SECTION 221316 - SANITARY WASTE AND VENT PIPING

Revise this Section by deleting and inserting text to meet Project-specific requirements.

This Section uses the term "Architect." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

See "Writing Guide" Article in the Evaluations for a discussion of how this Section is organized and the most efficient way to revise this Section.

1. GENERAL
	* + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			1. SUMMARY
				1. Section Includes:

Hub-and-spigot, cast-iron soil pipe and fittings.

Hubless, cast-iron soil pipe and fittings.

Galvanized-steel pipe and fittings.

Stainless-steel drainage pipe and fittings.

Ductile-iron pipe and fittings.

Copper tube and fittings.

Specialty pipe fittings.

Encasement for underground metal piping.

* + - 1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are submitted and tabbed (for combined submittals).
				4. Product Data: For each type of product.

USE PARAGRAPH BELOW WITH EPD REQUIREMENT WHEN PROJECT ESTIMATE IS $1M OR MORE.

* + - * 1. Submit an Environmental Product Declaration (EPD) from the manufacturer for steel pipe within this specification section, if available. A statement of the contractor’s good faith effort to obtain the EPD shall be provided if not available.

Manufacturer-provided EPDs must be Product Specific Type III (Third-Party Reviewed), in adherence with ISO 14025 *Environmental labels and declarations*, ISO 14044
*Environmental management – Life cycle assessment*, and ISO 21930 *Core rules for environmental product declarations of construction products and services*.

Retain "Shop Drawings" paragraph below if retaining a hubless, single-stack drainage system.

* + - * 1. Shop Drawings: For hubless, single-stack drainage system. Include plans, elevations, sections, and details.

Retain "Seismic Qualification Certificates" paragraph below if required by seismic criteria applicable to Project. Coordinate with Sections specifying mechanical vibration, supports, and seismic controls. See ASCE/SEI 7 for certification requirements for equipment and components.

* + - * 1. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.

Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

Detailed description of piping anchorage devices on which the certification is based and their installation requirements.

* + - * 1. Field quality-control reports.
			1. FIELD CONDITIONS

Retain paragraph below if interruption of existing sanitary waste service is required.

* + - * 1. Interruption of Existing Sanitary Waste Service: Do not interrupt service to occupied facilities unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

Notify Director’s Representative no fewer than 7 days in advance of proposed interruption of service.

Do not interrupt service without written permission from Director’s Representative.

* + - 1. WARRANTY
				1. Listed manufacturers to provide labeling and warranty of their respective products.
1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

* + - 1. PERFORMANCE REQUIREMENTS
				1. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

Revise pressure ratings in two subparagraphs below to suit Project. Coordinate with Section 221319 "Sanitary Waste Piping Specialties." Soil and waste piping may require higher rating if used in high-rise buildings.

Soil, Waste, and Vent Piping: [**10-foot head of water**] <Insert pressure>.

Waste, Force-Main Piping: [**50 psig**] [**100 psig**] [**150 psig**] <Insert pressure>.

Retain "Seismic Performance" paragraph below with "Seismic Qualification Certificates" paragraph in "Informational Submittals" Article for Projects requiring seismic design. Model building codes and ASCE/SEI 7 establish criteria for buildings subject to earthquake motions. Coordinate requirements with structural engineer. Verify requirements of authorities having jurisdiction.

* + - 1. PIPING MATERIALS
				1. Piping materials shall bear label, stamp, or other markings of specified testing agency.

See piping materials articles in the Evaluations for a discussion of piping materials covered by referenced standards.

* + - * 1. 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.
			1. HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=12635) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[AB & I Foundry; a part of the McWane family of companies](http://www.specagent.com/Lookup?uid=123457147475).

[Charlotte Pipe and Foundry Company](http://www.specagent.com/Lookup?uid=123457147476).

[Tyler Pipe; a part of McWane family of companies](http://www.specagent.com/Lookup?uid=123457147477).

Approved equivalent.

Pipe and fittings in this article are available in NPS 2 to NPS 15 (DN 50 to DN 375).

