

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper tube and fittings.
2. ABS pipe and fittings.
3. PVC pipe and fittings.
4. Specialty pipe fittings.
5. Encasement for underground metal piping.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Copper tube and fittings.
2. ABS pipe and fittings.
3. PVC pipe and fittings.
4. Specialty pipe fittings.
5. Encasement for underground metal piping.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For hubless, single-stack drainage system. Include plans, elevations, sections, and details.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans and elevations, or Building Information Model (BIM) drawn to scale, showing items described in this Section and coordinated with all building trades.

B. Field quality-control reports.

1.4 FIELD CONDITIONS

A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service in accordance with requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of sanitary waste service.
2. Do not proceed with interruption of sanitary waste service without Architect's written permission.

1.5 WARRANTY

- A. Listed manufacturers to provide labeling and warranty of their respective products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Components and installation are capable of withstanding the following minimum working pressure unless otherwise indicated:
 1. Soil, Waste, and Vent Piping: **10 ft. head of water.**
- B. Components and installation are capable of withstanding the following maximum working waste stream temperatures unless otherwise indicated:

<u>Piping Material</u>	<u>Maximum Allowable Temperature</u>
DWV Copper	150°F
Acrylonitrile Butadiene Styrene (ABS)	160°F
Polyvinyl Chloride (PVC) - Schedule 40	120°F
Polyvinyl Chloride (PVC) - Schedule 80	200°F

2.2 PIPING MATERIALS

- A. Piping materials to bear label, stamp, or other markings of specified testing agency.
- B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 COPPER TUBE AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Apollo Valves; a part of Alberts Integrated Piping Systems.

2. Cambridge-Lee Industries, LLC.
 3. Cerro Flow Products, LLC.
 4. Wieland Copper Products, LLC.
- B. Copper Type DWV Tube: ASTM B306, drainage tube, drawn temper.
- C. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
- D. Hard Copper Tube: ASTM B88, Type M, water tube, drawn temper.
- E. Soft Copper Tube: ASTM B88, Type M, water tube, annealed temper.
- F. Solder: ASTM B32, lead free with ASTM B813, water-flushable flux.

2.4 ABS PIPE AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Charlotte Pipe and Foundry Company.
 2. JM Eagle.
 3. Royal Building Products, a Westlake Company.
- B. NSF Marking: Comply with NSF 14 for plastic piping components. Include "NSF-dwv" marking for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.
- C. Solid-Wall ABS Pipe: ASTM D2661, Schedule 40.
- D. Cellular-Core ABS Pipe: **NOT ALLOWED**.
- E. ABS Socket Fittings: ASTM D2661, made in accordance with ASTM D3311, drain, waste, and vent patterns.
- F. Solvent Cement: ASTM D2235.
1. Verify solvent cement has a VOC content of 325 g/L or less.
 2. Verify solvent cement complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.5 PVC PIPE AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Apollo Valves; a part of Alberts Integrated Piping Systems.
 2. Charlotte Pipe and Foundry Company.
 3. GF Piping Systems.

4. JM Eagle.
 5. National Pipe and Plastic, Inc.
 6. North America Pipe Corporation.
 7. Rocky Mountain Colby Pipe Company.
 8. Silver-line Plastics.
- B. Comply with NSF 14 for plastic piping components. Include "NSF-dwv" marking for plastic drain, waste, and vent piping and "NSF-sewer" marking for plastic sewer piping.
- C. Solid-Wall PVC Pipe: ASTM D2665 drain, waste, and vent.
- D. Cellular-Core PVC Pipe: **NOT ALLOWED**.
- E. PVC Socket Fittings: ASTM D2665, made in accordance with ASTM D3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- F. Adhesive Primer: ASTM F656.
1. Verify adhesive primer has a VOC content of 550 g/L or less.
 2. Verify adhesive primer complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- G. Solvent Cement: ASTM D2564.
1. Verify solvent cement has a VOC content of 510 g/L or less.

