# SECTION 22 00 10

# BASIC MATERIALS AND METHODS - PLUMBING

## PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the work specified in this Section.

1.2 REFERENCE

A. Install all piping, fixtures, equipment, etc., to meet the requirements of the following:

New Castle County Department of Sewers
International Plumbing Code (All applicable sections)
International Mechanical Code (All applicable sections)
NFPA
OSHA

All requirements of the above governing agencies shall be in compliance with the latest issues, rules or regulations in effect.

B. Appliances and materials governed by UL requirements shall meet such requirements and bear the label.

1.3 QUALITY ASSURANCE

A. Provide adequate supervision of labor force to assure all aspects of specifications are being fulfilled.

B. Insure that all work and equipment is installed in accordance with manufacturer's warranty requirements.

C. Replace all pipes and fittings shown to be defective as a result of testing.

1.4 SUBMITTALS

A. Submit shop drawings and product data in accordance with Section 220000.

B. Submit the following:

1. Manufacturer's Product Data on all pipe and fittings to be used in project.
2. Manufacturer's Product Data on all valves to be used in project.

1.5 WARRANTY/GUARANTEE

A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

**PART 2 – PRODUCTS**

2.1 CAST IRON PIPE AND FITTINGS
(Note: Any cast iron piping made or marked "CHINA" will NOT be acceptable on this project)

A. Aboveground:

1. Pipe & Fittings: Hubless cast iron, CISPI 301, ASTM A-74 and ASTM A-888 shall be marked with the collective trademark of the Cast Iron Institute (soil pipe).

2. Joints: Neoprene sleeve and stainless steel shield and clamp assembly, CISPI 310, ASTM-1277.

B. Below grade and/or slab: (Contractor's Option)

1. Bell and Spigot: Service weight bell and spigot pattern ASTM-74 with compression type neoprene gaskets ASTM C-564.

2. Hubless: Hubless cast iron pipe CISPI 301, with heavy duty 3.04.016 stainless steel bands for below-grade installation. Elastomeric seal component ASTM C-564 and CSA B-602.

3. Hubless Joints: Cast iron CISPI 310 and as TM C-1277.

4. PVC DWV pipe and fittings, Schedule 40, ASTM D-2665, D2949, F891 and CSA B181.2.

5. Corrosion protection shall be in accordance with IPC 305.1. Provide appropriate wrapping or sheathing when pipe is exposed to lime and acid of concrete, cinder or other corrosive materials.

6. Protection of all below-grade storm and sanitary shall be in accordance with IPC Section 305.

C. Corrosion protection shall be in accordance with IPC 305.1. Provide appropriate wrapping or sheathing when piping is exposed to lime and acid of concrete, cinder or other corrosive materials.

2.2 COPPER TUBING

A. Domestic hot, cold and recirculated water:

1. Aboveground:

a. Tubing: Hard-drawn, seamless ASTM B-88, Type "L".
b. Fittings: Solder joint wrought copper ANSI B-16.22.

c. Joints: Lead-free solder 410°, ASTM B-32 alloy designation “TC”, ASTM B-828.
d. Flux: Non-toxic and non-corrosive, ASTM B-813.

2. Underground:

a. Tubing: Soft-drawn, seamless ASTM B-88, Type "K".
b. Fittings: Solder joint wrought copper ANSI B-16.22.
c. Joints: Lead-free solder 410°, ASTM B-32, ASTM B-828.
d. Flux: Non-toxic and non-corrosive, ASTM B-813.

B. Drainage and vent piping:

1. Aboveground:

a. Tubing: Hard-drawn seamless ASTM B-88, ASTM B-75, Type "M" and DWV as pipe size permits.
b. Fittings: Solder joint cast copper drainage type ANSI B-16.29.
c. Joints: Soldered, 95/5 tin-antimony ASTM B-828, ASTM B-32.
d. Flux: Non-toxic and non-corrosive, ASTM B-813.

C. Solder/Flux: See Paragraph 3.4 of this section for Soldering/Brazing.

2.3 PVC GRAVITY SEWER PIPE (BELOW GROUND ONLY)

A. Pipe: Unplasticized polyvinyl chloride (PVC) with integral wall bell and spigot joints.

B. Material: ASTM D-3034 for SDR 35, colored green for inground identification as sewer pipe.

C. Joints: Two sections of pipe shall be assembled in accordance with manufacturer's recommendations and tested as per ASTM D 3212 for use with flexible elastomeric seals.

D. Sizes: For site drainage systems 4" to 15".

E. Additional compliances:

1. Drop Impact Test - ASTM D-2444
2. Pipe Stiffness - ASTM D-2412
3. Temperature for Testing - Designed to pass all tests at 73 degrees F (+/- 3 degrees F).

