



Anvil CSI 3 Part MasterFormat Specifications:

- 23 05 00 Basic Mechanical Methods and Materials
- 23 05 29 Hangers and Supports
- 21 11 00 Pipes, Valves and Fittings for Fire Protection Systems
- 22 30 00 Pipes, Valves and Fittings for Plumbing Systems
- 23 60 00 Pipes, Valves and Fittings for HVAC Heating and Cooling Systems
- 23 50 00 Piping Specialties

B U I L D I N G C O N N E C T I O N S T H A T L A S T

BUILDING CONNECTIONS THAT LAST



For over 150 years, Anvil has worked diligently to build a strong, vibrant tradition of making connections — from pipe to pipe and people to people.

We pride ourselves in providing the finest-quality pipe products and services with integrity and dedication to superior customer service at all levels.

We provide expertise and product solutions for a wide range of applications, from plumbing, mechanical, HVAC, industrial and fire protection to mining, oil and gas. Our comprehensive line of products includes: grooved pipe couplings, grooved and plain-end fittings, valves, cast and malleable iron fittings, forged steel fittings, steel pipe nipples and couplings, pipe hangers and supports, channel and strut fittings, mining and oil field fittings, along with much more.

As an additional benefit to our customers, Anvil offers a complete and comprehensive Design Services Analysis for mechanical equipment rooms, to help you determine the most effective and cost-efficient piping solutions.

Anvil is a proud member of the United States Green Building Council (USGBC). Go to the Anvil website to obtain manufacturer recycled certificates and other Green information.

At Anvil, we believe that responsive and accessible customer support is what makes the difference between simply delivering products — and delivering solutions.



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Anvil also offers downloadable CSI 3 Part MasterFormat Specifications at www.anvilintl.com.

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Piping, couplings, fittings and valves for piped building systems.

1.2 RELATED SECTIONS

- A. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
- B. Section 21 11 00 - Facility Fire-Suppression Water-Service Piping.
- C. Section 22 30 00 - Plumbing Equipment.
- D. Section 23 50 00 - Central Heating Equipment.
- E. Section 23 60 00 - Central Cooling Equipment.

1.3 REFERENCES

- A. American Society of Mechanical Engineers (ASME) B31.1 - Power Piping (SI Edition).
- B. American Society of Mechanical Engineers (ASME) B31.3 - Chemical Plant and Petroleum Refinery Piping.
- C. American Society of Mechanical Engineers (ASME) B31.9 - Building Services Piping.
- D. ASTM International (ASTM) A36 - Standard Specification for Carbon Structural Steel.
- E. ASTM International (ASTM) A47 - Standard Specification for Ferritic Malleable Iron Castings.
- F. ASTM International (ASTM) A48 - Standard Specification for Gray Iron Castings.
- G. ASTM International (ASTM) A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- H. ASTM International (ASTM) A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- I. ASTM International (ASTM) A153 - Specification for Zinc Coating (Hot Dip) on Iron & Steel Hardware.
- J. ASTM International (ASTM) A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- K. ASTM International (ASTM) A387 - Standard Specification for Pressure Vessel Plates, Alloy Steel, Chromium-Molybdenum.
- L. ASTM International (ASTM) A515 - Standard Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate-and Higher-Temperature Service.
- M. ASTM International (ASTM) A536 - Standard Specification for Ductile Iron Castings.
- N. ASTM International (ASTM) A575 - Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.
- O. ASTM International (ASTM) A668 - Standard Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use.
- P. ASTM International (ASTM) A1011 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- Q. ASTM International (ASTM) B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
- R. Manufacturers Standardization Society of The Valve and Fittings Industry (MSS) SP-58 Pipe Hangers and Supports - Materials, Design and Manufacture.
- S. Manufacturers Standardization Society of The Valve and Fittings Industry (MSS) SP-69 Pipe Hangers and Supports - Selection and Application.
- T. Manufacturers Standardization Society of The Valve and Fittings Industry (MSS) SP-77 Guidelines for Pipe Support Contractual Relationships.
- U. Manufacturers Standardization Society of The Valve and Fittings Industry (MSS) SP-89 Pipe Hangers and Supports - Fabrication and Installation Practices.
- V. Manufacturers Standardization Society of The Valve and Fittings Industry (MSS) SP-90 Guidelines on Terminology for Pipe Hangers and Supports.
- W. Manufacturers Standardization Society of The Valve and Fittings Industry (MSS) SP-127 Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, Application.

1.4 SYSTEM DESCRIPTION

- A. Grooved Mechanical Products: Couplings, fittings, valves and grooved components shall be used as the piping method.
 - 1. Product: Gruvlok as manufactured by Anvil International.
- B. System Design Requirements:
 - 1. Grooved products shall meet National and Local Piping and/or Building Codes. Mechanical commercial and industrial piping products shall have a minimum 300-psi (2.4 MPa) working pressure with 3 to 1 or greater safety working pressure with the exception of plain-end end fittings, which shall have a minimum of 175-psi (1.2MPa) working pressure.
 - 2. Fire Protection UL/ULC listed and FM approved products shall conform to NFPA working pressures.
 - 3. Incorporate in construction pipe hangers and supports to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies. Grooved piping installation shall meet ANSI B-31.1 - ANSI B-31.9 standards for horizontal and vertical pipe support design criteria.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. [Product Data]: Manufacturer’s data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Installation methods.
- C. Certifications:
 - 1. Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements. Certificates shall be furnished only as required by specific codes, upon request.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer’s full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- F. Closeout Submittals:
 - 1. Warranty: Warranty documents.
 - 2. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Manufacturing facilities shall be registered to ISO 9001:2000 and assessed to ISO 9000:2000 standard. A copy of the current certificate shall be available upon request.
- B. Conduct pre-installation meeting to verify project requirements, coordinate with other trades, and establish condition and completeness of substrate. Review manufacturer’s installation instructions and manufacturer’s warranty requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer’s unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer’s absolute limits.

1.9 WARRANTY

- A. Manufacturer’s Warranty: Submit, for Owner’s acceptance, manufacturer’s standard warranty document executed by authorized company official. Manufacturer’s warranty is in addition to, and not a limitation of, other rights. Owner may have under Contract Documents.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Anvil International, which is located at: 110 Corporate Dr. Suite 10 ; Portsmouth, NH 03801; Tel: 603-422-8000; Fax: 603-422-8033; Email: slaird@anvilintl.com; Web: www.anvilintl.com
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 PIPING

- A. Steel Piping: Black Steel and/or galvanized pipe conforming to ASTM A-53, Grade A or B. Grooving shall conform to Gruvlok published grooving specifications.
- B. Steel Piping: Black Steel and/or galvanized pipe conforming to ASTM A-135 or A-795. Grooving shall conform to Gruvlok published grooving specifications.
- C. Steel Piping: Black Steel and/or galvanized pipe conforming to ASTM A-53, Grade A or B. Standard schedule 40 pipe shall be roll or cut grooved. Grooving shall conform to Gruvlok published grooving specifications.
- D. Steel Piping: Black Steel and/or galvanized pipe conforming to ASTM A-53, Grade A or B. Schedule 10 pipe and below shall be roll grooved. Grooving shall conform to Gruvlok published grooving specifications.
- E. Copper Tubing: Copper tube to comply with ASTM B-88.
 - 1. Types K, L, M, and DWV shall be used in conjunction with the Gruvlok Copper roll grooved method.

2.3 FITTINGS

- A. Material:
 - 1. Couplings and Grooved Flange Adapters shall conform to ASTM A-536 Ductile Grade 65-45-12 or to ASTM A-47 Malleable Grade 32510.
 - 2. Coupling Track Head Bolts shall conform to ASTM A-183 Grade 2.

Basic Mechanical Methods and Materials

Hangers and Supports

Pipes, Valves and Fittings for Fire Protection Systems

Pipes, Valves and Fittings for Plumbing Systems

Pipes, Valves and Fittings for HVAC Heating and Cooling Systems

Piping Specialties

3. Hex nuts shall conform to ASTM A-563 Grade A. Bolts and nuts shall be zinc electroplated.
 4. Fittings shall conform to Cast Ductile ASTM A-536 or Cast Malleable ASTM A-47.
 5. Forged steel fittings shall conform to ASTM A-234 or A-106 Grade B.
 6. Segmental welded fittings shall conform to ASTM A-53.
 7. Coatings shall be (Orange) Alkyd-enamel rust inhibiting lead free paint.
 8. Coating shall be hot dipped galvanized fittings shall conform to ASTM A-153.
 9. Standard coupling gaskets for building services shall be Grade "E" EPDM conforming to ASTM D-2000 with operating temperature range from -40 degrees F to +230 degrees F (-40 degrees C to 110 degrees C).
- B. Gasket Lubricant: Coupling gaskets except where noted shall be lubricated with approved lubricant.
1. Copper Systems: Gruvlok Xtreme Lubricant.
 2. Environments below -20 degrees F (-28 degrees C), and above 150 degrees F (66 degrees C) and systems subject to continuous cycle temperature changes: Gruvlok Xtreme Lubricant.
 3. Systems Subject to Thermal Cycling: Gruvlok Xtreme Lubricant.
 4. DRI-SEAL Fire Protection Gaskets: Standard Gruvlok lubricants.
- C. Grooved Couplings for Steel Pipe Systems and other Approved Piping:
1. Sizes 1 inch to 30 inches (25 mm to 762 mm): Gruvlok Style 7401 Rigidlok couplings shall be used including style 7012 flange adapters.
 2. Gruvlok Style 7001 (Flexible) couplings shall be used for vibration attenuation and noise suppression at equipment locations.
 3. Combination rigid, flexible, and outlet couplings shall be used for vibration, noise suppression and seismic tremor.
 4. Clamp type couplings shall be used for branch outlets.
 5. Grade "E" EPDM gaskets shall be used for water service applications with temperature ranges between - 40 degree F and +230 degree F (-40 degree C and 110 degree C).
 6. Use other gasket materials as recommended for petroleum service and other applications.
 7. Flexible or other style couplings designed for axial motion or other movements shall be supported in strict accordance with factory recommendations.
- D. Grooved Couplings for Copper Tube Systems: Coupling working pressure not to exceed 300 psig (2.0 MPa).
1. Gruvlok style 7400 Rigidlite and style 7012 coupling flange adapters.
 2. Grade "E" EPDM gasket.
 3. Gruvlok Xtreme Lubricant.
- E. Grooved Flange Adapters: Flange adapters to transition from flange to groove with no nipple shall be Gruvlok Fig 7012 or Figure 7013:
1. Flanges in Figures 7012 and 7013 are designed with internal anti-rotation tines and are designated as a rigid connection.
 2. Figures 7012 and 7013 flange adapters require sealing rings when used with certain flanged products.
 3. Figure 7012: Conforms to ANSI class 125 or 150 lb (57 or 68 kg).
 - a. Sizes 2 inches through 20 inches (51 mm through 508 mm) are rated at 300 psig (2.0 MPa).
 - b. Size 24 inches (610 mm) is rated at 250 psig (1.72 MPa).
 4. Figure 7013: 2 inches through 12 inches (51 mm through 305 mm) available for ANSI class 250 or 300 lb (113 kg or 136 kg) bolt pattern and is rated at 750 psig (5 MPa).
- F. Grooved Fittings for Steel Piping Systems - Shall be Gruvlok cast ductile, malleable, forged steel, and/or segmental welded steel fittings.
1. Sizes 1 inches to 30 inches (25 mm to 762 mm) diameter:
 - a. Cast ductile conforms to ASTM A-536 or ASTM A-47.
 - b. Forged steel conforms to ASTM A-234.
 - c. Segmental welded conforms to ASTM A-53.
 2. Fittings shall be coated with an Alkyd-enamel non-toxic paint.
 3. Zinc electroplated fittings conform to ASTM B-633.
 4. Hot Dip Galvanized fittings conform to ASTM A-153.
 5. Standard Fittings shall be schedule 40 or standard wall. Other fittings are schedule 80 or light wall as scheduled.
- G. Grooved Copper Fittings: Gruvlok Wrot Copper fittings per ASTM B-75 and ANSI B-16.22, alloy C12200.
1. Wrought Copper fittings size 2 inches to 8 inches (51 mm to 203 mm) diameter shall be schedule 10 or standard wall 304 or 316 stainless steel. Copper fittings shall be 99.9 percent lead free.
 2. Couplings and Wrought Copper Fittings shall be NSF, Plumbing Code approved and UL/ULC listed.
- H. Di-Electric Insulated Pipe Connections: Di-LOK Figure 7088 or 7089 grooved by grooved or grooved by thread insulating nipples.
1. Shall inhibit the formation of a galvanic cell between dissimilar metals.
 2. Housing: Steel tube to comply with ASTM A513.
 3. Liner: Polypropylene to ASTM D4140. 300 psig (2 MPa).
 4. Operating Temperature -40 degrees F to +230 degrees F (-40 degrees C to 100 degrees C).
 5. Size range is 3/4 inch to 6 inches (19 mm to 152 mm) diameter.
- I. Branch Outlets: Shall be Gruvlok Clamp-T Styles 7045 and 7046, and Clamp-T Cross Figure 7047, 7048 and 7049 with grooved or threaded outlets.
1. Designated as a bolted-on positive pipe engagement branch outlet. Working pressure to 500 psi (3.5 KPa).

2. Run Sizes 2 inches to 8 inches (51 mm to 203 mm).
 3. Branch outlets from 1/2 inch to 3 inches (13 mm to 76 mm) diameter.
 - J. Outlet Couplings: Shall be Gruvlok Figure 7042 with grooved or threaded outlets. Working pressure shall be 500-psig minimum.
 1. Run sizes 1-1/2 inches to 6 inches (38 mm to 152 mm).
 2. Branch outlets from 1/2 inch to 2 inches (13 mm to 51 mm) diameter.
 - K. Plain End Couplings and Fittings: Gruvlok Roughneck coupling Style 7005 and plain-end fittings to match.
 1. Size range is 2 inches to 16 inches (51 mm to 406 mm) diameter. Materials conform to ASTM A-536 and A-47. Fittings are cast or forged steel. Intended for working pressures 300 to 750 psig (2.0 KPa to 5.2 KPa) with bolts fully torque to factory recommend torque requirements on plain-end or beveled standard wall steel pipe and Gruvlok Plain-End fittings. Fittings match coupling working pressure.
 2. Size range is 1 inch to 2-1/2 inches (25 mm to 64 mm) diameter: Plain End "Sock-it" Method: Gruvlok Sock-it fitting series 7100 through 7107. Material conforms to ASTM A-126 Class A Cast Iron. Working pressures from 175 - 300 psi (1.2 KPa to 2.0 KPa) UL/ULC listed and FM approved.
 - L. Gaskets for Industrial and Other Piping Systems: Systems with different media products shall be provided with industrial grade gaskets as scheduled.
 - M. Track Head Bolts and Hex Nuts: Couplings shall be furnished with heat-treated; oval neck track head bolts conforming to ASTM A-183 Grade 2. Bolts shall meet minimum tensile strength of 110,000 psi (758 KPa). Hex nuts shall be carbon steel conforming to ASTM A-563 Grade A. Bolts and nuts shall be zinc electroplated.
- 2.4 GROOVED CONNECTION FLOW CONTROL VALVES
- A. Gruvlok Tri-Service Valves - Model FTV-S.
 - B. Gruvlok Tri-Service Valves - Model FTV-A.
 1. Size: As indicated on drawings.
 2. Body and Yoke: Ductile iron; comply with ASTM A395 or ASTM A536.
 3. Disc: Cast iron, comply with ASTM A126.
 4. Stem: Bronze, comply with ASTM B21.
 5. Seat-Guide: Bronze, comply with ASTM B584.
 6. Disc Guide: Cast iron, comply with ASTM A126.
 7. Seat: Bronze.
 8. Flanged Gland: Cast iron, comply with ASTM A126.
 9. Packing: Graphited, non-asbestos packing.
 10. Spring: 302 stainless steel.
 11. Stem Guide: Ductile iron; comply with ASTM A395 or ASTM A536.
 - C. Gruvlok Balancing Valves - Model GBV-S (Soldered).
 - D. Gruvlok Balancing Valves - Model GBV-T (Threaded).
 1. Size: As indicated on drawings.
 2. Material: Cast bronze.
 3. Type and Description: Y-style globe valve with 4 full-turn adjustment, pressure differential ports on both sides of the valve, with positive shutoff and micrometer type handwheel adjustment. Provide tamperproof memory stop.
 - E. Gruvlok Balancing Valves - Model GBV-G (Grooved-End Straight).
 - F. Gruvlok Balancing Valves - Model GBV-A (Grooved-End Angle).
 1. Size: As indicated on drawings.
 2. Body: Ductile iron, comply with ASTM A536.
 3. Disc: Bronze, comply with ASTM B584.
 4. Seat: Ultra-high strength engineered resin.
 5. Trim: Brass C-37700.
 6. O-ring: Nitrile.
 - G. Gruvlok Butterfly Valves - Series 7700:
 1. Size: As indicated on drawings.
 2. Body: Ductile iron; comply with ASTM A536, Grade 65-42-12.
 3. Body Coating: Epoxy.
 4. Body Coating: Nylon.
 5. Disc: Ductile iron; comply with ASTM A536, Grade 65-42-12.
 6. Grade: Grade E - EPDM.
 7. Grade: Grade T - Nitrile.
 8. Grade: Grade O - Fluoroelastomer.
 9. Upper and Lower Shaft: Type 416 stainless steel.
- 2.5 EQUIPMENT ANCHOR BOLTS AND TEMPLATES
- A. Provide templates to ensure accurate location of anchor bolts.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. General: Grooved piping installation shall meet ANSI B-31.1 - ANSI B-31.9 Codes for Pressure Piping.
- B. Install in accordance with manufacturer's instructions.
- C. Pipe ends shall be clean and free from indentations, burrs, rust or damage.
- D. Field grooving or pipe cutting of galvanized pipe may require repair of possible damaged galvanized pipe ends. Two coats of spray-on "liquid-galvanize" are recommended.
- E. Install rigid couplings with tongue-and-groove housing for precise coupling alignment and engagement. Install tines in the housing key section to provide a rigid-like pipe connection.
- F. Companion or mating flanges shall have a flat hard surface and shall be free from gouges, undulations or deformities. Use flange gasket sealing rings if mating surfaces are not uniform.
- G. Plain-end coupling and fitting installation shall comply with specific torque and installation requirements. Consult current manufacturer's product installation data.
- H. Gasket lubricant shall be used to assure proper coupling gasket seating, and conformance with gasket service usage.