2.6 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
1. General Requirements: Fitting or device for joining piping with small differences in ODs or of different materials. Include end connections of same size as and compatible with pipes to be joined.
 2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
 3. Unshielded, Nonpressure Transition Couplings:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Dallas Specialty & Mfg. Co.
 - 2) Fernco Inc.
 - 3) Mission Rubber Company, LLC; a division of MCP Industries.
 - 4) Plastic Oddities.
 - b. Standard: ASTM C1173.
 - c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - d. End Connections: Same size as and compatible with pipes to be joined.
 - e. Sleeve Materials:

- 1) For Cast-Iron Soil Pipes: ASTM C564, rubber.
- 2) For Plastic Pipes: ASTM F477, elastomeric seal or ASTM D5926 PVC.
- 3) For Dissimilar Pipes: ASTM D5926 PVC or other material compatible with pipe materials being joined.
4. Shielded, Non-pressure Transition Couplings:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cascade Waterworks Mfg. Co.
 - 2) Mission Rubber Company, LLC; a division of MCP Industries.
 - b. Standard: ASTM C1460.
 - c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - d. End Connections: Same size as and compatible with pipes to be joined.
5. Pressure Transition Couplings:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Apollo Valves; a part of Aalberts Integrated Piping Systems.
 - 2) Cascade Waterworks Mfg. Co.
 - 3) EBAA Iron Sales, Inc.
 - 4) Ford Meter Box Company, Inc. (The).
 - 5) JCM Industries, Inc.
 - 6) Romac Industries, Inc.
 - b. Standard: AWWA C219.
 - c. Description: Metal sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
 - d. Center-Sleeve Material: **Stainless steel**.
 - e. Gasket Material: Natural or synthetic rubber.
 - f. Metal Component Finish: Corrosion-resistant coating or material.

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 DELIVERY, STORAGE AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Pipes and fittings made of plastics such as Polyvinyl Chloride (PVC), Acrylonitrile Butadiene Styrene (ABS) etc shall be protected from exposure to direct sunlight.
- C. Pipes made of plastics shall be supported to prevent sagging and bending while stored on site.

3.3 INSTALLATION OF PIPING

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
 - 1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
 - 2. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.
 - 1. 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.
 - 2. Use long-turn, double Y-branch, and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.
 - a. Straight tees, elbows, and crosses may be used on vent lines.
 - 3. Do not change direction of flow more than 90 degrees.
 - 4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
 - a. Reducing size of waste piping in direction of flow is prohibited.
- K. Lay buried building waste piping beginning at low point of each system.
 - 1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
 - 2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
 - 3. Maintain swab in piping and pull past each joint as completed.

- L. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Waste: 2% downward in direction of flow for piping NPS 2-1/2 and smaller; 1% downward in direction of flow for piping NPS 3 and larger.
 - 2. Horizontal Sanitary Waste Piping: 2% downward in direction of flow.
 - 3. Vent Piping: 1% down toward vertical fixture vent or toward vent stack.
- M. Install aboveground copper tubing in accordance with CDA's "Copper Tube Handbook."
- N. Install aboveground ABS piping in accordance with ASTM D2661.
- O. Install aboveground PVC piping in accordance with ASTM D2665.
- P. Install underground ABS and PVC piping in accordance with ASTM D2321.
- Q. Install engineered soil and waste and vent piping systems as follows:
 - 1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
 - 2. Hubless, Single-Stack Drainage System: Comply with ASME B16.45 and hubless, single-stack aerator fitting manufacturer's written installation instructions.
 - 3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.
- R. Plumbing Specialties:
 - 1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.
 - a. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping.
 - b. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
 - 2. Install drains in sanitary waste gravity-flow piping.
 - a. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."
- S. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- T. Install sleeves for piping penetrations of walls, ceilings, and floors.
 - 1. Comply with requirements for sleeves specified in Section 220500 "Common Work Results for Plumbing."
- U. Install sleeve seals for piping penetrations of concrete walls and slabs.
 - 1. Comply with requirements for sleeve seals specified in Section 220500 "Common Work Results for Plumbing."
- V. Install escutcheons for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for escutcheons specified in Section 220500 "Common Work Results for Plumbing."

3.4 JOINT CONSTRUCTION

- A. Join copper tube and fittings with soldered joints in accordance with ASTM B828. Use ASTM B813, water-flushable, lead-free flux and ASTM B32, lead-free-alloy solder.
- B. Plastic, Non-pressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings in accordance with the following:
 1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
 2. ABS Piping: Join in accordance with ASTM D2235 and ASTM D2661 appendixes.
 3. PVC Piping: Join in accordance with ASTM D2855 and ASTM D2665 appendixes.

