

## SECTION 15000 – PIPING COMPONENTS

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. The Contractor shall furnish and install all piping systems shown and specified, in accordance with the requirements of the Contract Documents. Each system shall be complete with all necessary fittings, hangers, supports, anchors, seismic restraints, expansion joints, flexible connectors, valves, accessories, heat tracing, insulation, lining and coating, testing, disinfection, excavation, backfill and encasement, to provide a functional installation.
- B. The piping shown in the plans is intended to define the general layout, configuration, routing, method of support, pipe size, and pipe type. The plans are not pipe construction or fabrication drawings. It is the Contractor's responsibility to develop the details necessary to construct all mechanical piping systems, to accommodate the specific equipment provided, and to provide and install all spools, spacers, adapters, connectors, and other appurtenances for a complete and functional system.

#### 1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 – Submittals
- B. Section 01730 – Operation and Maintenance Data
- E. Section 09900 – Painting and Coating
- F. Section 15042 – Hydrostatic Testing of Pressure Pipelines

#### 1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Uniform Mechanical Code
- B. Uniform Plumbing Code
- C. Uniform Fire Code
- D. Commercial Standards: All equipment, products, and their installation shall be in accordance with the following standards, as applicable, and as indicated in each Section:
  - 1. American Society for Testing and Materials (ASTM)
  - 2. American National Standards Institute (ANSI)
  - 3. American Society of Mechanical Engineers (ASME)
  - 4. American Water Works Association (AWWA)
  - 5. American Welding Society (AWS)
  - 6. American Iron and Steel Institute (AISI)
  - 7. National Fire Protection Association (NFPA)

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E. The following standards have been referenced in this Section:

ANSI/ASME B1.20.1	Pipe Threads, General Purpose (inch)
ANSI B16.5	Pipe Flanges and Flanged Fittings, NPS ½ through NPS 24
ANSI/ASME B31.1	Power Piping
ANSI/AWWA C207	Steel Pipe Flanges for Water Works Service, Sizes 4 in through 144 in.
ANSI/AWS D1.1	Structural Welding Code – Steel
ANSI/MSS SP 58	Pipe Hangers and Supports – Materials, Design, and Manufacture
ANSI/MSS SP 69	Pipe Hangers and Supports – Selection and Application
ASTM A 36	Specification for Carbon Structural Steel
ASTM A 123	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 283	Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A 285	Specification for Pressure Vessel Plates, Carbon Steel, Low- and Intermediate- Tensile Strength
ASTM A 307	Specification for Carbon Steel Bolts and Studs, 60000 PSI Tensile Strength
ASTM A 325	Specification for High-Strength Bolts for Structural Steel Joints
ASTM A 563	Specification for Carbon and Alloy Steel Nuts
ASTM D 2000	Classification System for Rubber Products in Automotive Applications
ASTM/AWWA C219	Bolted, Sleeve-Type Couplings for Plain- End Pipe
AWWA Manual M11	Steel Pipe - A Guide for Design and Installation

### 1.4 CONTRACTOR SUBMITTALS

A. The Contractor shall submit complete shop drawings and certificates, test reports, affidavits of compliance, of all piping systems for review by the Engineer in accordance with the requirements in the Standard Specifications, and as indicated in the individual piping sections. The shop drawings shall include dimensions and details on pipe joints,

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fittings, fitting specials, harnessed joints, valves, pipe supports, restraints, hangers, anchors, guides, and appurtenances, and shall include design calculations and material lists. The submittals shall include detailed layout, spool, or fabrication drawings which show all pipe spools, spacers, adapters, connectors, fittings, and pipe supports and seismic restraints necessary to accommodate the equipment and valves provided in a complete and functional system.