3.4 VALVE INSTALLATION

A. Tri-Service Valves - Models FTV-S, FTV-A:

- 1. Mount valve to a spool piece on the discharge side of the pump. Spool piece required is based on a minimum recommended space of 12 inches (305 mm) for pump sizes 2 inches by 2 inches (51 mm by 51 mm) to 6 inches by 6 inches (152 mm by 152 mm) and 24 inches (610 mm) for pump sizes 8 inches by 8 inches (203 mm by 203 mm) to 12 inches by 12 inches (305 x 305 mm).
- 2. Do not mount valve directly to pump to avoid causing undesirable noise in the system.
- 3. Leave sufficient clearance around valve for valve removal or repair.
- 4. Install valve in the direction of flow arrows on valve body.
- 5. Mount valve to flanged equipment using Gruvlok Flange Adapter or industry standard grooved coupling, suitable for system pressure and temperatures encountered.
- 6. Valve body has been designed to handle the weight of the pump on vertical in-line installations. The valve body is not designed to support the piping weight. Support piping by hangers. Provide pipe supports under valve and strainer bodies.

B. Globe Valves - Model GBV-S (Soldered), GBV-T (Threaded), Balancing Valves - Model GBV-G (Grooved-End Straight), GBV-A (Grooved-End Angle):

- 1. To ensure accuracy of measurement of GBV-S, GBV-T, GBV-G and GBV-A valves, locate valves at least 5 pipe diameters downstream from any fitting and at least 10 pipe diameters downstream from a pump.
- 2. Install no fittings within 2 pipe diameters downstream of valve.
- 3. Install valves with flow in the direction of the arrow on the valve body.
- 4. Provide easy access to probe metering ports (PMPs), drain ports and handwheel.
- 5. For solder applications, solder valve body in line using 95/5 solder.
- 6. Install valve-bonnet assembly into body, making sure non-asbestos gasket is in place.
- 7. Install valves in horizontal or vertical piping as indicated.
- 8. Do not install metering ports below the pipe (pointing down), as this will allow system sediment to accumulate in the ports.
- 9. Metering ports and body/drain plugs may be interchanged for improved accessibility.

END OF SECTION

PART 4 GENERAL

4.1 SECTION INCLUDES

- A. Hangers and supports for mechanical piping, ducting and equipment.

4.2 RELATED SECTIONS

- A. Division 3 Section: Cast-in-Place Concrete.
- B. Division 5 Section: Structural Steel.
- C. Division 5 Section: Metal Fabrications.

4.3 REFERENCES

- A. American Society of Mechanical Engineers (ASME):
 1. B31.1 - Power Piping (SI Edition).
 2. B31.3 - Chemical Plant and Petroleum Refinery Piping.
 3. B31.9 - Building Services Piping.
- B. ASTM International (ASTM):
 1. A36 - Standard Specification for Carbon Structural Steel.
 2. A47 - Standard Specification for Ferritic Malleable Iron Castings.
 3. A48 - Standard Specification for Gray Iron Castings.
 4. A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 5. A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 6. A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 7. A387 - Standard Specification for Pressure Vessel Plates, Alloy Steel, Chromium-Molybdenum.
 8. A515 - Standard Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate-and Higher-Temperature Service.
 9. A536 - Standard Specification for Ductile Iron Castings.
 10. A575 - Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.
 11. A668 - Standard Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use.
 12. A1011 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 13. B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
- C. Manufacturers Standardization Society of The Valve and Fittings Industry (MSS) Standard Practices:
 1. SP-58 Pipe Hangers and Supports - Materials, Design and Manufacture.
 2. SP-69 Pipe Hangers and Supports - Selection and Application.
 3. SP-77 Guidelines for Pipe Support Contractual Relationships.
 4. SP-89 Pipe Hangers and Supports - Fabrication and Installation Practices.
 5. SP-90 Guidelines on Terminology for Pipe Hangers and Supports.
 6. SP-127 Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, Application.

4.4 SYSTEM DESCRIPTION

- A. Contractor General Requirements:
 1. Incorporate in construction pipe hangers and supports to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
 2. Comply with maximum load ratings with consideration for allowable stresses prescribed by ASME B31.1 or MSS SP-58.
 3. Provide supports, guides and anchors that do not transmit unacceptable heat and vibration to building structure.
 4. The selection of pipe hangers and supports shall be based upon the overall design concept of the piping systems and any special requirements, which may be called for in the specifications. The support systems shall provide for, and control, the free or intended movement of the piping including its movement in relation to that of connected equipment. (Extracted from ANSI/MSS-SP69, 2003, Page 1, Section 4.2, with permission of the publisher, the Manufacturers Standardization Society.)
 5. Provide for vertical adjustments after installation of supported material and during commissioning, where feasible, to ensure pipe is at design elevation and slope.
- B. Selection of Hangers and Supports for Pipe Movement:
 1. Select hangers and supports to perform under all conditions of operation, allowing free expansion and contraction, and to prevent excessive stresses being introduced into piping system and connected equipment.
 2. Angularity of rod hanger resulting from horizontal movement of the piping system from cold to hot positions shall not to exceed 4 degrees from vertical.
 3. Where horizontal pipe movement is greater than 1/2 inch (12.7 mm), offset pipe hanger and support so that rod hanger is vertical in hot position.
 4. Where significant vertical movement of the pipe occurs at the hanger location, a resilient support must be used. Selection of resilient supports shall be based on permissible load variation and effects on adjacent equipment. Support selection for typical load variations are shown in Table 2 of MSS-SP-69. Load and movement calculations shall be made for the proper selection of spring hangers. Vertical movement and load transfer from riser expansion to horizontal runs shall be given consideration when applying spring hangers. Spring Cushion Hangers may be used where vertical movement

does not exceed 1/4 inch (6 mm), and where formal load and movement calculations are not required. Variable spring Hangers shall be used for all other resilient support requirements. Constant Support Hangers shall be used on piping systems where the deviation in supporting force must be limited to 6 percent and which cannot be accommodated by a Variable Spring Hanger. (Extracted from ANSI/MSS-SP69, 2003, Page 7, Section 7.4 and 7.4.1 to 7.4.3, inclusive, with permission of the publisher, the Manufacturers Standardization Society.)

- C. Hanger Spacing: (Extracted from ANSI/MSS-SP69, 2003, Page 8, Table 3, with permission of the publisher, the Manufacturers Standardization Society.)

TABLE 3 – Maximum Horizontal Pipe Hanger and Support Spacing

Nominal Pipe or Tube Size	1		2		3		4		5	6	7	8	9	10						
	Std Wt Steel Pipe				Copper Tube										Fire Protection	Ductile Iron Pipe	Cast Iron Soil	Glass	Plastic	Fiberglass Reinforced
	Water Service		Vapor Service		Water Service		Vapor Service													
in. mm	ft. m	ft. m	ft. m	ft. m	ft. m	ft. m	ft. m													
1/4 (6)	–	–	–	–	5	1.5	5	1.5	Follow requirements of the National Fire Protection Association See Section 14.	20 ft. (6.1 m) max spacing: min of one (1) hanger per pipe section close to the joint behind the bell and at change of direction and branch connections. For pipe sizes six (6) inches (150 mm) and under, installed on ASME B31 projects, that are subjected to loadings other than weight of pipe and contents, the span should be limited to the maximum spacing for water service steel pipe.	10 ft. (3.0 m) max spacing: min of one (1) hanger per pipe section close to joint on the barrel also at change of direction and branch connections	8 ft. (2.4 m) max spacing, follow pipe manufacturer's recommendations See Section 17.	Follow pipe manufacturer's recommendations for material and service condition. See Section 18.	Follow pipe manufacturer's recommendations for material and service condition. See Section 19.						
3/8 (10)	7	2.1	8	2.4	5	1.5	6	1.8												
1/2 (15)	7	2.1	8	2.4	5	1.5	6	1.8												
3/4 (20)	7	2.1	9	2.7	5	1.5	7	2.1												
1 (25)	7	2.1	9	2.7	6	1.8	8	2.4												
1 1/4 (32)	7	2.1	9	2.7	7	2.1	9	2.7												
1 1/2 (40)	9	2.7	12	3.7	8	2.4	10	3.0												
2 (50)	10	3.0	13	4.0	8	2.4	11	3.4												
2 1/2 (65)	11	3.4	14	4.3	9	2.7	13	4.0												
3 (80)	12	3.7	15	4.6	10	3.0	14	4.3												
3 1/2 (90)	13	4.0	16	4.9	11	3.4	15	4.6												
4 (100)	14	4.3	17	5.2	12	3.7	16	4.9												
5 (125)	16	4.9	19	5.8	13	4.0	18	5.5												
6 (150)	17	5.2	21	6.4	14	4.3	20	6.1												
8 (200)	19	5.8	24	7.3	16	4.9	23	7.0												
10 (250)	22	6.7	26	7.9	18	5.5	25	7.6												
12 (300)	23	7.0	30	9.1	19	5.8	28	8.5												
14 (350)	25	7.6	32	9.8	–	–	–	–												
16 (400)	27	8.2	35	10.7	–	–	–	–												
18 (450)	28	8.5	37	11.3	–	–	–	–												
20 (500)	30	9.1	39	11.9	–	–	–	–												
24 (600)	32	9.8	42	12.8	–	–	–	–												
30 (750)	33	10.1	44	13.4	–	–	–	–												

- Notes: (1) For spacing supports incorporating type 40 shields, see table 5.
 (2) Does not apply where span calculations are made or where there are concentrated loads between supports such as flanges, valves, specialties, etc. or changes in direction requiring additional supports.
 (3) Unbalanced forces of hydrostatic or hydrodynamic origin (thrust forces) unless restrained externally can result in pipe movement and separation of joints if the joints of the system are not of a restrained joint design. See Section 13.3.

D. Pipe Attachments for Insulated Lines:

1. The connections to pipe attachments shall be outside the insulation so that movement of the line shall not cause damage to the insulation. Insulation protection shields shall be provided to protect the vapor barrier of the insulation on cold lines. Under no circumstances shall hangers, supports or guides be applied directly to horizontal pipe or tubing on vapor barrier lines. For cryogenic piping systems, shields incorporating rigid, high-density polyurethane foam inserts or other load bearing insulation should be used. The support should include means for maintaining vapor barrier integrity. Because of the temperature/compressive strength relationship of polyurethane foam, the recommended shield designs must be selected to accommodate loading conditions at both the installation and operating temperature. (Extracted from ANSI/MSS-SP69, 2003, Page 10, Section 10 and 10.1 to 10.3, inclusive, with permission of the publisher, the Manufacturers Standardization Society.)
2. Deviation to the above is permissible when the Anvil Fig 260 ISS (Insulation Saddle System) is used when proper insulating techniques are employed including the use of mastic and caulk on all insulation edges, and final taping.

- E. Recommended Minimum Rod Diameters for Single Rigid Rod Hangers: (Extracted from ANSI/MSS-SP69, 2003, Page 9, Table 4, with permission of the publisher, the Manufacturers Standardization Society.)

TABLE 4 – Recommended Min. Rod Diameter for Single Rigid Rod Hangers⁽¹⁾⁽²⁾

Nominal Pipe or Tubing Size		Columns ⁽³⁾ 1, 2, 6, 7		Columns ⁽³⁾ 3, 4, 8, 9, 10	
		Nominal Rod Diameter		Nominal Rod Diameter	
<i>in.</i>	<i>mm</i>	<i>ft.</i>	<i>m</i>	<i>ft.</i>	<i>m</i>
1/4	(6)	–	–	3/8	M10
3/8	(10)	3/8	M10	3/8	M10
1/2	(15)	3/8	M10	3/8	M10
3/4	(20)	3/8	M10	3/8	M10
1	(25)	3/8	M10	3/8	M10
1 1/4	(32)	3/8	M10	3/8	M10
1 1/2	(40)	3/8	M10	3/8	M10
2	(50)	3/8	M10	3/8	M10
2 1/2	(65)	1/2	M12	1/2	M12
3	(80)	1/2	M12	1/2	M12
3 1/2	(90)	1/2	M12	1/2	M12
4	(100)	5/8	M16	1/2	M12
5	(125)	5/8	M16	1/2	M12
6	(150)	3/4	M20	5/8	M16
8	(200)	3/4	M20	3/4	M20
10	(250)	7/8	M20	3/4	M20
12	(300)	7/8	M20	3/4	M20
14	(350)	1	M24	–	–
16	(400)	1	M24	–	–
18	(450)	1	M24	–	–
20	(500)	1 1/4	M30	–	–
24	(600)	1 1/4	M30	–	–
30	(750)	1 1/4	M30	–	–

1. (1) For calculated loads, rod diameters may be sized in accordance with MSS SP-58, Table 3 provided Table 1 and Section 7.3 of MSS SP-58 are satisfied.
 2. (2) Rods may be reduced one size for double rod hangers. Minimum rod diameter shall be 3/8 inch (9.5 mm) (M10).
 3. (3) Columns noted refer to Table 3.
- F. Anchors Guides and Restraints:
1. Anchors, guides and restraints shall be located by the Engineer responsible for piping design. Should the need or the desirability of relocating, eliminating or adding anchors, guides or restraints arise; such changes shall be brought to the attention of the Engineer for consideration and approval.
 2. Anchors, guides and restraints shall be designed for imposed loadings as determined by the Engineer. For guided systems, in the absence of specified lateral loads, the guide shall be designed for 20 percent of the dead weight load based on the spans listed in Table 3, with a design load of 50 lb (0.22 kN) as a minimum.
 3. For pressure piping with joints not having a restraining design, other positive restraining means such as clamps, rods and/or thrust blocking shall be used to maintain the integrity of the joints.
 4. The necessity for, and the location of, shock suppressors and seismic control devices shall be as determined by the Engineer responsible for piping design.
 5. The location, type and number of corrective devices which may be necessary to control any unforeseen vibrations, as determined after the piping is in service, are not a part of this standard.
 6. Refer to MSS SP-127 for the design, selection, and application of the bracing piping systems subject to seismic - wind - dynamic loading.
 7. (Extracted from ANSI/MSS-SP69, 2003, Page 11, Section 13 and 13.1 to 10.6, inclusive, with permission of the publisher, the Manufacturers Standardization Society.)

