

## PART 1 - GENERAL

## 1.01 SUMMARY

## A. Section Includes: Pipe and pipe fittings for the following systems:

1. Domestic water piping within 5 feet (1500 mm) of building.
2. Sanitary sewer piping within 5 feet (1500 mm) of building.
3. Chemical resistant sewer piping.
4. Storm water piping within 5 feet (1500 mm) of building.
5. Equipment drains and over flows.
6. Compressed air piping.
7. Vacuum air piping.
8. RO/DI pure water system piping.
9. Natural gas piping.
10. Unions and flanges.
11. Underground pipe markers.
12. Bedding and cover materials.

## B. Related Sections:

1. Division 07 - Firestopping: Product requirements for firestopping for placement by this section.
2. Division 08 - Access Doors and Frames: Product requirements for access doors for placement by this section.
3. Division 09 - Painting and Coating: Product and execution requirements for painting specified by this section.
4. Section 22 05 16 - Expansion Fittings and Loops for Plumbing Piping: Product requirements for piping expansion compensation devices for placement by this section.
5. Section 22 05 23 - General-Duty Valves for Plumbing Piping: Product requirements for valves for placement by this section.
6. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment: Product requirements for pipe hangers and supports and firestopping for placement by this section.

7. Section 22 05 48 - Noise and Vibration Controls for Plumbing Piping and Equipment: Product requirements for vibration isolation for placement by this section.
8. Section 22 07 00 - Plumbing Insulation: Product requirements for piping insulation for placement by this section.
9. Section 22 60 10 - RO/DI Water Purification System: Product requirements for RO/DI Water Purification System for placement by this section.
10. Section 22 61 19 - Laboratory Service Compressed-Air Systems: Product requirements for laboratory compressed air systems for placement by this section.
11. Section 22 62 19 - Laboratory Service Vacuum Systems: Product requirements for laboratory gas systems for placement by this section.
12. Division 31 - Soils for Earthwork: Soils for backfill in trenches.
13. Section 31 - Aggregates for Earthwork: Aggregate for backfill in trenches.
14. Division 31 - Excavation: Product and execution requirements for excavation and backfill required by this section.
15. Division 31 - Trenching: Execution requirements for trenching for underground piping systems.
16. Section 31 - Fill: Execution requirements for backfilling required by this Division.

## 1.02 REFERENCES

### A. American Society of Mechanical Engineers:

1. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
2. ASME B16.3 - Malleable Iron Threaded Fittings.
3. ASME B16.4 - Gray Iron Threaded Fittings.
4. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
5. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
6. ASME B31.9 - Building Services Piping.
7. ASME B36.10M - Welded and Seamless Wrought Steel Pipe.
8. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

### B. ASTM International:

1. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings.

2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
  3. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
  4. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
  5. ASTM A536 - Standard Specification for Ductile Iron Castings.
  6. ASTM B32 - Standard Specification for Solder Metal.
  7. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes.
  8. ASTM B75 - Standard Specification for Seamless Copper Tube.
  9. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
  10. ASTM B251 - Standard Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube.
- C. American Welding Society:
1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
  2. AWS D1.1 - Structural Welding Code - Steel.
- D. American Water Works Association:
1. AWWA C104 - American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
  2. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.
  3. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  4. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
- E. Cast Iron Soil Pipe Institute:
1. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
  2. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
- F. National Fire Protection Association:
1. NFPA 54 - National Fuel Gas Code.

### 1.03 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate layout of piping systems, including equipment, critical dimensions, and sizes.
- C. Product Data: Submit data on pipe materials and fittings. Submit manufacturers catalog information.
- D. Design Data: Indicate pipe sizes. Indicate pipe sizing methods. Indicate calculations used. Submit sizing methods and calculations sealed by registered professional engineer.
- E. Welders' Certificate: Include welders' certification of compliance with ASME Section IX.

### 1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.
- B. Perform Work in accordance with IBS-NJ.
- C. Maintain one (1) copy of each document on site.

### 1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum 5 years documented experience approved by manufacturer.
- C. Design pipe hangers and supports under direct supervision of Professional Engineer experienced in design of this Work and licensed in the State of New Jersey.

### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Division 01 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Furnish temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

## 1.07 ENVIRONMENTAL REQUIREMENTS

- A. Division 01 - Product Requirements: Environmental conditions affecting products on site.
- B. Do not install underground piping when bedding is wet or frozen.

## 1.08 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

## 1.09 COORDINATION

- A. Division 01 - Administrative Requirements: Requirements for coordination.
- B. Coordinate installation of buried piping with trenching.

## PART 2 - PRODUCTS

### 2.01 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Tubing: ASTM B88, Type L drawn.
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
  - 2. Joints: ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, lead free. Mechanical press type fittings are not acceptable.

### 2.02 DOMESTIC WATER PIPING, BELOW GRADE

- A. Copper Tubing: ASTM B88, Type K drawn.
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
  - 2. Joints: ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, lead free. Mechanical press type fittings are not acceptable.

### 2.03 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

- A. Cast Iron Soil Pipe: ASTM A74, service weight, bell and spigot ends.
  - 1. Fittings: Cast iron, ASTM A74.
  - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.

## 2.04 SANITARY SEWER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hub-less, service weight.
  - 1. Fittings: Cast iron, CISPI 301.
  - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

## 2.05 CHEMICAL RESISTANT LAB WASTE AND VENT PIPING

- A. PPR Pipe: Polypropylene, flame retardant - Schedule 40.
  - 1. Fittings: Polypropylene.
  - 2. Joints: Electrical resistance fusion.

## 2.06 STORM WATER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

- A. Cast Iron Pipe: ASTM A74, service weight, bell and spigot ends.
  - 1. Fittings: Cast iron, ASTM A74.
  - 2. Joints: ASTM C564, rubber gasket joint devices.

## 2.07 STORM WATER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
  - 1. Fittings: Cast iron, CISPI 301.
  - 2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

## 2.08 EQUIPMENT DRAINS AND OVERFLOWS

- A. Copper Tubing: ASTM B88, Type L drawn.
  - 1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
  - 2. Joints: ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, lead free solder. Mechanical press type fittings are not acceptable.

## 2.09 COMPRESSED AIR PIPING

- A. Copper Tubing: ASTM B88, Type L drawn.
  - 1. Fittings: ASME B16.18 cast copper alloy or ASME B16.22, wrought copper and bronze.
  - 2. Joints: ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, lead free. Mechanical press type fittings are not acceptable.

## 2.10 VACUUM AIR PIPING

- A. Copper Tubing: ASTM B88 (ASTM B88M), Type L drawn.
  - 1. Fittings: ASME B16.18 cast copper alloy or ASME B16.22, wrought copper and bronze.
  - 2. Joints: ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, lead free. Mechanical press type fittings are not acceptable.

## 2.11 INERT GAS PIPING

- A. Factory Preparation: Wash inside of copper pipe and copper fitting with hot solution of sodium carbonate or trisodium phosphate mixed 1 lb to 3 gal (1 kg to 25 L) of water; rinse with water, and blow dry with oil-free dry nitrogen or compressed air.
- B. Oxygen, Carbon Dioxide, Nitrous Oxide, Nitrogen Systems, Inert Gas, aboveground:
  - 1. Copper Tube: ASTM B88, Type L, drawn.
  - 2. Fittings: ASME B16.18 cast copper alloy or ASME B16.22, wrought copper.
  - 3. Joints: AWS A5.8 Classification BCuP-3 or BCuP-4 silver braze. Mechanical press type fittings are not acceptable.

## 2.12 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black or Schedule 40 galvanized steel.
  - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M forged steel welding type. Galvanized piping shall receive galvanized fittings.
  - 2. Joints: Threaded for pipe 2 inch (50 mm) and smaller; welded for pipe 2-1/2 inches (65 mm) and larger.

## 2.13 WATER PURIFICATION SYSTEM PIPING

- A. Refer to Section 22 60 10, RO/DI Water Purification System, for piping and valves.

## 2.14 UNIONS AND FLANGES

- A. Unions for Pipe 2 inches (50 mm) and Smaller:
  - 1. Ferrous Piping: Class 250, malleable iron, threaded.
  - 2. Copper Piping: Class 150, bronze unions with [soldered] [brazed joints]
  - 3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
- B. Flanges for Pipe 2-1/2 inches (65 mm) and Larger:
  - 1. Ferrous Piping: Class 150, forged steel, slip-on flanges.

