June 2014, Draft 01

22 1316 – Sanitary and Waste Vent Piping

PART 1. GENERAL

1.01 Summary

A. This Section includes the following for soil, waste, and vent piping **inside** the building:

1. Pipe, tube, and fittings.
2. Special pipe fittings.
3. Encasement for underground metal piping.

1.02 Performance Requirements

A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:

1. Storm, Soil, Waste, and Vent Piping: 10 foot head of water.
2. Storm and Sanitary Sewer, Force-Main Piping: 100 psig.

1.03 Submittals

A. Product Data: Provide for pipe, tube, fittings, and couplings.

B. Shop Drawings: For a Sovent drainage system, include plans, elevations, sections, and details.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.04 Quality Assurance

A. Piping materials shall bear label, stamp, or other markings of specified testing agency. In addition, all pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute or receive prior approval of the engineer.

B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

PART 2. PRODUCTS

2.01 Piping Materials

A. Flexible Transition Couplings for Underground Non-pressure Piping: ASTM C 1173 with elastomeric sleeve. Include ends of same sizes as piping to be joined and include corrosion-resistant metal band on each end.

B. Transition Couplings for Underground Pressure Piping: AWWA C219 metal, sleeve-type coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.02 Cast Iron Soil Piping

A. Main Risers shall be cast iron.

B. Storm sewer piping above ground shall be cast iron. Cast iron shall be used in supply air and return plenums.

C. Hub-and-Spigot Pipe and Fittings: ASTM A 74, Service and Extra-Heavy classes.

1. Gaskets: ASTM C 564, rubber.

D. Hubless Pipe and Fittings: ASTM A 888 or CISPI 301.

1. Couplings: ASTM C 1277 assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 rubber sleeve with integral, center pipe stop.

a). Heavy duty, Type 304, Stainless steel Couplings: ASTM A 666, Type 304, stainless steel shield; stainless steel bands; and sleeve.

1). NPS 3 to NPS 4: 3 inch wide shield with 4 bands.
2). NPS 5 to NPS 10: 4 inch wide shield with 6 bands.

b). Heavy duty, Cast iron Couplings: ASTM A 48, 2-piece, cast iron housing; stainless steel bolts and nuts; and sleeve.
c). Compact, Stainless steel Couplings: CISPI 310 with ASTM A 167, Type 301, or ASTM A 666, Type 301, stainless steel corrugated shield; stainless steel bands; and sleeve.

1). NPS 1-1/2 to NPS 4: 2-1/2 inch wide shield with 2 bands.

E. Sovent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.

2.03 Copper Tubing

A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.

1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

B. Soft Copper Tube: ASTM B 88, Type Land M, water tube, annealed temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought- copper, solder-joint fittings. Furnish wrought copper fittings if indicated.
2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end.
3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

C. Hard Copper Tube: ASTM B 88, Types L and M, water tube, drawn temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought- copper, solder-joint fittings. Furnish wrought copper fittings if indicated.
2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end.
3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.04 PVC Piping

A. PVC piping may be used horizontally off of Main Riser

B. Cellular-Core, Schedule 40, PVC Pipe: ASTM F 891, Schedule 40.

1. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe. Fittings shall come from the same manufacturer as the piping.

C. Schedule 40, PVC Pipe: ASTM D 2665, solid-wall drain, waste, and vent.

1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns. Fittings shall come from the same manufacturer as the piping.

D. PVC Special Fittings: ASTM F 409, drainage-pattern tube and tubular fittings with ends as required for application.

E. Where kitchen sanitary sewer piping, such as floor drains serving dish washers, may exceed 140º F use CPVC.

F. Laboratory sanitary sewer piping material shall be selected based upon what is most compatible with the expected effluent. Possible materials include CPVC, PP, PVFD.