4.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. Product Data: Manufacturer’s data sheets on each product to be used, including:
 1. Preparation instructions and recommendations.
 2. Load capacity and sizing schedules specific to Project.
 3. Installation methods.
- C. Certifications:
 1. Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements. Certificates shall be furnished only as required by specific codes, upon request.
- D. Shop Drawings:

1. Bases, hangers and supports.
 2. Connections to equipment and structure.
 3. Structural assemblies.
- E. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- F. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- G. Closeout Submittals:
1. Warranty: Warranty documents.
 2. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.
- 4.6 QUALITY ASSURANCE
- A. Manufacturer Qualifications:
1. Manufacturing facilities shall be registered to ISO 9001.2000 and assessed to ISO 9000.2000 standard. A copy of the current certificate shall be available upon request.
- B. Installer Qualifications:
1. Utilize an installer experienced in performing work of this section who is experienced in installation of work similar to that required for this project and per the minimum requirements of MSS SP-89.
- C. Conduct pre-installation meeting to verify project requirements, coordinate with other trades, and establish condition and completeness of substrate. Review manufacturer's installation instructions and manufacturer's warranty requirements.
- 4.7 DELIVERY, STORAGE, AND HANDLING
- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
- 4.8 PROJECT CONDITIONS
- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- 4.9 WARRANTY
- A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights, Owner may have under Contract Documents.

PART 5 PRODUCTS

- 5.1 MANUFACTURERS
- A. Acceptable Manufacturer: Anvil Intl., Inc.; 110 Corporate Dr. Suite 10, Portsmouth, NH 03802. ASD. Tel: (603) 422-8000. Fax: (603) 422-8033. Email: nwright-ross@anvilintl.com. Web: <http://www.anvilintl.com>.
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.
- 5.2 MANUFACTURED UNITS - APPLICATION REQUIREMENTS
- A. Fabricate hangers, supports and sway braces to comply with building codes.
- B. Do not use installed hangers for rigging or erection purposes.
- C. Materials available by product type. Provide materials to comply with location and application requirements unless noted otherwise on drawings and schedules.
1. Pipe rings - Malleable iron, carbon steel.
 2. Clevis - Carbon steel.
 3. Steel pipe clamps - Carbon steel, alloy, stainless steel.
 4. Socket clamps - Carbon steel.
 5. Beam clamps - Malleable/ductile iron, hardened steel, carbon steel, forged steel.
 6. Structural attachments - Carbon steel, malleable iron.
 7. Ceiling plates/ceiling flanges - Plastic, cast iron, malleable iron.
 8. Concrete inserts and attachments - Malleable iron, carbon steel; stainless steel body, fiberglass bars, polypropylene disc (iron cross design).
 9. Rod attachments - Carbon steel, malleable iron, forged steel.
 10. Pipe supports - Carbon steel, cast iron.
 11. Pipe shields and saddles - Carbon steel, alloy steel, stainless steel.
 12. Pipe rolls - Cast iron, carbon steel.
 13. Guides - Carbon steel; slides, carbon steel with PTFE slide plates.
 14. Engineered hangers - Carbon steel, stainless steel, chrome molybdenum steel.

- D. Finishes: Provide finishes to comply with location and application requirements unless noted otherwise on drawings and schedules.
1. Electro-plating galvanizing process per ASTM B633.
 2. Hot Dipped galvanizing process per ASTM A153.
 3. Epoxy paint.
 4. Zinc-rich paint.
 5. Standard primer shall meet Fed Spec TT-P-636.
- E. Application Requirements: Use components for intended service conditions only. Comply with service requirements below unless noted otherwise on drawings and schedules.
1. Steel hangers in contact with copper piping shall be copper plated, copper painted or epoxy coated.
 2. Exterior utility and mechanical yard areas shall use piping that is hot dip galvanized.
 3. Interior piping to be black iron.
 4. Hydronics and plumbing piping hangers shall be manufactured from carbon steel, cast malleable iron or cast iron.
 5. Steam piping hangers shall be manufactured from Chrome Molybdenum steel.
 6. Submerged piping hangers shall be manufactured from 316 stainless steel.
- 5.3 MANUFACTURED UNITS - MSS-SP-69 TYPES NOTED FOR PRODUCTS THAT ARE IN COMPLIANCE
- A. Copper Tubing Hangers: Fig. Numbers.
1. CT65 Light Weight Adjustable Clevis.
 2. CT69 Adjustable Swivel Ring, MSS-SP-69 (Type 10).
 3. CT109 Split Tubing Ring (Ring Only), MSS-SP-69 (Type 11).
 4. CT121 Copper Tubing Riser Clamp, MSS-SP-69 (Type 8).
 5. CT121C Copper Tubing Riser Clamp.
 6. CT128R Rod Threaded Ceiling Flange.
 7. CT138R Extension Split Tubing Clamp (Rod Threaded), MSS-SP-69 (Type 12).
 8. CT255 Copper Tubing Alignment Guide.
- B. Pipe Rings: Fig. Numbers.
1. 67 Pipe or Conduit Hanger, MSS-SP-69 (Type 5).
 2. 69 Adjustable Swivel Ring, Tapped per NFPA Standards, MSS-SP-69 (Type 10).
 3. 104 Adjustable Swivel Ring, Split Ring Type, MSS-SP-69 (Type 6).
 4. 108 Split Pipe Ring, MSS-SP-69 (Type 11).
 5. 138R Extension Split Pipe Clamp (Rod Threaded), MSS-SP-69 (Type 12).
- C. Clevis: Fig. Numbers.
1. 65 Light Duty Adjustable Clevis.
 2. 67 Pipe or Conduit Hanger, MSS-SP-69 (Type 5).
 3. 260 ISS (Insulation Saddle System) for support of insulated pipe operating between -40 degrees F to 200 degrees F. See section 2.3.P.11 for additional information.
 4. 260 Adjustable Clevis Hanger, MSS-SP-69 (Type 1).
 5. 300 Adjustable Clevis for Insulated Lines, MSS-SP-69 (Type 1).
 6. 590 Adjustable Clevis for Ductile or Cast Iron Pipe, MSS-SP-69 (Type 1).
- D. Steel Pipe Clamps: Fig. Numbers.
1. 40 Riser Clamp - Standard, MSS-SP-69 (Type 42).
 2. 100 Extended Pipe Clamp.
 3. 103 Offset Pipe Clamp.
 4. 212 Medium Pipe Clamp, MSS-SP-69 (Type 4).
 5. 212FP Earthquake Bracing Clamp, MSS-SP-69 (Type 4).
 6. 216 Heavy Pipe Clamp, MSS-SP-69 (Type 4).
 7. 224 Alloy Steel Pipe Clamp, MSS-SP-69 (Type 2).
 8. 246 Heavy Duty Alloy Steel Pipe Clamp, MSS-SP-69 (Type 2).
 9. 261 Extension Pipe or Riser Clamp, MSS-SP-69 (Type 8).
 10. 295 Double Bolt Pipe Clamp, MSS-SP-69 (Type 3).
 11. 295A Alloy Double Bolt Pipe Clamp, MSS-SP-69 (Type 3).
 12. 295H Heavy Duty Double Bolt Pipe Clamp, MSS-SP-69 (Type 3).
- E. Steel Riser Clamps: Fig. Numbers.
1. 40 Riser Clamp - Standard, MSS-SP-69 (Type 42).
 2. 261 Extension Pipe or Riser Clamp, MSS-SP-69 (Type 8).
- F. Socket Clamps (AWWA/Ductile/Cast Iron Pipe Sizes Only): Fig. Numbers.
1. 594 Socket Clamp Washer.
 2. 595 Socket Clamp for Ductile Iron or Cast Iron Pipe, MSS-SP-69 (Type 8).
 3. 599 Socket Clamp Washer.
 4. 600 Socket Clamp for Ductile Iron or Cast Iron Pipe, MSS-SP-69 (Type 8).
- G. Beam Clamps: Fig. Numbers.

1. 14 Adjustable Side Beam Clamp, MSS-SP-69 (Type 27).
 2. 86 C-Clamp with Set Screw & Lock Nut, MSS-SP-69 (Type 23).
 3. 87 C-Clamp with Set Screw & Fig. 89 Retaining Clip, MSS-SP-69 (Type 23).
 4. 88 C-Clamp with Set Screw Only, MSS-SP-69 (Type 23).
 5. 89 Retaining Clip.
 6. 89X Retaining Clip.
 7. 92 Universal C-type Clamp (Standard Throat), MSS-SP-69 (Type 19 and 23).
 8. 93 Universal C-type Clamp (Wide Throat), MSS-SP-69 (Type 19 and 23).
 9. 94 Wide Throat Top Beam C-Clamp, MSS-SP-69 (Type 19).
 10. 95 C-Clamp with Locknut, MSS-SP-69 (Type 23).
 11. 133 Standard Duty Beam Clamp, MSS-SP-69 (Type 21).
 12. 134 Heavy Duty Beam Clamp, MSS-SP-69 (Type 21).
 13. 217 Adjustable Side Beam Clamp, MSS-SP-69 (Type 25).
 14. 218 Malleable Beam Clamp without Extension Piece, MSS-SP-69 (Type 30).
 15. 227 Top Beam Clamp, MSS-SP-69 (Type 25).
 16. 228 Universal Forged Steel (UFS) Beam Clamp, MSS-SP-69 (Type 28 and 29).
 17. 292 Beam Clamp Right Hand Thread with Weld less Eye Nut, MSS-SP-69 (Type 28 and 29).
 18. 292L Beam Clamp Left Hand Thread with Weld less Eye Nut, MSS-SP-69 (Type 28 and 29).
- H. Structural Attachments: Fig. Numbers.
1. 54 Two Hole Welding Beam Lug.
 2. 55 Structural Welding Lug (Short), MSS-SP-69 (Type 57).
 3. 55L Structural Welding Lug (Long), MSS-SP-69 (Type 57).
 4. 60 Steel Washer Plate.
 5. 66 Welded Beam Attachment, MSS-SP-69 (Type 22).
 6. 112 Brace Fitting Complete.
 7. 113 Brace Fitting (Pipe End Only).
- I. Ceiling Plates and Ceiling Flanges: Fig. Numbers.
1. 127 Plastic Ceiling Plate.
 2. 128 Pipe Threaded, Ceiling Flange.
 3. 128R Rod Threaded, Ceiling Flange.
 4. 153 Pipe Hanger Flange.
 5. 395 Cast Iron Ceiling Plate.
- J. Brackets: Fig. Numbers.
1. 194 Light Welded Steel Bracket, MSS-SP-69 (Type 31).
 2. 195 Medium Welded Steel Bracket, MSS-SP-69 (Type 32).
 3. 199 Heavy Welded Steel Bracket, MSS-SP-69 (Type 33).
 4. 202 Iron Side Beam Bracket, MSS-SP-69 (Type 34).
 5. 206 Steel Side Beam Bracket, MSS-SP-69 (Type 34).
 6. 207 Threaded Steel Side Beam Bracket, MSS-SP-69 (Type 34).
- K. Concrete Inserts and Attachments: Fig. Numbers.
1. 47 Concrete Single Lug Plate.
 2. 49 Concrete Clevis Plate.
 3. 52 Concrete Rod Attachment Plate.
 4. 152 Screw Concrete Insert.
 5. 281 Wedge Type Concrete Insert, MSS-SP-69 (Type 18).
 6. 282 Universal Concrete Insert, MSS-SP-69 (Type 18).
 7. 285 Light Weight Concrete Insert, MSS-SP-69 (Type 19).
 8. 286 Iron Cross Design, MSS-SP-69 (Type 18).
- L. Hanger Rod and Rod Attachments: Fig. Numbers.
1. 110R Socket, Rod Threaded, MSS-SP-69 (Type 16).
 2. 114 Turnbuckle Adjuster, MSS-SP-69 (Type 15).
 3. 135 Straight Rod Coupling (With Sight-Hole).
 4. 135E Straight Rod Coupling (Less Sight-Hole).
 5. 135R Straight Rod Coupling (Reducing).
 6. 136 Straight Rod Coupling, MSS-SP-69 (Type 40).
 7. 136R Straight Rod Coupling (Reducing).
 8. 140 Machine Threaded Rod. Threaded both ends with right-hand threads.
 9. 142 Machine Threaded Coach Screw Rod. Plain finish.
 10. 146 Continuous Machine Threaded Rods.
 11. 148 Machine Threaded Rod with Eye End.
 12. 157 Extension piece.
 13. 230 Turnbuckle, MSS-SP-69 (Type 13).

14. 233 Turnbuckle, MSS-SP-69 (Type 13).
 15. 248 Machine Threaded Rod with Eye End. Right-hand threads with un-welded eye.
 16. 248L Machine Threaded Rod with Eye End. Left-hand threads with un-welded eye.
 17. 248X Machine Threaded Rod with Linked Eye Ends. Un-welded eye.
 18. 253 Machine Threaded Rod. Threaded both ends with right-hand and left-hand threads.
 19. 278 Machine Threaded Rod with Eye End. Right-hand threads with welded eye.
 20. 278L Machine Threaded Rod with Eye End. Left-hand threads with welded eye.
 21. 278X Machine Threaded Rod with Linked Eye Ends. Welded eye.
 22. 290 Thread Weld less Eye Nut (Right Hand Threads), MSS-SP-69 (Type 17).
 23. 290L Thread Weld less Eye Nut (Left Hand Threads), MSS-SP-69 (Type 17).
 24. 299 Forged Steel Clevis, MSS-SP-69 (Type 14).
- M. U-Bolts and Straps: Fig. Numbers.
1. 120 Light Weight U-Bolt.
 2. 126 One-Hole Clamp.
 3. 137 Standard U-Bolts, MSS-SP-69 (Type 24).
 4. 137C Plastic Coated U-Bolts, MSS-SP-69 (Type 24).
 5. 137S Special U-Bolts (Non-Standard).
 6. 243 Pipe Strap.
 7. 244 Pipe Strap.
 8. 262 Strap Short, MSS-SP-69 (Type 26).
 9. 291 Clevis Pin with Cotters.
- N. Pipe Supports: Fig. Numbers.
1. 62 Pipe Stanchion, Type A, B and C.
 2. 63 Pipe Stanchion, Type A, B and C.
 3. 191 Pipe Stanchion Saddle With U-Bolt, MSS-SP-69 (Type 37).
 4. 192 Adjustable Pipe Saddle Support, MSS-SP-69 (Type 38).
 5. 258 Pipe Saddle Support, MSS-SP-69 (Type 36).
 6. 259 Pipe Stanchion Saddle Support, MSS-SP-69 (Type 37).
 7. 264 Adjustable Pipe Saddle Support, MSS-SP-69 (Type 38).
 8. 265 Adjustable Pipe Saddle Support with U-Bolt, MSS-SP-69 (Type 38).
- O. Trapeze and Channel Support: Fig. Numbers.
1. 45 Channel Assembly.
 2. 46 Universal Trapeze Assembly.
 3. 50 Equal Leg Angle for Trapeze Assembly.
- P. Pipe Shields and Saddles: Fig. Numbers.
1. 160 Pipe Covering Protection Saddle, MSS-SP-69 (Type 39A and 39B).
 2. 161 Pipe Covering Protection Saddle, MSS-SP-69 (Type 39A and 39B).
 3. 162 Pipe Covering Protection Saddle, MSS-SP-69 (Type 39A and 39B).
 4. 163 Pipe Covering Protection Saddle, MSS-SP-69 (Type 39A and 39B).
 5. 164 Pipe Covering Protection Saddle, MSS-SP-69 (Type 39A and 39B).
 6. 165 Pipe Covering Protection Saddle, MSS-SP-69 (Type 39A and 39B).
 7. 165A Pipe Covering Protection Saddle (Alloy), MSS-SP-69 (Type 39A and 39B).
 8. 166A Pipe Covering Protection Saddle (Alloy), MSS-SP-69 (Type 39A and 39B).
 9. 167 Insulation Protection Shield, MSS-SP-69 (Type 40).
 10. 168 Rib-Lok Shield, MSS-SP-69 (Type 40).
 11. 260 (ISS) Insulation Saddle System, Clevis with High Impact Glass Reinforced Poly-Propylene Saddle.
- Q. Pipe Rolls: Fig. Numbers.
1. 171 Single Pipe Roll, MSS-SP-69 (Type 41).
 2. 175 Roller Chair, MSS-SP-69 (Type 44).
 3. 177 Adjustable Pipe Roll Support, MSS-SP-69 (Type 41).
 4. 178 Spring Cushion Hanger, MSS-SP-69 (Type 49).
 5. 181 Adjustable Steel Yoke Pipe Roll, MSS-SP-69 (Type 43).
 6. 271 Complete Pipe Roll Stand, MSS-SP-69 (Type 44).
 7. 274 Adjustable Pipe Roll Stand With Base Plate, MSS-SP-69 (Type 46).
 8. 274P Adjustable Pipe Roll Stand, Base Plate Only.
 9. 275 Adjustable Pipe Roll Stand Without Base Plate.
 10. 277 Pipe Roll and Base Plate with Cast Iron Base Plate, MSS-SP-69 (Type 45).
 11. 277S Pipe Roll and Base Plate with Steel Base Plate.
- R. Guides and Slides: Fig. Numbers.
1. 212 Medium Pipe Clamp, use with slide assemblies.
 2. 255 Pipe Alignment Guide, Single Clamp (MVT 4-8 in.)
 3. 256 Pipe Alignment Guide, Double Clamp (MVT 6-10 in.)

