

# Louisiana State University Design Standards

## DIVISION 22 – PLUMBING

### 1 REFERENCES

- 1.1 ANSI B31.1 Power Piping
- 1.2 ANSI B31.2 Fuel Gas Piping
- 1.3 ANSI B31.4 Liquid Petroleum Transportation Piping Systems
- 1.4 ANSI B31.9 Building Service Piping
- 1.5 ASME Boiler and Pressure Vessel Code
- 1.6 ASME Sec. 9 Welding and Brazing Qualifications
- 1.7 ASME B16.1 Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250 and 800
- 1.8 ASME B16.3 Malleable Iron Threaded Fittings
- 1.9 ASME B16.4 Cast Iron Threaded Fittings Class 125 and 250
- 1.10 ASME B16.18 Cast Bronze Solder-Joint Pressure Fittings
- 1.11 ASME B16.22 Wrought Copper and Bronze Solder-Joint Pressure Fittings
- 1.12 ASME B16.23 Cast Copper Alloy Solder-Joint Drainage Fittings – DWV
- 1.13 ASME B16.26 Cast Bronze Fittings for Flared Copper Tubes
- 1.14 ASME B16.29 Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings – DWV
- 1.15 ASME B16.32 Cast Copper Alloy Solder-Joint Fittings for Solvent Drainage Systems
- 1.16 ASTM A47 Ferritic Malleable Iron Castings
- 1.17 ASTM A53 Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless
- 1.18 ASTM A74 Cast Iron Soil Pipe and Fittings
- 1.19 ASTM A120 Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses
- 1.20 ASTM A234 Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
- 1.21 ASTM B32 Solder Metal
- 1.22 ASTM B42 Seamless Copper Pipe
- 1.23 ASTM B43 Seamless Red Brass Pipe
- 1.24 ASTM B75 Seamless Copper Tube
- 1.25 ASTM B88 -Seamless Copper Water Tube
- 1.26 ASTM B251 Wrought Seamless Copper and Copper-Alloy Tube
- 1.27 ASTM B302 Threadless Copper Pipe (TP)
- 1.28 ASTM B306 Copper Drainage Tube (DWV)
- 1.29 ASTM C14 Concrete Sewer, Storm Drain, and Culvert Pipe
- 1.30 ASTM C425 Compression Joints for Vitrified Clay Pipe and Fittings
- 1.31 ASTM C443 Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
- 1.32 ASTM C564 Rubber Gaskets for Cast Iron Soil Pipe and Fittings
- 1.33 ASTM C700 Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
- 1.34 ASTM D1785 Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
- 1.35 ASTM D2235 Solvent Cement for Acrylonitrile - Butadiene - Styrene (ABS) Plastic Pipe and Fittings
- 1.36 ASTM D2241 Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR)
- 1.37 ASTM D2466 Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
- 1.38 ASTM D2513 Thermoplastic Gas Pressure Pipe, Tubing and Fittings
- 1.39 ASTM D2564 Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings
- 1.40 ASTM D2680 Acrylonitrile-Butadiene-Styrene (ABS) Composite-Sewer Piping

- 1.41 ASTM D2683 - Socket-Type Polyethylene Fillings for Outside Diameter-Controlled Polyethylene Pipe
- 1.42 ASTM D2729 - Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
- 1.43 ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings
- 1.44 ASTM D2846 - Chlorinated Polyvinyl Chloride (CPVC) Pipe, Fittings, Solvent Cements and Adhesives for Potable Hot Water Systems
- 1.45 ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings
- 1.46 ASTM D3033 - Type PSP Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
- 1.47 ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
- 1.48 ASTM D3309 - Polybutylene (PB) Plastic Hot Water Distribution System
- 1.49 ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- 1.50 ASTM F493 - Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings
- 1.51 ASTM F845 - Plastic Insert Fittings for Polybutylene (PB) Pipe
- 1.52 AWS A5.8 - Brazing Filler Metal
- 1.53 AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids
- 1.54 AWWA C110 - Ductile - Iron and Gray - Iron Fittings 3 in. through 48 in., for Water and Other Liquids
- 1.55 AWWA C111- Rubber-Gasket Joints for Ductile Iron and Gray-Iron Pressure Pipe and Fittings
- 1.56 AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
- 1.57 AWWA C651 - Disinfecting Water Mains
- 1.58 CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems
- 1.59 CISPI 310 - Joints for Hub-less Cast Iron Sanitary Systems
- 1.60 CAN-3 B281 - Aluminum Drain, Waste, and Vent Pipe and Components
- 1.61 NCPWB - Procedure Specifications for Pipe Welding
- 1.62 NFPA 54 - National Fuel Gas Code
- 1.63 NFPA 58 - Storage and Handling of Liquefied Petroleum Gases