* + - * 1. Pipe and Fittings: ASTM A 74, [**Service**] [**and**] [**Extra Heavy**] class(es).
				2. Gaskets: ASTM C 564, rubber.
				3. Caulking Materials: ASTM B 29, pure lead and oakum or hemp fiber.
			1. HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=12636) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[AB & I Foundry; a part of the McWane family of companies](http://www.specagent.com/Lookup?uid=123457147479).

[Charlotte Pipe and Foundry Company](http://www.specagent.com/Lookup?uid=123457147480).

[Tyler Pipe; a part of McWane family of companies](http://www.specagent.com/Lookup?uid=123457147481).

Approved equivalent.

Pipe in “Pipe and Fittings” paragraph below is available in NPS 1-1/2 to NPS 15 (DN 40 to DN 375).

* + - * 1. Pipe and Fittings: ASTM A 888 or CISPI 301.

Retain “Single-Stack Aerator Fittings” paragraph below only if Project has a hubless, single-stack drainage system. Fittings below are available in NPS 2 to NPS 8 (DN 50 to DN 200). Use of hubless, single-stack aerator fittings does not eliminate need for standard hubless, cast-iron pipe fittings.

* + - * 1. Single-Stack Aerator Fittings: ASME B16.45, hubless, cast-iron aerator and deaerator drainage fittings.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=12648) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Conine Manufacturing Co., Inc](http://www.specagent.com/Lookup?uid=123457147483).

[SE Sovent](http://www.specagent.com/Lookup?uid=123457147484).

Approved equivalent.

Retain one or more of three hubless fittings paragraphs below. If retaining more than one, indicate location of each type on Drawings. Couplings in "CISPI, Hubless-Piping Couplings" paragraph below are economical and are made in NPS 1-1/2 to NPS 15 (DN 40 to DN 375). They may be unsuitable for installation in corrosive soil.

* + - * 1. CISPI, Hubless-Piping Couplings:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=2165) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Charlotte Pipe and Foundry Company](http://www.specagent.com/Lookup?uid=123457147439).

[Fernco Inc](http://www.specagent.com/Lookup?uid=123457147430).

[Josam Company](http://www.specagent.com/Lookup?uid=123457147440).

[MIFAB, Inc](http://www.specagent.com/Lookup?uid=123457147434).

Approved equivalent.

Standards: ASTM C 1277 and CISPI 310.

Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

Couplings in "Heavy-Duty, Hubless-Piping Couplings" paragraph below are made in NPS 1-1/2 to NPS 15 (DN 40 to DN 375).

* + - * 1. Heavy-Duty, Hubless-Piping Couplings:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=2167) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Charlotte Pipe and Foundry Company](http://www.specagent.com/Lookup?uid=123457147449).

[Clamp-All Corp](http://www.specagent.com/Lookup?uid=123457147444).

[MIFAB, Inc](http://www.specagent.com/Lookup?uid=123457147443).

Approved equivalent.

Standards: ASTM C 1277 and ASTM C 1540.

Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

Couplings in "Cast-Iron, Hubless-Piping Couplings" paragraph below are made in NPS 1-1/2 to NPS 10 (DN 40 to DN 250).

* + - * 1. Cast-Iron, Hubless-Piping Couplings:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=2168) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Charlotte Pipe and Foundry Company](http://www.specagent.com/Lookup?uid=123457147451).

[MG Piping Products Company](http://www.specagent.com/Lookup?uid=123457147450).

Approved equivalent.

Standard: ASTM C 1277.

Description: Two-piece ASTM A 48, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stop.

* + - 1. GALVANIZED-STEEL PIPE AND FITTINGS

Pipe in "Galvanized-Steel Pipe" paragraph below is available in NPS 1/8 to NPS 26 (DN 6 to DN 650).

* + - * 1. Galvanized-Steel Pipe: ASTM A 53, Type E, Standard Weight class. Include square-rolled-grooved or threaded ends matching joining method.

Fittings in "(Galvanized-)Cast-Iron Drainage Fittings" paragraph below are available in NPS 1-1/4 to NPS 8 (DN 32 to DN 200).

