineers).
- C. ASTM (American Society for Testing and Materials)
- D. ASTM B813, Water-flushable lead-free flux
- E. ASTM B32, Lead-free alloy solder
- F. ASTM B828, Procedures for soldered joints

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Fiberglass reinforced plastic pipe: Smith Fiberglass or approved equal.
- B. Underground insulated piping: Ric-Wil Incorporated or approved equal.

2.2 PIPE AND FITTINGS

- A. Steam (0 - 15 PSIG):
 - 1. Standard weight black steel, ASTM A-53 Type F or A-53 Type ERW Grade B, or A-106 seamless.
 - 2. 125 pound cast iron screwed fittings, 2-1/2 inch and smaller. Butt welding fittings for 3 inch and larger, ANSI B16.9, with wall thickness identical to pipe in which installed. Flanges shall be Class 150, ANSI B16.5, forged steel, screwed, welding neck or slip-on type as required.
- B. Steam (16 - 125 PSIG):
 - 1. Standard weight black steel, ASTM A-53 Type ERW Grade B or A-106 seamless.
 - 2. 125 pound cast iron screwed fittings, 2-1/2 inch and smaller. Butt welding fittings for 3 inch and larger, ANSI B16.9, with wall thickness identical to pipe in which installed. Flanges shall be Class 150, ANSI B16.5, forged steel, screwed, welding neck or slip-on type as required.
- C. Condensate Return:
 - 1. Schedule 80 black steel pipe, ASTM A-53 Type ERW Grade B or A-106 seamless, with 125 pound cast iron screwed fittings for 2-1/2 inch and smaller and butt welding fittings for 3 inch and larger.

PART 3 - EXECUTION

3.1 SEISMIC RESTRAINTS

- A. Fabricate and support piping in accordance with specifications herein, and latest edition of CMC. Provide seismic restraint in accordance with a current OSHPD pre-approved system that carries a current OSHPD OPA Number. For seismic restraint, see Section 23 05 48.
- B. Install seismic separation assemblies at building seismic joints.

3.2 PREPARATION OF PIPING

- A. Ream pipe ends to remove burrs. Make joints smooth and unobstructed inside. Remove any obstructions or debris inside piping, blowing it out with compressed air or otherwise cleaning it internally immediately prior to assembly.
- B. Cap or cover open piping during erection to prevent entry of foreign objects.

3.3 GENERAL

- A. No lead bearing solders shall be used for assembly of piping specified under this Section. Flux shall be water-flushable and lead-free.

Deleted: <#> Steam (126 - 250 PSIG):¶
<#> Extra strong black steel, ASTM A-53 Type ERW Grade B or A-106 seamless, for all threaded pipe and standard weight for welded pipe.¶
<#> Fittings for piping 1-1/2 inch and smaller shall be forged steel, screwed or socket welding, minimum rating of 250 psig.¶

Deleted: <#> Equal to Smith Fiberglass "Green Thread" fiberglass reinforced plastic pipe, if approved by governing authorities.¶
<#> Underground Insulated Piping:¶
<#> Steel Conduit Type:¶
<#> Equal to Ric-Wil, Incorporated Prefabricated underground insulated piping. Conduit shall be 10 gauge smoothwall galvanized steel, Galva-Gard, multiple machine coated with high melting point asphalt with an interposed layer of fiberglass cloth and one (1) final outer wrap of asphalt impregnated fiberglass reinforced asbestos pipe line felt applied spirally under tension. Minimum coating thickness shall be 3/16 inch.¶
<#> The unloading, handling and installation of the underground insulated piping system shall be in strict accordance with the manufacturer's recommendations. A qualified, factory trained representative of the conduit manufacturer shall be present during all critical periods of the installation indicating that the system was installed in accordance with the manufacturer's recommendations. He shall also provide operating and maintenance instructions to the Owner.¶
<#> Steam piping shall be Schedule 40 black steel, ASTM A-53 Type ERW Grade B or A-106 seamless, with welded joints. Condensate piping shall be Schedule 80 extra heavy black steel, ASTM A-53 Type ERW Grade B ... [1]

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Deleted: <#> Fabricate and support piping in accordance with specifications herein, and latest edition of CMC. Provide seismic restraint in accordance with the latest edition of the SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems. The Seismic Hazard Level (SHL) for this project shall be "A". The connection level for this project shall be Connection Level 1. For seismic restraint, see Section 23 05 48.¶

