SECTION 402510 - LIQUID ACIDS PIPING

Note that this section has only been edited for NYSOGS standardization and has not been technically edited. The designer shall make all technical edits specific to the project for this section.

This Section includes requirements for plant process piping systems transporting acids and acidic solutions in a water or wastewater treatment plant. Piping for Site utilities are specified in Division 33, plumbing piping and appurtenances are specified in Division 22, and process piping and valves are specified in Division 40.

In process industries such as water and wastewater treatment, piping is typically specified by pipe material. Individual piping systems (e.g., sanitary, raw water, drainage) may be defined on Drawings by using a pipe schedule that describes piping components required for that system and provides other relevant data such as pressure testing requirements and applicable valve types.

Piping, as well as fittings, joints, accessories, and other appurtenances, should be indicated on the pipe schedule and specified by pipe material in Division 40 based on service.

Valving, including appurtenances and accessories, should be indicated on valve schedule and specified by valve type in Division 40.

Consult with piping manufacturer and select materials based on type and strength of acid solution and specific application.

1. GENERAL
   * + 1. SUMMARY
          1. Section Includes:

Pipes and tubes for conveying liquid acid.

Requirements of Section 400523 - Stainless Steel Process Pipe and Tubing as applied to this Section.

* + - * 1. Related Requirements:

List other Sections directly related to or affecting Work of this Section. Include Sections specifying information expected to be found in this Section as well as Sections required to describe complete system or assembly requirements.

Section 400523 - Stainless Steel Process Pipe and Tubing: Pipe and tubing used for process systems.

Section 400561 - Gate Valves: Execution requirements for gate valves as specified by this Section.

Section 400562 - Plug Valves: Execution requirements for plug valves as specified by this Section.

Section 400563 - Ball Valves: Execution requirements for ball valves as specified by this Section.

Section 400564 - Butterfly Valves: Execution requirements for butterfly valves as specified by this Section.

* + - 1. DEFINITIONS

Limit list of definitions to terms unique to this Section and not provided elsewhere.

* + - * 1. PE: Polyethylene.
        2. PVDF: Polyvinylidene fluoride.
      1. REFERENCE STANDARDS

List reference standards included within text of this Section, with designations, numbers, and complete document titles.

* + - * 1. American Society of Mechanical Engineers:

ASME B1.1 - Unified Inch Screw Threads (UN and UNR Thread Form).

ASME B1.20.1 - Pipe Threads, General Purpose (Inch).

ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard.

ASME B16.9 - Factory Made Wrought Buttwelding Fittings.

ASME B16.11 - Forged Fittings, Socket-Welding and Threaded.

ASME B16.20 - Metallic Gaskets for Pipe Flanges: Ring-Joint, Spiral-Wound, and Jacketed.

ASME B16.21 - Nonmetallic Flat Gaskets for Pipe Flanges.

ASME B16.42 - Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300.

ASME B31.3 - Process Piping.

ASME B36.19M - Stainless Steel Pipe.

* + - * 1. ASTM International:

ASTM A105 - Standard Specification for Carbon Steel Forgings for Piping Applications.

ASTM A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.

ASTM A194 - Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.

ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

ASTM A312 - Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.

ASTM A351 - Standard Specification for Castings, Austenitic, for Pressure-Containing Parts.

ASTM A403 - Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings.

ASTM A479 - Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels.

ASTM A632 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing (Small-Diameter) for General Service.

ASTM A789 - Standard Specification for Seamless and Welded Ferritic/Austenitic Stainless Steel Tubing for General Service.

ASTM A813 - Standard Specification for Single- or Double-Welded Austenitic Stainless Steel Pipe.

ASTM A814 - Standard Specification for Cold-Worked Welded Austenitic Stainless Steel Pipe.

ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

ASTM D2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.

ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

ASTM D2310 - Standard Classification for Machine-Made "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.

ASTM D2464 - Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

ASTM D2609 - Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe.

ASTM D2737 - Standard Specification for Polyethylene (PE) Plastic Tubing.

ASTM D2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products.

ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.

ASTM D2992 - Standard Practice for Obtaining Hydrostatic or Pressure Design Basis for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Fittings.

ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.

ASTM D3222 - Standard Specification for Unmodified Poly(Vinylidene Fluoride) (PVDF) Molding Extrusion and Coating Materials.

ASTM D3308 - Standard Specification for PTFE Resin Skived Tape.

ASTM D3754 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer and Industrial Pressure Pipe.

ASTM D4024 - Standard Specification for Machine Made "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Flanges.

ASTM D4161 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals.

ASTM D5421 - Standard Specification for Contact Molded "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Flanges.