* + - * 1. [**Galvanized-**]Cast-Iron Drainage Fittings: ASME B16.12, threaded.
				2. Steel Pipe Pressure Fittings:

Fittings in "(Galvanized-)Steel Pipe Nipples" subparagraph below are available in NPS 1/8 to NPS 12 (DN 6 to DN 300).

[**Galvanized-**]Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, seamless steel pipe. Include ends matching joining method.

Fittings in "Malleable-Iron Unions" subparagraph below are available in NPS 1/8 to NPS 4 (DN 6 to DN 100).

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.

Fittings in "(Galvanized-)Gray-Iron, Threaded Fittings" subparagraph below are available in NPS 1/4 to NPS 12 (DN 8 to DN 300).

[**Galvanized-**]Gray-Iron, Threaded Fittings: ASME B16.4, Class 125, standard pattern.

Flanges in "Cast-Iron Flanges" paragraph below are available in NPS 1 to NPS 96 (DN 25 to DN 2400).

* + - * 1. Cast-Iron Flanges: ASME B16.1, Class 125.

Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

Fittings and couplings in "Grooved-Joint, Galvanized-Steel-Pipe Appurtenances" paragraph below are available in NPS 3/4 to NPS 24 (DN 20 to DN 600).

* + - * 1. Grooved-Joint, Galvanized-Steel-Pipe Appurtenances:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=2169) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Victaulic Company](http://www.specagent.com/Lookup?uid=123457147453).

GRUVLOK

GRINNELL

Approved equivalent.

Galvanized, Grooved-End Fittings for Galvanized-Steel Piping: ASTM A 536 ductile-iron castings, ASTM A 47 malleable-iron castings, ASTM A 234 forged steel fittings, or ASTM A 106 steel pipes with dimensions matching ASTM A 53 steel pipe, and complying with AWWA C606 for grooved ends.

Couplings in "Grooved Mechanical Couplings for Galvanized-Steel Piping" subparagraph below are available in at least NPS 3/4 to NPS 24 (DN 20 to DN 600).

Grooved Mechanical Couplings for Galvanized-Steel Piping: ASTM F 1476, Type I. Include ferrous housing sections with continuous curved keys; EPDM-rubber gasket suitable for hot and cold water; and bolts and nuts.

* + - 1. STAINLESS-STEEL DRAINAGE PIPE AND FITTINGS

Pipe and fittings in this article are available in NPS 2 to NPS 8 (DN 50 to DN 200) and are specific to drainage applications.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=13219) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Josam Company](http://www.specagent.com/Lookup?uid=123457147486).

Blucher, A Watts Brand.

ACO, Inc.

Approved equivalent.

* + - * 1. Description: Comply with requirements of ASME A112.3.1, drainage pattern.
				2. Material: [Type 304 stainless steel] [Type 316L stainless steel] [Type 304 or 316L stainless steel].
				3. Pipe Construction: Seamless.

Retain "Internal Sealing Ring" Article below for elastomeric O-ring sealing materials. Sealing ring materials are permitted for various drain applications. ASME 112.3.1 requires marking or color coding.

* + - * 1. Internal Sealing Rings: [EPDM] [NBR] <Insert material>[, marked or color coded for the application].
				2. Joints: Single or double, socket and spigot ends.
			1. DUCTILE-IRON PIPE AND FITTINGS

Retain one of first three paragraphs below. Piping in "Ductile-Iron, Mechanical-Joint Piping" paragraph is available in NPS 3 to at least NPS 24 (DN 80 to at least DN 600).

* + - * 1. Ductile-Iron, Mechanical-Joint Piping:

Ductile-Iron Pipe: AWWA C151/A21.51, with mechanical-joint bell and plain spigot ends unless grooved or flanged ends are indicated.

Ductile-Iron Fittings: AWWA C110/A21.10, mechanical-joint, ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.

Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

Piping in "Ductile-Iron, Push-on-Joint Piping" paragraph below is available in NPS 3 to NPS 64 (DN 80 to DN 1600).

