SECTION 226600 - CHEMICAL-WASTE SYSTEMS FOR LABORATORY FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Single-wall piping.
2. Double-containment piping.
3. Piping specialties.

1.3 PERFORMANCE REQUIREMENTS

A. Single-Wall Piping Pressure Rating: 10 feet head of water (30 kPa).

B. Double-Containment Piping Pressure Rating:

1. Carrier Piping: 5-psig (34.5-kPa) air test pressure.
2. Containment Piping: 5-psig (34.5-kPa) air test pressure.

C. Field-Fabrication Containment-Piping Pressure Rating: 5-psig (34.5-kPa) air test pressure.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittal:

1. Product Data for Credit EQ 4.1: For solvent cements and adhesive primers, including printed statement of VOC content.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For chemical-waste specialties and leak-detection systems to include in emergency, operation, and maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties with sealing plugs in ends or with end protection.

B. Do not store plastic pipe or fittings in direct sunlight.

C. Protect pipe, fittings, and seals from dirt and damage.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Chemical-Waste Service: Do not interrupt chemical-waste service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary chemical-waste service according to requirements indicated:

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

1.7 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

PART 2 - PRODUCTS

2.1 SINGLE-WALL PIPE AND FITTINGS

A. PP Drainage Pipe and Fittings: ASTM F 1412, pipe extruded and drainage-pattern fittings molded, with Schedule 40 dimensions, from PP resin with fire-retardant additive complying with ASTM D 4101; with mechanical-joint ends.

1. Exception: Pipe and fittings made from PP resin without fire-retardant additive may be used for underground installation.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Orion Fittings, Inc.; a division of Watts Water Technologies, Inc.
b. Ipex Inc., Labline,

B. High-Silicon-Iron, Mechanical-Joint Pipe and Fittings: ASTM A 861, pipe and drainage-pattern fittings; and stainless-steel clamps with TFE inner sleeve and CR outer sleeve.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Flowserve Corporation; Foundry Operations.

C. Borosilicate Glass Pipe and Fittings: ASTM C 1053, pipe and drainage-pattern fittings; with manufacturer's standard couplings.

1. Covering: Factory-applied polystyrene for pipe installed underground.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. SCHOTT Corporation.

D. Adapters and Transition Fittings: Assemblies with combination of clamps, couplings, adapters, and gaskets; compatible with piping and system liquid; made for joining different piping materials.

2.2 DOUBLE-CONTAINMENT PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Orion Fittings, Inc.; a division of Watts Water Technologies, Inc.
2. Ipex Inc., Labline

B. Description: Factory-fabricated, double-wall pipe and fittings. Sizes indicate carrier-pipe size; with carrier (inner) pipe and fittings; annular-space, carrier-pipe supports; containment (outer) pipe and fittings; and joining materials and fasteners. Include manufacturer's standard piping materials according to the following:

1. PP, Double-Containment Drainage Pipe and Fittings: Made of ASTM D 4101, PP resin.

    a. Carrier and Containment Pipes: ASTM F 1412, Schedule 40.
    b. Fittings: ASTM F 1412, Schedule 40 drainage pattern complying with ASTM D 3311.

2. PP/PVC, Double-Containment Drainage Pipe and Fittings:

    a. PP Carrier Pipe: ASTM F 1412, Schedule 40; made of ASTM D 4101, PP resin.
    b. PP Carrier-Pipe Fittings: ASTM F 1412, Schedule 40 drainage pattern complying with ASTM D 3311; made of ASTM D 4101, PP resin.
    c. PVC Containment Pipe: ASTM D 2665, PVC pipe.
    d. PVC Containment Pipe Fittings: ASTM D 2665, PVC drainage pattern.

2.3 JOINING MATERIALS

A. Couplings: Assemblies with combination of clamps, gaskets, sleeves, and threaded or flanged parts; compatible with piping and system liquid; and made by piping manufacturer for joining system piping.

B. Adapters and Transition Fittings: Assemblies with combination of clamps, couplings, adapters, gaskets, and threaded or flanged parts; compatible with piping and system liquid; and made for joining different piping materials.

C. Flanges: Assemblies of companion flanges and gaskets complying with ASME B16.21 and compatible with system liquid, and bolts and nuts.

2.4 PIPING SPECIALTIES

A. Corrosion-resistant PP Dilution Traps:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Orion Fittings, Inc.; a division of Watts Water Technologies, Inc.

2. End Connections: Mechanical joint.
3. Dilution Tanks: 1-gal. (3.8-L) capacity, with clear base unless colored base is indicated; with two NPS 1-1/2 (DN 40) top inlets and one NPS 1-1/2 (DN 40) side outlet.
4. Small Dilution Jars: 1-pint (0.5-L) capacity, with clear base unless colored base is indicated; with NPS 1-1/2 (DN 40) top inlet and NPS 1-1/2 (DN 40) side outlet.
5. Large Dilution Jars: 1-quart (1-L) capacity; with NPS 1-1/2 (DN 40) top inlet and NPS 1-1/2 (DN 40) side outlet.