2. Gaskets: 1/16 inch (1.6 mm) thick preformed neoprene gaskets.
3. Flanges shall be of same weight as the fittings and valves in each service category. Welding neck flanges shall be used with flanged valves and equipment on welded lines. Galvanized screwed flanges shall be used on galvanized screwed lines. Flanges shall be drilled in conformance with 150 lbs. or 300 lbs. standard and shall be faced and spot-faced. Threaded and loose flanges on brass piping shall be brass. Laps shall be machined on front, back and edge. Threaded flanges shall have faces perpendicular to adjoining pipe.

#### 2.15 PIPE FITTINGS

- A. Each pipe fitting shall have cast, stamped, or indelibly marked on it the marker's name or mark, weight, and quality of the product when such marking is required by the approved standard.
- B. Welding fittings shall be of same material and schedule as pipe to which they are welded. Welding fittings including laterals shall be approved factory reinforced to develop full working pressure of connecting piping main. Welding elbows shall be long radius pattern. Welding fittings shall be used exclusively, except as otherwise specified. Weldolets may be used for branches only where branch is two (2) or more nominal pipe sizes smaller than main or riser. All welding "lateral" fittings shall have pressure ratings equal to the pipe with which they are to be used. Welding fittings shall be of Tube-Turn or Walworth manufacture or approved equal, to conform to ASTM-A-234 specifications.
- C. Nipples shall be extra heavy shoulder type of same material as pipe, close nipples are not acceptable.

#### 2.16 UNDERGROUND PIPE MARKERS

- A. Plastic Ribbon Tape: Bright colored, continuously printed, minimum 6 inches (150 mm) wide by 4 mil (0.10 mm) thick, manufactured for direct burial service.

#### 2.17 BEDDING AND COVER MATERIALS

- A. Bedding: Fill as specified in Division 31.
- B. Cover: Fill as specified in Division 31.
- C. Soil Backfill from Above Pipe to Finish Grade: Soil as specified in Division 31. Subsoil with no rocks over 6 inches (150 mm) in diameter, frozen earth or foreign matter.

#### 2.18 TEMPORARY PIPING

- A. Temporary piping, fitting and material installation shall match piping material specified for each type of usage.



## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Division 01 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify excavations are to required grade, dry, and not over-excavated.
- C. Verify trenches are ready to receive piping.

### 3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

### 3.03 INSTALLATION - BURIED PIPING SYSTEMS

- A. Install natural gas piping in accordance with NFPA 54 and the International Fuel Gas Code.
- B. Verify connection to existing piping system size, location, and invert are as indicated on Drawings.
- C. Establish elevations of buried piping.
- D. Establish minimum separation of 5 ft. from sanitary sewer piping in accordance with local code.
- E. Excavate pipe trench in accordance with Division 31.
- F. Install pipe to elevation as indicated on Drawings.
- G. Place bedding material at trench bottom to provide uniform bedding for piping, level bedding materials in one continuous layer not exceeding 4 inches loose depth; compact to 95 percent maximum density.
- H. Install pipe on prepared bedding.
- I. Route pipe in straight line.

- J. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- K. Install shutoff and drain valves at locations indicated on Drawings in accordance with Section 22 02 23.
- L. Install plastic ribbon tape continuous buried 6 inches below finish grade, above pipe line. Refer to Section 22 02 53.
- M. Install Work in accordance with the NSPC standards.
- N. Mechanical press type fittings are not acceptable for copper piping systems.

### 3.04 INSTALLATION - ABOVE GROUND PIPING

- A. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- B. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.
- C. Group piping whenever practical at common elevations.
- D. Sleeve pipe passing through partitions, walls and floors. Refer to Section 22 05 29.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 21 05 16.
- F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 07 00.
- G. Provide access where valves and fittings are not accessible. Coordinate size and location of access doors.
- H. Install non-conducting dielectric connections wherever jointing dissimilar metals.
- I. Establish invert elevations, slopes for drainage to 1/4 or 1/8 inch per foot minimum as required by NSPC. Maintain gradients.
- J. Slope piping and arrange systems to drain at low points.
- K. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.
- L. Install piping penetrating roofed areas to maintain integrity of roof assembly.
- M. Install valves in accordance with Section 22 05 23.