## **2 SUBMITTALS**

- 2.1 Provide data on pipe materials, pipe fittings, valves, and accessories.
- 2.2 Provide manufacturers catalog information. Indicate valve data and ratings.

## **3 PROJECT RECORD DOCUMENTS**

- 3.1 Record actual locations of valves and concealed terminal units.

## **4 MAINTENANCE DATA**

- 4.1 Include installation instructions, spare parts lists, exploded assembly views.

## **5 QUALITY ASSURANCE**

- 5.1 Valves - Manufacturer's name and pressure rating marked on valve body.
- 5.2 Welding Materials and Procedures - Conform to ASME Code.
- 5.3 Welders Certification - In accordance with ASME Sec 9.
- 5.4 Maintain one copy of each document on site.

## **6 REGULATORY REQUIREMENTS**

- 6.1 Perform Work in accordance with State plumbing code.
- 6.2 Conform to applicable code for installation of backflow prevention devices.
- 6.3 Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

## **7 DELIVERY, STORAGE, AND HANDLING**

- 7.1 Deliver, store, protect and handle products to site.
- 7.2 Accept valves on site in shipping containers with labelling in place and inspect for damage.

- 7.3 Provide temporary protective coating on cast iron and steel valves.
- 7.4 Provide temporary end caps and closures on piping and fittings and maintain in place until installation.
- 7.5 Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

## **8 ENVIRONMENTAL REQUIREMENTS**

- 8.1 Do not install underground piping when bedding are wet or frozen.

## **9 EXTRA MATERIALS**

- 9.1 Provide two repacking kits for each size valve.

