SECTION 33 14 16 SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes commissioning of water utility pipework in the Private Air Terminal courtyard including:
   1. Potable water pipework
   2. Non-potable water pipework
   3. Firefighting water pipework for fire suppression systems (sprinklers)
   4. Firefighting water pipework for hydrants

B. Section includes:
   1. Ductile-iron pipe and fittings.
   2. PE pipe and fittings.
   3. Special pipe fittings.
   4. Piping joining materials.
   5. Piping specialties.
   6. Encasement for piping

1.2 DEFINITIONS

A. DI: Ductile iron

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

C. PA: Polyamide (nylon) plastic.

D. PE: Polyethylene plastic.

E. PP: Polypropylene plastic.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:
   1. Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.

B. Field Quality-Control Submittals:
   1. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of product indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare piping, valves, meters, backflow prevention devices, and fire hydrants according to the following:
   1. Ensure that piping, valves, meters, backflow prevention devices, and fire hydrants are dry and internally protected against rust and corrosion.
   2. Protect threaded ends and flange faces against damage.
   3. Set piping, valves, meters, backflow prevention devices, and fire hydrants in best position for handling and to prevent rattling.

B. During Storage: Use precautions for piping, valves, meters, backflow prevention devices, and fire hydrants according to the following:
   1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
   2. Protect from weather. Store indoors and maintain temperature higher than ambient dew point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle products if size requires handling by crane or lift. Rig products to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.

B. Comply with standards of authorities having jurisdiction for domestic water-service piping, including materials, installation, testing, and disinfection.

C. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

D. Piping materials to bear label, stamp, or other markings of specified testing agency.

E. Comply with ASTM F645 for selection, design, and installation of thermoplastic water piping.

F. Comply with FM Approvals' "Approval Guide" and/or UL's "Fire Protection Equipment Directory" for fire-suppression water-service products.

G. Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-suppression water-service piping.

H. All piping and appurtenances intended to convey or dispense water for human consumption are to comply with the provisions of the appropriate standards.

2.2 PIPING MATERIALS

A. Potable-water piping and components comply with the provisions of the appropriate standards.

2.3 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe:
1. AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. AWWA C104/A21.4 cement mortar-lined.

B. Mechanical-Joint, Ductile-Iron Fittings:
1. AWWA C110, ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
3. AWWA C104/A21.4 cement mortar-lined.

C. Push-on-Joint, Ductile-Iron Pipe:
1. AWWA C151/A21.51, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. AWWA C104/A21.4 cement mortar-lined.

D. Push-on-Joint, Ductile-Iron Fittings:
1. AWWA C110, ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.
2. Gaskets: AWWA C111/A21.11, rubber.
3. AWWA C104/A21.4 cement mortar-lined.

E. Grooved-End, Ductile-Iron Pipe:
1. AWWA C151/A21.51, with cut, rounded-grooved ends.
2. AWWA C104/A21.4 cement mortar-lined.

F. Grooved-End, Ductile-Iron Pipe Appurtenances:

1. Source Limitations: Obtain grooved-end, ductile-iron pipe appurtenances from single manufacturer.
2. Grooved-End, Ductile-Iron Fittings:
   a. ASTM A536, ductile-iron castings with dimensions matching pipe.
   b. AWWA C104/A21.4 cement mortar-lined.
3. Grooved-End, Ductile-Iron-Piping Mechanical Couplings:
   a. AWWA C606, for ductile-iron-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

G. Flanges: ASME 16.1, Class 125, cast iron.

2.4 PE PIPE AND FITTINGS

A. PE, ASTM Pipe: ASTM D2239, SIDR No. 5.3, 7, or 9; with PE compound number required to give pressure rating not less than 1380 kPa.
   1. Insert Fittings for PE Pipe: ASTM D2609, made of PA, PP, or PVC with serrated male insert ends matching inside of pipe. Include bands or crimp rings.
   2. Molded PE Fittings: ASTM D3350, PE resin, socket- or butt-fusion type, made to match PE pipe dimensions and class.

B. PE, AWWA Pipe: AWWA C906, DR No. 7.3, 9, or 9.3; with PE compound number required to give pressure rating not less than 380 kPa.
   1. PE, AWWA Fittings: AWWA C906, socket- or butt-fusion type, with DR number matching pipe and PE compound number required to give pressure rating not less than 1380 kPa.

C. E, Fire-Service Pipe: ASTM F714, AWWA C906, or equivalent for PE water pipe; FM Global approved, with minimum thickness equivalent to FM Global [Class 150] [and] [Class 200].
   1. Molded PE Fittings: ASTM D3350, PE resin, socket- or butt-fusion type, and made to match PE pipe dimensions and class.

