

SECTION 221316 – SANITARY, CHEMICAL, AND VENT PIPING SYSTEMS

Latest Update: 08-16-2020 See Underlined Text for Edits

(Engineer shall edit specifications and blue text in header to meet project requirements. This includes but is not limited to updating Equipment and/or Material Model Numbers indicated in the specifications and adding any additional specifications that may be required by the project. Also turn off all “Underlines”.)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section and all other sections of Division 22.

1.2 SUMMARY

- A. This section includes the requirements for sanitary, chemical and vent piping and specialties above ground within the building, and sanitary piping below the floor slab to five (5) feet outside the building, and includes the following:

<Edit for particular project>

1. Cast iron hub and spigot pipe and fittings.
2. Hubless, cast-iron soil pipe and fittings.
3. Chemical waste systems for laboratory and health care facilities.
4. Specialty pipe fittings.
5. Floor drains.
6. Backwater valves.
7. Cleanouts.
8. Drainage specialties.
9. Roof flashing assemblies.
10. Flashing materials,
11. Fire stop assemblies.

1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
 1. Soil, Waste, and Vent Piping: Ten (10) foot head of water.
- B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.4 ACTION SUBMITTALS

- A. Product Data: For each specified product, include manufacturers cut sheets, dimensional data, performance data, installation instructions, and warranty information.

B. LEED Submittals:

1. Product Data for Credit IEQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit IEQ 4: For solvent cements and adhesive primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: For drainage system. Include plans, elevations, sections, and details.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Include a copy of each approved submittal along with any applicable maintenance data in the project operation and maintenance manual.

1.6 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.
- B. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
- C. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.
- D. Field quality-control reports.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: The installer shall be a qualified licensed installer within the jurisdiction and familiar with the installation of the pipes and fittings specified herein for each piping system.
- B. Material Labels: Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. Compliance: Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.
- D. Source Limitations: Obtain pipe and fittings from the same manufacturer for each pipe system.

1.8 PROJECT 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 according to requirements indicated:
1. Notify Owner no fewer than ten (10) days in advance of proposed interruption of sanitary waste service.
 2. Do not proceed with interruption of sanitary waste service without Owner's written permission.

1.9 WARRANTY/GUARENTEE

- A. See Division 22, Specification Section “Basic Mechanical Requirements – Plumbing” for warranty and guarantee requirements.

PART 2 - PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS

- A. Material Design and Selection: Sanitary, Chemical and Vent pipes, fittings, and specialties shall be designed and selected, for the intended use, in accordance with the sizes on the drawings and the requirements of this specification.
- B. Acceptable Manufacturers:
1. Cast Iron Piping Systems: The basic of design is Charlotte Pipe. Other acceptable manufacturers are:
 - a. Tyler Pipe Company.
 2. Hubless Cast Iron Piping Systems: The basic of design is Charlotte Pipe. Other acceptable manufacturers are:
 - a. Tyler Pipe Company.
 3. Chemical Acid Waste Piping Systems: The basic of design is Enfield mechanical joint piping system. Other acceptable manufacturers are:
 - a. Orion Products.
 4. Floor Drains, Floor Sinks, Cleanouts and Back Water Valves: The basis of design is Zurn Plumbing Products. Other acceptable manufacturers are:
 - a. Josam Company
 - b. J.R. Smith Manufacturing Company

- c. MIFAB Inc.
- 5. Specialty Pipe Fittings: The basis of design is Watts Plumbing Products. Other acceptable manufacturers are:
 - a. Wilkins.
 - b. Capitol Manufacturing Company
 - c. Fernco Inc.

2.2 SANITARY, CHEMICAL AND VENT PIPE APPLICATION

- A. General Application: All pipe, fittings and joint methods shall be as specified below. The listed manufacturers, materials and model numbers below are the basis of design. For this application, Sanitary, Chemical and Vent Piping Systems are defined as follows:
 - 1. Sanitary System: Includes Waste and Vent Piping serving non laboratory areas of the project and/or the building.
 - 2. Chemical System: Includes Chemical Waste and Vent Piping serving laboratory areas of the project and/or the building.
- B. Sanitary, Chemical and Vent Pipe Material Application Schedule:
 - 1. See application schedule below:

Pipe System	Pipe Material	Fitting Material	Joint Material
Sanitary and Vent Systems Below Grade to 5 feet beyond the building.	Cast Iron: 2 inch – 15 inch, Service Weight, Hub and Spigot, , ASTM A74	Cast Iron Fittings: 2 inch – 15 inch, Service Weight, Hub and Spigot, ASTM A74	Hub and Spigot, Lead and Oakum joints or compression gaskets, ASTM C 564
	All Cast Iron Soil Pipe and Fittings shall be marked with the Collective Trade Mark of the Cast Iron Soil Pipe Institute (CISPI) and listed by NSF International		