- B. The Contractor shall submit operation and maintenance data in accordance with the Standard Specifications

### 1.5 QUALITY ASSURANCE

- A. Inspection: All pipe shall be subject to inspection at the place of manufacture. The Contractor shall notify the District in writing of the date for the start of each phase of pipe production and the dates for the proof of design tests. The notification shall be given at least 14 days prior to the start of the pipe manufacture. During the manufacture of the pipe, the District's Representative shall be given access to all areas where manufacturing is in progress and shall be permitted to make all inspections necessary to confirm compliance with the Standard Specifications.
- B. Tests: Except where otherwise indicated, all materials used in the manufacture of the pipe shall be tested in accordance with the applicable specifications and standards. Welds shall be tested as indicated. The Contractor shall perform all tests at no additional cost to the District. Copies of all test reports shall be furnished to the District.
- C. Welding Requirements: All welding procedures used to fabricate pipe shall be prequalified under the provisions of ANSI/AWS D1.1. Welding procedures shall be required for, but not necessarily limited to, longitudinal and girth or spiral welds for pipe cylinders, spigot and bell ring attachments, reinforcing plates and ring flange welds, and plates for lug connections.
- D. Welder Qualifications: Certified under Section IX, Part A of the ASME Boiler and Pressure Vessel Code or in accordance with AWWA C206, Section 3. Machines and electrodes similar to those used in the Work shall be used in qualification tests. The Contractor shall furnish all material and bear the expense of qualifying welders at no increased cost to the District.

### 1.6 MANUFACTURER'S SERVICE REPRESENTATIVE

- A. Where the assistance of a manufacturer's service representative is advisable in order to obtain perfect pipe joints, supports, or special connections, the Contractor shall furnish such assistance at no additional cost to the District.

### 1.7 MATERIAL DELIVERY, STORAGE, AND PROTECTION

- A. All piping materials, fittings, valves, and accessories shall be delivered in a clean and undamaged condition and shall be stored off the ground to provide protection against oxidation caused by ground contact. All defective or damaged materials shall be replaced with new materials.

### 1.8 CLEANUP

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- A. After completion of the Work, all remaining pipe cuttings, joining and wrapping materials, and other scattered debris, shall be removed from the site by the Contractor. The entire piping system shall be handed over to the District in a clean and functional condition.

### PART 2 - PRODUCTS

#### 2.1 GENERAL

- A. All pipes, fittings, and appurtenances shall be furnished in accordance with the requirements of the applicable Sections of Divisions 2 and 15 of the Standard Specifications and this Section.
- B. Pipe Supports: All pipes shall be adequately supported in accordance with the requirements of this Section.
  1. Code Compliance: All piping systems and pipe connections to equipment shall be properly anchored and supported to prevent undue deflection, vibration, dislocation due to seismic events and line pressures, and stresses on piping, equipment, and structures. All supports and parts thereof shall conform to the requirements of ANSI/ASME B31.1 - Power Piping, except as supplemented or modified below. Supports for plumbing piping shall be in accordance with the latest edition of the applicable plumbing code or local administration requirements.
  2. Structural Members: Wherever possible, pipes shall be supported from structural members. Where it is necessary to frame structural members between existing members, such supplementary members shall be provided at no additional cost to the District. All supplementary members shall be in accordance with the requirements of the building code and the American Institute of Steel Construction and shall be acceptable to the Engineer.
  3. Pipe Hangers: Pipe hangers shall be capable of supporting the pipe in all conditions of operation, allowing free expansion and contraction of the piping, and preventing excessive stress on equipment. All hangers shall have a means of vertical adjustment after erection. Hangers shall be designed to prevent becoming disengaged by any movement of the supported pipe. Hangers subject to shock, seismic disturbances, or thrust imposed by the actuation of safety valves, shall include hydraulic shock suppressors. All hanger rods shall be subject to tensile loading only.
  4. Hangers Subject to Horizontal Movements: At hanger locations where lateral or axial movement is anticipated, suitable linkage shall be provided to permit such movement. Where horizontal pipe movement is greater than a half-inch (1/2”), or where the hanger rod deflection from the vertical is greater than 4 degrees from the cold to the hot position of the pipe, the hanger rod and structural attachment shall be offset in such a manner that the rod is vertical in the hot position.
  5. Spring-Type Hangers: Spring-type pipe hangers shall be provided for piping subject to vibration or vertical expansion and contraction, such as engine exhausts and similar piping. All spring-type hangers shall be sized to the manufacturer's printed recommendations and the loading conditions encountered. Variable spring supports shall be provided with means to limit misalignment, buckling, eccentric loading, or to prevent overstressing of the spring, and with means to indicate at all times the

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compression of the spring. Supports shall be capable of accommodating at least four times the maximum travel due to thermal expansion.