4. 257 Pipe Slides Assembly, Structural Tee Slide Assembly, MSS-SP-69 (Type 35).
5. 257A Pipe Slides Assembly, Structural Tee.
6. 432 Special Clamp, use with slide assemblies.
7. 436 Pipe Slides Assembly, Fabricated Tee Slide Assembly, MSS-SP-69 (Type 35).
8. 436A Pipe Slides Assembly, Fabricated Tee.
9. 439 Structural "H" Slide Assembly, Complete, MSS-SP-69 (Type 35).
10. 439A "H" Section Only.

5.4 METAL FRAMING

- A. Provide metal framing channel, fittings and hardware components as indicated or required for the structural support of piping systems and equipment.
 1. Metal framing shall be Anvil Strut as manufactured by Anvil International.
 2. Accessories: As indicated or required by application and location.
 - a. Strut mounted pipe support, Klo-Shure insulated couplings with strut clamp, size range of 3/8 inch (9.5 mm) through 4 inch (102 mm) copper tube with 3/8 inch (9.5 mm) through 1 inch (25 mm) thick insulation.
 - b. Strut mounted pipe clamps.
 - c. Strut mounted pipe rollers.
 - d. Strut mounted Cushion Clamps (steel pipe and copper tube).
- B. Materials Available: Provide materials and finishes to comply with locations and applications requirements as noted on drawings or schedules.
 1. Channels shall be produced from prime structural metals complying with the following specification as applicable:
 - a. Pre-Galvanized Steel - ASTM A653.
 - b. Plain Steel - ASTM A570.
 - 1) Finish: Hot-dip galvanized.
 - 2) Finish: Supr-Green powder coating.
 - 3) Finish: PVC coated.
 - c. Aluminum (Type 6063-T6) - ASTM B221.
 - d. Stainless Steel (Type 304 and 316) - ASTM A240.

5.5 EQUIPMENT SUPPORTS

- A. Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of Section 05 12 16 - Fabricated Fireproofed Steel Columns.

5.6 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

- A. Provide templates to ensure accurate location of anchor bolts.

PART 6 EXECUTION

6.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

6.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

6.3 HANGER SPACING

- A. Plumbing Piping: Most stringent requirements of Plumbing Code, or authority having jurisdiction.
- B. Fire Protection: Comply with applicable fire code.
- C. Gas and Fuel Oil Piping: Comply with pipe manufacturer's recommendations and applicable codes.
- D. Copper Piping: Comply with pipe manufacturer's recommendations and applicable codes.
- E. Flexible System Grooved Pipe: Minimum of one hanger required per the minimum recommended pipe length. Comply with groove manufacturer's recommended average hangers per pipe length.
- F. When practical located immediately adjacent to any change of direction of pipe. Total length of pipe between supports less than three-fourths the full hanger span.
- G. In case of concentrated loads (such as valves) the supports shall be placed as close as possible.

6.4 HANGER INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Clamps on Riser Piping:
 1. Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
 2. Bolt tightening torques shall be to industry standards.
 3. Cast Iron Pipes: Install clamp below joint.
 4. Steel Pipes: Clamp is fitted preferably below coupling or welded pipe lug.

- C. Use approved constant support type hangers where:
 - 1. For critical high temperature where vertical movement of pipe work is 1/2 inch (12.7 mm) or more.
 - 2. Transfer of load to adjacent hangers or connected equipment is not permitted.
 - D. Use variable support spring hangers where:
 - 1. Transfer of load to adjacent piping or to connected equipment is not critical.
 - 2. Variation in supporting effect does not exceed 25 percent of total load.
 - E. Adjust hangers to equalize load.
 - F. Support from Structural Members: Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.
 - G. Field welding of supports should be done by qualified welders using qualified welding procedures.
 - H. Proper care and ventilation should be given when welding galvanized components.
- 6.5 HORIZONTAL MOVEMENT
- A. Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.
 - B. Where horizontal pipe movement is greater than 1/2 inch (12.7 mm), offset pipe hanger and support so that rod hanger is vertical in hot position.
- 6.6 FINAL ADJUSTMENT
- A. Adjust Hangers and Supports:
 - 1. Ensure that rod is vertical under operating conditions.
 - 2. Equalize loads.
 - B. Adjustable Clevis:
 - 1. Tighten hanger load nut securely to ensure proper hanger performance.
 - 2. Tighten upper nut after adjustment.
 - C. C-Clamps:
 - 1. Follow manufacturer’s recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.
 - D. Beam Clamps:
 - 1. Tighten all set screws and lock nuts.
 - 2. Hammer jaw firmly against underside of beam for Figure 127 only.
- 6.7 PROTECTION
- A. Protect installed products until completion of project.
 - B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

Basic Mechanical
Methods and Materials

Hangers and
Supports

Pipes, Valves and Fittings
for Fire Protection Systems

Pipes, Valves and Fittings
for Plumbing Systems

Pipes, Valves and Fittings
for HVAC Heating and Cooling Systems

Piping
Specialties

PART 7 GENERAL

7.1 SECTION INCLUDES

- A. Scope of work:
 - 1. All areas as indicated on the drawings are to be protected by an automatic suppression system, of type as indicated.
 - 2. Wet pipe.
 - 3. Dry-pipe.
 - 4. Wet standpipe.
 - 5. Dry-standpipe.
- B. Contractor shall be responsible for designing the distribution systems and sizing of the systems by hydraulic calculation; and shall provide the necessary engineering drawings and calculations to obtain acceptance of all authorities having jurisdiction.

7.2 RELATED SECTIONS

- A. Section 07 84 13 - Penetration Firestopping Mortars.
- B. Section 08 31 16 - Access Panels and Frames.
- C. Section 23 05 00 - Common Work Results for HVAC.
- D. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
- E. Section 23 50 00 - Central Heating Equipment.

7.3 REFERENCES

- A. ASTM International (ASTM) A536 - Standard Specification for Ductile Iron Castings.
- B. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) SP-127 Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, Application.
- C. NFPA 13 - Installation of sprinkler systems.
- D. NFPA 72 - Installation, maintenance and use of protective signaling devices.

7.4 SYSTEM DESCRIPTION

- A. System components to be UL listed/FM approved and labeled.
- B. System components to be to be rated for minimum operating pressure of 175 psig.
- C. Pipe, Valves, and Fittings - Grooved products for steel and copper fire protection systems shall be used. Refer to Section 23 05 00 - Common Work Results for HVAC.
- D. Products shall be UL/ULC listed and FM approved. Materials shall be installed in accordance with current NFPA Standards, local Rating Bureau and/or local Fire Marshall requirements.
- E. Incorporate in construction pipe hangers and supports to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies. Refer to Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

7.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. [Product Data]: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Installation methods.
- C. Certifications:
 - 1. Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements. Certificates shall be furnished only as required by specific codes, upon request.
- D. Shop Drawings:
 - 1. Submit shop drawings and [Product Data] grouped to include complete submittals of related systems, products, and accessories in a single submittal.
- E. Closeout Submittals:
 - 1. Warranty: Warranty documents.
 - 2. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.

7.6 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Fire Protection Contractor shall be licensed by the State in which the project is located authorized to furnish and install fire protection systems.
 - 2. Contractor shall obtain all necessary permits and licenses pertaining to this Division (expense borne by the Contractor) and comply with Municipal and State Codes, Laws, Ordinances and Regulations, and the requirements of the National Fire protection Association, and pay all fees and sales taxes as required, and post all bonds incident thereto.
- B. Conduct pre-installation meeting to verify project requirements, coordinate with other trades, and establish condition and

completeness of substrate. Review manufacturer's installation instructions and manufacturer's warranty requirements.

7.7 DEFINITION

- A. "Piping" includes all pipe, fittings, valves, hangers, and other supports and accessories related to such piping.
- B. "Concealed" means hidden from sight in chases, furred spaces, shafts, hung ceilings, embedded in construction, in crawl spaces or buried.
- C. "Exposed" means not installed underground or "concealed" as defined above.
- D. "Fire Protection Work" is all of the work Indicated or required by the Contract Documents.
- E. "Or equivalent" means to possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity.
- F. "Provide" means the Contractor shall "furnish and install" work and/or equipment.
- G. "FPC" means the Fire Protection Contractor.

7.8 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

7.9 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

7.10 WARRANTY

- A. Contractor shall guarantee, in writing, that all work installed shall be free from any and all defects in workmanship and materials; that all apparatus shall develop capacities and characteristics specified; and that if, during the period of one year, or as otherwise specified, from the date of substantial completion, any defects in workmanship, material or performance appear, the Contractor shall, without cost to the Owner, remedy such defects within a reasonable time as specified in notice from the Owner's Representative. In default thereof, the Owner's Representative shall have the work done and charge the cost of the work to the Contractor.
- B. Furnish manufacturers written warranties for all equipment, stating effective date of Warranty, to the Owner's Representative.

PART 8 PRODUCTS

8.1 MANUFACTURERS

- A. Acceptable Manufacturer: Anvil International, which is located at: 110 Corporate Dr. Suite 10 ; Portsmouth, NH 03801; Tel: 603-422-8000; Fax: 603-422-8033; Email: slaird@anvilintl.com; Web: www.anvilintl.com
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

8.2 MANUFACTURED UNITS

- A. Grooved Butterfly Valve: Gruvlok Figure AE-7722-3A, 2 to 10 inches (51 mm to 254 mm). 300 PSI (2.1 MPa) rated UL/FM approved grooved-end with two (2) switches; one is a supervisory switch and the other is an auxiliary switch. Tamper resistant screws shall be provided to attach the cover of the actuator.
- B. Check Valves: Gruvlok Figure 78FP, 2 to 12 inches (51 to 305 mm): 300 PSI (2.1 MPa) rated, UL/ULC listed and FM approved grooved-end.
- C. Couplings for Fire Protections Systems - Gruvlok UL/ULC listed and/or FM approved. Figure 7000 (Flexible) and 7400 (Rigidlok) Grade "E" EPDM Type A, "C" Style Gaskets (DRI-SEAL), Type E EPDM, or Flush Gap Gasket.
- D. Grooved Fittings for Fire Protection Piping Systems: Gruvlok Fire-Rite short pattern fittings, 90 degree elbows and tees in 2 to 8 inches (51 mm to 203 mm) or Gruvlok standard pattern fittings, 2 to 12 inches (51 to 305 mm). Cast ductile conforms to ASTM A-536 Ductile Iron to Grade 65-45-12. Fittings are painted to industry specification and are available galvanized. Fire-RiteSYMBOL 212 fittings are UL/ULC listed and FM approved.
- E. Expansion Compensation Loop:
 1. A flexible pipe loop that absorbs and compensates for multi-plane movements simultaneously while reduce piping stress.
 2. Anvil Star Tri-Flex Loop as manufactured by Anvil Star Fire Products Div. of Anvil International, or pre-approved equal.
 - a. Model ANVL2 (+/-2 inches (51 mm) movement).
 - b. Model ANVL4 (+/-4 inches (102 mm) movement).
 - c. Model ANVL8 (+/-8 inches (203 mm) movement).
 3. Construction shall be 3 equal length sections of annular corrugated stainless steel close-pitch hose (made in USA) with stainless steel over braid (made in USA) that will absorb or compensate for pipe movements in all 6 degrees of freedom (3 coordinate axes, plus rotation about those axes) simultaneously.
 - a. The corrugated metal hose, braid(s), and a stainless steel ring-ferrule/band (material gauge not less than .048 inch (1.2 mm) shall be integrally seal-welded using a 100 percent circumferential, full penetration TIG welds. End fittings shall be selected per application. Fittings shall be attached using a 100 percent circumferential TIG weld.

- b. Design for pressure testing to 1.5 times their maximum rated working pressure and a minimum 4:1 (burst to working) safety factor.
 - c. Individually leak tested by the manufacturer using air-under-water or hydrostatic pressure.
 - d. In fire protection systems provide pipe loop that is Factory Mutual tested and approved for use in fire protection piping systems. Sizes 2 inches to 3 inches (51 mm to 76 mm) ID shall be FM Approved for 300 psi (2.1 MPa) working pressure at ambient temperature, and sizes 4 inches to 12 inches (102 mm to 305 mm) ID shall be FM Approved for 175 psi (1.2 MPa) working pressure at ambient temperature.
4. Warranty: Provide a 3-year product warranty when installed in accordance with all specifications and installation instructions as described in the Anvil Star Tri-Flex Loop Installation and Maintenance Instructions.

8.3 SPRINKLER HEADS

A. Manufacturer:

- 1. Viking, Central, Reliable or equal.
- 2. Type: Refer to schedule on drawings for head type required for different building areas.

8.4 PIPING

A. Steel Piping:

- 1. Refer to Section 23 05 00 - Common Work Results for HVAC.

B. Copper Piping:

- 1. Refer to Section 23 05 00 - Common Work Results for HVAC.

8.5 ACCESS PANELS

- A. Provide access panels as required by Section 08 31 16 - Access Panels and Frames.

8.6 FIRESTOPPING MATERIALS

- A. Provide fire stopping assemblies as required by Section 07 84 13 - Penetration Firestopping Mortars.

8.7 EQUIPMENT SUPPORTS

- A. Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of Section 05 12 16 - Fabricated Fireproofed Steel Columns.

8.8 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

- A. Provide templates to ensure accurate location of anchor bolts.

PART 9 EXECUTION

9.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Contractor shall verify and obtain fire flow test data required for design.

9.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Provide openings as necessary to permit installation of piping or any other part of work under this Section.
- D. Provide sleeves for piping penetrating floor and masonry walls.
- E. This Contractor shall be responsible for establishing sizes and locations of all openings and lintels in new work and to transmit this information to the Contractor whose work is involved at such time as to avoid cutting and patching.
- F. All patching shall match adjacent surfaces.
- G. Contractor shall inspect and take note of existing conditions along with the Owner's Representative to avoid disputes regarding the condition of existing surface before work began.
- H. Openings through existing concrete shall be core-drilled or saw cut.

9.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide access panels for access to equipment, valves, or other specialties installed behind wall or above ceiling surfaces.
- C. Lay-in acoustical tee bar ceilings and snap-in removable metal pan ceilings shall be considered adequate for access.
- D. Fire Protection Contractor shall sublet installation work to subcontractors specifically skilled in the construction of the surfaces involved.
- E. Contractor shall confer with the other Project Contractors with respect to access panel locations and shall, wherever practicable, group devices in such a manner so as to eliminate as many panels as possible.
- F. Contractor shall remove all markings and labels from access panels.
- G. Cutting or drilling thru structural beams or joists is not permitted.