## **10 PRODUCTS**

### 10.1 Sanitary Sewer Piping

#### 10.1.1 Buried beyond 5' of building

##### 10.1.1.1 Cast Iron Pipe: ASTM A74, service weight

###### 10.1.1.1.1 Fittings: Cast iron

###### 10.1.1.1.2 Joints: ASTM C564, neoprene gasket system or lead and oakum

##### 10.1.1.2 ABS Pipe: ASTM D2680 or D2751

###### 10.1.1.2.1 Fittings: ABS

###### 10.1.1.2.2 Joints: ASTM D2235, solvent weld

##### 10.1.1.3 PVC Pipe: ASTM D3033 or D3034, SDR 35

###### 10.1.1.3.1 Fittings: PVC

###### 10.1.1.3.2 Joints: ASTM F477, elastomeric gaskets

#### 10.1.2 Buried within 5' of building

##### 10.1.2.1 Cast Iron Pipe: ASTM A74 service weight

###### 10.1.2.1.1 Fittings: Cast iron

###### 10.1.2.1.2 Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum

##### 10.1.2.2 Cast Iron Pipe: CISPI 301, hub-less, service weight

###### 10.1.2.2.1 Fittings: Cast iron

###### 10.1.2.2.2 Joints: ASTM C564, neoprene gasket system or lead and oakum

##### 10.1.2.3 Copper Tubing: ASTM B306, DWV

###### 10.1.2.3.1 Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper

###### 10.1.2.3.2 Joints: ASTM B32, solder, Grade 50B

##### 10.1.2.4 ABS Pipe: ASTM D2680 or D2751

###### 10.1.2.4.1 Fittings: ABS

###### 10.1.2.4.2 Joints: ASTM D2235, solvent weld

##### 10.1.2.5 PVC Pipe: ASTM D2729

###### 10.1.2.5.1 Fittings: PVC

###### 10.1.2.5.2 Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement

#### 10.1.3 Above Grade (Use cast iron in acoustically sensitive applications)

##### 10.1.3.1 Cast Iron Pipe: ASTM A74, service weight

###### 10.1.3.1.1 Fittings: Cast iron

###### 10.1.3.1.2 Joints: ASTM C564, neoprene gasket system or lead and oakum

##### 10.1.3.2 Cast Iron Pipe: CISPI 301, hub-less, service weight

###### 10.1.3.2.1 Fittings: Cast iron

###### 10.1.3.2.2 Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies

##### 10.1.3.3 Copper Tube: ASTM B306, DWV Type L

- 10.1.3.3.1 Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper
- 10.1.3.3.2 Joints: ASTM B32, solder, Grade 50B
- 10.1.3.4 Copper Pipe: ASTM B42
  - 10.1.3.4.1 Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper
  - 10.1.3.4.2 Joints: ASTM B32, solder, Grade 50B
- 10.1.3.5 Brass Pipe: ASTM B43, chrome plated
  - 10.1.3.5.1 Fittings: ASME B16.23, cast bronze, chrome plated.
- 10.1.3.6 Steel Pipe: ASTM A53 Schedule 40, galvanized
  - 10.1.3.6.1 Cast Iron Fittings: ASME B16.4, screwed fittings
  - 10.1.3.6.2 Malleable Iron Fittings: ASME B16.3, screwed type
  - 10.1.3.6.3 Mechanical Grooved Couplings: Malleable iron, galvanized
- 10.1.3.7 ABS Pipe: ASTM D2680 or D2751
  - 10.1.3.7.1 Fittings: ABS
  - 10.1.3.7.2 Joints: ASTM D2235, solvent weld
- 10.1.3.8 PVC Pipe: ASTM D2729
  - 10.1.3.8.1 Fittings: PVC
  - 10.1.3.8.2 Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement

## 10.2 Water Piping

- 10.2.1 Buried beyond 5' of building
  - 10.2.1.1 Cast Iron Pipe: AWWA C151
    - 10.2.1.1.1 Fittings: Ductile or gray iron, standard thickness
    - 10.2.1.1.2 Joints: AWWA C111, rubber gasket with 3/4 inch diameter rods
  - 10.2.1.2 Copper Tubing: ASTM B88, Type L, hard drawn
    - 10.2.1.2.1 Fittings: ASME B16.18, cast bronze or ASTM B16.22 wrought copper and bronze
    - 10.2.1.2.2 Joints: ASTM B32, solder, Grade 95TA
- 10.2.2 Buried within 5' of building
  - 10.2.2.1 Copper Tubing: ASTM B88, Type L, hard drawn
    - 10.2.2.1.1 Fittings: ASME B16.18, cast bronze or ASTM B16.22 wrought copper and bronze
    - 10.2.2.1.2 Joints: ASTM B32, solder, Grade 95TA
  - 10.2.2.2 Copper Tubing: ASTM B88, Type L, annealed
    - 10.2.2.2.1 Fittings: ASME B16.26, cast bronze
    - 10.2.2.2.2 Joints: Flared
  - 10.2.2.3 Cast Iron Pipe: AWWA C151
    - 10.2.2.3.1 Fittings: Ductile iron, standard thickness
    - 10.2.2.3.2 Joints: AWWA C111, rubber basket with 3/4 inch diameter rods
- 10.2.3 Above Grade
  - 10.2.3.1 Copper Tubing: ASTM B88, Type L, hard drawn
    - 10.2.3.1.1 Fittings: ASME B16.18, cast bronze, or ASME B16.22, wrought copper and bronze
    - 10.2.3.1.2 Joints: ASTM B32, solder, Grade 95TA
  - 10.2.3.2 CPVC Pipe: ASTM D2846
    - 10.2.3.2.1 Fittings: ASTM D2846, CPVC
    - 10.2.3.2.2 Joints: ASTM D2846, solvent weld with ASTM F493 solvent cement
  - 10.2.3.3 PB Pipe: ASTM D3309
    - 10.2.3.3.1 Fittings: ASTM F845 PB, or copper
    - 10.2.3.3.2 Joints: Mechanical with copper compression rings