2.05 Steel Piping

A. Steel Pipe: ASTM A 53, Type E or S, Grade A or B, Schedule 40, galvanized. Include ends matching joining method.

1. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53 or ASTM A 106, Schedule 40, galvanized, seamless steel pipe. Include ends matching joining method.
2. Malleable iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.
3. Cast iron, Flanged Fittings: ASME B16.1, Class 125, galvanized.
4. Steel piping, Grooved-End Fittings: ASTM A 47, galvanized, malleable iron casting; ASTM A 106, galvanized steel pipe; with dimensions matching steel pipe.

a). Steel piping, Keyed Couplings: AWWA C606, for steel-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

5. Steel piping, Expansion Joints: Compound, galvanized steel fitting with telescoping body and slip-pipe section. Include packing rings, packing, limit rods, chrome-plated finish on slip-pipe section, and flanged ends.
6. Steel piping, Double Expansion Joints: Compound, galvanized steel fitting with telescoping body and two slip-pipe sections. Include packing rings, packing, limit rods, chrome-plated finish on slip-pipe sections, and flanged ends.

2.06 PE Encasement for Underground Metal Piping: ASTM A 674 or AWWA C105, PE film, 0.008 inch minimum thickness, tube or sheet.

2.07 Insulation

A. Insulation shall be glass-fiber insulation; ASTM-C-547; 'K' value of 0.24 at 75"F; non-combustible, insulation for storm gravity drainage system shall be limited to horizontal branches only unless noted otherwise on the drawings.

1. Acceptable Manufacturers:

a). Manville Corporation.
b). Knauf.
c). Certain-Teed.
d). Owens Corning Fiberglass

B. Jackets

1. Interior Applications:

a). Vapor-Barrier Jackets: Kraft reinforced-foil vapor barrier with self-sealing adhesive joints.
b). PVC Jackets: One piece, premolded type.

2. Exterior Applications:

a). Aluminum Jackets: ASTM-B-209; 0.020 inch thick; smooth finish.
b). Stainless Steel Jackets: Type 304 stainless steel; 0.010 inch thick; smooth finish.

C. Accessories

1. Insulation Bands: 3/4 inch wide; 0.015 inch thick galvanized steel or 0.007 inch thick aluminum.
2. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum or 0.010 inch thick stainless steel.
3. Insulating Cement: ASTM-C-195; hydraulic-setting mineral wool.
4. Finishing Cement: ASTM-C-449.
5. Fibrous Glass Cloth: Untreated; 9 oz./sq. yd. weight.
6. Adhesives: Compatible with insulation.

D. Insulation thickness shall be:

1. Storm drainage piping (horizontal branches only)- 1/2"

PART 3. EXECUTION

3.01 Excavation

A. Refer to Division 2 for excavating, trenching, and backfilling.

3.02 Piping Applications

A. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.

B. Flanges may be used on above ground pressure piping, unless otherwise indicated.

C. Above ground Storm, Soil, Waste, and Vent Piping: Use any of the following piping materials for each size range:

1. NPS 1-1/4 to NPS 2-1/2: Copper DWV tube, copper drainage fittings, and soldered joints.

2. NPS 1-1/4 to NPS 10: Schedule 40 PVC with solvent cemented joints (for use off of main riser only).
3. NPS 3 to NPS 12: Service class, cast iron soil piping; gaskets; and gasketed joints.
4. NPS 3 to NPS 12: Service class, cast iron soil piping, hubless fittings.
5. NPS 3 to NPS 12: Schedule 40 Galvanized Steel pipe.

D. Underground Storm, Soil, Waste, Vent Piping:

1. Service class, cast iron soil piping; gaskets; and gasketed joints.
2. Copper piping shall not be used in this application

E. Underground Vent Piping NPS 4 and smaller:

1. Hubless, cast-iron soil pipe and fittings.

F. Above ground Storm and Sanitary-Sewage Force Mains: Use any of the following piping materials for each size range:

1. NPS 1-1/2 to NPS 4: Hard copper tube, Type L; copper pressure fittings; and soldered joints.
2. NPS 1-1/2 to NPS 4: Schedule 40 Galvanized Steel pipe.
3. Schedule 40 PVC may be use for this application.

