**SECTION 22 15 13**

**GENERAL SERVICE COMPRESSED-AIR PIPING**

**BASED ON DFD MASTER SPECIFICATION DATED 10/1/12**

***This section has been written to cover most (but not all) situations that you will encounter. Depending on the requirements of your specific project, you may have to add material, delete items, or modify what is currently written. The Division of Facilities Development expects changes and comments from you.***

**P A R T 1 - G E N E R A L**

**SCOPE**

This section contains specifications for plumbing pipe and pipe fittings for this project. Included are the following topics:

PART 1 - GENERAL

 Scope

 Reference

 Reference Standards

 Shop Drawings

 Quality Assurance

 Delivery, Storage, and Handling

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 Welder Qualifications

PART 2 - PRODUCTS

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PART 3 - EXECUTION

 General

 Preparation

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 Copper Pipe Joints

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 Mechanical Joint Pipe Connections

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**RELATED WORK**

Section 01 91 01 or 01 91 02 – Commissioning Process

Section 22 08 00 – Commissioning of Plumbing

22 05 29 - Hangers and Supports for Plumbing Piping and Equipment

22 05 14 - Plumbing Specialties

**REFERENCE**

Applicable provisions of Division 1 govern work under this section.

**REFERENCE STANDARDS**

ANSI A21.4

ANSI A21.11

ANSI A21.51

ANSI B16.3 Malleable Iron Threaded Fittings

ANSI B16.22 Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings

ANSI B16.29 Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV

ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless

ASTM A105 Forgings, Carbon Steel, for Piping Components

ASTM A126 Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings

ASTM A234 Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures

ASTM B32 Solder Metal

ASTM B88 Seamless Copper Water Tube

ASTM B280 Seamless Copper Tube for Air Conditioning and Refrigeration Field Service

ASTM B813 Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube

ASTM B819 Seamless Copper Tube for Medical Gas Systems

ASTM D1785 Poly Vinyl Chloride (PVC) Plastic Pipe

ASTM D2464 Threaded Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80

ASTM D2466 Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40

ASTM D2564 Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings

ASTM D2855 Making Solvent Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings

ASTM F493 Solvent Cements for Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe and Fittings

ASTM F656 Primers for Use in Solvent Cement Joints of Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings

NFPA 99 Health Care Facilities

**SHOP DRAWINGS**

Schedule from the contractor indicating the ASTM specification number of the pipe being proposed along with its type and grade, if known at the time of submittal, and sufficient information to indicate the type and rating of fittings for each service.

Statement from manufacturer on his letterhead that pipe furnished meets the ASTM, AWWA or CISPI specification contained in this section.

***Manufacturer's statement is appropriate on large or specialized projects and may be deleted on small projects.***

**QUALITY ASSURANCE**

Substitution of Materials: Refer to Section GC – General Conditions of the Contract, Equals and Substitutions.

Order all copper, steel, and PVC pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier.

Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the State.

**DELIVERY, STORAGE, AND HANDLING**

Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

Offsite storage agreements will not relieve the contractor from using proper storage techniques.

Storage and protection methods must allow inspection to verify products.

**DESIGN CRITERIA**

Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM specifications as listed in this specification.

Construct all piping for the highest pressures and temperatures in the respective system.

Non-metallic piping will be acceptable only for the services indicated. It will not be acceptable in ventilation plenum spaces, including plenum ceilings.

Where weld fittings or mechanical grooved fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.

Where ASTM A53 type F pipe is specified, grade A type E or S, or grade B type E or S may be substituted at Contractor's option. Where the grade or type is not specified, Contractor may choose from those commercially available.

Where ASTM B88, type L H (drawn) temper copper tubing is specified, ASTM B88, type K H (drawn) temper copper tubing may be substituted at Contractor's option.

**WELDER QUALIFICATIONS**

Welding procedures, welders, and welding operators for all building service piping to be in accordance with certified welding procedures of the National Certified Pipe Welding Bureau and Section 927.5 of ASME B31.9 Building Services Piping or AWS 10.9 Qualification of Welding Procedures and Welders for Piping and Tubing. Before any metallic welding is performed, Contractor to submit his Standard Welding Procedure Specification together with the Procedure Qualification Record as required by Section 927.6 of ASME B31.9 Building Services Piping.