3.5 INSTALLATION OF SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
 1. Install transition couplings at joints of piping with small differences in ODs.
 2. In Waste Drainage Piping: Shielded, nonpressure transition couplings.
 3. In Aboveground Force Main Piping: Fitting-type transition couplings.
 4. In Underground Force Main Piping:
 - a. NPS 1-1/2 (DN 40) and Smaller: Fitting-type transition couplings.
 - b. NPS 2 (DN 50) and Larger: Pressure transition couplings.

3.6 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment"
 1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
 2. Install **carbon-steel** pipe support clamps for vertical piping in noncorrosive environments.
 3. Install stainless steel pipe support clamps for vertical piping in corrosive environments.
 4. Vertical Piping: MSS Type 8 or Type 42 clamps.
 5. Install individual, straight, horizontal piping runs:
 - a. 100 Ft. (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Ft. (30 m): MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Ft. (30 m) if Indicated: MSS Type 49, spring cushion rolls.
 6. Multiple, Straight, Horizontal Piping Runs 100 Ft. (30 m) or Longer: MSS Type 44 pipe rolls. Support pipe rolls on trapeze.
 7. Base of Vertical Piping: MSS Type 52 spring hangers.

- C. Install hangers for ABS and PVC piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- D. Support horizontal piping and tubing within 12 inches of each fitting and coupling.
- E. Support vertical runs of ABS and PVC piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.7 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 waste and vent piping to the following:
 - 1. Plumbing Fixtures: Connect waste 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 waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
 - 5. Comply with requirements for cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."
 - 6. Equipment: Connect waste piping as indicated.
 - a. Provide shutoff valve if indicated and union for each connection.
 - b. Use flanges instead of unions for connections NPS 2-1/2 and larger.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- E. Make connections in accordance with the following unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping.
- B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 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. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary waste and vent piping in accordance with 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.
 - a. 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 waste and vent piping until it has been tested and approved.
 - a. Expose work that was covered or concealed before it was tested.
 - 3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.
 - a. Close openings in piping system and fill with water to point of overflow, but not less than 10 ft. head of water.
 - b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
 - c. 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.
 - a. 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.
 - b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
 - c. Air pressure must remain constant without introducing additional air throughout period of inspection.
 - d. 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. Using compressed air to pressure test any portion of the sanitary, waste, drain and vent system that is PVC or any other plastic/polymer material **IS STRICTLY PROHIBITED BY THE INTERNATIONAL PLUMBING CODE** and the Manufacturer.
 - a. Any PVC or any other plastic/polymer piping tested with compressed air SHALL BE completely removed and replaced at NO ADDITIONAL COST to the owner.
 - 7. Prepare reports for tests and required corrective action.

3.10 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect sanitary waste and vent piping 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.
- D. Exposed Plastic Piping: Protect ABS or PVC plumbing vents exposed to sunlight with two coats of water-based latex paint.
- E. Repair damage to adjacent materials caused by waste and vent piping installation.

3.11 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 4 (DN 100) and smaller are to be the following:
 - 1. Copper Type DWV tube, copper drainage fittings, and soldered joints.
 - 2. Solid-wall ABS pipe, ABS socket fittings, and solvent-cemented joints.
 - 3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 - 4. Dissimilar Pipe-Material Couplings: Shielded, non-pressure transition couplings.
 - 5. The use of Foam Core / Cellular Core is **NOT ALLOWED!**
- C. Underground, soil, waste, and vent piping are to be the following:
 - 1. Solid-wall ABS pipe, ABS socket fittings, and solvent-cemented joints.
 - 2. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 - 3. Dissimilar Pipe-Material Couplings: Shielded, non-pressure transition couplings.
 - 4. The use of Foam Core / Cellular Core is **NOT ALLOWED!**
- D. Equipment drain piping shall be according to the following schedule:
 - 1. P&T relief piping, drain piping for equipment generating hot water:
 - a. Copper Type M, hard temper, copper drainage fittings, and soldered joints
 - 2. Equipment generating condensate from refrigeration:
 - a. Copper Type M, hard temper, copper drainage fittings, and soldered joints
 - 3. Equipment generating condensate from combustion process/flue gasses:
 - a. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 - 4. Backflow preventer relief piping
 - a. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

END OF SECTION 221316