2.4 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. Underground – Drainage & Vent (Sanitary) IPC Table 702.2

1. ASTM D 2665
2. ASTM D 2949
3. ASTM F 891
4. CSA CAN/CSA-B 181.2

B. Building Sewer Pipe (Near Water Service) IPC Table 702.3 (DWV)

1. ASTM D 2665
2. ASTM D 2949
3. ASTM D 3034
4. ASTM F 891
5. CSA B182.2
6. CSA B 182.4 (Ribbed Sewer Pipe & Fittings)

C. Fittings:

1. ASTM D 3311
2. ASTM D-2665
3. ASTM F-1866

D. Solvent Cement: (All Purpose on ABS, PVC and CPVC)
Sewer, Drain Waste and Vent

1. ASTM D-2564, D-2235 and F-493
2. CSA B137.3
3. CSA B181.2 or B182.1 (Sanitary Pipe only)
4. ASTM D2855
5. CSA B181.1

E. Primers: (PVC and CPVC)

1. ASTM F 656, purple color, SCAQMD Rule 1168 and OTC Regulations for VOC emission levels. NSF Standard 61 PW, DWV, Sewer.

F. Uniformity: To insure installation uniformity, all piping components shall be of one manufacturer.

2.5 VALVES (Copper Systems) – Solder ends of Threaded

A. Valves listed below shall be for domestic water systems and comply with the latest requirements of NSF 61-8. Refer to individual sections for gas valves.

B. Ball Valves: NIBCO two piece, full port, 600 psi WOG rated, cold non-shock valve with reinforced TFE seals, 316 stainless steel ball, Eco-brass body, ASTM 584, Alloy C87850, solder ends, or threaded non-blowout stem design. Acceptable NIBCO figure numbers: T/S 685-80-66-LF; T/S 595-Y-66-LF (3 piece).

C. Check Valves: NIBCO Class 125, Eco-brass body, ASTM 584, Alloy C87850, swing type, Y Pattern, threaded cap access. Acceptable NIBCO figure number: T/S 413-LF.

D. Gate Valves: NIBCO Class 125, Eco-Brass body, ASTM 584, Alloy C87850, Rising Stem. Acceptable NIBCO figure number: T/S 113-LF.

E. Balance Valves: All balance valves shall be provided with a memory stop feature with calibrated name plate to assure specific valve setting. Bronze body/brass ball, carbon filled TFE seat rings. NIBCO, Bell & Gosset, Accu-Flow, Taco or Flow Design "Accusetter". Acceptable NIBCO figure numbers: T/S 1710, F/G 737.

F. Strainers:

1. Class 125 Bronze Y-Strainer, body to be ASTM B584 or B62 bronze with threaded, solder or female press end connections and .033 inch perforated type 304 stainless steel screen or 20 mesh type 304 stainless steel screen accessible without removing the strainer from the line. Acceptable Figure numbers: NIBCO Fig. S/T-221, S/T-222, PF-221/222-A,B.

2. Class 125 Flanged Cast Iron Y-Strainer, body to be ASTM A-126 Class B cast iron. End connections to be Class 125 flanged, tapped bolted bonnet with plug. Screen shall be .033 inch perforated type 304 stainless steel screen or 20 mesh type 304 stainless steel screen accessible without removing the strainer from the line. Acceptable Figure numbers: NIBCO Fig. F 721-A.

3. Class 250 Threaded Cast Iron Y-Strainer: Strainer body to be ASTM A-126 Class B cast iron. End connections to be Class 250 threaded, tapped screw-in bonnet with plug. Screen shall be .033 inch perforated type 304 stainless steel screen or 20 mesh type 304 stainless steel screen accessible without removing the strainer from the line. Acceptable Figure numbers: NIBCO Fig. T-751-A

G. VALVES (Copper Systems) – Press Fit

1. Valves listed below shall be for domestic water systems and comply with the latest requirements of NSF-61-8.

a. <u>2 Inch and Smaller Ball Valves (On/Off):</u>
Ball Valves with male or female press to connect shall be rated at 200 PSI CWP to +225°F maximum. Valves shall be manufactured in accordance with MSS SP-110 and constructed of dezincification resistant cast bronze bodies. Brass with more than 15% zinc shall not be approved. Valve shall have reinforced PTFE Seats, Blow-out Proof Stem, Full Port Ball, Chrome/Nickel Plated or Stainless Steel Ball for aggressive water.

b. <u>2 Inch and Smaller Check Valves (Swing Type)</u>:
Check valves shall be swing type Y pattern with male or female press to connect ends and shall be rated 200 PSI CWP to + 250°F maximum. Valves shall be manufactured in accordance with MSS SP-80. Body & cap shall be manufactured of dezincification resistant cast bronze ASTM B62 or ASTM B584 Alloy C8440. Valves shall have PTFE seat disc.

c. <u>2 Inch and Smaller Check Valves (Lift or Spring Type):</u>
Incline resilient disc, spring actuated, 250psi rating, non-shock cold working pressure, 2500F maximum working temperature, bronze ASTM B584 alloy C84400. Stainless steel stem and disc holder and spring, EDPM O-ring.