* + - * 1. Ductile-Iron, Push-on-Joint Piping:

Ductile-Iron Pipe: AWWA C151/A21.51, with push-on-joint bell and plain spigot ends unless grooved or flanged ends are indicated.

Ductile-Iron Fittings: AWWA C110/A21.10, push-on-joint, ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.

Gaskets: AWWA C111/A21.11, rubber.

Pipe in "Ductile-Iron, Grooved-Joint Piping" paragraph below is available in NPS 3 to NPS 64 (DN 80 to DN 1600).

* + - * 1. Ductile-Iron, Grooved-Joint Piping: AWWA C151/A21.51, with round-rolled-grooved ends according to AWWA C606.

Appurtenances in "Ductile-Iron, Grooved-End Pipe Appurtenances" paragraph below are available in NPS 4 to NPS 24 (DN 100 to DN 600).

* + - * 1. Ductile-Iron, Grooved-End Pipe Appurtenances:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=2171) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Anvil International](http://www.specagent.com/Lookup?uid=123457147491).

[Victaulic Company](http://www.specagent.com/Lookup?uid=123457147490).

Approved equivalent.

Grooved-End, Ductile-Iron Fittings: ASTM A 536 ductile-iron castings, with dimensions matching AWWA C110/A 21.10 ductile-iron pipe or AWWA C153/A 21.53 ductile-iron fittings and complying with AWWA C606 for grooved ends.

Couplings in "Grooved Mechanical Couplings for Ductile-Iron Pipe" subparagraph below are available in NPS 4 to NPS 24 (DN 100 to DN 600). Other AWWA pipe size couplings in NPS 3 to NPS 36 (DN 80 to DN 900) are also available.

Grooved Mechanical Couplings for Ductile-Iron Pipe: ASTM F 1476, Type I. Include ferrous housing sections with continuous curved keys; EPDM-rubber center-leg gasket suitable for hot and cold water; and bolts and nuts.

* + - 1. COPPER TUBE AND FITTINGS

Tube and fittings in first two paragraphs below are available in NPS 1-1/4 to NPS 8 (DN 32 to DN 200).

* + - * 1. Copper Type DWV Tube: ASTM B 306, drainage tube, drawn temper.
				2. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

Tube and fittings in first three paragraphs below are available in NPS 1/4 to NPS 12 (DN 8 to DN 300).

* + - * 1. Hard Copper Tube: ASTM B 88, Type L and Type M, water tube, drawn temper.
				2. Soft Copper Tube: ASTM B 88, Type L, water tube, annealed temper.
				3. Copper Pressure Fittings:

Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

Unions in "Copper Unions" subparagraph below are available in NPS 1/2 to NPS 4 (DN 15 to DN 100).

Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

Flanges in "Copper Flanges" paragraph below are available in NPS 1/4 to at least NPS 6 (DN 8 to at least DN 150).

* + - * 1. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.

Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

* + - * 1. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.
			1. TRANSITION COUPLINGS:

Retain pipe couplings in subparagraphs below if dissimilar piping materials or piping with small differences in OD must be joined.

* + - * 1. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

Couplings in "Unshielded, Nonpressure Transition Couplings" subparagraph below are for underground nonpressure piping and should be available in all sizes.

* + - * 1. Shielded, Nonpressure Transition Couplings:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=2174) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Cascade Waterworks Mfg. Co](http://www.specagent.com/Lookup?uid=123457147499).

[Mission Rubber Company, LLC; a division of MCP Industries](http://www.specagent.com/Lookup?uid=123457147500).

Approved equivalent.

Standard: ASTM C 1460.

Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

End Connections: Same size as and compatible with pipes to be joined.

Couplings in "Pressure Transition Couplings" Subparagraph below are for underground pressure piping and are available in at least NPS 1-1/2 to NPS 24 (DN 40 to DN 600).

* + - * 1. Pressure Transition Couplings:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=2175) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Apollo Valves; a part of Aalberts Integrated Piping Systems](http://www.specagent.com/Lookup?uid=123457147467).