2.5 SPECIAL PIPE FITTINGS

1. Ductile-Iron Rigid Expansion Joints: Three-piece, ductile-iron assembly consisting of telescoping sleeve with gaskets and restrained-type, ductile-iron, end sections.
2. Source Limitations: Obtain ductile-iron rigid expansion joints from single manufacturer.
3. Standards: AWWA C110 or AWWA C153/A21.53; AWWA C111/A21.11.
4. Pressure Rating: 1725 kPa minimum.

B. Ductile-Iron Flexible Expansion Joints: Compound, ductile-iron fitting with combination of flanged and mechanical-joint ends. Include two gasketed ball-joint sections and one or more gasketed sleeve sections.
   1. Source Limitations: Obtain ductile-iron flexible expansion joints from single manufacturer.
   2. Standards: AWWA C110 or AWWA C153/A21.53; AWWA C111/A21.11.
   3. Pressure Rating: 1725 kPa minimum.

C. Ductile-Iron Deflection Fittings, Lead Free: Compound, ductile-iron coupling fitting with sleeve and one or two flexing sections for up to 15-degree deflection, gaskets, and restrained-joint ends.
   1. Source Limitations: Obtain ductile-iron deflection fittings from single manufacturer.
   2. Standards: AWWA C110 or AWWA C153/A21.53; AWWA C111/A21.11.

3. Pressure Rating: 1725 kPa minimum.

2.6 PIPING JOINING MATERIALS

A. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series.

B. Bonding Adhesive for Fiberglass Piping: As recommended by fiberglass piping manufacturer.

C. Gaskets for Ferrous Piping and Copper-Alloy Tubing: ASME B16.21, asbestos free.

D. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.7 PIPING SPECIALTIES

A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

B. Tubular-Sleeve Pipe Couplings: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners and with ends of same sizes as piping to be joined.
1. Source Limitations: Obtain tubular-sleeve pipe couplings from single manufacturer.
2. Standard: AWWA C219.
3. Center-Sleeve Material: Ductile iron.
4. Gasket Material: Natural or synthetic rubber.
5. Pressure Rating: 1380 kPa
6. Metal Component Finish: Corrosion-resistant coating or material.

C. Split-Sleeve Pipe Couplings: Metal, bolted, split-sleeve-type, reducing or transition coupling with sealing pad and closure plates, O-ring gaskets, and bolt fasteners.
1. Standard: AWWA C227.
2. Sleeve Material: [Manufacturer's standard] [Carbon steel] [Stainless steel].
3. Sleeve Dimensions: Of thickness and width required to provide pressure rating.
4. Gasket Material: O-rings made of EPDM rubber unless otherwise indicated.
5. Pressure Rating: 1380 kPa.
6. Metal Component Finish: Corrosion-resistant coating or material.

D. Flexible Connectors:
1. Nonferrous-Metal Piping: Bronze hose covered with bronze wire braid; with copper-tube, pressure-type, solder-joint ends or bronze flanged ends brazed to hose.
2. Ferrous-Metal Piping: Stainless steel hose covered with stainless steel wire braid; with ASME B1.20.1, threaded steel pipe nipples or ASME B16.5, steel pipe flanges welded to hose.

E. Dielectric Fittings: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
1. Dielectric Unions:
   a. Standard: ASSE 1079.
   b. Pressure Rating: (1725 kPa.

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

2. Flanges in "Dielectric Flanges" Subparagraph below are available in at least NPS 1-1/2 to NPS 4 (DN 40 to DN 100).
3. Dielectric Flanges:
   a. Standard: ASSE 1079.
   b. Factory-fabricated, bolted, companion-flange assembly.
   c. Pressure Rating: 2070 kPa.
   d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
4. Dielectric-Flange Insulating Kits: Nonconducting materials for field assembly of companion flanges.
   a. Pressure Rating: 1035 kPa.
   b. Gasket: Neoprene or phenolic.
   c. Bolt Sleeves: Phenolic or PE.
   d. Washers: Phenolic with steel backing washers.
5. Dielectric Nipples:
   a. Standard: IAPMO PS 66.
   b. Electroplated steel nipple complying with ASTM F1545.
   c. Pressure Rating: 2070 kPa.
   d. End Connections: Male threaded or grooved.
   e. Lining: Inert and noncorrosive, PP.

2.8 ENCASEMENT FOR PIPING

A. Authorities having jurisdiction may not permit direct burial of fire-suppression water-service piping. If allowed by authorities having jurisdiction, consider installing piping in PVC conduit.