H. Insofar as possible, all valves of the same type shall be of the same manufacturer.

I. Valve Manufacturers: Subject to compliance with requirements, provide valves of one of the following:

Apollo/Conbraco
Stockham
Nibco
Milwaukee
Watts
Hammond
Webstone

J. System Application:

1. Domestic Water:
   a. Check Valves - 2" & Smaller - threaded or soldered.
   b. Ball Valves - 3" & Smaller - threaded or soldered.
   c. Balance Valves - All sizes - threaded.
   d. Butterfly Valves - 4" and larger - flanged.
   e. Butterfly Valves – 3” and smaller – wafer type.

2.6 ANCHORS AND GUIDES

A. Anchors and guides shall be provided to support and maintain pipes in position and properly distribute expansion. The anchors and guides must be securely fastened to the building structure, and must be completely installed before the system is tested.

B. Guides shall be as manufactured by J.J. McNally, Inc., Flexonics, Inc., Tube-Turns, American District Steam Co.

2.7 UNIONS

A. Up to and including 2 inch pipe size: Screwed pattern, bronze-to- bronze seat.

B. Above 2 inch pipe size: 125 Class Flanged pattern, A.S.A. sweat copper fitting, with gaskets, bolts and nuts.

C. Copper tubing unions shall have sweated type ends. Flanged unions on copper tubing may be soldered connections.

D. Materials and pressure ratings shall be the same as specified for the respective pipe and fitting system unless otherwise specified.

**PART 3 – EXECUTION**

3.1 PIPING SYSTEM INSTALLATION REQUIREMENTS

A. Drawings are generally diagrammatic and due to small scale, it is impossible to indicate all fittings, valves, gauges and specialties required. Provide complete operating systems and all necessary fittings, valves gauges and specialties whether or not indicated.

B. Install all piping in accordance with the best practices of the trade and latest code requirements. Use uniform system materials throughout the building. All branch take-offs shall be off the top of the pipe.

C. Pipe and fittings shall be clean from cutting burrs, foreign materials and defects in structure and threading. Make all cuts square. Ream after cutting. Clean off scale and dirt inside and outside, before assembly. Remove welding slag or other foreign material.

D. Keep all piping as high as possible, consistent with proper pitch, to maintain maximum headroom. Cut piping accurately to measurements established at the building, work into place without springing, forcing or cutting of the building structure, and install as directly as possible between connecting points parallel with or at right angles to building construction, except as required to obtain pitch.

E. Unless otherwise shown, run piping within the building, concealed in the walls, furred spaces, pipe spaces or above suspended ceilings. Unless otherwise noted, do not build in or bury horizontal piping in partitions. Install all exposed piping as closely as possible to walls, ceilings and columns, consistent with access and applicable insulation requirements.

F. All piping to drain to low points. Low points will be provided with drain valves with hose thread. All piping shall have high points vented with ball valve, nipple and threaded cap.

G. Do not install trapped lines where water cannot be drained or air can accumulate without being vented.

H. Piping shall run square with building lines.

I. Piping shall not be insulated or covered until tested and until building is closed in.

J. Necessary drains, off-sets, vents and drips shall be provided for coordination of the work as part of the contract.

K. Piping shall not be installed over electrical transformers, panels, switchgear, substations, and control panels as per the National Electric Code. No piping shall be installed in elevator machine rooms unless it is directly related to the room's system equipment.

L. Allow clearance for expansion and contraction.

M. Install isolating fittings between sections of ferrous and non- ferrous pipe or connected equipment.

N. Valves shall be installed with stems above horizontal.

O. Valves shall be installed on all sides of equipment and control valves to allow isolation for repair.

P. Do not support piping from other piping, conduits or equipment. Provide additional bracing to prevent movement of trapeze piping, or any singular run of pipe to fixtures. Provide additional bracing on all piping through walls to flush valves to prevent movement during normal operation or performing maintenance on valves.

Q. Unions shall be provided adjacent to all valves, at equipment connections, and where necessary to facilitate dismantling of the piping system.

R. Ball valves to be installed with the proper clearance for operating the valve handle. A minimum clearance of 10" from center of valve to wall must be maintained for ease of operation.

S. All pipe unions installed shall be accessible. Unions shall not be concealed or located in places where they cannot be maintained.

T. Support and bracing of 4” and above pipe shall be in accordance with the CISPI Standards and IPC Chapter 3.

3.2 TAGS, CHARTS, AND IDENTIFICATION

A. All piping shall be labeled in accordance with IPC 303.1 and 303.4.

B. Identify each valve in all systems with black, numbered and stamped 1-1/2" brass or aluminum tags fastened to valve by brass chain and S-hook.