B. High-Silicon-Iron Dilution Traps:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Flowserve Corporation; Foundry Operations.

2. Standard: ASTM A 861.
3. Size: NPS 1-1/2 or NPS 2 (DN 40 or DN 50) as required for fixture and waste.
4. End Connections: Mechanical.

C. Glass, Drain-Line, Interceptor Traps:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. SCHOTT Corporation.

2. Standard: ASTM C 1053.

3. Type: Drum trap.
4. Size: NPS 1-1/2 (DN 40), NPS 2 by NPS 1-1/2 (DN 50 by DN 40), or NPS 2 (DN 50), as required to match connecting piping.

D. Corrosion-Resistant Traps:

1. Type: P-trap or drum trap.
2. Size: NPS 1-1/2 or NPS 2 (DN 40 or DN 50), as required to match connected piping.
3. High-Silicon Iron: ASTM A 861, with horizontal outlet and hub-and-plain or plain ends to match connecting piping.
4. PP: ASTM D 4101, with mechanical-joint pipe connections.
5. PVDF: ASTM D 3222, with mechanical-joint pipe connections.
6. Glass: ASTM C 1053, with coupling pipe connections.

E. High-Silicon-Iron Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Flowserve Corporation; Foundry Operations.

2. Standard: ASTM A 861, fitting with PTFE gasket and closure plug, of design appropriate for piping application.

F. High-Silicon-Iron Sink Outlets:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Flowserve Corporation; Foundry Operations.

2. Standard: ASTM A 861, high-silicon iron, NPS 1-1/2 (DN 40), with clamping device and 4-, 6-, or 8-inch- (100-, 150-, or 200-mm-) high overflow fitting, as indicated.

G. PP Sink Outlets:

1. Description: NPS 1-1/2 (DN 40), with clamping device, stopper, and 7-inch- (178-mm-) high overflow fitting.

H. Glass Sink Outlets:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. SCHOTT Corporation.

2. Standard: ASTM C 1053, components for field assembly, NPS 1-1/2 (DN 40); with sink assembly of outlet, strainer, gasket, and locknut; overflow fitting of length indicated; and tailpiece assembly of borosilicate glass and locknut.

2.5 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

B. Galvanized-Steel-Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

C. Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc-coated, plain ends.

2.6 SLEEVE SEALS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. Metraflex, Inc.

B. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements.

2.7 ESCUTCHEONS

A. General Requirements for Escutcheons: Manufactured wall and ceiling escutcheons and floor plates, with ID to closely fit around pipe and tube and OD that completely covers opening.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Chemical-Waste Piping Inside the Building:

1. Install piping next to equipment, accessories, and specialties to allow service and maintenance.
2. Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used unless otherwise indicated.
3. Flanges may be used on aboveground piping unless otherwise indicated.
4. Install underground fiberglass piping according to ASTM D 3839.

5. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
6. 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.
7. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
8. Install piping at indicated slopes.
9. Install piping free of sags and bends.
10. Install fittings for changes in direction and branch connections.
11. Glass pipe shall be installed free of strain, in a manner to permit limited movement. Horizontal runs shall be supported by a padded hanger or hangers 8 feet on centers. Vertical risers shall be supported by padded riser clamps designed to restrict lateral and downward movement. Glass pipe shall not be installed underground.
    Install escutcheons for penetrations of walls, ceilings, and floors.
12. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
13. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.
14. Verify final equipment locations for roughing-in.

3.2 JOINT CONSTRUCTION

A. Chemical-Waste Piping Inside the Building:

1. Dissimilar-Material Piping Joints: Make joints using adapters compatible with both system materials.
2. Join high-silicon-iron, mechanical-joint piping with coupled joints using clamps and sleeves.

3.3 HANGER AND SUPPORT INSTALLATION

A. Pipe sizes in this article refer to aboveground, single-wall piping and carrier piping of containment piping.

B. Comply with requirements in Division 22 Section "Vibration Controls for Plumbing Piping and Equipment" for seismic-restraint devices.

C. Comply with requirements in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support devices. Install the following:

1. Vertical Piping: MSS Type 8 or MSS Type 42, riser clamps.
2. Individual, Straight, Horizontal Piping Runs:

    a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

D. Comply with requirements in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" for installation of supports.

E. Support horizontal piping and tubing within 12 inches (300 mm) of each fitting and coupling.

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

G. Rod diameter may be reduced 1 size for double-rod hangers, to minimum of 3/8 inch (10 mm).

H. Install vinyl-coated hangers for PP piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 2 (DN 50): 33 inches (840 mm) with 3/8-inch (10-mm) rod.
2. NPS 2-1/2 and NPS 3 (DN 65 and DN 80): 42 inches (1067 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1220 mm) with 5/8-inch (16-mm) rod.
4. NPS 6 (DN 150): 48 inches (1220 mm) with 3/4-inch (19-mm) rod.
5. NPS 8 (DN 200): 48 inches (1220 mm) with 7/8-inch (22-mm) rod.