- H. Provide all openings and set all sleeves in cooperation with Contractors whose work is affected thereby.
 - I. Caulk opening between pipe and sleeve with fire barrier sealant.
 - J. In event holes must be provided through reinforced concrete, they shall be carefully drilled so as to avoid spalling and unnecessary damage of weakening of any structural member; chopping or breaking out will not be permitted.
 - K. Obtain Architect's approval before providing openings through concrete or masonry in place and then proceed as directed.
 - L. Contractor shall be responsible for damage to finished work resulting from cutting or drilling required because of neglect of Contractor to provide accurate and sufficient information.
 - M. Penetrations through fire and/or smoke rated construction shall be sealed to maintain the rating of the construction in which they occur.
 - N. Comply with the manufacturer's requirements for proper installation of fire stop materials to obtain the required fire and/or smoke rating.
- 9.4 COMPENSATION LOOPS
- A. Compensation loops shall be prepared for shipment using a cut-to-length metal shipping bar, tacked securely between the elbows of the two parallel legs, to maintain the manufactured length during shipping. Shipping bar must be removed prior to system start-up.
 - B. Compensation loop hanger assembly kit shall be used to support and hang the loop. The FM Approved and UL Listed Seismic Wire/Cable assemblies conform to the requirements of the ASCE (American Society of Civil Engineers) guidelines for structural applications of wire rope, in that the cable is pre-stretched and the permanent end fittings maintain the break strength of the cable with a safety factor of two.
- 9.5 SPRINKLER HEADS
- A. Locate sprinkler heads, main piping and valves as indicated on the drawings.
 - B. Install sprinkler heads to coordinate with all lights, grilles and any other obstructions in ceiling.
 - C. Center sprinkler heads in ceiling tile and provide piping offsets as required.
 - D. Where ceiling is to be painted or sprayed, apply paper cover over sprinkler heads to ensure the head and escutcheons do not get coated. Remove protective paper cover after painting or spraying is completed.
 - E. Provide mountable metal box of spare heads with proper wrench for head replacement.
- 9.6 TESTS AND INSPECTIONS
- A. Contractor shall be responsible for testing and certification of systems and ordering inspections as required by authorities having jurisdiction.
 - B. All tests shall be conducted in the presence of and to the satisfaction of the Owner or an authorized representative.
 - C. Inspections shall be made by the Owner's authorized representative and inspectors having jurisdiction.
- 9.7 PROTECTION
- A. After all tests have been made and the systems pronounced to be satisfactory, the Contractor shall go over all work and clean equipment, fixtures, and related appurtenances and piping, and leave them clean and in complete working order at final completion of the project.
 - B. Protect installed products until completion of project.
 - C. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

Basic Mechanical
Methods and Materials

Hangers and
Supports

Pipes, Valves and Fittings
for Fire Protection Systems

Pipes, Valves and Fittings
for Plumbing Systems

Pipes, Valves and Fittings
for HVAC Heating and Cooling Systems

Piping
Specialties

PART 10 GENERAL

10.1 SECTION INCLUDES

- A. Plumbing requirements.

10.2 RELATED SECTIONS

- A. Section 07 84 13 - Penetration Firestopping Mortars.
- B. Section 08 31 16 - Access Panels and Frames.
- C. Section 23 05 00 - Common Work Results for HVAC.
- D. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
- E. Section 23 50 00 - Central Heating Equipment.

10.3 REFERENCES

- A. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) SP-127 Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, Application.

10.4 SYSTEM DESCRIPTION

- A. Grooved products for steel and copper plumbing systems shall be used. Refer to Section 23 05 00 - Common Work Results for HVAC and Section 23 50 00 - Central Heating Equipment for related materials.
 - 1. Galvanized fittings to be used with galvanized pipe.
 - 2. Schedule 10 Type 304 or 316 grooved stainless steel pipe and grooved stainless steel fittings shall be used in conjunction with copper systems 8 inch (203 mm) diameter and above.
 - 3. Couplings shall not be galvanized unless system is exposed to a corrosive environment.
 - 4. Copper fittings shall be 99.9 percent lead free.
- B. Contractor Design Requirements:
 - 1. Incorporate in construction pipe hangers and supports to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.

10.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. [Product Data]: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Installation methods.
- C. Certifications:
 - 1. Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements. Certificates shall be furnished only as required by specific codes, upon request.
- D. Shop Drawings:
 - 1. Submit shop drawings and [Product Data] grouped to include complete submittals of related systems, products, and accessories in a single submittal.
- E. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- F. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- G. Closeout Submittals:
 - 1. Warranty: Warranty documents.
 - 2. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.

10.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Manufacturing facilities shall be registered to ISO 9001:2000 and assessed ISO 9000.2000 standard. A copy of the current certificate shall be available upon request.
- B. Installer Qualifications:
 - 1. Contractor shall obtain all necessary permits and licenses pertaining to this Division (expense borne by the Contractor) and comply with Municipal and State Codes, Laws, Ordinances and Regulations, and the requirements of the National Fire protection Association, and pay all fees and sales taxes as required, and post all bonds incident thereto.
- C. Conduct pre-installation meeting to verify project requirements, coordinate with other trades, and establish condition and completeness of substrate. Review manufacturer's installation instructions and manufacturer's warranty requirements.

10.7 DEFINITION

- A. "Piping" includes all pipe, fittings, valves, hangers, and other supports and accessories related to such piping.
- B. "Concealed" means hidden from sight in chases, furred spaces, shafts, hung ceilings, embedded in construction, in crawl

spaces or buried.

- C. "Exposed" means not installed underground or "concealed" as defined above.
- D. "Fire Protection Work" is all of the work Indicated or required by the Contract Documents.
- E. "Or equivalent" means to possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity.
- F. "Provide" means the Contractor shall "furnish and install" work and/or equipment.
- G. "FPC" means the Fire Protection Contractor.

10.8 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

10.9 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

10.10 WARRANTY

- A. Contractor shall guarantee, in writing, that all work installed shall be free from any and all defects in workmanship and materials; that all apparatus shall develop capacities and characteristics specified; and that if, during the period of one year, or as otherwise specified, from the date of substantial completion, any defects in workmanship, material or performance appear, the Contractor shall, without cost to the Owner, remedy such defects within a reasonable time as specified in notice from the Owner's Representative. In default thereof, the Owner's Representative shall have the work done and charge the cost of the work to the Contractor.
- B. Furnish manufacturers written warranties for all equipment, stating effective date of Warranty, to the Owner's Representative.

PART 11 PRODUCTS

11.1 MANUFACTURERS

- A. Acceptable Manufacturer: Anvil International, which is located at: 110 Corporate Dr. Suite 10 ; Portsmouth, NH 03801; Tel: 603-422-8000; Fax: 603-422-8033; Email: slaird@anvilintl.com; Web: www.anvilintl.com
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

11.2 FITTINGS

- A. Material:
 1. Couplings and Grooved Flange Adapters shall conform to ASTM A-536 Ductile Grade 65-45-12 or to ASTM A-47 Malleable Grade 32510.
 2. Coupling Track Head Bolts shall conform to ASTM A-183 Grade 2.
 3. Hex nuts shall conform to ASTM A-563 Grade A. Bolts and nuts shall be zinc electroplated.
 4. Fittings shall conform to Cast Ductile ASTM A-536 or Cast Malleable ASTM A-47.
 5. Forged steel fittings shall conform to ASTM A-234 or A-106 Grade B.
 6. Segmental welded fittings shall conform to ASTM A-53.
 7. Coatings shall be Standard (Orange) Alkyd-enamel rust inhibiting lead free paint.
 8. Hot dipped galvanized fittings shall conform to ASTM A-153.
 9. Standard coupling gaskets for building services shall be Grade "E" EPDM conforming to ASTM D-2000 with operating temperature range from -40 degrees F to +230 degrees F (-40 degrees C to 110 degrees C).
- B. Gaskets: Gruvlok Product Grade "E" EPDM pressure responsive design for all water and oil free air service. EPDM gaskets are color coded green.
 1. Material conformance to grooved industrial standards ASTM D-2000.
 2. Temperature operating range is -40 degrees to +230 degrees F (-40 degrees C to 110 degrees C).
 3. Gruvlok Xtreme lubricant shall be used to insure proper gasket installation.
 4. Gruvlok Xtreme Lubricant shall be used for all copper system installations, installations below - 20 degrees F (-28 degrees C), installations above 150 degrees F (66 degrees C) and installations that are subject to temperature cycles.
- C. Gasket Lubricant: Coupling gaskets except where noted shall be lubricated with approved lubricant.
 1. Copper Systems: Gruvlok Xtreme Lubricant.
 2. Environments below -20 degrees F (-28 degrees C), and above 150 degrees F (66 degrees C) and systems subject to continuous cycle temperature changes: Gruvlok Xtreme Lubricant.
 3. DRI-SEAL Fire Protection Gaskets: Standard Gruvlok lubricants.
- D. Grooved Couplings for Steel Pipe Systems and other Approved Piping:
 1. Sizes 1 inch to 30 inches (25 mm to 762 mm): Gruvlok Style 7401 (Rigidlok) couplings shall be used including style 7012 flange adapters.
 2. Gruvlok Style 7001 (Flexible) couplings shall be used for vibration attenuation and noise suppression at equipment locations.

3. Combination rigid, flexible, and outlet couplings shall be used for vibration, noise suppression and seismic tremor.
 4. Clamp type couplings shall be used for branch outlets. Grade "E" EPDM gaskets are standard, but other gasket materials are available. Flexible or other style couplings designed for axial motion or other movements shall be supported in strict accordance with factory recommendations.
- E. Grooved Couplings for Copper Tube Systems: Coupling working pressure not to exceed 300 psig (2.0 MPa).
1. Gruvlok style 7400 Rigidlite and style 7012 coupling flange adapters.
 2. Grade "E" EPDM gasket.
 3. Gruvlok Xtreme Lubricant.
- F. Grooved Flange Adapters: Flange adapters to transition from flange to groove with no nipple shall be Gruvlok Fig 7012 or Figure 7013:
1. Flanges in Figures 7012 and 7013 are designed with internal anti-rotation "tines" and are designated as a rigid connection.
 2. Figures 7012 and 7013 flange adapters require sealing rings when used with certain flanged products.
 3. Figure 7012: Conforms to ANSI class 125 or 150 lb (57 or 68 kg).
 - a. Sizes 2 inches through 20 inches (51 mm through 508 mm) are rated at 300 psig (2.0 MPa).
 - b. Size 24 inches (610 mm) is rated at 250 psig (1.72 MPa).
 4. Figure 7013: 2 inches through 12 inches (51 mm through 305 mm) available for ANSI class 250 or 300 lb (113 kg or 136 kg) bolt pattern and is rated at 750 psig (5 MPa).
- G. Grooved Fittings for Steel Piping Systems - Shall be Gruvlok cast ductile, malleable, forged steel, and/or segmental welded steel fittings.
1. Sizes 1 inches to 30 inches (25 mm to 762 mm) diameter:
 - a. Cast ductile conforms to ASTM A-536 or ASTM A-47.
 - b. Forged steel conforms to ASTM A-234.
 - c. Segmental welded conforms to ASTM A-53.
 2. Fittings shall be coated with an Alkyd-enamel non-toxic paint.
 3. Zinc electroplated fittings conform to ASTM B-633.
 4. Hot Dip Galvanized fittings conform to ASTM A-153.
 5. Standard Fittings shall be schedule 40 or standard wall. Other fittings are schedule 80 or lightwall as scheduled.
- H. Grooved Copper Fittings: Gruvlok Wrot Copper fittings per ASTM B-75 and ANSI B-16.22, alloy C12200.
1. Wrought Copper fittings size 2 inches to 8 inches (51 mm to 203 mm) diameter shall be schedule 10 or standard wall 304 or 316 stainless steel. Copper fittings shall be 99.9 percent lead free.
 2. Couplings and Wrought Copper Fittings shall be NSF, Plumbing Code approved and UL/ULC listed.
- I. Di-Electric Insulated Pipe Connections: Di-LOK Figure 7088 or 7089 grooved by grooved or grooved by thread insulating nipples.
1. Shall inhibit the formation of a galvanic cell between dissimilar metals.
 2. Housing: Steel tube to comply with ASTM A513.
 3. Liner: Polypropylene to ASTM D4140. 300 psig (2 MPa).
 4. Operating Temperature -40 degrees F to +230 degrees F (-40 degrees C to 100 degrees C).
 5. Size range is 3/4 inch to 6 inches (19 mm to 152 mm) diameter.
- J. Branch Outlets: Shall be Gruvlok Clamp-T Styles 7045 and 7046, and Clamp-T Cross Figure 7047, 7048 and 7049 with grooved or threaded outlets.
1. Designated as a bolted-on positive pipe engagement branch outlet. Working pressure to 500 psi (3.5 KPa).
 2. Run Sizes 2 inches to 8 inches (51 mm to 203 mm).
 3. Branch outlets from 1/2 inch to 3 inches (13 mm to 76 mm) diameter.
- K. Outlet Couplings: Shall be Gruvlok Figure 7042 with grooved or threaded outlets. Working pressure shall be 500 psig minimum.
1. Run sizes 1-1/2 inches to 6 inches (38 mm to 152 mm).
 2. Branch outlets from 1/2 inch to 2 inches (13 mm to 51 mm) diameter.
- L. Plain End Couplings and Fittings: Gruvlok Roughneck coupling Style 7005 and plain-end fittings to match.
1. Size range is 2 inches to 16 inches (51 mm to 406 mm) diameter. Materials conform to ASTM A-536 and A-47. Fittings are cast or forged steel. Intended for working pressures 300 to 750 psig (2.0 KPa to 5.2 KPa) with bolts fully torque to factory recommend torque requirements on plain-end or beveled standard wall steel pipe and Gruvlok Plain-End fittings. Fittings match coupling working pressure.
 2. Size range is 1 inch to 2-1/2 inches (25 mm to 64 mm) diameter: Plain End "Sock-it" Method: Gruvlok Sock-it fitting series 7100 through 7107. Material conforms to ASTM A-126 Class A Cast Iron. Working pressures from 175 - 300 psi (1.2 KPa to 2.0 KPa) UL/ULC listed and FM approved.
- M. Gaskets for Industrial and Other Piping Systems: Gaskets with different media products shall be provided with industrial grade gaskets as scheduled.
- N. Track Head Bolts and Hex Nuts: Couplings shall be furnished with heat treated, oval neck track head bolts conforming to ASTM A-183 Grade 2. Bolts shall meet minimum tensile strength of 110,000 psi (758 KPa). Hex nuts shall be carbon steel conforming to ASTM A-563 Grade A. Bolts and nuts shall be zinc electroplated.

11.3 GROOVED CONNECTION FLOW CONTROL VALVES

- A. Gruvlok Tri-Service Valves - Model FTV-S.

- B. Gruvlok Tri-Service Valves - Model FTV-A.
 - 1. Size: As indicated on drawings.
 - 2. Body and Yoke: Ductile iron, comply with ASTM A395 or ASTM A536.
 - 3. Disc: Cast iron, comply with ASTM A126.
 - 4. Stem: Bronze, comply with ASTM B21.
 - 5. Seat-Guide: Bronze, comply with ASTM B584.
 - 6. Disc Guide: Cast iron, comply with ASTM A126.
 - 7. Seat: Bronze.
 - 8. Flanged Gland: Cast iron, comply with ASTM A126.
 - 9. Packing: Graphited, non-asbestos packing.
 - 10. Spring: 302 stainless steel.
 - 11. Stem Guide: Ductile iron, comply with ASTM A395 or ASTM A536.
 - C. Gruvlok Balancing Valves - Model GBV-S (Soldered).
 - D. Gruvlok Balancing Valves - Model GBV-T (Threaded).
 - 1. Size: As indicated on drawings.
 - 2. Material: Cast bronze.
 - 3. Type and Description: Y-style globe valve with 4 full-turn adjustment, pressure differential ports on both sides of the valve, with positive shutoff and micrometer type handwheel adjustment. Provide tamperproof memory stop.
 - E. Gruvlok Balancing Valves - Model GBV-G (Grooved-End Straight).
 - F. Gruvlok Balancing Valves - Model GBV-A (Grooved-End Angle).
 - 1. Size: As indicated on drawings.
 - 2. Body: Ductile iron, comply with ASTM A536.
 - 3. Disc: Bronze, comply with ASTM B584.
 - 4. Seat: Ultra-high strength engineered resin.
 - 5. Trim: Brass C-37700.
 - 6. O-ring: Nitrile.
 - G. 4. Gruvlok Butterfly Valves - Series 7700:
 - 1. Size: As indicated on drawings.
 - 2. Body: Ductile iron, comply with ASTM A536, Grade 65-42-12.
 - 3. Body Coating: Epoxy.
 - 4. Body Coating: Nylon.
 - 5. Disc: Ductile iron, comply with ASTM A536, Grade 65-42-12.
 - 6. Grade: Grade E - EPDM.
 - 7. Grade: Grade T - Nitrile.
 - 8. Grade: Grade O - Fluoroelastomer.
 - 9. Upper and Lower Shaft: Type 416 stainless steel.
- 11.4 PIPING
- A. Steel Piping:
 - 1. Refer to Section 23 05 00 - Common Work Results for HVAC.
 - B. Copper Piping:
 - 1. Refer to Section 23 05 00 - Common Work Results for HVAC.
 - C. Stainless Steel Piping:
 - 1. Refer to Section 23 05 00 - Common Work Results for HVAC.
 - D. Aluminum Piping:
 - 1. Refer to Section 23 05 00 - Common Work Results for HVAC.
 - E. Steel Piping:
 - 1. Refer to Section 23 05 00 - Common Work Results for HVAC.
 - F. Plastic Piping:
 - 1. Refer to Section 23 05 00 - Common Work Results for HVAC.
- 11.5 ACCESS PANELS
- A. Provide access panels as required by Section 08 31 16 - Access Panels and Frames.
- 11.6 FIRESTOPPING MATERIALS
- A. Provide fire stopping assemblies as required by Section 07 84 13 - Penetration Firestopping Mortars.
- 11.7 EQUIPMENT SUPPORTS
- A. Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of Section 05 12 16 - Fabricated Fireproofed Steel Columns.
- 11.8 EQUIPMENT ANCHOR BOLTS AND TEMPLATES
- A. Provide templates to ensure accurate location of anchor bolts.