6. Thermal Expansion: Wherever expansion and contraction of piping is expected, a sufficient number of expansion loops or joints shall be provided, together with the necessary rolling or sliding supports, anchors, guides, pivots, and restraints permitting the piping to expand and contract freely in directions away from the anchored points. All components shall be structurally suitable to withstand all loads imposed.
  7. Riser Supports: Where practical, risers shall be supported on each floor with riser clamps and lugs, independent of the connected horizontal piping.
  8. Freestanding Piping: Free-standing pipe connections to equipment such as chemical feeders and pumps shall be firmly attached to steel frames fabricated from angles, channels, or I-beams anchored to the structure. Exterior, free-standing overhead piping shall be supported on fabricated pipe stands consisting of pipe columns anchored to concrete footings, with horizontal, welded steel angles and U-bolts or clamps securing the pipes.
  9. Materials of Construction: All piping, as well as piping, conduits, and equipment in hydraulic structures, shall be supported with support, assemblies, including framing, hardware, and anchors, constructed of fiberglass reinforced plastic and Type 316 stainless steel, unless otherwise indicated.
  10. Point Loads: Any meters, valves, heavy equipment, and other point loads on PVC, FRP, and other plastic pipes, shall be supported on both sides, according to manufacturer's recommendations to avoid undue pipe stresses and failures. To avoid point loads, all supports on PVC, FRP, and other plastic piping shall be equipped with extra wide pipe saddles or galvanized steel shields.
  11. Noise Reduction: To reduce transmission of noise in piping systems, all copper tubes in buildings and structures shall be wrapped with a two-inch (2") wide strip of rubber fabric or similar, suitable material at each pipe support, bracket, clip, or hanger.
- C. Lining: The thickness, application, and curing of pipe lining shall be in accordance with the requirements of the applicable Sections of Division 2 of the Standard Specifications, unless otherwise indicated.
- D. Coating: The thickness, application, and curing of pipe coating shall be in accordance with the requirements of the applicable Sections of Division 2 of the Standard Specifications, unless otherwise indicated. Pipes installed above ground or in structures shall be field-painted in accordance with the Standard Specifications .
- E. Pressure Rating: All piping systems shall be designed for the maximum expected pressure as defined in Section 15042, or as indicated on the piping schedule.

### 2.2 PIPE FLANGES

- A. Flanges: Where the design pressure is 150 psi or less, flanges shall conform to either ANSI/AWWA C207 Class D or ANSI B16.5 150-pound class. Where the design pressure is greater than 150 psi, up to a maximum of 275 psi, flanges shall conform to

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either ANSI/AWWA C207 Class E, Class F, or ANSI B16.5 150-pound class. Where the design pressure is greater than 275 psi up to a maximum of 700 psi, flanges shall conform to ANSI B16.5 300-pound class. Flanges shall have flat faces and shall be attached with bolt holes straddling the vertical axis of the pipe unless otherwise shown. Attachment of the flanges to the pipe shall conform to the applicable requirements of ANSI/AWWA C207.