- B. Nipples shall be the same material, composition and weight classification as the pipe with which they are installed. Close or running thread nipples shall not be used.
- C. Install horizontal piping parallel with adjacent walls and partitions unless otherwise shown. All risers shall be plumb. Springing or forcing piping into place will not be permitted unless specifically called for.
- D. Take branches and riser arms off the top of mains at a 45 degree angle, unless otherwise shown.
- E. Use a minimum of two field fabricated or installed fittings or joints when connecting piping to equipment or prefabricated piping assemblies.
- F. Grade piping for drainage using 1 inch drop per 40 feet of run, except where otherwise indicated. Steam and condensate lines shall pitch downward in direction of flow, except where noted otherwise.
- G. Back pitch steam runouts which are less than 10'-0" from steam main. Runouts over 10'-0" from steam main shall be pitched in direction of flow and dripped before control valve.
- H. Provide manual drain valves at low points of condensate return piping. Drains to be 2 inch valves for piping 4 inch and larger and 3/4 inch for smaller piping.
- I. Provide eccentric fittings where necessary to avoid pockets of condensation in steam and gravity condensate return piping. Install driplegs at all rises in pipe elevation. Where condensate lines form a trap, provide vent loop over the trapped section. Install float and thermostatic traps where indicated and at all points where condensate can lodge.
- J. Arrange piping to provide access to coils in piping or ductwork, manholes and access openings, and to permit convenient removal of heads and coils and pulling of tubes. Removal of heads and coils and pulling of tubes shall be accomplished without disturbing equipment shutoff valves and by the removal of a minimum amount of piping between shutoff valves and equipment. Provide additional flanges or unions as required to provide these features.
- K. All control valves shall be set by this Contractor. Piping to control valves shall be run line size as close as possible to valve connections. Concentric increasers at valve outlets may be used. Use eccentric reducers at valve inlets, flat on bottom for steam. Strainers shall be line size. Provide unions or flanges at automatic control valves for servicing.
- L. Piping in finished portions of the building, except in mechanical equipment rooms or where otherwise indicated on the drawings, shall be concealed.
- M. Provide clearance for installation of insulation and for access to valves, air vents, drains and unions.
- N. Install same type underground piping material specified for inside building to 5 feet outside of building.
- O. Do not install piping within 3 feet in horizontal direction from electrical panels or equipment. Coordinate with Division 16 contractor.

3.4 **WELDED CONNECTIONS**

- A. All welding shall be done in accordance with Chapter V of the American Standard Code for Pressure Piping, ASA B31.3 (as amended to date) unless otherwise noted.

Deleted: <#> Steam supply piping to pan type humidifiers shall use 2 – 45° fittings for 90° turns. 90° elbows are not acceptable.¶

- B. Make welded joints with continuous welds, without backing rings, and with pipe ends beveled before welding. Gas cuts shall be true and free from burned metal. Before welding, welding surfaces shall be thoroughly cleaned. Piping shall be carefully aligned and no weld metal shall project inside the pipe.
- C. Use seamless butt-welding fittings at all elbows, tees and reducers. Mitered or fabricated elbows will not be permitted.
- D. Branch lines at least two pipe sizes smaller than the main may be connected by means of 3000 psig forged steel couplings or "Threadolets" in lieu of welding tees.
- E. Where branch lines are at least two pipe sizes smaller than the main and the main is larger than 3 inch, direct welding to the main may be permitted using a "Threadolet". The welder shall demonstrate to the Owner and/or Engineer, acceptable workmanship with this procedure, including proper matching of branch pipe ends to wall contour of the main.

3.5 CORROSION PROTECTION FOR UNDERGROUND PIPING

- A. After testing of underground piping, apply one heavy coat of coal tar bituminous material, equal to Bitumastic 50, to stainless steel, aluminum, cadmium plated or galvanized steel bolts, rods, banding and other items constructed of these materials.

3.6 EXPANSION OF PIPING

- A. Provide expansion loops where shown on drawings or required to prevent damage to piping and equipment due to thermal expansion in the piping system.
- B. Where loops are shown, the height and width dimensions shall be adhered to where possible. If adjustments are necessary because of interferences with other work, obtain Engineer's approval before proceeding with fabrication of the loop.
- C. Expansion loops shall be all welded steel construction, utilizing long radius elbows.
- D. Install loops with "cold spring" so that loop will have 1/2 of the calculated expansion during normal operation.
- E. Anchor pipe in an approved manner at points shown on drawings, using U-bolt or iron bar clamps secured to the building construction.
- F. Install guides to maintain the position and alignment of piping.
- G. Install runouts from mains and/or risers with swing joints of sufficient length to absorb vertical expansion or contraction of risers and horizontal expansion or contraction of mains.
- H. Where space does not permit installation of expansion loops, provide expansion joints as described in Section 23 22 16, Steam and Steam Condensate Specialties.
- I. Install piping to allow for expansion and contraction without stressing pipe, joints, equipment or fixtures.
- J. Install piping connected to equipment to provide flexibility for thermal stresses and for vibration. Adequately support and anchor pipe so that strain from weight and thermal movement of piping is not imposed on the equipment.
- K. Provide piping passing through seismic, expansion, and construction joints with minimum [] inch deflection capabilities in all directions. Anchor piping on both sides of joint so that

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building movement will not cause structural stress on piping supports. Use multiple flexible pipe connectors or seismic separation assemblies to achieve deflection capabilities indicated.