PART 12 EXECUTION

12.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

12.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Provide openings as necessary to permit installation of piping or any other part of work under this Section.
- D. Provide sleeves for piping penetrating floor and masonry walls.
- E. This Contractor shall be responsible for establishing sizes and locations of all openings and lintels in new work and to transmit this information to the Contractor whose work is involved at such time as to avoid cutting and patching.
- F. All patching shall match adjacent surfaces.
- G. Contractor shall inspect and take note of existing conditions along with the Owner's Representative to avoid disputes regarding the condition of existing surface before work began.
- H. Openings through existing concrete shall be core-drilled or saw cut.

12.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

12.4 VALVE INSTALLATION

- A. Tri-Service Valves - Models FTV-S, FTV-A:
 - 1. Mount valve to a spool piece on the discharge side of the pump. Spool piece required is based on a minimum recommended space of 12 inches (305 mm) for pump sizes 2 inches by 2 inches (51 mm by 51 mm) to 6 inches by 6 inches (152 mm by 152 mm) and 24 inches (610 mm) for pump sizes 8 inches by 8 inches (203 mm by 203 mm) to 12 inches by 12 inches (305 by 305 mm).
 - 2. Do not mount valve directly to pump to avoid causing undesirable noise in the system.
 - 3. Leave sufficient clearance around valve for valve removal or repair.
 - 4. Install valve in the direction of flow arrows on valve body.
 - 5. Mount valve to flanged equipment using Gruvlok Flange Adapter or industry standard grooved coupling, suitable for system pressure and temperatures encountered.
 - 6. Valve body has been designed to handle the weight of the pump on vertical in-line installations. The valve body is not designed to support the piping weight. Support piping by hangers. Provide pipe supports under valve and strainer bodies.
- B. Globe Valves - Model GBV-S (Soldered), GBV-T (Threaded), Balancing Valves - Model GBV-G (Grooved-End Straight), GBV-A (Grooved-End Angle):
 - 1. To ensure accuracy of measurement of GBV-S, GBV-T, GBV-G and GBV-A valves, locate valves at least 5 pipe diameters downstream from any fitting and at least 10 pipe diameters downstream from a pump.
 - 2. Install no fittings within 2 pipe diameters downstream of valve.
 - 3. Install valves with flow in the direction of the arrow on the valve body.
 - 4. Provide easy access to probe metering ports (PMPs), drain ports and handwheel.
 - 5. For solder applications, solder valve body in line using 95/5 solder.
 - 6. Install valve-bonnet assembly into body, making sure non-asbestos gasket is in place.
 - 7. Install valves in horizontal or vertical piping as indicated.
 - 8. Do not install metering ports below the pipe (pointing down), as this will allow system sediment to accumulate in the ports.
 - 9. Metering ports and body/drain plugs may be interchanged for improved accessibility.

12.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

PART 13 GENERAL

13.1 SECTION INCLUDES

- A. HVAC requirements.

13.2 RELATED SECTIONS

- A. Section 07 84 13 - Penetration Firestopping Mortars.
- B. Section 08 31 16 - Access Panels and Frames.
- C. Section 23 05 00 - Common Work Results for HVAC.
- D. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
- E. Section 23 50 00 - Central Heating Equipment.

13.3 REFERENCES

- A. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) SP-127 Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, Application.

13.4 SYSTEM DESCRIPTION

- A. Grooved products for steel and copper heating and cooling systems shall be used. Refer to Section 23 05 00 - Common Work Results for HVAC.
 - 1. Galvanized fittings shall be used with galvanized pipe.
 - 2. Schedule 10 Type 304 or 316 grooved stainless steel pipe and grooved stainless steel fittings shall be used in conjunction with copper systems 8 inch (203 mm) diameter and larger.
 - 3. Couplings shall not be galvanized unless system is exposed to a corrosive environment.
 - 4. Copper fittings shall be 99.9 percent lead free.
- B. Contractor Design Requirements:
 - 1. Incorporate in construction pipe hangers and supports to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.

13.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. [Product Data]: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Installation methods.
- C. Certifications:
 - 1. Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements. Certificates shall be furnished only as required by specific codes, upon request.
- D. Shop Drawings:
 - 1. Submit shop drawings and [Product Data] grouped to include complete submittals of related systems, products, and accessories in a single submittal.
- E. Closeout Submittals:
 - 1. Warranty: Warranty documents.
 - 2. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.

13.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Manufacturing facilities shall be registered to ISO 9001:2000 and assessed to ISO 9000:2000 standard. A copy of the current certificate shall be available upon request.
- B. Installer Qualifications:
 - 1. Contractor shall obtain all necessary permits and licenses pertaining to this Division (expense borne by the Contractor) and comply with Municipal and State Codes, Laws, Ordinances and Regulations, and the requirements of the National Fire protection Association, and pay all fees and sales taxes as required, and post all bonds incident thereto.
- C. Conduct pre-installation meeting to verify project requirements, coordinate with other trades, and establish conditions and completeness of substrate. Review manufacturer's installation instructions and manufacturer's warranty requirements.

13.7 DEFINITION

- A. "Piping" includes all pipe, fittings, valves, hangers, and other supports and accessories related to such piping.
- B. "Concealed" means hidden from sight in chases, furred spaces, shafts, hung ceilings, embedded in construction, in crawl spaces or buried.
- C. "Exposed" means not installed underground or "concealed" as defined above.
- D. "Fire Protection Work" is all of the work Indicated or required by the Contract Documents.
- E. "Or equivalent" means to possess the same performance qualities and characteristics and fulfill the utilitarian function

without any decrease in quality, durability or longevity.

F. "Provide" means the Contractor shall "furnish and install" work and/or equipment.

G. "FPC" means the Fire Protection Contractor.

13.8 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

13.9 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

13.10 WARRANTY

A. Contractor shall guarantee, in writing, that all work installed shall be free from any and all defects in workmanship and materials; that all apparatus shall develop capacities and characteristics specified; and that if, during the period of one year, or as otherwise specified, from the date of substantial completion, any defects in workmanship, material or performance appear, the Contractor shall, without cost to the Owner, remedy such defects within a reasonable time as specified in notice from the Owner's Representative. In default thereof, the Owner's Representative shall have the work done and charge the cost of the work to the Contractor.

B. Furnish manufacturers written warranties for all equipment, stating effective date of Warranty, to the Owner's Representative.

PART 14 PRODUCTS

14.1 MANUFACTURERS

A. Acceptable Manufacturer: Anvil International, which is located at: 110 Corporate Dr. Suite 10 ; Portsmouth, NH 03801; Tel: 603-422-8000; Fax: 603-422-8033; Email: slaird@anvilintl.com; Web: www.anvilintl.com

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

14.2 FITTINGS

A. Material:

1. Couplings and Grooved Flange Adapters shall conform to ASTM A-536 Ductile Grade 65-45-12 or to ASTM A-47 Malleable Grade 32510.

2. Coupling Track Head Bolts shall conform to ASTM A-183 Grade 2.

3. Hex nuts shall conform to ASTM A-563 Grade A. Bolts and nuts shall be zinc electroplated.

4. Fittings shall conform to Cast Ductile ASTM A-536 or Cast Malleable ASTM A-47.

5. Forged steel fittings shall conform to ASTM A-234 or A-106 Grade B.

6. Segmental welded fittings shall conform to ASTM A-53.

7. Coatings shall be Standard (Orange) Alkyd-enamel rust inhibiting lead free paint.

8. Hot dipped galvanized fittings shall conform to ASTM A-153.

9. Standard coupling gaskets for building services shall be Grade "E" EPDM conforming to ASTM D-2000 with operating temperature range from -40 degrees F to +230 degrees F (-40 degrees C to 110 degrees C).

B. Gaskets: Gruvlok Product Grade "E" EPDM pressure responsive design for all water and oil free air service. EPDM gaskets are color coded green.

1. Material conformance to grooved industrial standards ASTM D-2000.

2. Temperature operating range is -40 degrees to +230 degrees F (-40 degrees C to 110 degrees C).

3. Gruvlok Xtreme lubricant shall be used to insure proper gasket installation.

4. Gruvlok Xtreme Lubricant shall be used for all copper system installations, installations below - 20 degrees F (-28 degrees C), installations above 150 degrees F (66 degrees C) and installations that are subject to temperature cycles.

C. Gasket Lubricant: Coupling gaskets except where noted shall be lubricated with approved lubricant.

1. Copper Systems: Gruvlok Xtreme Lubricant.

2. Environments below -20 degrees F (-28 degrees C), and above 150 degrees F (66 degrees C) and systems subject to continuous cycle temperature changes: Gruvlok Xtreme Lubricant.

3. DRI-SEAL Fire Protection Gaskets: Standard Gruvlok lubricants.

D. Grooved Couplings for Steel Pipe Systems and other Approved Piping:

1. Sizes 1 inch to 30 inches (25 mm to 762 mm): Gruvlok Style 7401 (Rigidlok) couplings shall be used including style 7012 flange adapters.

2. Gruvlok Style 7001 (Flexible) couplings shall be used for vibration attenuation and noise suppression at equipment locations.

3. Combination rigid, flexible, and outlet couplings shall be used for vibration, noise suppression and seismic tremor.

4. Clamp type couplings shall be used for branch outlets. Grade "E" EPDM gaskets are standard, but other gasket materials are available. Flexible or other style couplings designed for axial motion or other movements shall be supported in strict accordance with factory recommendations.

E. Grooved Couplings for Copper Tube Systems: Coupling working pressure not to exceed 300 psig (2.0 MPa)).

1. Gruvlok style 7400 Rigidlite and style 7012 coupling flange adapters.
 2. Grade "E" EPDM gasket.
 3. Gruvlok Xtreme Lubricant.
- F. Grooved Flange Adapters: Flange adapters to transition from flange to groove with no nipple shall be Gruvlok Fig 7012 or Figure 7013:
1. Flanges in Figures 7012 and 7013 are designed with internal anti-rotation "tines" and are designated as a rigid connection.
 2. Figures 7012 and 7013 flange adapters require sealing rings when used with certain flanged products.
 3. Figure 7012: Conforms to ANSI class 125 or 150 lb (57 or 68 kg).
 - a. Sizes 2 inches through 20 inches (51 mm through 508 mm) are rated at 300 psig (2.0 MPa).
 - b. Size 24 inches (610 mm) is rated at 250 psig (1.72 MPa).
 4. Figure 7013: 2 inches through 12 inches (51 mm through 305 mm) available for ANSI class 250 or 300 lb (113 kg or 136 kg) bolt pattern and is rated at 750 psig (5 MPa).
- G. Grooved Fittings for Steel Piping Systems - Shall be Gruvlok cast ductile, malleable, forged steel, and/or segmental welded steel fittings.
1. Sizes 1 inches to 30 inches (25 mm to 762 mm) diameter:
 - a. Cast ductile conforms to ASTM A-536 or ASTM A-47.
 - b. Forged steel conforms to ASTM A-234.
 - c. Segmental welded conforms to ASTM A-53.
 2. Fittings shall be coated with an Alkyd-enamel non-toxic paint.
 3. Zinc electroplated fittings conform to ASTM B-633.
 4. Hot Dip Galvanized fittings conform to ASTM A-153.
 5. Standard Fittings shall be schedule 40 or standard wall. Other fittings are schedule 80 or lightwall as scheduled.
- H. Grooved Copper Fittings: Gruvlok Wrot Copper fittings per ASTM B-75 and ANSI B-16.22, alloy C12200.
1. Wrought Copper fittings size 2 inches to 8 inches (51 mm to 203 mm) diameter shall be schedule 10 or standard wall 304 or 316 stainless steel. Copper fittings shall be 99.9 percent lead free.
 2. Couplings and Wrought Copper Fittings shall be NSF, Plumbing Code approved and UL/ULC listed.
- I. Di-Electric Insulated Pipe Connections: Di-LOK Figure 7088 or 7089 grooved by grooved or grooved by thread insulating nipples.
1. Shall inhibit the formation of a galvanic cell between dissimilar metals.
 2. Housing: Steel tube to comply with ASTM A513.
 3. Liner: Polypropylene to ASTM D4140. 300 psig (2 MPa).
 4. Operating Temperature -40 degrees F to +230 degrees F (-40 degrees C to 100 degrees C).
 5. Size range is 3/4 inch to 6 inches (19 mm to 152 mm) diameter.
- J. Branch Outlets: Shall be Gruvlok Clamp-T Styles 7045 and 7046, and Clamp-T Cross Figure 7047, 7048 and 7049 with grooved or threaded outlets.
1. Designated as a bolted-on positive pipe engagement branch outlet. Working pressure to 500 psi (3.5 KPa).
 2. Run Sizes 2 inches to 8 inches (51 mm to 203 mm).
 3. Branch outlets from 1/2 inch to 3 inches (13 mm to 76 mm) diameter.
- K. Outlet Couplings: Shall be Gruvlok Figure 7042 with grooved or threaded outlets. Working pressure shall be 500-psig minimum.
1. Run sizes 1-1/2 inches to 6 inches (38 mm to 152 mm).
 2. Branch outlets from 1/2 inch to 2 inches (13 mm to 51 mm) diameter.
- L. Plain End Couplings and Fittings: Gruvlok Roughneck coupling Style 7005 and plain-end fittings to match.
1. Size range is 2 inches to 16 inches (51 mm to 406 mm) diameter. Materials conform to ASTM A-536 and A-47. Fittings are cast or forged steel. Intended for working pressures 300 to 750 psig (2.0 KPa to 5.2 KPa) with bolts fully torque to factory recommend torque requirements on plain-end or beveled standard wall steel pipe and Gruvlok Plain-End fittings. Fittings match coupling working pressure.
 2. Size range is 1 inch to 2-1/2 inches (25 mm to 64 mm) diameter: Plain End "Sock-it" Method: Gruvlok Sock-it fitting series 7100 through 7107. Material conforms to ASTM A-126 Class A Cast Iron. Working pressures from 175 - 300 psi (1.2 KPa to 2.0 KPa) UL/ULC listed and FM approved.
- M. Gaskets for Industrial and Other Piping Systems: Gaskets with different media products shall be provided with industrial grade gaskets as scheduled.
- N. Track Head Bolts and Hex Nuts: Couplings shall be furnished with heat-treated; oval neck track head bolts conforming to ASTM A-183 Grade 2. Bolts shall meet minimum tensile strength of 110,000 psi (758 KPa). Hex nuts shall be carbon steel conforming to ASTM A-563 Grade A. Bolts and nuts shall be zinc electroplated.
- 14.3 GROOVED CONNECTION FLOW CONTROL VALVES
- A. Grooved Butterfly Valve: Gruvlok Series 7700 and Series 8000GR grooved butterfly valves. Service usage for Balancing and On/Off service.
1. Series 7700: Butterfly Valve - Sizes 2 inches to 12 inches (51 mm to 305 mm). Listed in accordance with MSS SP-67. Bubble tight at 300 psig (2.1 MPa). Body - Ductile Iron, available with standard nylon body coating or epoxy body coated. Disc- Ductile Iron with EPDM encapsulation. Operating temperature -40 degrees F to + 230 degrees F (-40 degrees C to 110 degrees C). (Optional - Nitrile Disc encapsulation) Operating temperature up to +180 degrees F (82

degrees C) and Grade O Fluoroelastomer. Operating Temperature up to 230 degrees F (110 degrees C). Trim - 416 s/s. Bronze upper and lower shaft bearings conforming to ASTM B438, Grade 1 - type 1 for sizes 8 inches to 12 inches (203 mm to 305 mm) only. Low Torque. Rated for "Dead-end" service.