Pipe System	Pipe Material	Fitting Material	Joint Material
Non Laboratory Sanitary and Vent Systems above ground within the building	Cast Iron: 2 inch – 10 inch, Service Weight, No Hub, C15P1-301.	Cast Iron Fittings: 2 inch – 10 inch, Service Weight, No Hub, C15P1-301	Couplings: Husky SD 4000 Heavy Duty Type 304 Stainless Steel Couplings
Laboratory Chemical Waste and Vent Systems above ground within the building	1-1/2 inch – 8 inch, Polypropylene Flame retardant, ASTM D635, Schedule 40 piping, manufactured by the Enfield Industrial Corporation.	Fittings: 1-1/2 inch – 8 inch, Polypropylene: Flame retardant, ASTM D635, Schedule 40, union type fittings as manufactured by the Enfield Industrial Corporation	Mechanical Joint: Same manufacturer as pipe material.
	1-1/2 inch – 8 inch, Polypropylene Blue Line Flame retardant, Schedule 40 piping, conforming to ASTM F1412, ASTM D4104 & ASTM D3311 as manufactured by Orion. (Contractors Option)	Fittings: 1-1/2 inch – 8 inch, Polypropylene Blue Line Flame retardant, Schedule 40 fittings, conforming to ASTM F1412, ASTM D4104 & ASTM D3311 as manufactured by Orion, (Contractors Option)	No hub mechanical joints for piping in accessible areas such as above suspended ceilings, in mechanical rooms & utility shafts. Socket fusion joints for concealed piping in non accessible areas such as in walls, and/or above hard ceilings. (Contractors Option)

Pipe System	Pipe Material	Fitting Material	Joint Material
<u>Laboratory Chemical Waste and Vent Systems above ground within the building in plenum spaces</u>	<u>1-1/2 inch – 8 inch, Polyvinylidene Fluoride PVDF Schedule 40 piping, conforming to ASTM D3222 as manufactured by Orion.</u>	<u>Fittings: 1-1/2 inch – 8 inch, Polyvinylidene Fluoride PVDF Schedule 40, Schedule 40 fittings, conforming to ASTM F1673, ASTM D3311 & ASTM D3222 as manufactured by Orion.</u>	<u>No hub mechanical joints for piping in accessible areas such as above suspended ceilings, in mechanical rooms & utility shafts. Socket fusion joints for concealed piping in non accessible areas such as in walls, and/or above hard ceilings.</u>

2.3 COUPLINGS FOR SANITARY WASTE AND VENT SYSTEMS

- A. General: All couplings shall be a Husky SD 4000 heavy-duty, all stainless steel coupling to join No-Hub pipe and fittings as engineered by Anaco. Each coupling shall include a super-duty corrugated shield of sufficient width to accommodate additional surface-bearing sealing clamps. All SD 4000 couplings shall be designed to be installed with a pre-set torque wrench calibrated at eighty (80) inch pounds to accommodate the 305 stainless steel three eighths (3/8) inch Hex Head screws.
- B. Waste and Vent Pipe Sizes One and One Half (1-1/2) Inch Through Four (4) Inch: The one and one half (1-1/2) inch through four (4) inch diameter couplings shall consist of three (3) inch wide corrugated 304 stainless steel shield in conjunction with four (4) stainless steel clamps, secured in place by means of an affixed and “floating” eyelet to allow clamp “travel” during tightening.
- C. Waste and Vent Pipe Sizes Five (5) Inch Through Ten (10) Inch: The five (5) inch through ten (10) inch diameter couplings shall consist of four (4) inch wide corrugated 304 stainless steel shield in conjunction with six (6) stainless steel clamps, secured in place by means of an affixed and “floating” eyelet to allow clamp “travel” during tightening.
- D. Material Specifications:

1. Clamp: Type 304 AISI stainless steel
2. Screw: Type 305 AISI stainless steel 3/8 inch screws
3. Shield: Type 304 AISI stainless steel, corrugated. Shield thickness 0.015
4. Gasket: The gasket shall be manufactured from a properly vulcanized virgin compound in which the primary elastomer is polychloroprene (neoprene) conforming to ASTM C 564. Oil Immersion test: 80% max. Volume Change after immersion in IRM 903 for seventy (70) hours at 212° F.