- B. Blind Flanges: Blind flanges shall be in accordance with ANSI/AWWA C207. All blind flanges for pipe diameters twelve-inches (12”) and over shall be provided with lifting eyes in form of welded or screwed eye bolts.
- C. Flange Coating: All machined faces of metal blind flanges and pipe flanges shall be coated with a temporary rust-inhibitive coating to protect the metal until the installation is completed.
- D. Flange Bolts: All bolts and nuts shall conform to this Section. Studs and bolts shall extend through the nuts a minimum of a fourth-inch (1/4”). All-thread studs shall be used on all valve flange connections, where space restrictions preclude the use of regular bolts.
- E. Insulating Flanges: Insulated flanges shall have bolt holes a fourth-inch (1/4”) diameter greater than the bolt diameter.
- F. Insulating Flange Sets: Insulating flange sets shall be provided where shown on the plans. Each insulating flange set shall consist of an insulating gasket, insulating sleeves and washers and a steel washer. Insulating sleeves and washers shall be one piece when flange bolt diameter is one and a half-inches (1 1/2”) or smaller and shall be made of acetal resin. For bolt diameters larger than one and a half-inches (1 1/2”), insulating sleeves and washers shall be two-piece and shall be made of polyethylene or phenolic. Steel washers shall be in accordance with ASTM A 325. Insulating gaskets shall be full-face.
- G. Insulating Flange Manufacturers, or Equal:
  - 1. Tripac
  - 2. Calpico, Inc.
  - 3. Farwest
  - 4. PSI Products, Inc., Gardena, California.
- H. Flange Gaskets: Gaskets for flanged joints shall be ring-faced, one eighth-inch (1/8”) thick compressed sheets of asbestos-free aramid fiber base, with nitrile binder and nonstick coating, suitable for temperatures to 700 degrees F, a pH of 1 to 11, pressures to 1,000 psig, and NSF-61. Blind flanges shall have gaskets covering the entire inside face of the blind flange and shall be cemented to the blind flange.
- I. Flange Gasket Manufacturers, or Equal:
  - 1. Tripac
  - 2. John Crane, Style 2160.

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3. Garlock, Style 3000.

- J. Nuts and Bolts: Bolts, nuts, and washers shall conform to ASTM A307, zinc plated, in accordance with this Section. All buried nuts and bolts shall be completely coated with no-oxide grease, as manufactured by KOP-COAT, Inc., or approved equal, which must be applied in two coats to a minimum thickness of 15 mils per coat.

Bolts, nuts and washers for aboveground, below ground structures, and sanitary sewer installations shall be Type 316 stainless steel. All aboveground or below ground structure bolt threads shall be lubricated with graphite and oil.

The fit shall be ANSI B1.1, "Unified Screw Threads," Class 2, except that Class 3 fit shall be used in holes tapped for studs. Threads may be made by either cutting or cold forming. Between fourth-inch (1/4") and three eighth-inch (3/8") shall project through the nut when drawn tight.

### 2.3 THREADED INSULATING CONNECTIONS

- A. General: Threaded insulating bushings, unions, or couplings, as appropriate, shall be used for joining threaded pipes of dissimilar metals and for piping systems where corrosion control and cathodic protection are involved.
- B. Materials: Threaded insulating connections shall be of nylon, Teflon, polycarbonate, polyethylene, or other nonconductive materials, and shall have ratings and properties to suit the service and loading conditions.
- C. Manufacturers: Isojoint or approved equal.

### 2.4 VICTAULIC COUPLINGS

- A. Couplings for Grooved and Shouldered Joints: Couplings shall be cast of ductile iron conforming to ASTM A536 Grade 65-45-12. Gaskets shall be EPDM (ethylene propylene diene monomer) conforming to ASTM D 2000. Nuts and bolts shall be in accordance with ASTM A183, 110,000 psi tensile strength.
- B. Couplings for pipe smaller than twenty four-inches (24") shall be flexible type, square cut groove, such as Victaulic Style 77, Gustin-Bacon Figure 100, or equal. Use Victaulic Style 44, or equal, couplings with Type "D" collars for pipe twenty four-inches (24") and larger.
- C. The grooves and shoulders for pipe shall conform to AWWA C606, latest revision.
- D. All rings for shouldered joints shall be provided by the coupling manufacturer.

### 2.5 SLEEVE-TYPE COUPLINGS

- A. Construction: Sleeve-type couplings shall be provided where indicated on the plans, in accordance with ANSI/AWWA C219 unless otherwise indicated on the plans, and shall be of steel with Type 316 stainless steel bolts, without pipe stop, and shall be of sizes to fit the pipe and fittings. The middle ring shall be not less than 1/4-inch in thickness and shall be either five-inches (5") or seven-inches (7") long for sizes up to and including

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thirty-inches (30") and ten-inches (10") long for sizes greater than thirty-inches (30"), for stainless steel couplings, and sixteen-inches (16") long for long-sleeve couplings. The followers shall be single-piece contoured mill section welded and cold-expanded as required for the middle rings. They shall be of sufficient strength to accommodate the number of bolts necessary to obtain adequate gasket pressures without excessive rolling. The shape of the follower shall be of such design as to provide positive confinement of the gasket. Bolts and nuts for buried couplings shall be Type 316 stainless steel. Bolts and nuts for exposed couplings shall conform to the requirements of this Section and shall be coated in accordance with the Standard Specifications. Buried sleeve-type couplings shall be fusion bonded epoxy lined and coated at the factory in accordance with AWWA C213.