[JCM Industries, Inc](http://www.specagent.com/Lookup?uid=123457147463).

[Romac Industries, Inc](http://www.specagent.com/Lookup?uid=123457147464).

Approved equivalent.

Standard: AWWA C219.

Description: Metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.

Center-Sleeve Material: [**Manufacturer's standard**] [**Carbon steel**] [**Stainless steel**] [**Ductile iron**] [**Malleable iron**].

Gasket Material: Natural or synthetic rubber.

Metal Component Finish: Corrosion-resistant coating or material.

* + - 1. DIELECTRIC FITTINGS:
				1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
				2. Valves: Bronze ball valve with end connections and pressure rating to match associated piping.

Unions in "Dielectric Unions" subparagraph below are available in at least NPS 1/2 to NPS 2 (DN 15 to DN 50).

* + - * 1. Dielectric Unions:

Standard: ASSE 1079.

Revise pressure rating and temperature in first subparagraph below to suit Project, or insert other options for specific applications.

Pressure Rating: [**125 psig** minimum at **180 deg F**] [**150 psig**] [**250 psig**] <Insert pressure>.

End Connections: Solder-joint copper alloy and threaded ferrous.

Flanges in "Dielectric Flanges" subparagraph below are available in at least NPS 1-1/2 to NPS 4 (DN 40 to DN 100).

* + - * 1. Dielectric Flanges:

Standard: ASSE 1079.

Factory-fabricated, bolted, companion-flange assembly.

Revise pressure rating in first subparagraph below to suit Project or insert other options for specific applications.

Pressure Rating: [125 psig minimum at 180 deg F [150 psig [175 psig (1200 kPa)] [300 psig] <Insert pressure>.

End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder joint copper alloy and threaded ferrous.

Flanges in "Dielectric-Flange Insulating Kits" subparagraph below are available in at least NPS 1/2 to NPS 48 (DN 15 to DN 1200).

* + - * 1. Dielectric-Flange Insulating Kits:

Nonconducting materials for field assembly of companion flanges.

Revise pressure rating in first subparagraph below to suit Project, or insert other options for specific applications.

Pressure Rating: [**150 psig**] <Insert pressure>.

Gasket: Neoprene or phenolic.

Bolt Sleeves: Phenolic or polyethylene.

Washers: Phenolic with steel backing washers.

Nipples in "Dielectric Nipples" subparagraph below are available in at least NPS 1/2 to NPS 4 (DN 15 to DN 100).

* + - * 1. Dielectric Nipples: Nipples with inert non-corrosive thermoplastic linings are not acceptable.

Description:

Standard: IAPMO PS 66.

Electroplated steel nipple.

Revise pressure rating and temperature in first subparagraph below to suit Project, or insert other options for specific applications.

1. Pressure Rating: [**300 psig at 225 deg F**] <**Insert pressure and temperature**>.
2. End Connections: Male threaded or grooved.
	* + 1. ENCASEMENT FOR UNDERGROUND METAL PIPING

Retain this article if corrosion protection is required for underground metal piping.

* + - * 1. Standard: ASTM A 674 or AWWA C105/A 21.5.
				2. Material: Linear low-density polyethylene film of **0.008-inch**, or high-density, cross-laminated polyethylene film of **0.004-inch** minimum thickness.
				3. Form: [**Sheet**] [**or**] [**tube**].
				4. Color: [Black] [or] [natural] <Insert color>.
1. EXECUTION
	* + 1. PIPING INSTALLATION
				1. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.

Install piping as indicated unless deviations to layout are approved on coordination drawings.

* + - * 1. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
				2. 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.
				3. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
				4. Install piping to permit valve servicing.
				5. Install piping at indicated slopes.
				6. Install piping free of sags and bends.
				7. Install fittings for changes in direction and branch connections.
				8. Install piping to allow application of insulation.

Retain first paragraph below if piping is required to withstand specific design loads.

* + - * 1. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in
				2. 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 two 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 waste piping in direction of flow is prohibited.