ASTM D5685 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe Fittings.

ASTM F336 - Standard Practice for Design and Construction of Nonmetallic Enveloped Gaskets for Corrosive Service.

ASTM F437 - Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.

ASTM F438 - Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.

ASTM F439 - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.

ASTM F441 - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.

ASTM F442 - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR).

ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing.

ASTM F1545 - Standard Specification for Plastic-Lined Ferrous Metal Pipe, Fittings, and Flanges.

* + - * 1. American Water Works Association:

AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. Through 3 In., for Water Service.

1. PRODUCTS
   * + 1. FIBERGLASS PIPING
          1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=12097&mf=04&src=wd):

designer to provide two manufacturers and approved equivalent for all listed products.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following Paragraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

* + - * 1. Furnish materials according to <**\_\_\_\_\_\_\_\_**> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

Potential applications of fiberglass-reinforced plastic (FRP) piping include phosphoric acid, sulfuric acid, and other chemical processing materials. Consult with piping manufacturer, and select materials based on specific application.

* + - * 1. Fiberglass-Reinforced Plastic (FRP) Pressure Pipe and Fittings:

Pipe: Comply with ASTM D3754, Type [**1**] [**2**] [**3**] [**4**], Pressure Class <**\_\_\_\_\_\_\_\_**>.

Pressure Rating:

[**<\_\_\_\_\_\_\_\_> psig**] [**As indicated in pipe schedule**] <**\_\_\_\_\_\_\_\_**>.

Comply with [**ASTM D2310**] [**and**] [**ASTM D2992**].

Fittings:

Non-flanged: Comply with ASTM D5685.

Flanged: Comply with ASTM D5421.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Flanged: Comply with ASTM D4024, Type [**A**] [**B**], Grade <**\_\_\_\_\_\_\_\_**>, Class [**I**] [**II**].

Joints: [**Bell and spigot, ASTM D3754**] [**Bell and spigot, ASTM D4161**] [**Butt, ASTM D3754**] [**Flanged**] <**\_\_\_\_\_\_\_\_**>.

* + - 1. PVC PIPING AND TUBING
         1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=12098&mf=04&src=wd):

designer to provide two manufacturers and approved equivalent for all listed products.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following Paragraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

* + - * 1. Furnish materials according to <**\_\_\_\_\_\_\_\_**> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

Potential applications of PVC piping and tubing include hydrochloric acid, phosphoric acid, and other chemical processing materials. Consult with piping manufacturer and select materials based on specific application.

* + - * 1. Piping:

Pipe: Comply with ASTM D1785, Schedule [**40**] [**80**] <**\_\_\_\_\_\_\_\_**>.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Pipe: Comply with ASTM D2241, [**SDR-26 for 160-psig pressure rating, calculated according to ASTM D2837**] [**SDR-41 for 100-psig rating, calculated according to ASTM D2837**] [**SDR-21 for 200-psig rating, calculated according to ASTM D2837**] [**as indicated on pipe schedule**].

Fittings:

[**Schedule 40, ASTM D2466**] [**Schedule 80, ASTM D2467**].

[**Socket, solvent-welded, ASTM D2855**] [**Threaded, ASTM D2464**] <**\_\_\_\_\_\_\_\_**>.

Joints: [**Socket, solvent-welded, ASTM D2855**] [**Threaded, ASTM D2464**] <**\_\_\_\_\_\_\_\_**>.

* + - * 1. Tubing:

Tube:

[**Clear**] <**\_\_\_\_\_\_\_\_**>.

Size and Wall Thickness: [**As indicated on pipe schedule**] <**\_\_\_\_\_\_\_\_**>.

Pressure Rating: As indicated on [**Drawings**] [**pipe schedule**].

Fittings: Compression type; materials suitable for application.

Threads: Straight; ASME B1.20.1

* + - 1. CPVC PIPING
         1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=12099&mf=04&src=wd):

designer to provide two manufacturers and approved equivalent for all listed products.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following Paragraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

* + - * 1. Furnish materials according to <**\_\_\_\_\_\_\_\_**> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

Potential applications of CPVC piping include sulfuric acid and other chemical processing materials. Consult with piping manufacturer and select materials based on specific application.

* + - * 1. Piping:

Pipe: Comply with ASTM F441, Schedule [**40**] [**80**].

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Pipe: Comply with ASTM F442, SDR-<**\_\_\_\_\_\_\_\_**>.

Fittings:

Flanged: Comply with ASME B16.5, Class [**125**] <**\_\_\_\_\_\_\_\_**>.

Socket Welded: [**Schedule 40, ASTM F438**] [**Schedule 80, ASTM F439**].