- B. Pipe Preparation: The ends of the pipe, where indicated, shall be prepared for flexible steel couplings. Plain ends for use with couplings shall be smooth and round for a distance of twelve-inches (12") from the ends of the pipe, with outside diameter not more than one sixth four-inch (1/64") smaller than the nominal outside diameter of the pipe. The middle ring shall be tested by cold-expanding a minimum of one percent beyond the yield point, to proof-test the weld to the strength of the parent metal. The weld of the middle ring shall be subjected to air test for porosity.
- C. Gaskets: Gaskets for sleeve-type couplings shall be rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions. Gaskets for wastewater and sewerage applications shall be Buna "N," grade 60, or equivalent suitable elastomer. Gaskets shall be immune to attack by impurities normally found in water or wastewater. All gaskets shall meet the requirements of ASTM D 2000, AA709Z, meeting Suffix B13 Grade 3, except as noted above. All gaskets shall be compatible with the piping service and fluid conveyed. The rubber in the gasket shall meet the following specifications:
1. Color - Jet Black.
  2. Surface - Nonblooming.
  3. Durometer Hardness -  $74 \pm 5$ .
  4. Tensile Strength - 1,000 psi minimum.
  5. Elongation - 175 percent minimum.
- D. Insulating Couplings: Where insulating couplings are required, both ends of the coupling shall have a wedge-shaped gasket which assembles over a rubber sleeve of an insulating compound in order to obtain insulation of all coupling metal parts from the pipe.
- E. Restrained Joints: Sleeve-type couplings on pressure lines shall be harnessed unless thrust restraint is provided by other means. Harnesses shall conform to the requirements of the appropriate reference standard, to the requirements specified herein, or to the plans.
1. Joint Harnesses for Sleeve-Type Couplings on Steel Water Pipelines: Bolts and stud materials shall conform to ASTM A307, Grade B. Nuts shall conform to ASTM A563, Grade A, heavy hex. Lug material shall conform to one of the following: ASTM A36; ASTM A283 Grade B, Grade C, or D; or ASTM A285, Grade C. Lug dimensions shall be as shown in AWWA Manual M11. Lugs



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shall be Type P for pipe from six-inch (6”) through ten-inch (10”) diameter, and Type RR for pipe twelve-inch (12”) diameter and larger.

2. End Thrust: Joint harnesses shall be designed to accommodate the design working pressure of 200 psi plus a surge allowance of 66 psi.
3. Coating of Joint Harnesses: Coatings for joint harnesses shall conform to the Standard Specifications.

### F. Manufacturers, or Equal:

1. Dresser, Style 38.
2. Ford Meter Box Co., Inc., Style FC1 or FC3.
3. Smith-Blair, Style 411.

## 2.6 FLEXIBLE CONNECTORS

- A. Flexible connectors shall be installed in all piping connections to engines, compressors, and other vibrating equipment, and where shown on the plans. Flexible connectors for service temperatures up to 180 degrees F shall be flanged, reinforced Neoprene or Butyl spools, rated for a working pressure of 40 to 150 psi, or reinforced, flanged duck and rubber, as best suited for the application, unless otherwise shown. Flexible connectors for service temperatures above 180 degrees F shall be flanged, braided stainless steel spools with inner, annular, corrugated stainless steel hose, rated for minimum 150 psi working pressure, unless otherwise shown on the plans. The connectors shall be nine-inch (9”) long, face-to-face flanges, unless otherwise shown on the plans. The final material selection shall be approved by the manufacturer. The Contractor shall submit to the District, the manufacturer's shop drawings and calculations.