* + - * 1. Lay buried building waste 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.

* + - * 1. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:

Revise three subparagraphs below as required by authorities having jurisdiction.

Building Sanitary Waste: 1/4 inch per foot downward in direction of flow for piping 2-1/2 inch and smaller; 1/8 inch per foot downward in direction of flow for piping 3 inch and larger.

* + - * 1. 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."

Retain subparagraph below if piping will be in corrosive soil.

Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.

* + - * 1. Install steel piping according to applicable plumbing code.
				2. Install stainless-steel piping according to ASME A112.3.1 and applicable plumbing code.
				3. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

Retain first paragraph and one or more subparagraphs below if these systems are used on Project.

* + - * 1. Install engineered soil and waste and vent piping systems as follows:

Combination Waste and Vent: Comply with standards of authorities having jurisdiction.

Hubless, Single-Stack Drainage System: Comply with ASME B16.45 and hubless, single-stack aerator fitting manufacturer's written installation instructions.

Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

Retain first paragraph below if ductile-iron, force-main piping is required.

* + - * 1. Install underground, ductile-iron, force-main piping according to AWWA C600.

Install buried piping inside building between wall and floor penetrations and connection to sanitary sewer piping outside building with restrained joints.

Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.

Retain subparagraph below if piping will be in corrosive soil.

Install encasement on piping according to ASTM A 674 or AWWA C105/A 21.5.

Retain first paragraph below for copper, force-main tubing.

* + - * 1. Install underground, copper, force-main tubing according to CDA's "Copper Tube Handbook."

Retain subparagraph below if piping will be in corrosive soil.

Install encasement on piping according to ASTM A 674 or AWWA C105/A 21.5.

* + - * 1. Install force mains at elevations indicated.
				2. Plumbing Specialties:

Install backwater valves in sanitary waster gravity-flow piping.

Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.

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

Install drains in sanitary waste gravity-flow piping.

* + - * 1. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
				2. Install sleeves for piping penetrations of walls, ceilings, and floors.

Retain first paragraph below for piping that penetrates an exterior concrete wall or concrete slab.

* + - * 1. Install sleeve seals for piping penetrations of concrete walls and slabs.
				2. Install escutcheons for piping penetrations of walls, ceilings, and floors.
			1. JOINT CONSTRUCTION
				1. 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.
				2. 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.
				3. 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.
				4. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1.

Cut threads full and clean using sharp dies.

Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

Do not use pipe sections that have cracked or open welds.

* + - * 1. Join stainless-steel pipe and fittings with gaskets according to ASME A112.3.1.
				2. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.
				3. Grooved Joints: Roll groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.
				4. 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.
			1. SPECIALTY PIPE FITTING INSTALLATION
				1. Transition Couplings:

Install transition couplings at joints of piping with small differences in ODs.

In Gravity Drainage and Vent Piping: Shielded, nonpressure transition couplings.

In Aboveground Force Main Piping: Fitting-type transition couplings.

In Underground Force Main Piping:

1-1/2 inch and Smaller: Fitting-type transition couplings.

2 inch and Larger: Pressure transition couplings.

* + - 1. Dielectric Fittings:
				1. General Requirements: Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

Joining Dissimilar Threaded Piping: Make up connection with a threaded coupling or with companion flanges.

Joining Dissimilar Non-Threaded Piping: Make up connection with adapters recommended by the manufacturers of the piping to be joined.

Joining Galvanized Steel Pipe and Copper Tubing: Make up connection with a dielectric connector.

* + - * 1. Dielectric Fittings for [**2 inch**] <**Insert pipe size**> and Smaller: Use dielectric [**nipples**] [**unions**].
				2. Dielectric Fittings for [**2-1/2 inch to 4 inch**] <Insert pipe size range>: Use dielectric [flanges] [flange kits] [nipples].
				3. Dielectric Fittings for [**5 inch**] <**Insert pipe size**> and Larger: Use dielectric flange kits.
			1. VALVE INSTALLATION

Retain this article if valves are required.

* + - * 1. Shutoff Valves:

Install shutoff valve on each sewage pump discharge.