3.03 Piping Installation

A. Install cleanouts at grade and extend to where building storm and sanitary drains connect to building storm and sanitary sewers.

B. Install cleanout fitting with closure plug inside the building in storm and sanitary force-main piping.

C. Install cast iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight.

D. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight.

E. Install cast iron storm and soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Encase underground piping with PE film according to ASTM A 674 or AWWA C105.

F. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

G. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

H. Install storm, soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Building Storm and Sanitary Drain: 2 percent downward in direction of flow for piping NPS 2-1/2 and smaller; 1 percent downward in direction of flow for piping NPS 3 and larger.
2. Horizontal Storm and Sanitary Drainage Piping: 2 percent downward in direction of flow for piping NPS 2-1/2 and smaller; 1 percent downward in direction of flow for piping NPS 3 and larger.

I. Install force mains at elevations indicated.

J. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.04 Joint Construction

A. Cast iron, Soil piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
2. Hubless Joints: Make with rubber gasket and sleeve or clamp.
3. Lead and Oakum Joints.

B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

C. Grooved Joints: Assemble joint with keyed coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

D. PVC Non-pressure Piping Joints: Join piping according to ASTM D 2665.

3.05 Hanger and Support Installation

A. Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:

   a). 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
   b). Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
   c). Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Install hangers for cast iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8 inch rod.
2. NPS 3: 60 inches with 1/2 inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8 inch rod.
4. NPS 6: 60 inches with 3/4 inch rod.
5. NPS 8 to NPS 12: 60 inches with 7/8 inch rod.
6. NPS 15: 60 inches with 1 inch rod.
7. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

D. Install supports for vertical cast iron soil piping every 15 feet.

E. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters.

1. NPS 1-1/4: 84 inches with 3/8 inch rod.
2. NPS 1-1/2: 108 inches with 3/8 inch rod.
3. NPS 2: 10 feet with 3/8 inch rod.
4. NPS 2-1/2: 11 feet with 1/2 inch rod.
5. NPS 3: 12 feet with 1/2 inch rod.
6. NPS 4 and NPS 5: 12 feet with 5/8 inch rod.
7. NPS 6: 12 feet with 3/4 inch rod.
8. NPS 8 to NPS 12: 12 feet with 7/8 inch rod.

F. Install supports for vertical steel piping every 15 feet.

G. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 72 inches with 3/8 inch rod.
2. NPS 1-1/2 and NPS 2: 96 inches with 3/8 inch rod.
3. NPS 2-1/2: 108 inches with 1/2 inch rod.
4. NPS 3 to NPS 5: 10 feet with 1/2 inch rod.
5. NPS 6: 10 feet with 5/8 inch rod.
6. NPS 8: 10 feet with 3/4 inch rod.

H. Install supports for vertical copper tubing every 10 feet.

I. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 48 inches with 3/8 inch rod.
2. NPS 3: 48 inches with 1/2 inch rod.
3. NPS 4 and NPS 5: 48 inches with 5/8 inch rod.
4. NPS 6: 48 inches with 3/4 inch rod.
5. NPS 8 t0 NPS 12: 48 inches with 7/8 inch rod.

J. Install supports for vertical PVC piping every 48 inches.

K. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.06 Connections

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Connect force-main piping to the following:

1. Sanitary Sewer: To exterior force main or sanitary manhole.
2. Sewage Pumps: To sewage pump discharge.
3. Storm Sewer: To exterior force main or storm manhole
4. Sump Pumps: To sump pump discharge

3.07 Field Quality Control

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm and sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1 inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional

air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
4. Prepare reports for tests and required corrective action.

3.08 Cleaning

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.09 Protection

A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

End of Division 22 1316

This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.