## 2.7 EXPANSION JOINTS

- A. All piping subject to expansion and contraction shall be provided with sufficient means to compensate for such movement, without exertion of undue forces to equipment or structures. This may be accomplished with expansion loops, bellow-type expansion joints, or sliding-type expansion joints. Expansion joints shall be of stainless steel, monel, rubber, or other materials, best suited for each individual service. The Contractor shall submit to the District detailed calculations and manufacturer's shop drawings, guaranteeing satisfactory performance of all proposed expansion joints, piping layouts showing all anchors and guides, and information on materials, temperature and pressure ratings.

## 2.8 QUICK DISCONNECT COUPLER

- A. All quick disconnect couplers shall be of “dry disconnect” type and be constructed of type 316 stainless steel. The size and location shall be as shown on the plans. The gaskets shall be made of Buna-N.
- B. Quick disconnect couplers shall be Model 600-F-SS Kamlock adapter as manufactured by Dover Corporation/ OPW Division or approved equal. Coupler shall be equipped with a lockable cap and have MIP x Male ends.

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### 2.9 PIPE THREADS

- A. All pipe threads shall be in accordance with ANSI/ASME B1.20.1

### 2.10 AIR AND GAS TRAPS

- A. Air and gas pipes shall be sloping to low points, provided with drip legs, shutoff valves, strainers and traps. The traps shall be piped to the nearest drain. Air and gas traps shall be not less than 150-pound iron body float type with copper or stainless steel float. Bracket, lever, and pins shall be of stainless steel. Drain traps shall have threaded connections.
- B. Manufacturers, or Equal:
  - 1. Armstrong Machine Works.
  - 2. Spirax Sarco, Inc.

### 2.11 LINK SEALS

- A. Contractor shall furnish and install complete link seal assemblies of size and location as shown on the plans. Link Seal Assemblies shall be as follows:
  - 1. Wall opening sizes (i.e. cored hole) shall be selected according to manufactured recommendations based on most recent Link Seal catalog or approved equal.
  - 2. Calculations shall be provided to determine sufficient quantity and type of Link Seal are provided to effectively provide a hydrostatic seal.
  - 3. Each individual link shall be clearly and permanently shown with the name of the manufacturer and model number.
- B. Link Seals shall be modular, mechanical type, consisting of inter locking synthetic rubber links shaped to continuously fill the annular space between the pipe and the wall opening. The elastomeric element shall be sized and selected per manufacturer's recommendations and have the following properties as designated by ASTM: EPDM = ASTM D2000 M3 BA510
- C. References to installation guideline's shall be latest published edition of Link Seal Selection Guide for the service intended.
- D. Approved Manufacturer's:
  - 1. Thunderline/Link Seal
  - 2. Or approved equal

### 2.12 Y-STRAINERS

- A. Unless otherwise indicated, y-type strainers shall be sized and installed as indicated in the plans and shall conform to the following requirements:

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1. Cast iron bodies
2. NPT screwed ends
3. Type 304 stainless steel screen with 1/32 inch perforations
4. Steel screen drain plug
5. Unit shall be suitable for minimum pressure of 250 psi

B. Approved Manufacturers:

1. Fisher Controls Company, Type 260C
2. Approved equal

2.13 PIPE UNIONS

- A. Screw unions may be employed on pipelines two and a half-inches (2 1/2") in diameter and smaller. Pipes and fittings made of non-ferrous metals shall be isolated from ferrous metals by nylon insulating pipe bushings, unions or couplings manufactured by Smith-Blair, Pipe Seal and Insulator Co. or approved equal.

2.14 RED BRASS PIPE

- A. Brass pipe shall conform to the requirements of the "Specifications for Seamless Red Brass Pipe, Standard Sizes" (ASTM B43).

2.15 PIPE SUPPORTS

- A. Supports for piping shall be spaced to prevent excessive sag, bending, and shear stresses in the piping, with special consideration given where components such as flanges and valves impose concentrated loads. Pipe support spacing shall not exceed the maximum spans in the tables below. For temperatures other than ambient temperatures and for other piping materials or wall thicknesses, the pipe support spacings shall be modified in accordance with the pipe manufacturer's recommendations. Vertical supports shall be provided to prevent the pipe from being overstressed from the combination of all loading effects.