B. Standards: ASTM A674 or AWWA C105/A21.5.

C. Form: tube.

D. Material: high-density, cross-laminated PE film of 0.10-mm.

E. Color: black

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with excavating, trenching, and backfilling requirements in Section 31 20 00 "Earth Moving."

3.2 PIPING APPLICATIONS

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

B. Do not use flanges or unions for underground piping.

C. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

D. Underground water-service piping [NPS 3/4 to NPS 3 (DN 20 to DN 80)]
   1. PE, ASTM pipe; heat-fusion joints.

E. Underground water-service piping [NPS 4 to NPS 8 (DN 100 to DN 200to be the following:
   1. Ductile-iron pipes and fittings
   2. PE, AWWA pipe; PE, AWWA fittings; and heat-fusion joints.

F. Aboveground and vault water-service piping [NPS 3/4 to NPS 3 (DN 20 to DN 80)] to be[the following:

G. Aboveground [and vault]water-service piping [NPS 4 to NPS 8 (DN 100 to DN 200to be the following:
   1. Ductile-iron, grooved-end pipe; ductile-iron, grooved-end appurtenances; and grooved joints.

H. Underground fire-service-main piping [NPS 4 to NPS 12 (DN 100 to DN 300)] to be the following:
   1. Ductile-iron Pipes and fittings
   2. PE, [Class 200], fire-service pipe; molded PE fittings; and heat-fusion joints.

I. Aboveground and vault fire-service-main piping [NPS 4 to NPS 12 (DN 100 to DN 300)] to be ductile-iron, grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.

J. Underground Combined Water-Service and Fire-Service-Main Piping [NPS 6 to NPS 12 (DN 150 to DN 300)] to be the following:
   1. Ductile-iron pipes and fittings.

K. Aboveground and vault combined water service and fire-service-main piping [NPS 6 to NPS 12 (DN 150 to DN 300)] to be ductile-iron, grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.

3.3 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Comply with Section 330500 "Common Work Results for Utilities" for piping-system common requirements.

B. B. Provide a continuous bare copper or aluminum tracer wire not less than 2.5 mm in diameter in sufficient length over each separate run of nonmetallic pipe.

3.4 3.5 INSTALLATION OF PIPING

A. Comply with NFPA 24 for fire-service-main piping materials and installation.
   1. Install PE corrosion-protection encasement in accordance with ASTM A674 or AWWA C105/A21.5.

B. Install ductile-iron, water-service piping in accordance with AWWA C600 and AWWA M41.

1. Install PE corrosion-protection encasement in accordance with ASTM A674 or AWWA C105/A21.5.

C. Install PE pipe in accordance with ASTM D2774 and ASTM F645.

D. Install PVC, AWWA pipe in accordance with ASTM F645 and AWWA M23.

E. Install fiberglass AWWA pipe in accordance with AWWA M45.

F. Bury piping with depth of cover over top at least 750 mm, with top at least 300 mm below level of maximum frost penetration, and according to the following:
1. Under Driveways: With at least 910 mm of cover over top.
2. In Loose Gravelly Soil and Rock: With at least 300 mm) of additional cover.

G. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.

H. Extend water-service and fire-suppression water-service piping and connect to water-supply source and building water-piping and fire-suppression piping]systems at outside face of building wall in locations and pipe sizes indicated.

I. Terminate water-service and fire-suppression water-service piping at building wall until building water-piping and fire-suppression piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building water-piping and fire-suppression piping systems when those systems are installed.

J. Install sleeve seals for piping penetrations of concrete walls and slabs. Retain and revise first paragraph below for piping with gasketed joints; delete if not required.

K. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

L. Comply with Section 21 10 00 "Water-Based Fire-Suppression Systems" for fire-suppression-water piping inside the building.

M. Comply with Section 22 11 16 "Domestic Water Piping" for potable-water piping inside the building.

N. JOINT CONSTRUCTION

O. Comply with Section 330500 "Common Work Results for Utilities" for basic piping joint construction.

P. Make pipe joints according to the following:

Q. Copper-Tubing, Pressure-Sealed Joints: Join copper tube and pressure-seal fittings with tools and procedures recommended by pressure-seal-fitting manufacturer. Leave insertion marks on pipe after assembly.

R. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.

S. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.

T. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts in accordance with coupling manufacturer's written instructions.

U. PE Piping Insert-Fitting Joints: Use plastic insert fittings and fasteners in accordance with fitting manufacturer's written instructions.

END OF SECTION 33 14 16