Install gate or full-port ball valve for piping 2 inch and smaller.

Install gate valve for piping 2-1/2 inch and larger.

* + - * 1. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.
				2. Backwater Valves: Install backwater valves in piping subject to backflow.

Horizontal Piping: Horizontal backwater valves. Use normally closed type unless otherwise indicated.

Floor Drains: Drain outlet backwater valves unless drain has integral backwater valve.

Install backwater valves in accessible locations.

* + - 1. INSTALLATION OF HANGERS AND SUPPORTS

Retain first paragraph below for projects in areas that require seismic restraints.

* + - * 1. Comply with requirements for pipe hanger and support devices and installation specified in other sections.

Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.

Install stainless-steel pipe hangers for horizontal piping in corrosive environments.

Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.

Install stainless-steel pipe support clamps for vertical piping in corrosive environments.

Vertical Piping: MSS Type 8 or Type 42, clamps.

Install individual, straight, horizontal piping runs:

100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

Base of Vertical Piping: MSS Type 52, spring hangers.

* + - * 1. Install hangers for piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
				2. Support horizontal piping and tubing within 12 inches of each fitting**, valve,** and coupling.
				3. Support vertical runs of [**cast iron**] [**steel**] [**stainless-steel**] [**and**] [**copper**] soil piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
			1. CONNECTIONS

Coordinate piping installations and specialty arrangements with Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced or omitted.

* + - * 1. Drawings indicate general arrangement of piping, fittings, and specialties.
				2. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
				3. Connect waste and vent piping to the following:

Revise first four subparagraphs below to suit Project.

Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.

Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.

Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.

Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.

Pit installation option in first subparagraph below should be indicated on Drawings.

Install horizontal backwater valves [with cleanout cover flush with floor] [in pit with pit cover flush with floor] <Insert description>.

Equipment: Connect waste piping as indicated.

Provide shutoff valve if indicated and union for each connection.

Use flanges instead of unions for connections 2-1/2 inch and larger.

* + - * 1. Connect force-main piping to the following:

Revise both subparagraphs below to suit Project.

Sanitary Sewer: To exterior force main.

Sewage Pump: To sewage pump discharge.

* + - * 1. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
				2. Make connections according to the following unless otherwise indicated:

Install unions, in piping 2 inch and smaller, adjacent to each valve and at final connection to each piece of equipment.

Install flanges, in piping 2-1/2 inch and larger, adjacent to flanged valves and at final connection to each piece of equipment.

* + - 1. IDENTIFICATION
				1. Identify exposed sanitary waste and vent piping.
			2. FIELD QUALITY CONTROL

Portions of testing and inspection requirements in this article are taken from model plumbing codes. Revise if requirements vary.

* + - * 1. 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.

Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

* + - * 1. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
				2. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
				3. Test sanitary waste and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. Test under minimum head of 10 ft, fill with water for 3 hours.

If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.

Expose work that was covered or concealed before it was tested.

Roughing-in Plumbing Test Procedure: Test waste 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.

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.

Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

Prepare reports for tests and required corrective action.

* + - * 1. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

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.

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.

Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

Prepare reports for tests and required corrective action.

* + - 1. CLEANING AND PROTECTION
				1. Clean interior of piping. Remove dirt and debris as work progresses.
				2. 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.
				3. Place plugs in ends of uncompleted piping at end of day and when work stops.

Consider using other piping or specify protection by shielding or lightweight insulation if piping surface temperatures are expected to exceed 140 deg F (60 deg C).

* + - * 1. Repair damage to adjacent materials caused by waste and vent piping installation.
			1. PIPING SCHEDULE

Retain and revise applicable piping applications in this article. Coordinate with materials specified. Revise to suit Project.

* + - * 1. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

Retain " any of" option in first paragraph below to allow Contractor to select piping materials from those retained.

* + - * 1. Aboveground, storm, soil, waste, and vent piping **2-1/2 inch** **and smaller** shall be one of the following:

Retain one or more of first seven subparagraphs below. If more than one type of material and joining method is used, identify various materials on Drawings and show points of transition from one material to another.