E. Certifications & Standards: Tested & Certified to:

1. ASTM C1540
2. ASTM C564
3. FM 1680 Class 1

2.4 FLOOR DRAINS <Edit for particular project>

A. Cast Iron Floor Drain - FD – 1:

1. Model: Zurn Z415
2. Standard: ASME A112.6.3.
3. Pattern: Floor Drain.
4. Body Material: Cast Iron.
5. Seepage Flange: Required.
6. Anchor Flange: Required.
7. Clamping Device: Required.
8. Outlet: Bottom, Threaded, Spigot or No Hub.
9. Backwater Valve: Not Required.
10. Coating – Interior and Exterior Exposed Surfaces: Acid resistant enamel.
11. Sediment Bucket: Not Required.
12. Top of Strainer Material: Nickle Bronze.
13. Top of Strainer Finish: Nickle Bronze.
14. Top Shape: Round.
15. Strainer Dimension: Eight (8) inches.
16. Top Loading Classification: Light Duty.
17. Funnel: Not Required.
18. Inlet Fitting: Gray Iron.
19. Trap Material: Cast Iron.
20. Trap Pattern: ‘P’ Trap.
21. Trap Feature: Trap primer connection located in the outlet pipe connection, not in the body of the drain.

B. Cast Iron Floor Drain - FD – 2:

1. Model: Zurn Z415
2. Standard: ASME A112.6.3.

3. Pattern: Floor Drain.
4. Body Material: Cast Iron.
5. Seepage Flange: Required.
6. Anchor Flange: Required.
7. Clamping Device: Required.
8. Outlet: Bottom, Threaded, Spigot or No Hub.
9. Backwater Valve: Not Required.
10. Coating – Interior and Exterior Exposed Surfaces: Acid resistant enamel.
11. Sediment Bucket: Not Required.
12. Top of Strainer Material: Nickle Bronze.
13. Top of Strainer Finish: Nickle Bronze.
14. Top Shape: Round.
15. Strainer Dimension: Eight (8) inches.
16. Top Loading Classification: Light Duty.
17. Funnel: Not Required.
18. Inlet Fitting: Gray Iron.
19. Trap Material: Cast Iron.
20. Trap Pattern: ‘P’ Trap.
21. Trap Feature: Trap primer connection located in the outlet pipe connection.
Connections located in the body of the drain are not acceptable.

C. Cast Iron Floor Drain - FD – 3:

1. Model: Zurn Z415
2. Standard: ASME A112.6.3.
3. Pattern: Floor Drain.
4. Body Material: Cast Iron.
5. Seepage Flange: Required.
6. Anchor Flange: Required.
7. Clamping Device: Required.
8. Outlet: Bottom, Threaded, Spigot or No Hub.
9. Backwater Valve: Not Required.
10. Coating – Interior and Exterior Exposed Surfaces: Acid resistant enamel.
11. Sediment Bucket: Not Required.
12. Top of Strainer Material: Nickle Bronze.
13. Top of Strainer Finish: Nickle Bronze.
14. Top Shape: Round.
15. Strainer Dimension: Eight (8) inches.
16. Top Loading Classification: Light Duty.
17. Funnel: Not Required.
18. Inlet Fitting: Gray Iron.
19. Trap Material: Cast Iron.
20. Trap Pattern: ‘P’ Trap.
21. Trap Feature: Trap primer connection located in the outlet pipe connection.
Connections located in the body of the drain are not acceptable.

D. Cast Iron Floor Drain - FD – 4:

1. Model: Zurn Z415
2. Standard: ASME A112.6.3.
3. Pattern: Floor Drain.
4. Body Material: Cast Iron.
5. Seepage Flange: Required.
6. Anchor Flange: Required.
7. Clamping Device: Required.
8. Outlet: Bottom, Threaded, Spigot or No Hub.
9. Backwater Valve: Not Required.
10. Coating – Interior and Exterior Exposed Surfaces: Acid resistant enamel.
11. Sediment Bucket: Not Required.
12. Top of Strainer Material: Nickle Bronze.
13. Top of Strainer Finish: Nickle Bronze.
14. Top Shape: Round.
15. Strainer Dimension: Eight (8) inches.
16. Top Loading Classification: Light Duty.
17. Funnel: Not Required.
18. Inlet Fitting: Gray Iron.
19. Trap Material: Cast Iron.
20. Trap Pattern: 'P' Trap.
21. Trap Feature: Trap primer connection located in the outlet pipe connection.
Connections located in the body of the drain are not acceptable.