3.7 TESTING OF STEAM AND CONDENSATE RETURN PIPING

- A. Test low pressure steam and condensate return piping with a cold hydrostatic test of not less than 50 psig. Test medium and high pressure steam piping with pressure at 100 psig or 1-1/2 times normal operating pressure, whichever is greater. Test for 24 hours, remove thermostatic elements from traps and other devices that could be damaged by the test pressures. After testing and before replacing trap elements, operate system for 24 hours. Waste condensate to sewer through temporary connections as necessary. If freezing of water could be a problem, air may be used for testing.

3.8 CLEANING OF STEAM AND CONDENSATE RETURN PIPING

- A. After all equipment and piping has been installed, clean piping systems as follows:
 - 1. Circulate a solution containing 1 pound of trisodium phosphate per 50 gallons of water for 24 hours, at maximum temperature for each system. Operate all system pumps for a minimum of 50% of the cleaning time.
 - 2. Drain system and thoroughly flush with water.
 - 3. Fill, operate and drain system repeatedly until clean. Remove mesh elements of strainers at pumps, control valves and elsewhere and clean or replace repeatedly until system can operate continuously with no buildup of dirt on strainer mesh elements.
 - 4. After pipe cleaning is completed, flush and inspect all mechanical seals and pump impellers for wear and/or damage and replace same with new parts, if defective.
 - 5. Where it is not possible to clean a total system, such as with a remodeling project, take special care to clean piping materials prior to installation in the system.

END OF SECTION

Equal to Smith Fiberglass "Green Thread" fiberglass reinforced plastic pipe, if approved by governing authorities.

Underground Insulated Piping:

Steel Conduit Type:

Equal to Ric-Wil, Incorporated Prefabricated underground insulated piping. Conduit shall be 10 gauge smoothwall galvanized steel, Galva-Gard, multiple machine coated with high melting point asphalt with an interposed layer of fiberglass cloth and one (1) final outer wrap of asphalt impregnated fiberglass reinforced asbestos pipe line felt applied spirally under tension. Minimum coating thickness shall be 3/16 inch.

The unloading, handling and installation of the underground insulated piping system shall be in strict accordance with the manufacturer's recommendations. A qualified, factory trained representative of the conduit manufacturer shall be present during all critical periods of the installation indicating that the system was installed in accordance with the manufacturer's recommendations. He shall also provide operating and maintenance instructions to the Owner.

Steam piping shall be Schedule 40 black steel, ASTM A-53 Type ERW Grade B or A-106 seamless, with welded joints. Condensate piping shall be Schedule 80 extra heavy black steel, ASTM A-53 Type ERW Grade B or A-106 seamless, pipe. All piping shall be hydrostatically tested in the field under a pressure of 250 psig or twice the working pressure, whichever is greater, and all piping joints shall be hammer tested. Provide fiberglass insulation, [] thick on steam piping and [] thick on condensate return. Both pipes may be contained within the same conduit.

Conduit connectors shall be minimum 10 gauge and of the welded type. Conduit shall be air tested in the field at 15 psig and all joints shall be soap tested. Air pressure shall be kept in conduit while backfilling is being conducted and until system is completed and turned over to the Owner. After conduit field joints have been soap tested, apply Rip-Coat Mastic Blanket protective coating over the conduit connectors.

Conduit ends shall be provided with end seals or gland seals as required where conduit enters buildings. Conduit seals to have drain and vent openings. Conduit to be vented to atmosphere. The terminal ends of conduits in walls at building shall be equipped with leak plates or wall sleeve leak plates.

Where anchors are required, furnish and install concrete anchor block to be poured around each steel anchor plate and conduit in accordance with the manufacturer's recommendations.

Provide expansion type watershed at each riser and other accessories as shown on drawings and as recommended by the manufacturer.

The supplier of the prefabricated insulated pipe units shall be responsible for providing a design that will accommodate pipe expansion and shop drawings shall be submitted that show all lengths of the piping system and all required components.

Any pre-insulated piping system shall be provided with requirements as described for Ric-Wil, including compensation for expansion, water tight joints, shop drawings and field supervision by a factory trained representative.

Pan Type Humidifier

Steam Supply:

Type "L" hard temper copper tubing with wrought copper fittings, joined with equal to Thermacote Welco 5 solder and flux.

Condensate Drain:

Type "L" hard temper copper tubing with wrought copper fittings, joined with equal to Thermacote Welco 5 solder and flux.