## 10.3 Storm Water Piping

### 10.3.1 Buried beyond 5' of building

#### 10.3.1.1 Cast Iron Pipe: ASTM A74 service weight

10.3.1.1.1 Fittings: Cast iron

10.3.1.1.2 Joints: ASTM C564, neoprene gasket system or lead and oakum

#### 10.3.1.2 Copper Tube: ASTM B306, DWV

10.3.1.2.1 Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper

10.3.1.2.2 Joints: ASTM B32, solder, Grade 50B

#### 10.3.1.3 Concrete Pipe: ASTM C14

10.3.1.3.1 Fittings: Concrete

10.3.1.3.2 Joints: ASTM C443, rubber gaskets

#### 10.3.1.4 PVC Pipe: ASTM D3033 or D3034, SDR 35. Fittings: PVC. Joints: ASTM F477, elastomeric gaskets

### 10.3.2 Buried within 5' of building

#### 10.3.2.1 Cast Iron Pipe: ASTM A74 service weight

10.3.2.1.1 Fittings: Cast iron

10.3.2.1.2 Joints: ASTM C564, neoprene gasket system or lead and oakum

#### 10.3.2.2 Cast Iron Pipe: CISPI 301, hub-less, service weight

10.3.2.2.1 Fittings: Cast iron

10.3.2.2.2 Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies

#### 10.3.2.3 Copper Tube: ASTM B306, DWV

10.3.2.3.1 Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper

10.3.2.3.2 Joints: ASTM B32, solder, Grade 50B

#### 10.3.2.4 ABS Pipe: ASTM D2680 or D2751

10.3.2.4.1 Fittings: ABS

10.3.2.4.2 Joints: ASTM D2235, solvent weld

#### 10.3.2.5 PVC Pipe: ASTM D2729

10.3.2.5.1 Fittings: PVC

10.3.2.5.2 Joints: ASTM D2855, solvent weld

### 10.3.3 Above Grade (use cast iron in acoustically sensitive applications)

#### 10.3.3.1 Cast Iron Pipe: ASTM A74 service weight

10.3.3.1.1 Fittings: Cast iron

10.3.3.1.2 Joints: ASTM C564, neoprene gasket system or lead and oakum

#### 10.3.3.2 Cast Iron Pipe: CISPI 301, hub-less, service weight

10.3.3.2.1 Fittings: Cast iron

10.3.3.2.2 Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies

#### 10.3.3.3 Copper Tube: ASTM B306, DWV

10.3.3.3.1 Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper

10.3.3.3.2 Joints: ASTM B32, solder, Grade 50B

#### 10.3.3.4 ABS Pipe: ASTM D2680 or D2751

10.3.3.4.1 Fittings: ABS

10.3.3.4.2 Joints: ASTM D2235, solvent weld

#### 10.3.3.5 PVC Pipe: ASTM D2729

10.3.3.5.1 Fittings: PVC

10.3.3.5.2 Joints: ASTM D2855, solvent weld

## 10.4 Natural Gas Piping

- 10.4.1 Buried beyond 5' of building
    - 10.4.1.1 Polyethylene Pipe: ASTM D2513, SDR 11.5
      - 10.4.1.1.1 Fittings: ASTM D2683 or ASTM D2513 socket type
      - 10.4.1.1.2 Joints: Fusion weld
  - 10.4.2 Buried within 5' of building
    - 10.4.2.1 Steel Pipe: ASTM A53 or A120, Schedule 40 black
    - 10.4.2.2 Fittings: ASTM A234, forged steel welding type, with AWWA C105 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape
    - 10.4.2.3 Joints: ANSI B31.1, welded
  - 10.4.3 Above Grade
    - 10.4.3.1 Steel Pipe: ASTM A53 or A120, Schedule 40 black
      - 10.4.3.1.1 Fittings: ASME B16.3, malleable iron, or ASTM A234, forged steel welding type
      - 10.4.3.1.2 Joints: NFPA 54, threaded or welded to ANSI B31.1, ASME Sec 1
- 10.5 Flanges, Unions & Couplings
- 10.5.1 Pipe Size 2 Inches and Under
    - 10.5.1.1 Ferrous pipe - 150 psig malleable iron threaded unions
    - 10.5.1.2 Copper tube and pipe - 150 psig bronze unions with soldered joints
  - 10.5.2 Pipe Size Over 2 Inches
    - 10.5.2.1 Ferrous pipe: 150 psig forged steel slip-on flanges; 1/16 inch thick preformed neoprene gaskets
    - 10.5.2.2 Copper tube and pipe: 150 psig slip-on bronze flanges; 1/16 inch thick preformed neoprene gaskets