- N. Install piping specialties in accordance with Section 23 21 16.
- O. Insulate piping. Refer to Section 22 07 00.
- P. Install pipe identification in accordance with Section 22 05 53.
- Q. Mechanical press type fittings are not acceptable for copper piping systems.

### 3.05 INSTALLATION - DOMESTIC WATER PIPING SYSTEMS

- A. Install domestic water piping system in accordance with ASME B31.9.
- B. Install Work in accordance with NSPC standards.

### 3.06 INSTALLATION - SANITARY WASTE AND VENT PIPING SYSTEMS

- A. Install sanitary waste and vent piping systems in accordance with NSPC.
- B. Install bell and spigot pipe with bell end upstream.
- C. Support cast iron drainage piping at every joint.

### 3.07 INSTALLATION - STORM DRAINAGE PIPING SYSTEMS

- A. Install storm drainage piping systems in accordance with NSPC.
- B. Install storm drainage piping systems in accordance with Section 22 14 00.
- C. Install bell and spigot pipe with bell end upstream.
- D. Support cast iron drainage piping at every joint.
- E. Install Work in accordance with the NSPC standards.

### 3.08 INSTALLATION - COMPRESSED AIR PIPING SYSTEMS

- A. Install compressed air piping systems piping in accordance with ASME B31.9.
- B. Install drip connections with valves at low points of piping system.
- C. Install take-off to outlets from top of main, with shut off valve after takeoff. Slope take-off piping to outlets.
- D. Install compressed air couplings and pressure gages as indicated on Drawings.
- E. Cut pipe and tubing accurately and install without springing or forcing.
- F. Slope piping in direction of flow.

- G. Install strainers on inlet side of pressure reducing valves. Install pressure reducing valves with bypasses and isolation valves to allow maintenance without interruption of service.
- H. Install Work in accordance with the NSPC standards.

### 3.09 INSTALLATION - VACUUM AIR PIPING SYSTEM

- A. Install vacuum air piping systems piping in accordance with ASME B31.9.
- B. Install drip connections with valves at low points of piping system.
- C. Install take-off to outlets from top of main, with shut off valve after takeoff. Slope take-off piping to outlets.
- D. Install vacuum air couplings and pressure gages as indicated on Drawings.
- E. Cut pipe and tubing accurately and install without springing or forcing.
- F. Slope piping in direction of source.
- G. Install Work in accordance with the NSPC Standards.

### 3.10 INSTALLATION - INERT GAS PIPING SYSTEMS

- A. Install inert gas piping systems in accordance with NFPA 99.

### 3.11 INSTALLATION - GAS PIPING SYSTEMS

- A. Install natural gas piping in accordance with NFPA 54.
- B. Natural gas piping installed on roof shall be attached directly to the building structure system for vibration control.
- C. Provide support for utility meters in accordance with requirements of utility company.
- D. Natural gas piping installed exterior to the building shall be galvanized with galvanized fittings or factory wrapped to prevent corrosion.
- E. Install vent piping from gas pressure regulating valves to outdoors and terminate with gas vent cap with screen.
- F. Install gas pressure regulator vent full size opening on regulator and terminate outdoors.
- G. Install Work in accordance with IBC-NJ and IFGC.

### 3.12 FIELD QUALITY CONTROL

- A. Division 01 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Test domestic water piping system in accordance with local authority having jurisdiction. Hydrostatic pressure test shall be a minimum of 80 psig for 4 hours with no leaks.
- C. Test sanitary waste and vent piping system in accordance with local authority having jurisdiction.
- D. Test storm drainage piping system in accordance with local authority having jurisdiction.
- E. Test for Compressed Air Piping Leak Test: Prior to initial operation, clean and test compressed air piping in accordance with ASME B31.9.
- F. Test inert gas systems in accordance with NFPA 99.
- G. Pressure test natural gas piping in accordance with NFPA 54 and IFGC.

### 3.13 CLEANING

- A. Division 01 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Clean and disinfect domestic water distribution system in accordance with Section 22 11 00.
- C. Perform verification of inert gas systems in accordance with NFPA 99.

END OF SECTION