1. Support Spacing for Schedule 40 and Schedule 80 Steel Pipe:

<u>Nominal Pipe Diameter (inches)</u>	<u>Maximum Span (feet)</u>
1/2	6
3/4 and 1	8
1-1/4 to 2	10
3	12
4	14
6	17
8 and 10	19
12 and 14	23
16 and 18	25

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2. Support Spacing for Welded Fabricated Steel Pipe:

Maximum Spans (feet) for Pipe Supported in Minimum 120 Degree Contact Saddles

Nominal Pipe Diameter (inches)	Wall Thickness – inches									
	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1
24	33	37	41	43	45	47				
26	34	38	41	44	46	48				
28	34	38	41	44	47	49				
30	34	38	42	45	48	49				
32	34	39	42	45	48	50				
34	35	39	42	46	48	50				
36	35	39	43	46	49	51	55			

For steel pipe sizes not presented in the previous table, the support spacing shall be designed so that the stress on the pipe does not exceed 5,000 psi. Maximum deflection of pipe shall be limited to 1/360th of the span and shall be calculated by using the formula:

$$L = [(7500tD) / (32t + D)]^{0.5}$$

Where: T = Thickness (inches)  
 D = Diameter (inches)  
 L = Maximum span (feet)

3. Support Spacing for Copper Tubing:

<u>Nominal Pipe Diameter (inches)</u>	<u>Maximum Span (feet)</u>
1/2 to 1-1/2	6
2 to 4	10
6 and greater	12

4. Support Spacing for Schedule 80 PVC Pipe:

<u>Nominal Pipe Diameter (inches)</u> <u>(at 100 degrees F)</u>	<u>Maximum Span (feet)</u>
1/2	4
3/4	4.5
1	5
1-1/4	5.5
1-1/2	5.75
2	6.25
3	7.5
4	8.25
6	10
8	11
10	12.25
12	13.25

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### B. MANUFACTURED SUPPORTS

1. Stock Parts: Designs shall exemplify good engineering practice and use stock or production parts. Such parts shall be locally available, new, of best commercial quality, designed and rated for the intended purpose.
2. Manufacturers or equal:
  - a. Unistrut
  - b. Bergen - Paterson Pipesupport Corp., Woburn, MA
  - c. Grinnell Corp., Exeter, PA
  - d. B – Line Systems Inc.

### C. COATING

1. Galvanizing: Unless otherwise indicated, all fabricated pipe supports other than stainless steel or non-ferrous supports shall be blast-cleaned after fabrication and hot-dip galvanized in accordance with ASTM A 123 - Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. Other Coatings: Other than stainless steel or non-ferrous supports, all supports shall receive protective coatings in accordance with the requirements of the Standard Specifications.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. All pipes, fittings, and appurtenances shall be installed in accordance with the requirements of Divisions 2 and 15 of the Standard Specifications. The lining manufacturer shall take full responsibility for the complete, final product and its application. All pipe ends and joints at screwed flanges shall be epoxy-coated, to assure continuous protection.
- B. Where core drilling is required for pipes passing through existing concrete, core drilling locations shall be determined by radiograph of concrete construction to avoid damage to embedded raceways and rebars.

### 3.2 PIPE SUPPORTS

- A. General: All pipe supports, seismic restraints, hangers, brackets, anchors, guides, and inserts shall be fabricated and installed in accordance with the manufacturer's printed instructions and ANSI/ASME B31.1 - Power Piping. All concrete inserts for pipe hangers and supports shall be coordinated with the formwork.
- B. Appearance: Pipe supports and hangers shall be positioned to produce an orderly, neat piping system. All hanger rods shall be vertical, without offsets. Hangers shall be

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adjusted to line up groups of pipes at the proper grade for drainage and venting, as close to ceilings or roofs as possible, and without interference with other work.

- C. Quality Control: Pipe hangers, supports, and seismic restraints shall be fabricated and installed by experienced welders and fitters, using the best welding procedures available. Fabricated supports shall be neat in appearance without sharp corners, burrs, and edges.

**\*\*END OF SECTION\*\***