2.5 FLOOR SINKS <Edit for particular project>

A. Cast Iron Floor Sinks – FS – 1 and FS – 2:

1. Model: Zurn Z1926
2. Standard: ASME A112.6.3.
3. Pattern: Floor Sink.
4. Body Material: Cast Iron.
5. Seepage Flange: Required.
6. Anchor Flange: Required.
7. Clamping Device: Required.
8. Outlet: Bottom, Threaded, Spigot or No Hub.
9. Backwater Valve: Not Required.
10. Coating – Interior and Exterior Exposed Surfaces: Acid resistant enamel.
11. Sediment Bucket: Not Required.
12. Anti - Splash Dome Strainer: Required.
13. Top of Strainer Material: Gray Iron.
14. Top of Strainer Finish: Rough Bronze.
15. Top Shape: Square.
16. Strainer Dimension: Sixteen (16) inches.

17. Top Loading Classification: Heavy Duty.
18. Funnel: Not Required.
19. Inlet Fitting: Gray Iron.
20. Trap Material: Cast Iron.
21. Trap Pattern: 'P' Trap.
22. Trap Feature: Trap primer connection located in the outlet pipe connection. Connections located in the body of the drain are not acceptable.

2.6 BACKWATER VALVES <Delete if not applicable to particular project>

A. Horizontal, Cast-Iron Backwater Valves:

1. Standard: ASME A112.14.1.
2. Size: Same as connected piping.
3. Body: Cast iron.
4. Cover: Cast iron with bolted or threaded access check valve.
5. End Connections Hub and spigot or hubless.
6. Extension: ASTM A 74, Service class; full-size, cast-iron, soil-pipe extension to field-installed cleanout at floor; replaces backwater valve cover.

2.7 CLEANOUTS <Edit for particular project>

A. Exposed Metal Cleanouts:

1. ASME A112.36.2M, Cast-Iron Cleanouts with straight threads and gasket seal or taper threads for plug flashing flange and clamping ring, and a brass closure plug. Cleanouts for installation in floors not having membrane waterproofing may be furnished without clamping ring:
2. Cleanouts in concrete floors:
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Model No. Z-1400 style to suit floor finish with round scoriated top or comparable product by one of the following:
3. Cleanouts in Finished Floors:
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Model No. ZN-1400 style to suit floor finish with recessed top for tile or carpet, or comparable product.
4. Cleanouts in Piping:
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Model No. ZN-1450-7 with bronze plug, or comparable product.

5. Cleanouts in Walls:

- a. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Model No. ZN-1440-1 style to suit all finishes with vandal proof screws, or comparable product.

2.8 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
2. Size: Same as connected waste piping with increaser fitting of size indicated.

B. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 or 3/4 side inlet.

C. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

D. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend two (2) inches above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

E. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.

2. Size: Same as connected stack vent or vent stack.

F. Frost-Resistant Vent Terminals:

1. Description: Manufactured or shop-fabricated assembly constructed of copper, lead-coated copper, or galvanized steel.
2. Design: To provide one (1) inch enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing.

G. Expansion Joints:

1. Standard: ASME A112.21.2M.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

2.9 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Acorn Engineering Company; Elmdor/Stoneman Div.
 - b. Thaler Metal Industries Ltd.
2. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch- thick, lead flashing collar and skirt extending at least 8 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.
 - a. Open-Top Vent Cap: Without cap.
 - b. Low-Silhouette Vent Cap: With vandal-proof vent cap.
 - c. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.10 FLASHING MATERIALS

- A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:
1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
 2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
 3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.
- B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft..
 2. Vent Pipe Flashing: 8 oz./sq. ft..
- C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.
- D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.
- E. Fasteners: Metal compatible with material and substrate being fastened.
- F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.
- G. Solder: ASTM B 32, lead-free alloy.
- H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

2.11 THROUGH PENETRATION FIRESTOPPING ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ProSet Systems Inc.
2. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
3. Size: Same as connected soil, waste, or vent stack.
4. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
5. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
6. Special Coating: Corrosion resistant on interior of fittings.

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Division 31 Specification Section "Earth Moving."

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of sanitary, chemical and vent piping systems. Install sanitary, chemical and vent piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install sanitary, chemical and vent piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install sanitary, chemical and vent 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 sanitary, chemical and vent piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install sanitary, chemical and vent piping to permit valve servicing.
- F. Install sanitary, chemical and vent piping at indicated slopes.
- G. Install sanitary, chemical and vent piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install sanitary, chemical and vent piping to allow application of insulation.
- J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Division 22 Specification Section "Vibration and Seismic Controls for Plumbing Systems."
- K. Make changes in direction for sanitary, chemical 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 two (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.
- L. 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.