Hub-and-spigot, Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.

Hubless, cast-iron soil pipe and fittings; **CISPI** hubless-piping couplings; and coupled joints.

Galvanized-steel pipe, drainage fittings, and threaded joints.

Copper Type DWV tube, copper drainage fittings, and soldered joints.

Retain " any of" option in first paragraph below to allow Contractor to select piping materials from those retained.

* + - * 1. Aboveground, storm, soil, waste, and vent piping **3 inch and larger** shall be one of the following:

Retain one or more of first five subparagraphs below. If more than one type of material and joining method is used, identify various materials on Drawings and show points of transition from one material to another.

Hub-and-spigot, Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.

Hubless, cast-iron soil pipe and fittings; **CISPI** hubless-piping couplings; and coupled joints.

Galvanized-steel pipe, drainage fittings, and threaded joints.

Retain " any of" option in first paragraph below to allow Contractor to select piping materials from those retained.

* + - * 1. Underground, storm, soil, waste, and vent piping **2-1/2 inch and smaller** shall be one of the following:

Retain one or more of first five subparagraphs below. If more than one type of material and joining method is used, identify various materials on Drawings and show points of transition from one material to another.

Hub-and-spigot, **Service** class, cast-iron soil pipe and fittings; **gaskets; and gasketed** joints.

Hub-and-spigot, **Extra Heavy** class, cast-iron soil pipe and fittings; **gaskets; and gasketed** joints.

Retain " any of" option in first paragraph below to allow Contractor to select piping materials from those retained.

* + - * 1. Underground, storm, soil and waste piping **3 inch and larger** shall be one of the following:

Retain one or more of first three subparagraphs below. If more than one type of material and joining method is used, identify various materials on Drawings and show points of transition from one material to another.

Hub-and-spigot, **Service** class, cast-iron soil pipe and fittings; **gaskets; and gasketed** joints.

Hub-and-spigot, **Extra Heavy** class, cast-iron soil pipe and fittings; **gaskets; and gasketed** joints.

Retain " any of" option in first paragraph below to allow Contractor to select piping materials from those retained.

* + - * 1. Aboveground sanitary-sewage force mains **1-1/2 inch and 2 inch** shall be one of the following:

Retain one or both subparagraphs below. If more than one type of material and joining method is used, identify various materials on Drawings and show points of transition from one material to another.

Hard copper tube, Type L; copper pressure fittings; and soldered joints.

Galvanized-steel pipe, pressure fittings, and threaded joints.

Retain "any of" option in first paragraph below to allow Contractor to select piping materials from those retained.

* + - * 1. Aboveground sanitary-sewage force mains **2-1/2 inch to 6 inch** shall be one of the following:

Retain one or more of three subparagraphs below. If more than one type of material and joining method is used, identify various materials on Drawings and show points of transition from one material to another.

Galvanized-steel pipe, pressure fittings, and threaded joints.

Grooved-end, galvanized-steel pipe; grooved-joint, galvanized-steel-pipe appurtenances; and grooved joints.

Retain " any of" option in first paragraph below to allow Contractor to select piping materials from those retained.

* + - * 1. Underground sanitary-sewage force mains **3 inch and smaller** shall be one of the following:

Retain one or more of first four subparagraphs below. If more than one type of material and joining method is used, identify various materials on Drawings and show points of transition from one material to another.

**Soft** copper tube, Type L; **wrought** copper pressure fittings; and soldered joints.

Ductile-iron, grooved-joint piping, and grooved joints.

Retain " any of" option in paragraph below to allow Contractor to select piping materials from those retained.

* + - * 1. Underground sanitary-sewage force mains **4 inch and larger** shall be one of the following:

Retain one or more of first four subparagraphs below. If more than one type of material and joining method is used, identify various materials on Drawings and show points of transition from one material to another.

Ductile-iron, mechanical-joint piping, and mechanical joints.

Ductile-iron, grooved-joint piping, and grooved joints.

END OF SECTION 221316