Threaded:

Schedule 80, ASTM F437.

Threads: ASME B1.20.1.

Joints: [**Socket welded**] [**Flanged**] [**Push-on**] [**Threaded**].

* + - 1. POLYVINYLIDENE FLUORIDE (PVDF) PIPING AND TUBING
         1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=12100&mf=04&src=wd):

designer to provide two manufacturers and approved equivalent for all listed products.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following Paragraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

* + - * 1. Furnish materials according to <**\_\_\_\_\_\_\_\_**> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

Potential applications of PVDF piping and tubing include fluorosilicic acid and other chemical processing materials. Consult with piping manufacturer and select materials based on specific application.

* + - * 1. Piping:

Pipe: Comply with ASTM D3222, Schedule [**40**] [**80**].

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Pipe: [**SDR as indicated on pipe schedule**] [**SDR-<\_\_\_\_\_\_\_\_>, calculated according to ASTM D2837**].

Butt and socket welding are preferred methods for joining PVDF pipe. A common recommendation for PVDF fittings is that butt welding be used for sizes 1/2 inch to 12 inches and socket welding be used for sizes 3/8 inch to 4 inches.

Threading is available for Schedule 80 piping only.

Fittings:

Comply with ASTM D3222.

Type: Molded.

End Connections: [**Butt welded**] [**Socket welded**].

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

End Connections: Flanged, ASME B16.5, Class [**125**] <**\_\_\_\_\_\_\_\_**>.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

End Connections: Threaded, ASME B1.20.1

Joints: [**Butt fusion**] [**Socket fusion**] [**Threaded**] [**Flanged**].

* + - * 1. Tubing:

Tube:

Size and Wall Thickness: [**As indicated on pipe schedule**] <**\_\_\_\_\_\_\_\_**>.

Pressure Rating: As indicated on [**Drawings**] [**pipe schedule**].

Fittings:

Type: Compression.

Materials: Suitable for application.

* + - 1. POLYPROPYLENE (PP) PIPING
         1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=12101&mf=04&src=wd):

designer to provide two manufacturers and approved equivalent for all listed products.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following Paragraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

* + - * 1. Furnish materials according to <**\_\_\_\_\_\_\_\_**> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

Potential applications of PP piping include fluorosilicic (hydrofluorosilicic), phosphoric, and sulfuric acids and other chemical processing materials. Consult with piping manufacturer and select materials based on specific application.

* + - * 1. [**Polypropylene (PP)**] [**Fire-Retardant Polypropylene (PPFR)**] Piping:

Pipe:

Material: [**PP**] [**PPFR**].

[**Flame retardant.**]

Fittings: [**PP**] [**PPFR**].

Joints: Electrical-resistance fusion.

* + - 1. POLYETHYLENE (PE) PIPING AND TUBING
         1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=12102&mf=04&src=wd):

designer to provide two manufacturers and approved equivalent for all listed products.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following Paragraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

* + - * 1. Furnish materials according to <**\_\_\_\_\_\_\_\_**> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

Potential applications of PE piping and tubing include hydrochloric acid and other chemical processing materials. Consult with piping manufacturer and select materials based on specific application.

ASTM D3035 piping is available in ten different wall thicknesses, ranging from DR 32.5 (thinnest) to DR 7 (thickest), with pressure ratings from 160 psig to 840 psig. Coordinate wall thickness and pressure rating with required service conditions.

* + - * 1. Piping:

Pipe: Comply with [**AWWA C901**] [**ASTM D3035, DR <\_\_\_\_\_\_\_\_> for <\_\_\_\_\_\_\_\_> psig pressure rating**].

Fittings:

Material: PE.

Comply with AWWA C901.

Type: Molded [**or fabricated**].

Joints: [**Compression**] [**Butt fusion**].

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

ASTM D2239 includes six standard inside diameter dimension ratio (SIDR) wall thicknesses, ranging from SIDR 19 to SIDR 5.3. SIDR 19 most closely matches Schedule 40 pipe.

* + - * 1. Piping:

Pipe: Comply with ASTM D2239, SIDR 19.

Fittings:

Material: PE.

Comply with ASTM D2609.

Joints: Mechanical with stainless steel clamps.

* + - * 1. Tubing:

Tube:

Comply with AWWA C901.

Size and Wall Thickness: Comply with [**ASTM D2737**] [**ASTM F876**] [**; as indicated on piping schedule**] <**\_\_\_\_\_\_\_\_**>.

Pressure Rating: As indicated on [**Drawings**] [**piping schedule**].

Fittings:

Type: Compression.

Materials: Suitable for application.

Threads:

Type: Straight.

Comply with ASME B1.1.