I. Install supports for vertical PP piping every 72 inches (1830 mm).

J. Install hangers for high-silicon-iron piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 60 inches (1520 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 60 inches (1520 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1520 mm) with 5/8-inch (16-mm) rod.
4. NPS 6 (DN 150): 60 inches (1520 mm) with 3/4-inch (19-mm) rod.
5. NPS 8 to NPS 12 (DN 200 to DN 300): 60 inches (1520 mm) with 7/8-inch (22-mm) rod.
6. NPS 15 (DN 375): 60 inches (1520 mm) with 1-inch (25-mm) rod.
7. Spacing for horizontal pipe in 84-inch (2134-mm) lengths may be increased to 84 inches (2134 mm). Spacing for fittings is limited to 60 inches (1520 mm).

K. Install supports for vertical high-silicon-iron piping every 15 feet (4.5 m).

L. Install vinyl-coated hangers for glass piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1830 mm) with 3/8-inch (10-mm) rod.
2. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2440 mm) with 3/8-inch (10-mm) rod.

3. NPS 3 (DN 80): 96 inches (2440 mm) with 1/2-inch (13-mm) rod.
4. NPS 4 and NPS 6 (DN 100 and DN 150): 96 inches (2440 mm) with 5/8-inch (16-mm) rod.

M. Install supports for vertical glass piping every 96 inches (2440 mm).

N. Support piping and tubing not listed above according to MSS SP-69.

3.4 CONNECTIONS

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

B. Make connections to existing piping so finished Work complies as nearly as practical with requirements specified for new Work.

C. Protect existing piping to prevent concrete or debris from entering while making connections. Remove debris or other extraneous material that may accumulate.

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

3.5 LABELING AND IDENTIFICATION

A. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for labeling of equipment and piping.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect assembled leak-detection systems and their installation, including piping and electrical connections, and to assist in testing.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Chemical-waste piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.7 STARTUP SERVICE

A. Perform startup service for leak-detection systems.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.8 CLEANING

A. Use procedures prescribed by authorities having jurisdiction or, if not prescribed, use procedures described below:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Clean piping by flushing with potable water.

3.9 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain leak-detection systems.

3.10 PIPING SCHEDULE

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

B. Single-Wall, Chemical-Waste Sewerage Piping: Use any of the following piping materials for each size range:

1. NPS 2 to NPS 4 (DN 50 to DN 100): High-silicon-iron, mechanical-joint pipe and fittings and coupled joints.
2. NPS 1-1/2 to NPS 4 (DN 40 to DN 100): PP drainage pipe and fittings and electrofusion joints.
3. NPS 1-1/2 to NPS 4 (DN 40 to DN 100): Glass pipe and fittings and coupled joints.
4. NPS 6 (DN 150): High-silicon-iron, mechanical-joint pipe and fittings and coupled joints.
5. NPS 6 (DN 150): PP drainage pipe and fittings and electrofusion joints.
6. NPS 6 (DN 150): Glass pipe and fittings and coupled joints.
7. NPS 8 to NPS 12 (DN 200 to DN 300): PP drainage pipe and fittings and electrofusion joints.

C. Aboveground Chemical-Waste Piping: Use any of the following piping materials for each size range:

1. NPS 1-1/2 to NPS 6 (DN 40 to DN 150): PP drainage piping and mechanical joints.
2. NPS 1-1/2 to NPS 4 (DN 40 to DN 100): High-silicon-iron piping with mechanical-joint ends, mechanical couplings, and coupled joints.
3. NPS 1-1/2 to NPS 6 (DN 40 to DN 150): Borosilicate glass pipe and fittings, couplings, and coupled joints.

D. Under Slab-on-Grade, Indoor, Chemical-Waste Piping: Use any of the following piping materials for each size range:

1. NPS 1-1/2 to NPS 6 (DN 40 to DN 150): PP drainage piping and electrofusion joints.
2. NPS 1-1/2 to NPS 6 (DN 40 to DN 150): Borosilicate glass piping with covering, couplings, and coupled joints.
3. NPS 1-1/2 to NPS 6 (DN 40 to DN 150): PE, double-containment drainage piping and manufacturer's standard joints.
4. NPS 8 (DN 200): PE, double-containment drainage piping and manufacturer's standard joints.

END OF SECTION 226600