***Welder certifications are required to be renewed every three years. If qualification papers are needed on a project, verify that they are current.***

Before any polyethylene fusion welding is performed, Contractor to submit certification that the welders to be used on this project have successfully demonstrated proper welding procedures in accordance with the Code of Federal Regulations, Title 49, Part 192, Section 192.285.

The Architect or Engineer reserves the right to test the work of any welder employed on the project, at the State's expense. If the work of the welder is found to be unsatisfactory, the welder shall be prevented from doing further welding on the project and all defective welds replaced.

**P A R T 2 - P R O D U C T S**

**COMPRESSED AIR (NON-MEDICAL, NON-LAB)**

INSTRUMENT AIR: Type L copper water tube, H (drawn) temper, ASTM B88; with cast copper pressure fittings, ANSI B16.18; wrought copper pressure fittings, ANSI B16.22; lead free (<.2%) solder, ASTM B32; flux, ASTM B813; copper phosporous brazing alloy, AWS A5.8 BCuP.

2" and Smaller TOOL AIR:

Black steel pipe, Schedule 40, Type F, Grade A, ASTM A53; with black malleable iron threaded fittings, Class 150, ASTM A197/ANSI B16.3; seamless carbon steel weld fittings, standard weight, ASTM A234 grade WPB/ANSI B16.9.

2-1/2" and Larger TOOL AIR:

Black steel pipe, Schedule 40, type F, Grade A, ASTM A53; with seamless carbon steel weld fittings, ASTM A234 grade WPB/ANSI B16.9.

**P A R T 3 - E X E C U T I O N**

**GENERAL**

Install pipe and fittings in accordance with reference standards, manufacturers recommendations and recognized industry practices.

**PREPARATION**

Cut pipe ends square. Ream ends of piping to remove burrs. Clean scale and dirt from interior and exterior of each section of pipe and fitting prior to assembly.

**ERECTION**

Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. Coordinate locations of plumbing piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

Where copper or steel piping is embedded in masonry or concrete, provide protective sleeve covering of elastomeric pipe insulation.

Maintain piping in clean condition internally during construction.

Provide clearance for installation of insulation, access to valves and piping specialties.

Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.

Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment

***This requirement is based on NFPA 70, 384-4 and 450-47.***

Install all valves and piping specialties, including items furnished by others, as specified and/or detailed. Provide access to valves and specialties for maintenance. Make connections to all equipment, fixtures and systems installed by others where same requires the piping services indicated in this section.

**COPPER PIPE JOINTS**

Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with metal brush, emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux and assemble joint to socket stop. Apply flame to fitting until solder melts when placed at joint. Remove flame and feed solder into joint until full penetration of cup and ring of solder appears. Wipe excess solder and flux from joint.

**WELDED PIPE JOINTS**

Make all welded joints by fusion welding in accordance with ASME Codes, ANSI B31, and State Codes where applicable. "Weldolets" and "Threadolets" may be used for branch takeoffs up to one-half (1/2) the diameter of the main.

**THREADED PIPE JOINTS**

Use a thread lubricant or teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

**COMPRESSED AIR**

Install a 4" minimum depth dirt leg at the bottom of each vertical run and at each outlet connection with shutoff valve at bottom of dirt leg.

**PIPING SYSTEM LEAK TESTS**

Isolate or remove components from system which are not rated for test pressure. Perform final testing for medical and lab gas with all system components in place. Test piping in sections or entire system as required by sequence of construction. Do not insulate or conceal pipe until it has been successfully tested.

For air or nitrogen tests, gradually increase the pressure to not more than one half of the test pressure; then increase the pressure in steps of approximately one-tenth of the test pressure until the required test pressure is reached. Examine all joints and connections with a soap bubble solution or equivalent method. System will not be approved until it can be demonstrated that there is no measurable loss of test pressure during the test period.

Inspect system for leaks. Where leaks occur, repair the area with new materials and repeat the test; caulking will not be acceptable.

Entire test must be witnessed by the Division's representative. All pressure tests are to be documented on **Division of Facilities Development** forms to be provided to the contractor.

 Test Initial Test Final Test

## System Medium Pressure Duration Pressure Duration

Compressed Air Air N/A 150 psig 24 hr

# CONSTRUCTION VERIFICATION ITEMS

Contractor is responsible for utilizing the construction verification checklists supplied under specification Section 2208 00 in accordance with the procedures defined for construction verification in Section 01 91 01 or 01 91 02.

END OF SECTION