2. Disc-to-stem attachment shall be made with splined stainless steel stems attached to disc by cold fusion process.
 - a. Disc/stem seals shall be triple redundant as follows: 1. Disc-to-valve body; 2. EPDM seat-to-stem; 3. EPDM O-rings in upper and lower shaft.
 3. Series 8000GR: Butterfly Valve - Size range 14 inches to 24 inches (356 mm to 610 mm). Bubble tight to 200-psig (1.4 MPa). Body: Cast Iron to ASTM A-126 CL.B. Disc- Nickel-Plated Ductile, Aluminum Bronze or Stainless Steel. Liner- Standard EPDM or Nitrile. Operating temperature same as 7700 series. Bearings: Upper and lower bearings Teflon reinforced. Trim - 316 and 416 s/s. Low Torque. Rated for "Dead-end" service.
 4. BFV Operators/Handles - Series 7700 and 8000GR available in 2 position, 10 position latch lock, Infinite position with memory stop for sizes 2 inches through 8 inches (51 mm through 203 mm), Double "D" with gear operators, chain wheel, and pneumatic or electric actuated for sizes 2 inches through 12 inches (51 mm through 305 mm).
- B. Grooved Ball Valve - Shall be Gruvlok Series 7500. Sizes 2 inches to 6 inches. Standard port design rated for 740 psig (5.1 KPa) cwp. Meets MSS SP-72 body and 100 percent hydro pressure tested. The Series 7500 is compliant with NACE MR01-75 when stainless steel trim is specified. Bi-directional flow. Low torque operation. Body and End Caps - Ductile Iron ASTM 395 and Stainless Steel ASTM A351 CF8M. Ball and Stem - chrome plated carbon steel and 316 Stainless Steel. RPTFE and Nylon Seats and fluorocarbon stem and body seals. Two position handle standard.
1. Grooved Three Way Diverter Valve - Shall be Gruvlok Series FS7500 Stainless Steel body or FC7500 Carbon Steel Body 3-Way Diverter Valve. Full port design rated for 600 psig (4.1 KPa) cwp. Meets MSS SP-72 body and 100 percent hydrostatic pressure tested.
 2. Grooved Bronze Ball Valve- Shall be Gruvlok Series 7500B. Sizes 1-1/2 inches to 4 inches (38 mm to 102 mm) are rated 300 psi (1.9 KPa) WOG. Full port sizes 1-1/2 inches to 3 inches (38 mm to 76 mm) and standard port in the 4 inches (102 mm) version. Cast bronze body with stainless 316 ball and PTFE Seats and Seals. Valve shall comply with extraction requirements of NSF/ANSI 6.
- C. Gruvlok Tri-Service Valves - Model FTV-S.
- D. Gruvlok Tri-Service Valves - Model FTV-A.
1. Size: As indicated on drawings.
 2. Body and Yoke: Ductile iron; comply with ASTM A395 or ASTM A536.
 3. Disc: Cast iron, comply with ASTM A126.
 4. Stem: Bronze, comply with ASTM B21.
 5. Seat-Guide: Bronze, comply with ASTM B584.
 6. Disc Guide: Cast iron, comply with ASTM A126.
 7. Seat: Bronze.
 8. Flanged Gland: Cast iron, comply with ASTM A126.
 9. Packing: Graphited, non-asbestos packing.
 10. Spring: 302 stainless steel.
 11. Stem Guide: Ductile iron; comply with ASTM A395 or ASTM A536.
- E. Gruvlok Balancing Valves - Model GBV-S (Soldered).
- F. Gruvlok Balancing Valves - Model GBV-T (Threaded).
1. Size: As indicated on drawings.
 2. Material: Cast bronze.
 3. Type and Description: Y-style globe valve with 4 full-turn adjustment, pressure differential ports on both sides of the valve, with positive shutoff and micrometer type hand wheel adjustment. Provide tamperproof memory stop.
- G. Gruvlok Balancing Valves - Model GBV-G (Grooved-End Straight).
- H. Gruvlok Balancing Valves - Model GBV-A (Grooved-End Angle).
1. Size: As indicated on drawings.
 2. Body: Ductile iron, comply with ASTM A536.
 3. Disc: Bronze, comply with ASTM B584.
 4. Seat: Ultra-high strength engineered resin.
 5. Trim: Brass C-37700.
 6. O-ring: Nitrile.

14.4 MANUFACTURED UNITS

- A. Grooved (Non- Slam) Check Valve: Shall be Gruvlok Series 7800. Sizes 2 inches to- 12 inches (51 mm to 305 mm). 300-psig (1.9 KPa). . Body- Ductile. Exterior body coated with rust Inhibiting paint. (Optional body coat is Nickel Zn Electroplated) Clapper- sizes 2 inches to 5 inches (51 mm to 127 mm) -- Type 304 or 302 s/s to ASTM A-167. Clapper- sizes 6 inches to 12 inches (152 mm to 305 mm). - Ductile Iron. Clapper facing- EPDM or Nitrile. Seat ring, spring, and hinge pin: - Type 302 or 304 s/s. Bronze hinge pin bushings. Iron hinge pin plugs and drain. Service from 300 psi (1.9 KPa) to a low 1 psi (28 inch water head) (6895 Pa). Replaceable clapper. Horizontal or vertical service usage. MSS SP-71 & SP-80. 100 percent Shell Test & Hydro Seat test pressure 100 percent.
- B. Grooved (Globe Type) Silent Check Valve: Shall be Gruvlok Series 400 G. Sizes 2 inches to 10 inches. Rated for 200-psi

- (1.3 KPa) maximum working pressure. Operating temperature to 200 degrees F (93 degrees C). Body- Ductile. Bronze Seat, Plug and Bushing. Durlon Gasket. Trim- Metal on Metal. Optional Trim- Bronze w/ Nitrile Seat, s/s and s/s w Nitrile Seat. Center-guided plug. (Positive noiseless opening and closing) Plug activated at 1/4 to 1/2 psi (1723 Pa to 3448 Pa).
1. Di-Electric Insulated Pipe Connections: Shall be Di-Lok Figure 7088 or 7089 grooved by grooved or grooved by thread insulating nipples. Inhibits the formation of a galvanic cell between dissimilar metals. Housing- Steel Tube to ASTM A513. Liner- Polypropylene to ASTM D4140. 300 psig (1.9 KPa). Operating temperature -40 degrees F to +230 degrees F (-40 degrees C to 110 degrees C).
- C. Grooved Strainers: Shall be Gruvlok Series 7260-T ("Tee" Type) or 758-G or 768-GF ("Wye" Type) strainers.
 1. Tee Strainer Series 7260: Sizes 2 inches to 24 inches (51 mm to 610 mm). Strainer in-line, twin-fold basket provides 100 percent of the projected pipe area for open flow. Body- Ductible 2 inches to 12 inches (51 mm to 305 mm) Malleable Iron ASTM A47 or Ductile Iron ASTM A536, Size 14 inches (356 mm) and larger: Carbon Steel Pipe ASTM A53. Basket- Stainless steel Type 304-basket standard #12 mesh (1/16 inch perf.) (1.6 mm perf.) through 3 inches (76 mm). Sizes 4 inches and larger standard with #6 mesh (1/8 inch perf.) (3.2 mm perf.). Monel or other alloy baskets, magnets, and various mesh sizes optional. Horizontal or vertical service usage.
 2. Wye Strainers 758-G & 768GF: Size range 2 inches to 12 inches (305 mm). Body- Ductile iron. 300 psig (1.9 KPa). Baskets- Same as Tee Series.
 - D. Grooved Suction Diffusers: Shall be Gruvlok Series 7250. Sizes 2-1/2 inches to 16 inches (64 mm to 406 mm). Body- Ductile or Malleable Iron body for sizes 2-1/2 inches by 2-1/2 inches through 10 inches by 8 inches (64 mm by 64 mm through 254 mm by 203 mm). Body- Carbon steel to ASTM A-53 body for sizes 10 inches by 10 inches through 16 inches by 14 inches (254 mm by 254 mm through 406 mm by 356 mm). 300 psig (1.9 KPa). Strainer Basket- Stainless steel (3/16 inch perf.) (4.76 mm perf.) With start-up #16 mesh pre-filter removable screen. Blow-down and gage plug standard.
 - E. Flexible Connectors: Sizes 2 inches to 12 inches (51 mm to 305 mm). Stainless steel tube and braid design. Carbon steel grooved, threaded & flanged end. Rated working pressure 150 to 300 psi (1.0 to 2.0 KPa).
 - F. Triple Duty Combination Valves: Shall be Gruvlok "Tri-Service" (FTV-A/FTV-S) service valves. Sizes 2-1/2 inches to 12 inches (64 mm to 305 mm). Services- Combination shut-off, non-slam silent check and full throttling. Throttling flow indicator is standard. Horizontal or vertical service usage. Flow measurement ports on either side of valve body. Fixed or portable meters available for differential pressure measurement.
 - G. Calibrated Circuit (Setter) Balancing Valves: Shall be GBV-Gruvlok "Circuit Balancing" Valve. Sizes 1/2 inch to 12 inches (13 mm to 305 mm). Multi-turn adjustment. Positive shut-off. Tamper-proof memory stop. Pressure differential read-out ports. Differential Pressure Meter- Provide CBV differential pressure meter/transducer as required. Direct Flow readout. Proportional balancing.
 - H. Automatic Air Vents - Gruvlok Models GAV-15 rated 150 psig and GAV-30 rated 300 psig.
- 14.5 PIPING
- A. Steel Piping:
 1. Refer to Section 23 05 00 - Common Work Results for HVAC.
 - B. Copper Piping:
 1. Refer to Section 23 05 00 - Common Work Results for HVAC.
 - C. Stainless Steel Piping:
 1. Refer to Section 23 05 00 - Common Work Results for HVAC.
 - D. Aluminum Piping:
 1. Refer to Section 23 05 00 - Common Work Results for HVAC.
 - E. Steel Piping:
 1. Refer to Section 23 05 00 - Common Work Results for HVAC.
 - F. Plastic Piping:
 1. Refer to Section 23 05 00 - Common Work Results for HVAC.
- 14.6 ACCESS PANELS
- A. Provide access panels as required by Section 08 31 16 - Access Panels and Frames.
- 14.7 FIRESTOPPING MATERIALS
- A. Provide fire stopping assemblies as required by Section 07 84 13 - Penetration Firestopping Mortars.
- 14.8 EQUIPMENT SUPPORTS
- A. Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of Section 05 12 16 - Fabricated Fireproofed Steel Columns.
- 14.9 EQUIPMENT ANCHOR BOLTS AND TEMPLATES
- A. Provide templates to ensure accurate location of anchor bolts.

PART 15 EXECUTION

15.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

15.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Provide openings as necessary to permit installation of piping or any other part of work under this Section.
- D. Provide sleeves for piping penetrating floor and masonry walls.
- E. This Contractor shall be responsible for establishing sizes and locations of all openings and lintels in new work and to transmit this information to the Contractor whose work is involved at such time as to avoid cutting and patching.
- F. All patching shall match adjacent surfaces.
- G. Contractor shall inspect and take note of existing conditions along with the Owner's Representative to avoid disputes regarding the condition of existing surface before work began.
- H. Openings through existing concrete shall be core-drilled or saw cut.

15.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

15.4 VALVE INSTALLATION

- A. Tri-Service Valves - Models FTV-S, FTV-A:
 - 1. Mount valve to a spool piece on the discharge side of the pump. Spool piece required is based on a minimum recommended space of 12 inches (305 mm) for pump sizes 2 inches by 2 inches (51 mm by 51 mm) to 6 inches by 6 inches (152 mm by 152 mm) and 24 inches (610 mm) for pump sizes 8 inches by 8 inches (203 mm by 203 mm) to 12 inches by 12 inches (305 x 305 mm).
 - 2. Do not mount valve directly to pump to avoid causing undesirable noise in the system.
 - 3. Leave sufficient clearance around valve for valve removal or repair.
 - 4. Install valve in the direction of flow arrows on valve body.
 - 5. Mount valve to flanged equipment using Gruvlok Flange Adapter or industry standard grooved coupling, suitable for system pressure and temperatures encountered.
 - 6. Valve body has been designed to handle the weight of the pump on vertical in-line installations. The valve body is not designed to support the piping weight. Support piping by hangers. Provide pipe supports under valve and strainer bodies.
- B. Globe Valves - Model GBV-S (Soldered), GBV-T (Threaded), Balancing Valves - Model GBV-G (Grooved-End Straight), GBV-A (Grooved-End Angle):
 - 1. To ensure accuracy of measurement of GBV-S, GBV-T, GBV-G and GBV-A valves, locate valves at least 5 pipe diameters downstream from any fitting and at least 10 pipe diameters downstream from a pump.
 - 2. Install no fittings within 2 pipe diameters downstream of valve.
 - 3. Install valves with flow in the direction of the arrow on the valve body.
 - 4. Provide easy access to probe metering ports (PMPs), drain ports and hand wheel.
 - 5. For solder applications, solder valve body in line using 95/5 solder.
 - 6. Install valve-bonnet assembly into body, making sure non-asbestos gasket is in place.
 - 7. Install valves in horizontal or vertical piping as indicated.
 - 8. Do not install metering ports below the pipe (pointing down), as this will allow system sediment to accumulate in the ports.
 - 9. Metering ports and body/drain plugs may be interchanged for improved accessibility.

15.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

PART 16 GENERAL

16.1 SECTION INCLUDES

- A. Specialty piped systems.

16.2 RELATED SECTIONS

- A. Section 07 84 13 - Penetration Firestopping Mortars.
- B. Section 08 31 16 - Access Panels and Frames.
- C. Section 23 05 00 - Common Work Results for HVAC.
- D. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

16.3 REFERENCES

- A. American Society of Mechanical Engineers (ASME) B31.1 - Power Piping (SI Edition).
- B. American Society of Mechanical Engineers (ASME) B31.3 - Chemical Plant and Petroleum Refinery Piping.
- C. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) SP-127 Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, Application.

16.4 SYSTEM DESCRIPTION

- A. Grooved products for steel and copper piping specialty systems shall be used. Refer to Section 23 05 00 - Common Work Results for HVAC for related materials.
 - 1. Galvanized fittings to be used with galvanized pipe.
 - 2. Schedule 10 Type 304 or 316 grooved stainless steel pipe and grooved stainless steel fittings shall be used in conjunction with copper systems 8 inch (203 mm) diameter and above.
 - 3. Couplings shall not be galvanized unless system is exposed to a corrosive environment.
 - 4. Copper fittings shall be 99.9 percent lead free.
- B. Contractor Design Requirements:
 - 1. Incorporate in construction pipe hangers and supports to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.

16.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. [Product Data]: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Installation methods.
- C. Certifications:
 - 1. Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements. Certificates shall be furnished only as required by specific codes, upon request.
- D. Shop Drawings:
 - 1. Submit shop drawings and [Product Data] grouped to include complete submittals of related systems, products, and accessories in a single submittal.
- E. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- F. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- G. Closeout Submittals:
 - 1. Warranty: Warranty documents.
 - 2. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.