  - 10.5.3 Grooved and Shouldered Pipe End Couplings
    - 10.5.3.1 Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe
    - 10.5.3.2 Sealing gasket: "C" shape composition sealing gasket
  - 10.5.4 Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier, bronze or brass fittings or valves are preferred over dielectric fittings between dissimilar metals
- 10.6 Gate Valves
- 10.6.1 Up to and including 2" - Bronze body, bronze trim, rising stem, handwheel, inside screw, single wedge or disc threaded ends
  - 10.6.2 Over 2" - Iron body, bronze trim, rising stem, handwheel, OS&Y, single wedge, flanged or grooved ends
- 10.7 Glove Valves
- 10.7.1 Up to and including 2" - Bronze body, bronze trim, rising stem, handwheel, inside screw, renewable composition disc, screwed ends, with back seating capacity repackable under pressure
  - 10.7.2 Over 2" - Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc
- 10.8 Ball Valves
- 10.8.1 Up to and including 2" - Bronze or Stainless steel two-piece body, stainless steel ball, Teflon seats and stuffing box ring, lever handle and balancing stops, threaded ends with union
  - 10.8.2 Over 2 Inches - Cast steel body, chrome plated steel ball, Teflon seat and stuffing box seals, lever handle, or gear drive handwheel for sizes 10 inches and over, flanged
- 10.9 Plug Valves
- 10.9.1 Up to and including 2" - Bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded or grooved ends

- 10.9.2 Over 2" - Cast iron body and plug, non-lubricated, Teflon packing, flanged or groove ends
- 10.10 Butterfly Valves
  - 10.10.1 Bronze body, stainless steel disc, resilient replaceable seat, threaded or grooved ends, extended neck, 10 position lever handle
  - 10.10.2 Cast or ductile iron body, chrome plated ductile iron disc, resilient replaceable EPDM seat, grooved, or lug ends, extended neck, 10 position lever handle
- 10.11 Flow Controls
  - 10.11.1 Construction - Brass or bronze body with union on inlet, and outlet, temperature and pressure test plug on inlet and outlet venturi metering independent of valve position with blowdown/backflush drain
  - 10.11.2 Calibration - Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psig
- 10.12 Swing Check Valves
  - 10.12.1 Up to and including 2" - Bronze swing disc, screwed ends
  - 10.12.2 Over 2" - Iron body, bronze trim, swing disc, renewable disc and seat, grooved or flanged ends
- 10.13 Spring Loaded Check Valves
  - 10.13.1 Iron body, bronze trim, stainless steel spring, renewable composition disc, screwed, grooved, or flanged ends
- 10.14 Water Pressure Reducing Valves
  - 10.14.1 Up to 2" - Bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, double union or grooved ends
  - 10.14.2 Over 2" - Cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged or grooved ends
- 10.15 Relief Valves
  - 10.15.1 Bronze body, Teflon seat, steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled
- 10.16 Strainers
  - 10.16.1 Size 2" and under - Screwed or grooved brass or iron body for 175 psig working pressure, Y pattern with 1/32" stainless steel perforated screen.
  - 10.16.2 Size 2-1/2" to 4" - Flanged or grooved iron body for 175 psig working pressure, Y pattern with 3/64" stainless steel perforated screen
  - 10.16.3 Size 5" and larger - Flanged iron body for 175 psig working pressure, basket pattern with 1/8" stainless steel perforated screen.