* + - 1. LINED STEEL PIPING
         1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=12103&mf=04&src=wd):

designer to provide two manufacturers and approved equivalent for all listed products.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following Paragraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

* + - * 1. Furnish materials according to <**\_\_\_\_\_\_\_\_**> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

Potential applications of PVDF-lined piping include fluorosilicic acid and other chemical processing materials. Consult with piping manufacturer and select materials based on specific application.

* + - * 1. PVDF-Lined Steel Piping:

Liner: Comply with ASTM F1545 and as indicated on [**Drawings**] [**pipe schedule**].

Maximum Design Pressure: <**\_\_\_\_\_\_\_\_**> psig at <**\_\_\_\_\_\_\_\_**> degrees F

Maximum Operating Temperature: 275 degrees F

Minimum Liner Thickness: <**\_\_\_\_\_\_\_\_**> mil

Lock liner to shell.

Gaskets: [**Rubber**] [**As indicated on pipe schedule**] <**\_\_\_\_\_\_\_\_**>.

PTFE-lined piping offers a relatively high maximum operating temperature. This liner material is virtually inert. Potential applications are nitric acid and other chemical processing materials. Consult with piping manufacturer and select materials based on specific application.

Operating temperature limitations may be encountered depending on specific chemical environments.

* + - * 1. PTFE-Lined Steel Piping:

Furnish as indicated on [**Drawings**] [**pipe schedule**].

Maximum Design Pressure: <**\_\_\_\_\_\_\_\_**> psig at <**\_\_\_\_\_\_\_\_**> degrees F

Maximum Operating Temperature: 450 degrees F

Minimum Liner Thickness: <**\_\_\_\_\_\_\_\_**> mil

Lock liner to shell.

Gaskets: [**Rubber**] [**As indicated on pipe schedule**] <**\_\_\_\_\_\_\_\_**>.

Flanges:

Pipes 1 inch through 8 inches Forged steel, Class [**150**] [**300**], ASTM A105,[**ASME B16.5**] [**ASME B16.42**].

Pipes 10 inches through 12 inches: Flared steel, lap jointed, Class [**150**] <**\_\_\_\_\_\_\_\_**>, ASTM A105, [**ASME B16.5**] [**ASME B16.42**].

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Flanges:

Pipes 4 inches and Larger: Flat-face; conforming to AWWA C207, Class D.

* + - * 1. Glass-Lined Steel Piping:

Potential applications of glass or glass-lined piping include sulfuric acid and other chemical processing materials. Consult with piping manufacturer and select materials based on specific application.

Liner: [**Chemically resistant, low-expansion, borosilicate glass**] [**Porcelain enamel**] <**\_\_\_\_\_\_\_\_**> and according to ASTM E438.

Operating Temperature Range: Minus 20 degrees F to plus 200 degrees F

Working Pressure: 150 psig [**and full vacuum**].

Minimum Liner Thickness: <**\_\_\_\_\_\_\_\_**> mil

Lock liner to shell.

Gaskets: [**PTFE**] <**\_\_\_\_\_\_\_\_**>-enveloped gaskets according to ASTM F336.

* + - 1. STAINLESS-STEEL PIPING AND TUBING
         1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=12104&mf=04&src=wd):

designer to provide two manufacturers and approved equivalent for all listed products.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

Potential applications of Type 316 stainless-steel piping and tubing include phosphoric acid and other chemical processing materials. Consult with piping manufacturer and select materials based on specific application.

* + - * 1. Piping:

Pipe: Comply with ASTM A312 [**, welded**] [**, seamless**].

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Pipe: Comply with ASTM A813 Class [**SW**] [**DW**].

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Pipe: Comply with ASTM A814 Class [**SW**] [**DW**] <**\_\_\_\_\_\_\_\_**>, Type 316.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Pipe: Comply with ASME B36.19M.

Wall Thickness: [**Schedule <\_\_\_\_\_\_\_\_>**] [**as indicated on Drawings**] [**as indicated on pipe schedule**] [**<\_\_\_\_\_\_\_\_>**].

Fittings:

Description:

Piping 2 inches and Smaller: Socket-weld type.

Piping 2-1/2 inches and Larger: Butt-weld type.

Threaded:

Comply with ASME B16.11, Type 316.

Threads: ASME B1.20.1

Butt-Welded: Comply with [**ASTM A403** ] [**ASME B16.9**], Type 316.

Socket-Welded: Comply with ASME B16.11, Type 316.

Flanged:

Type: [**Welding neck**] [**Slip-on**] [**Socket welded**] [**Lapped**] [**Threaded**].