16.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Manufacturing facilities shall be registered to ISO 9001:2000 and assessed to ISO 9000.2000 standard. A copy of the current certificate shall be available upon request.
- B. Installer Qualifications:
 - 1. Contractor shall obtain all necessary permits and licenses pertaining to this Division (expense borne by the Contractor) and comply with Municipal and State Codes, Laws, Ordinances and Regulations, and the requirements of the National Fire protection Association, and pay all fees and sales taxes as required, and post all bonds incident thereto.
- C. Conduct pre-installation meeting to verify project requirements, coordinate with other trades, establish condition and completeness of substrate. Review manufacturer's installation instructions and manufacturer's warranty requirements.

16.7 DEFINITION

- A. "Piping" includes all pipe, fittings, valves, hangers, and other supports and accessories related to such piping.

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Methods and Materials

Hangers and
Supports

Pipes, Valves and Fittings
for Fire Protection Systems

Pipes, Valves and Fittings
for Plumbing Systems

Pipes, Valves and Fittings
for HVAC Heating and Cooling Systems

Piping
Specialties

- B. "Concealed" means hidden from sight in chases, furred spaces, shafts, hung ceilings, embedded in construction, in crawl spaces or buried.
- C. "Exposed" means not installed underground or "concealed" as defined above.
- D. "Fire Protection Work" is all of the work Indicated or required by the Contract Documents.
- E. "Or equivalent" means to possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity.
- F. "Provide" means the Contractor shall "furnish and install" work and/or equipment.
- G. "FPC" means the Fire Protection Contractor.

16.8 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

16.9 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

16.10 WARRANTY

- A. Contractor shall guarantee, in writing, that all work installed shall be free from any and all defects in workmanship and materials; that all apparatus shall develop capacities and characteristics specified; and that if, during the period of one year, or as otherwise specified, from the date of substantial completion, any defects in workmanship, material or performance appear, the Contractor shall, without cost to the Owner, remedy such defects within a reasonable time as specified in notice from the Owner's Representative. In default thereof, the Owner's Representative shall have the work done and charge the cost of the work to the Contractor.
- B. Furnish manufacturers written warranties for all equipment, stating effective date of Warranty, to the Owner's Representative.

PART 17 PRODUCTS

17.1 MANUFACTURERS

- A. Acceptable Manufacturer: Anvil International, which is located at: 110 Corporate Dr. Suite 10 ; Portsmouth, NH 03801; Tel: 603-422-8000; Fax: 603-422-8033; Email: slaird@anvilintl.com; Web: www.anvilintl.com
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

17.2 MANUFACTURED UNITS

- A. Grooved Butterfly Valve: Gruvlok Series 7700 and Series 8000GR grooved butterfly valves. Service usage for Balancing and On/Off service.
 1. Series 7700: Butterfly Valve - Sizes 2 inches to 12 inches (51 mm to 305 mm). Listed in accordance with MSS SP-67. Bubble tight at 300 psig (2.1 MPa). Body - Ductile Iron, available with standard nylon body coating or epoxy body coated. Disc- Ductile Iron with EPDM encapsulation. Operating temperature -40 degrees FSYMBOL 176 to +230 degrees F (-40 degrees C to 110 degrees C). (Optional - Nitrile Disc encapsulation) Operating temperature up to +180 degrees F (82 degrees C) and Grade O Fluoroelastomer. Operating Temperature up to 230 degrees F (110 degrees C). Trim - 416 s/s. Bronze upper and lower shaft bearings conforming to ASTM B438, Grade 1 - type 1 for sizes 8 inches to 12 inches (203 mm to 305 mm) only. Low Torque. Rated for "Dead-end" service.
 - a. Disc-to-stem attachment shall be made with splined stainless steel stems attached to disc by cold fusion process. Disc/stem seals shall be triple redundant as follows: 1. Disc-to-valve body; 2. EPDM seat-to-stem; 3. EPDM O-rings in upper and lower shaft.
 2. Series 8000GR: Butterfly Valve - Size range 14 inches to 24 inches (356 mm to 610 mm). Bubble tight to 200-psig (1.4 MPa). Body: Cast Iron to ASTM A-126 CL.B. Disc- Nickel-Plated Ductile, Aluminum Bronze or Stainless Steel. Liner- Standard EPDM or Buna N. Operating temperature same as 7700 series. Bearings: Upper and lower bearings Teflon reinforced. Trim - 316 and 416 s/s. Low Torque. Rated for "Dead-end" service.
 3. BFV Operators/Handles - Series 7700 and 8000GR available in 2 position, 10 position latch lock, Infinite position with memory stop for sizes 2 inches through 8 inches (51 mm through 203 mm), Double "D" with gear operators, chain wheel, and pneumatic or electric actuated for sizes 2 inches through 12 inches (51 mm through 305 mm).
- B. Grooved Ball Valve - Shall be Gruvlok Series 7500. Sizes 2 inches to 6 inches. Standard port design rated for 740 psig (5.1 KPa) cwp. Meets MSS SP-72 body and 100 percent hydro pressure tested. The Series 7500 is compliant with NACE MR01-75 when stainless steel trim is specified. Bi-directional flow. Low torque operation. Body and End Caps - Ductile Iron ASTM 395 and Stainless Steel ASTM A351 CF8M. Ball and Stem - chrome plated carbon steel and 316 Stainless Steel. RPTFE and Nylon Seats and fluorocarbon stem and body seals. Two position handle standard.
 1. Grooved Three Way Diverter Valve - Shall be Gruvlok Series FS7500 Stainless Steel body or FC7500 Carbon Steel Body 3-Way Diverter Valve. Full port design rated for 600 psig (4.1 KPa) cwp. Meets MSS SP-72 body and 100 percent hydrostatic pressure tested.
 2. Grooved Bronze Ball Valve- Shall be Gruvlok Series 7500B. Sizes 1-1/2 inches to 4 inches (38 mm to 102 mm) are

rated 300 psi (1.9 KPa) WOG. Full port sizes 1-1/2 inches to 3 inches (38 mm to 76 mm) and standard port in the 4 inches (102 mm) version. Cast bronze body with stainless 316 ball and PTFE Seats and Seals. Valve shall comply with extraction requirements of NSF/ANSI 6.

- C. Grooved (Non- Slam) Check Valve: Shall be Gruvlok Series 7800. Sizes 2 inches to 12 inches (51 mm to 305 mm). 300-psig (1.9 KPa). Body- Ductile. Exterior body coated with rust Inhibiting paint. (Optional body coat is Nickel Zn Electroplated) Clapper- sizes 2 inches to 5 inches (51 mm to 127 mm) -- Type 304 or 302 s/s to ASTM A-167. Clapper-sizes 6 inches to 12 inches (152 mm to 305 mm) - Ductile Iron. Clapper facing- EPDM or Nitrile. Seat ring, spring, and hinge pin: - Type 302 or 304 s/s. Bronze hinge pin bushings. Iron hinge pin plugs and drain. Service from 300 psi (1.9 KPa) to a low 1 psi (28 inch water head) (6895 Pa). Replaceable clapper. Horizontal or vertical service usage. MSS SP-71 & SP-80. 100 percent Shell Test & Hydro Seat test pressure 100 percent.
- D. Grooved (Globe Type) Silent Check Valve: Shall be Gruvlok Series 400 G. Sizes 2 inches to 10 inches. Rated for 200-psi (1.3 KPa) maximum working pressure. Operating temperature to 200 degrees F (93 degrees C). Body- Ductile. Bronze Seat, Plug and Bushing. Durlon Gasket. Trim- Metal on Metal. Optional Trim- Bronze w/ Buna Seat, s/s and s/s w Buna Seat. Center-guided plug. (Positive noiseless opening and closing) Plug activated at 1/4 to 1/2 psi (1723 Pa to 3448 Pa).
 - 1. Di-Electric Insulated Pipe Connections: Shall be Di-Lok Figure 7088 or 7089 grooved by grooved or grooved by thread insulating nipples. Inhibits the formation of a galvanic cell between dissimilar metals. Housing- Steel Tube to ASTM A513. Liner- Polypropylene to ASTM D4140. 300 psig (1.9 KPa). Operating temperature -40 degrees F to +230 degrees F (-40 degrees C to 110 degrees C).
- E. Grooved Strainers: Shall be Gruvlok Series 7260-T ("Tee" Type) or 758-G or 768-GF ("Wye" Type) strainers.
 - 1. Tee Strainer Series 7260: Sizes 2 inches to 24 inches (51 mm to 610 mm). Strainer in-line, twin-fold basket provides 100 percent of the projected pipe area for open flow. Body- Ductile 2 inches to 12 inches (51 mm to 305 mm) Malleable Iron ASTM A47 or Ductile Iron ASTM A536, Size 14 inches (356 mm) and larger: Carbon Steel Pipe ASTM A53. Basket- Stainless steel Type 304-basket standard #12 mesh (1/16 inch perf.) (1.6 mm perf.) Through 3 inches (76 mm). Sizes 4 inches and larger standard with #6 mesh (1/8 inch perf.) (3.2 mm perf.). Monel or other alloy baskets, magnets, and various mesh sizes optional. Horizontal or vertical service usage.
 - 2. Wye Strainers 758-G & 768GF: Size range 2 inches to 12 inches (305 mm). Body- Ductile iron. 300 psig (1.9 KPa). Baskets- Same as Tee Series.
- F. Grooved Suction Diffusers: Shall be Gruvlok Series 7250. Sizes 2-1/2 inches to 16 inches (64 mm to 406 mm). Body- Ductile or Malleable Iron body for sizes 2-1/2 inches by 2-1/2 inches through 10 inches by 8 inches (64 mm by 64 mm through 254 mm by 203 mm). Body- Carbon steel to ASTM A-53 body for sizes 10 inches by 10 inches through 16 inches by 14 inches (254 mm by 254 mm through 406 mm by 356 mm). 300 psig (1.9 KPa). Strainer Basket- Stainless steel (3/16 inch perf.) (4.76 mm perf.) With start-up #16 mesh pre-filter removable screen. Blow-down and gage plug standard.
- G. Flexible Connectors: Sizes 2 inches to 12 inches (51 mm to 305 mm). Stainless steel tube and braid design. Carbon steel grooved, threaded & flanged end. Rated working pressure 150 to 300 psi (1.0 to 2.0 KPa).
- H. Triple Duty Combination Valves: Shall be Gruvlok "Tri-Service" (FTV-A/FTV-S) service valves. Sizes 2-1/2 inches to 12 inches (64 mm to 305 mm). Services- Combination shut-off, non-slam silent check and full throttling. Throttling flow indicator is standard. Horizontal or vertical service usage. Flow measurement ports on either side of valve body. Fixed or portable meters available for differential pressure measurement.
- I. Calibrated Circuit (Setter) Balancing Valves: Shall be GBV-Gruvlok "Circuit Balancing" Valve. Sizes 1/2 inch to 12 inches (13 mm to 305 mm). Multi-turn adjustment. Positive shut-off. Tamper-proof memory stop. Pressure differential read-out ports. Differential Pressure Meter- Provide CBV differential pressure meter/transducer as required. Direct Flow readout. Proportional balancing.
- J. Automatic Air Vents - Gruvlok Models GAV-15 rated 150 psig and GAV-30 rated 300 psig.

17.3 PIPING

- A. Steel Piping:
 - 1. Refer to Section 23 05 00 - Common Work Results for HVAC.
- B. Copper Piping:
 - 1. Refer to Section 23 05 00 - Common Work Results for HVAC.
- C. Stainless Steel Piping:
 - 1. Refer to Section 23 05 00 - Common Work Results for HVAC.
- D. Aluminum Piping:
 - 1. Refer to Section 23 05 00 - Common Work Results for HVAC.
- E. Steel Piping:
 - 1. Refer to Section 23 05 00 - Common Work Results for HVAC.
- F. Plastic Piping:
 - 1. Refer to Section 23 05 00 - Common Work Results for HVAC.

17.4 ACCESS PANELS

- A. Provide access panels as required by Section 08 31 16 - Access Panels and Frames.

Basic Mechanical Methods and Materials

Hangers and Supports

Pipes, Valves and Fittings for Fire Protection Systems

Pipes, Valves and Fittings for Plumbing Systems

Pipes, Valves and Fittings for HVAC Heating and Cooling Systems

Piping Specialties

17.5 FIRESTOPPING MATERIALS

- A. Provide fire stopping assemblies as required by Section 07 84 13 - Penetration Firestopping Mortars.

17.6 EQUIPMENT SUPPORTS

- A. Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of Section 05 12 16 - Fabricated Fireproofed Steel Columns.

17.7 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

- A. Provide templates to ensure accurate location of anchor bolts.

PART 18 EXECUTION

18.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

18.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Provide openings as necessary to permit installation of piping or any other part of work under this Section.
- D. Provide sleeves for piping penetrating floor and masonry walls.
- E. This Contractor shall be responsible for establishing sizes and locations of all openings and lintels in new work and to transmit this information to the Contractor whose work is involved at such time as to avoid cutting and patching.
- F. All patching shall match adjacent surfaces.
- G. Contractor shall inspect and take note of existing conditions along with the Owner's Representative to avoid disputes regarding the condition of existing surface before work began.
- H. Openings through existing concrete shall be core-drilled or saw cut.

18.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

18.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

BRANDS OF ANVIL INTERNATIONAL



Anvil® product lines include malleable and cast iron fittings, unions and flanges; seamless steel pipe nipples; steel pipe couplings; universal anvilets; forged steel fittings and unions; pipe hangers and supports; threaded rod; and engineered hangers.



The Gruvlok® product line consists of couplings for grooved and plain-end fittings, butterfly valves and check valves; flanges; pump protection components; pipe grooving tools; as well as copper and stainless steel system components.



Anvil-Strut™ products include a complete line of channel in stock lengths of 10 and 20 feet, with custom lengths available upon request. A variety of fittings and accessories are also offered. All products can be ordered in an assortment of finishes and material choices including SupR-Green™, Zinc Trivalent Chromium, pre-galvanized, hot-dipped galvanized, electro-galvanized, aluminum, plain, and stainless steel.



JB Smith™ is the leading manufacturer of oil country tubular fittings, swages and bull plugs – all meeting API specifications. Offering tubing nipples, casing nipples as well as a full line of traditional line pipe and oil country threads in every schedule, JB Smith is the resource for all your oilfield needs.



Catawissa™ NACE and API approved wing unions for Standard Service are offered in non-pressure seal ends as well as threaded and butt weld, and are interchangeable with most leading union manufacturers. Fully traceable and available with complete mill certifications, Catawissa's oilfield wing union product line includes the standard ball-and-cone design plus our unique Figure 300 Flat Face design, where space and pipe line separation are a consideration.



AnvilStar™ offers a complete line of products for the fire protection industry, including Gruvlok® couplings, fittings, flanges; valves, and roll groovers; steel pipe nipples and couplings; cast and malleable iron threaded and flanged fittings; pipe hangers and supports; Merit® tee-lets, drop nipples; steel welding flanges; SPF grooved couplings, fittings, and flanges; SPF cast iron and ductile iron threaded fittings, o'lets, steel pipe nipples; and Mueller valves and indicator posts.



The SPF/Anvil™ product line includes a variety of internationally sourced products such as grooved couplings, fittings and flanges, cast iron, malleable iron and ductile iron threaded fittings, steel pipe nipples, as well as o'lets.



The Merit® product line includes a variety of tee-lets, drop nipples, and steel welding flanges for fire protection applications. Most Merit products are UL/ULC Listed, FM Approved, and rated from 175 to 300 psi.



Beck steel pipe nipples and steel pipe couplings are manufactured in accordance with the ASTM A733 Standard Specification for Welded and Seamless Carbon Steel and Stainless Steel Pipe Nipples. Steel pipe couplings are manufactured in accordance with the ASTM A865 Standard Specification for Threaded Couplings, Steel, Black or Zinc-Coated (Galvanized) Welded or Seamless, for Use in Steel Pipe Joints. Beck API couplings are manufactured in accordance with the API Specification for line pipe.



Canvil® manufactures low pressure hexagon reducer bushings, as well as plugs and hex caps up to 1" in diameter in various finishes including Oil Treat, Phosphate and Electro Galvanized. In addition, Canvil manufactures A105 hex or round material in class 3000 and 6000 pound, forged steel couplings and bar stock products offered as either as normalized (A105N) or non-normalized (A105) that are fully traceable for mechanicals and chemistry through our MTR program.



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BUILDING CONNECTIONS THAT LAST



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