## **11 EXAMINATION**

- 11.1 Verify that excavations are to required grade, dry, and not over-excavated.

## **12 PREPARATION**

- 12.1 Ream pipe and tube ends
- 12.2 Remove burrs
- 12.3 Bevel plain end ferrous pipe
- 12.4 Remove scale and dirt, on inside and outside, before assembly
- 12.5 Prepare piping connections to equipment with flanges or unions

## **13 INSTALLATION**

- 13.1 Install in accordance with manufacturer's instructions
- 13.2 Provide non-conducting dielectric connections or bronze or brass fittings or valves wherever jointing dissimilar metals
- 13.3 Route piping in orderly manner and maintain gradient
- 13.4 Install piping to conserve building space and not interfere with use of space
- 13.5 Group piping whenever practical at common elevations

- 13.6 Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment
- 13.7 Provide clearance for installation of insulation and access to valves and fittings
- 13.8 Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with general contractor and other trades
- 13.9 Establish elevations of buried piping outside the building to ensure minimum specified cover
- 13.10 Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding
- 13.11 Verify weldability of all structural members before welding
- 13.12 Provide support for utility meters in accordance with requirements of utility companies, utility contracts and university metering
- 13.13 Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting
- 13.14 Excavate in accordance with other sections of these specifications
- 13.15 Backfill in accordance with other sections of these specifications
- 13.16 Install bell and spigot pipe with bell end upstream
- 13.17 Install valves with stems upright or horizontal, not inverted
- 13.18 Provide one plug valve wrench for every ten plug valves sized 2 inches and smaller, minimum of one
- 13.19 Provide each plug valve sized 2-1/2 inches and larger with a wrench with set screw
- 13.20 Pipe vents from gas pressure reducing valves to outdoors and terminate in weather-proof hood

#### **14 APPLICATION**

- 14.1 Install unions downstream of valves and at equipment or apparatus connections
- 14.2 Install brass male adapters each side of valves in copper piped system
- 14.3 Sweat solder adapters to pipe
- 14.4 Install gate, ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers
- 14.5 Install globe, ball, or butterfly valves for throttling, bypass, or manual flow control services
- 14.6 Provide spring loaded check valves on discharge of water pumps
- 14.7 Provide plug valves in Natural gas systems for shut-off service
- 14.8 Provide flow controls in water recirculating systems where indicated

#### **15 ERECTION TOLERANCES**

- 15.1 Establish invert elevations, slopes for drainage. Maintain gradients
- 15.2 Slope water piping and arrange to drain at low points

#### **16 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM**

- 16.1 Prior to starting work, verify system is complete, flushed and clean
- 16.2 Ensure PH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric)
- 16.3 Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual
- 16.4 Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets
- 16.5 Maintain disinfectant in system for 24 hours
- 16.6 If final disinfectant residual tests less than 25 mg/L, repeat treatment
- 16.7 Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L
- 16.8 Take samples no sooner than 24 hours after flushing, from 5 percent of outlets and from water entry, and analyze in accordance with AWWA C651

#### **17 SERVICE CONNECTIONS**

- 17.1 Provide new sanitary and storm sewer services

- 17.2 Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing
- 17.3 Provide new water service complete with reduced pressure, double check backflow preventer and water meter with by-pass valves, pressure reducing valve and sand strainer
- 17.4 Option 1
  - 17.4.1 Provide sleeve in wall for service main and support at wall with reinforced concrete bridge
  - 17.4.2 Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall
- 17.5 Option 2
  - 17.5.1 Provide 18 gage (1.20 mm) galvanized sheet metal sleeve around service main to 6 inch (150 mm) above floor and 6 feet (1800 mm) minimum below grade. Size for minimum of 2 inches (50 mm) of loose batt insulation stuffing
  - 17.5.2 Provide new gas service [complete with gas meter and regulators]. Gas service distribution piping to have initial minimum pressure as determined through consultation with LSU Facility Services. Provide regulators on each line serving gravity type appliances, sized in accordance with equipment.