Class: [**150**] [**300**] <**\_\_\_\_\_\_\_\_**>.

Comply with ASME B16.5, Type 316.

Facing: [**<\_\_\_\_\_\_\_\_>-inch raised face**] [**Flat face**] <**\_\_\_\_\_\_\_\_**>.

Backing Flanges:

Class [**150**] <**\_\_\_\_\_\_\_\_**>, Type 316 stainless steel.

Comply with ASTM A351 Grade <**\_\_\_\_\_\_\_\_**>.

Van Stone type.

Drilling: ASME B16.5.

* + - * 1. Tubing:

Tube:

Comply with [**ASTM A269**] [**ASTM A632**], [**seamless**] [**welded**], Type 316.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Comply with ASTM A789 [**seamless**] [**welded**], Grade <**\_\_\_\_\_\_\_\_**>.

Dimensions: [**As indicated on Drawings**] [**As indicated on pipe schedule**].

Fittings:

Threaded Fittings:

Comply with ASME B16.11.

Threads: Comply with ASME B1.20.1

Butt-Welding Fittings: Comply with [**ASTM A403**] [**ASME B16.9**], Type 316.

Socket-Welding Fittings:

Comply with [**ASTM A403]** [**ASME B16.9**], Type 316.

Flanged Fittings:

Type: [**Welding neck**] [**Slip-on**] [**Socket welded**] [**Lapped**] [**Threaded**].

Class: [**150**] [**300**] <**\_\_\_\_\_\_\_\_**>.

Comply with ASME B16.5, Type 316.

Facing: [**<\_\_\_\_\_\_\_\_>-inch raised face**] [**Flat face**] <**\_\_\_\_\_\_\_\_**>.

Backing Flanges:

Class [**150**] <**\_\_\_\_\_\_\_\_**>, Type 316 stainless steel.

Comply with ASTM A351 Grade <**\_\_\_\_\_\_\_\_**>.

Van Stone type.

Drilling: ASME B16.5.

Bolts: Comply with ASTM A193, Grade [**B5**] [**B7**] <**\_\_\_\_\_\_\_\_**>; hex head.

Nuts: Comply with ASTM A194, Grade <**\_\_\_\_\_\_\_\_**>; hex head.

Washers: Constructed of same material as bolts.

Crimp Fittings:

Type: Cold drawn.

Material: Type 316 stainless steel.

Compression Fittings:

Comply with ASTM A479

Material: Type 316 stainless steel.

Pressure Rating: As indicated on [**Drawings**] [**pipe schedule**].

* + - 1. ACCESSORIES
         1. Pipe-Thread Tape:

Material: PTFE.

Comply with ASTM D3308.

* + - * 1. Flange Gaskets:

ASME B16.5, to suit application.

Nonmetallic Gaskets: ASME B16.21, to suit application.

Metallic Ring Joint Gaskets: ASME B16.20, to suit application.

Raised-Face Flanges: Flat ring type.

Flat-Face Flanges: Full-face type.

* + - * 1. Dielectric Fittings: Furnished between dissimilar metals.

1. EXECUTION
   * + 1. EXAMINATION
          1. Verify conditions as specified in Section 400523 - Stainless Steel Process Pipe and Tubing.
       2. PREPARATION
          1. Protect equipment and other materials from damage and intrusion of water.
       3. INSTALLATION
          1. Piping and Appurtenances:

As indicated on [**Drawings**] [**Shop Drawings**].

Use minimum number of joints.

According to manufacturer instructions.

According to ASME B31.3.

* + - * 1. In locations where pipe expansion joints are indicated, install pipe alignment guides adjacent to and within [**four**] <**\_\_\_\_\_\_\_\_**> pipe diameters of joint.
        2. Field Fabrication: Fabricate fittings according to manufacturer instructions.
        3. Provide thrust restraints as required.
        4. Provide flexible couplings and expansion joints at connections to equipment and where indicated on [**Drawings**] [**Shop Drawings**].
        5. Install couplings, service saddles, and anchors according to manufacturer instructions.
        6. Provide upstream and downstream clearances [**as indicated on Drawings**] [**according to component manufacturer's recommendations**].
        7. Local Indicators:

Install direct-reading indicator devices, such as thermometers and pressure gages, to be read at floor level and accessible for maintenance and service.

Install according to manufacturer instructions.

* + - * 1. Orientate valves to permit operation and maintenance access to valve operator and to avoid interferences with other equipment.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following Paragraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

* + - * 1. Installation Standards: Install Work according to <**\_\_\_\_\_\_\_\_**> standards.
      1. ADJUSTING
         1. Field-calibrate local indicators at time of piping installation.

END OF SECTION 402510