C. Piping Identification: Provide identification and safety products, semi-rigid plastic, wraparound pipe markers with flow arrows and conforming to ANSI A13.1. Locate marker at each valve, changes in direction, where pipes pass thru barriers and every 25' of horizontal runs. Lettering on background shall be in accordance with the following colors:

| Legend | Background | Lettering |
|---|---|---|
| 1. Fire Protection | - Red | - White |
| 2. Domestic Cold Water | - Green | - White |
| 3. Domestic Hot Water (110° ^ 140°) | - Yellow | - Black |
| 4. Domestic Hot Water Return (110° ^ 140°) | - Yellow | - Black |
| 5. Sanitary Drainage | - Green | - White |
| 6. Condensate Drainage | - Yellow | - Black |
| 7. Vent | - Yellow | - Black |

D. Furnish and install color coded 1” diameter markers on ceiling tile grids to indicate system and valve locations.

1. Domestic cold water: - Green
2. Domestic hot water: - Yellow
3. Domestic hot water return: - Yellow
4. Gas - Yellow

E. Available Manufacturers: Subject to compliance with requirements, manufacturer’s offering identification markers which may be incorporated in the work are limited to the following:

Seton
Brimar
B-Line
Marking Services, Inc.

## 3.3 SOLDERING/BRAZING

A. Connections between copper tubing and copper sweat fittings shall be made by soldering using Taramet Sterling or approved substitute. Flux shall be non-corrosive type "Nokorode" or approved substitute or as recommended by the manufacturer of the solder.

B. All solder shall be "lead nickel and antimony free" in accordance with the Federal Safe Drinking Water Act Amendments of 1986 and 1996 as is ASTM B-32 Grade TC.

Composition:

| | |
|---|---|
| Tin | 95% |
| Copper | 4.0 – 5.0% |
| Selenium | .04 - .2% |
| Tensile Strength | 7,130 psi |
| Shear Strength | 5,970 psi |
| Melting temperature | 410°F |

C. Tubing shall be cut square and then reamed and deburred. End of tubing and inside of fitting cup shall be cleaned with steel wool and the flux shall be applied to the clean surface before soldering. After soldering, the excess solder shall be wiped off while still plastic.

D. 410 solder shall be used for all joints in:

1. Domestic cold water
2. Domestic hot water
3. Domestic hot water return
4. Copper drainage piping

E. Lead-Tin (50-50) solder or any solder containing lead shall NOT be used or permitted for joint connections on this project.

F. Form continuous solder bead or brazing filler bead around entire circumference of joint.

G. Wipe excess solder from joint area while solder is still plastic.

H. Solder joints shall be in accordance with IPC Section 605.2, 605.14.3 and ASTM B838. Flux shall conform to ASTM B-813.

## 3.4 PRESS-FIT SYSTEM

A. All new domestic water piping installed on this project shall be a solderless, press-fit, domestic water system. The system shall be Viega/Rigid copper press fitting system. Fittings shall be rated 0° to 250° at 200 psi and tested to 600 psi.

B. Fittings shall meet ANSI/NSF 61, – ASME B-16.22 and ASTM B88. Elastomeric seals shall meet ASTM D-2000.

C. Mechanical joining shall be recognized by:

IPC International Plumbing Code
SBCCI Standard Plumbing Code
IAPMO Uniform Plumbing Code
PHCC National Standard Plumbing Code

D. Copper and copper alloy press fittings shall conform to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer. Press end shall have SC (Smart Connect) feature design (leakage path). Smart Connect™ (SC Feature). In ProPress ½" to 4" dimensions, the Smart Connect Feature assures leakage of liquids and/or gases from inside the system past the sealing element of an unpressed connection. This feature shall provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.

E. Press Connections: Copper press fitting joints shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.

F. Installer shall be a qualified installer, licensed within the jurisdiction, and familiar with the installation of ProPress copper press joint systems. ProPress copper press fittings shall be installed using the proper tool, actuator, jaws and rings as instructed by the press fitting manufacturer. The installation of copper tubing for hot and cold water distribution systems shall conform to the requirements of the ICC International Plumbing Code or IAPMO Uniform Plumbing Code.

G. Note: Viega Press-fit installation shall only be permitted on this project. Push-on shark-teeth, or any type connection fittings that are not Press-Fit, shall NOT be approved.

H. T-drill mechanically formed tee fittings shall be used in conjunction with the ProPress Copper System in accordance with the IPC Chapter 6 Section 605.5.1, 605.5.1.2 and 605.14.1. Use caution around combustible material and follow all safety guidelines for open flame during silver brazing.

**END OF SECTION 22 00 10**