- M. Install sanitary, chemical and vent piping at the following minimum slopes unless otherwise indicated:
1. Building Sanitary Drain: 2% downward in direction of flow for piping NPS 3 and smaller; 1% downward in direction of flow for piping NPS 4 and larger.
 2. Horizontal Sanitary Drainage Piping: 2% downward in direction of flow.
 3. Vent Piping: 1% down toward vertical fixture vent or toward vent stack.
- N. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.
- O. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- P. Install sleeves for piping penetrations of masonry walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Specification Section "Sleeves, Sleeve Seals and Escutcheons for Plumbing Piping." See fire stopping specifications for
- Q. Install sleeve seals for piping penetrations of concrete foundation walls and slabs on grade. Comply with requirements for sleeve seals specified in Division 22 Specification Section "Sleeves, Sleeve Seals and Escutcheons for Plumbing Piping."
- R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Specification Section "Sleeve, Sleeve Seals and Escutcheons for Plumbing Piping."

3.3 INSTALLATION

- A. Equipment Mounting: <Edit for particular project>
1. Comply with requirements for vibration isolation and seismic control devices specified in Division 22 Specification Section "Vibration and Seismic Controls for Plumbing Systems."
 2. Comply with requirements for vibration isolation devices specified in Division 22 Specification Section "Vibration and Seismic Controls for Plumbing Systems."
- B. Assemble open drain fittings and install with top of hub one (1) inch above floor.
- C. Install deep-seal traps on floor drains and other waste outlets, if indicated.
- D. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
 2. Size: Same as floor drain inlet.
- E. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- F. Install vent caps on each vent pipe passing through roof.
- G. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.
- H. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.
- I. Plumbing Specialties: <Edit for particular project>
1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping.
 2. Install drains in sanitary drainage gravity-flow piping.
 3. Install backwater valves in sanitary waster gravity-flow piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.
 4. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 - a. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 - b. Locate at each change in direction of piping greater than 45 degrees.
 - c. Locate at minimum intervals of fifty (50) feet for piping NPS 4 and smaller and one hundred (100) feet for larger piping.
 - d. Locate at base of each vertical soil and waste stack.
 5. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
 6. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
 7. Where cleanouts are installed in plumbing chases serving wall mounted fixtures locate the cleanout at least thirty six (36) inches above the finished floor or above the grab bar in the stall.
 8. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
 9. Position floor drains for easy access and maintenance.

10. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
 - a. Radius, Thirty (30) Inches or Less: Equivalent to one (1) percent slope, but not less than one quarter (1/4) inch total depression.
 - b. Radius, Thirty (30) to sixty (60) Inches: Equivalent to one (1) percent slope.
 - c. Radius, Sixty (60) Inches or Larger: Equivalent to one (1) percent slope, but not greater than one (1) inch total depression.
11. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
12. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

3.4 JOINT CONSTRUCTION

- A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum calked joints.
- C. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- D. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

3.5 SPECIALTY PIPE FITTING INSTALLATION <Edit for particular project>

- A. Transition Couplings:
 1. Install transition couplings at joints of piping with small differences in OD's.
 2. In Drainage Piping: Unshielded, nonpressure transition couplings.
- B. Dielectric Fittings:
 1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
 2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.
 3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges or flange kits.
 4. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.6 VALVE INSTALLATION

- A. Sewage Pump Valves: Requirements for isolation valves and check valves are specified in Division 22 Specification Section "Valves for Plumbing Piping Systems."
- B. Backwater Valves: Install backwater valves in piping subject to backflow.
 - 1. Horizontal Piping: Horizontal backwater valves.
 - 2. Floor Drains: Drain outlet backwater valves unless drain has integral backwater valve.
 - 3. Install backwater valves in accessible locations.

3.7 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices specified in Division 22 Specification Section "Vibration and Seismic Controls for Plumbing Systems."
- B. Comply with requirements for pipe hanger and support devices and installation specified in Division 22 Specification Section "Hangers and Supports for Plumbing Piping Systems."

3.8 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. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
 - 5. 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. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to 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.

3.9 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Division 22 Specification Section "Identification for Plumbing Piping and Equipment."

3.10 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least twenty four (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.

3.11 CLEANING AND PROTECTION

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.

3.12 CONNECTIONS

A. Install piping adjacent to equipment to allow service and maintenance.

3.13 LEAK TEST PIPING SYSTEMS:

- A. See Division 22 Specification Section “Leak Test Plumbing Piping Systems” for testing requirements.

END OF SECTION 221316