SECTION 220513 - COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, installation, and identification, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing”, SBC 701, and the standards listed below in this section; whichever is more stringent.

C. Comply with NEMA MG1.

D. Comply with IEC 60034.

E. Comply with IEC 60072.

F. Comply with IEC 60529.

1.2 GENERAL MOTOR REQUIREMENTS

A. Motors shall be of the energy efficient design.

B. Comply with NEMA MG 1 unless otherwise indicated.

C. Comply with IEEE 841 for severe-duty motors.

D. Motors 0.746 kW (1 HP) and Larger: Three phase.

E. Motors smaller than 0.746 (1 HP): Single phase.

1.3 MOTOR CHARACTERISTICS

A. Motors shall be NEMA design B or design N or NY as applicable to IEC 60034-12, unless otherwise recommended by manufacturer and approved by the Engineer for high torque applications.

B. Duty: Continuous duty at ambient temperature of 46.1 deg C and at altitude of 625 m above sea level.

C. Service Factor: 1.15 according to NEMA MG1 or shall be duty type S1 - continuous running duty to IEC 60034-1, unless otherwise indicated. Motors used for excessive intermittent periodic operation shall be suitably designed for the expected number of starts. Motors’ dimensions shall comply with NEMA MG1 or IEC 60072 as applicable.

D. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

E. Low Voltage Motors’ Enclosure: Totally enclosed, fan-cooled type (TEFC) to NEMA MG1 or IC 411 to IEC 60034-6 as applicable, unless otherwise indicated or recommended by manufacturer and approved by the Engineer.

F. Medium Voltage Motors' Enclosures: Totally enclosed, air to air cooled (TEAAC) to NEMA MG1 or IC 611 to IEC 60034-6 as applicable or totally enclosed, water to air cooled (TEWAC) to NEMA MG1 or IC 817 to IEC 60034-6 as applicable. Enclosure type shall be as recommended by manufacturer and approved by the Engineer, unless otherwise indicated.

G. Degree of Protection (IP): Motors shall be IP55 to IEC 60529 for outdoor use and IP54 to IEC 60529 for indoor motors as a minimum .

H. Temperature Rise: Shall not exceed 80 deg. C based on 50 deg. C (122 deg. F) ambient temperature, unless otherwise indicated or recommended by manufacturer and approved by the Engineer for specific applications such as: overhead cranes or submersible pumps, where temperature rise not exceeding 105 deg. C may be used.

I. Motors that utilize a Variable Frequency Drive (VFD) shall be inverter duty to NEMA MG1 or Class I to IEC 60034-18-41and shall be classified as energy efficiency to NEMA MG1 or high efficiency class IE2 to IEC 60034-30.

J. Low Voltage Motors Terminal Boxes: Shall have the same motor's degree of protection.

K. Medium Voltage Motors Terminal Boxes: Shall have the same motor's degree of protection and shall be designed for differential CT's and/or surge protection (surge arrestor and surge capacitor). Enough space shall be provided below main terminal box for cable connection.

L. Include built-in terminal blocks and built in thermistors PTC100 / RTD200 for winding protection for all low voltage motors rated 50 HP and above and for all low voltage VFD motors.

M. Include built-in terminal blocks and built in thermistors PTC100 / RTD200 for winding and bearing protection for all medium voltage motors.

N. The contractor is responsible for coordination between the motor and motor controller suppliers to ensure compatibility, proper starting and satisfactory operation.

1.4 MATERIALS

A. Polyphase Motors: Design B, medium induction motors.

1. Efficiency: Premium efficient, as defined in NEMA MG 1 or class IE3 to IEC 60034-30 unless otherwise indicated.
2. Service Factor: 1.15.
3. Stator: Copper windings unless otherwise indicated.
4. Multispeed Motors: Variable torque or Separate winding for each speed as applicable.
5. Rotor: Random-wound, squirrel cage.
6. Bearings: Double-shielded, prelubricated ball bearings suitable for radial and thrust loading.
7. Temperature Rise: Match insulation rating.
8. Insulation: Unless otherwise indicated, Class F for motors with temperature rise 80 deg. C and Class H for motors with temperature rise 105 deg. C as indicated in paragraph 2.1 M above.
9. Code Letter Designation:

    a. Motors 15 HP and Larger: NEMA starting Code F or Code G.
    b. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.

10. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

B. Additional Requirements for Polyphase Motors:

1. Motors used with reduced-voltage and multispeed controllers.
2. Premium-efficient and inverter-duty motors used with variable-frequency controllers.
3. Severe-duty motors: Where indicated, motors are totally enclosed with 1.15 minimum service factor to NEMA MG1 and IEEE 841.

C. Single-Phase Motors:

1. Motors Larger Than 1/20 HP: Permanent-split capacitor; split phase; capacitor start, inductor run; or capacitor start, capacitor run to suit starting torque and requirements of specific motor application. Class B insulation may be used, unless otherwise indicated.
2. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
3. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
4. Motors 1/20 HP and Smaller: Shaded-pole type.
5. Internal thermal protection.

D. Electronically Commutated Motors (ECM):

1. Brushless, permanent magnet type, with ball bearing design.
2. Designed for synchronous rotation and able to be mounted with shaft in horizontal or vertical orientation.
3. Energy-Efficient Design: Super premium efficiency to NEMA MG1 or class IE4 to IEC 60034-30-1.
4. EC Motor Service Factor: 1.15.
5. Motor shall be resiliently mounted, self-aligning and oiled for life.
6. ECM built-in electronic drive suitable for either manual and/or DDC controlled flow adjustments.
7. Variable speed with motor speed input compatible with the DDC analog outputs range.
8. Motor shall be completed with Thermal Overload Protector (TOP).
9. Motor to be controlled and regulated by a DC signal supplied from a field instrument, DDC controller or BMS.

END OF SECTION 220513

SECTION 220516 - EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, and installation, and identification for expansion fittings and loops, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing”, SBC 701 and 702, and the standards listed below in this section; whichever is more stringent.

C. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

1.2 PERFORMANCE REQUIREMENTS

A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.

B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

1.3 PRODUCTS

A. Packless Expansion Joints:

1. Flexible-Hose Packless Expansion Joints:

   a. Description: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.
   b. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.
   c. Expansion Joints for Copper Tubing DN 50 and Smaller: Copper-alloy fittings with solder-joint end connections.
   d. Expansion Joints for Copper Tubing DN 65 to DN 100: Copper-alloy fittings with solder-joint end connections.
   e. Expansion Joints for Steel Piping DN 50 and Smaller: Carbon-steel fittings with threaded end connections.
   f. Expansion Joints for Steel Piping DN 65 to DN 150: Carbon-steel fittings with flanged end connections.
   g. Expansion Joints for Steel Piping DN 200 to DN 300: Carbon-steel fittings with flanged end connections.
   h. Expansion Joints for Steel Piping DN 350 and Larger: Carbon-steel fittings with flanged end connections.

2. Metal-Bellows Packless Expansion Joints:

   a. Standards: ASTM F1120.
   b. Type: Circular, corrugated bellows with external tie rods.
   c. Configuration: Single joint with base and double joint with base class(es).
   d. Expansion Joints for Copper Tubing: Single- and two-ply phosphor-bronze bellows, copper pipe ends, and brass shrouds.

1) End Connections for Copper Tubing DN 50 and Smaller: [**Solder joint**] [**or**] [**threaded**].
2) End Connections for Copper Tubing DN 65 to DN 100: [**Solder joint**] [**or**] [**threaded**].
3) End Connections for Copper Tubing DN 125 and Larger: Flanged.

e. Expansion Joints for Steel Piping: Single- and two-ply stainless-steel bellows, steel pipe ends, and carbon-steel shroud.

1) End Connections for Steel Pipe DN 50 and Smaller: Threaded.
2) End Connections for Steel Pipe DN 65 and Larger: [**Flanged**] [**Welded**].

f. Expansion Joints for Stainless-Steel Waterway: Single-ply stainless-steel bellows, stainless-steel-pipe end connections, and steel shroud.

1) End Connections for Stainless-Steel Pipe: Flanged.

3. Rubber Packless Expansion Joints:

a. Standards: ASTM F1123.
b. Material: Fabric-reinforced butyl rubber.
c. Spherical Type: Single and double spheres with external control rods.
d. Minimum Pressure Rating: 1200 kPa at 116 deg C .
e. Material for Fluids Containing Acids, Alkalis, or Chemicals: Butyl Rubber.
f. Material for Water: Butyl Rubber.
g. End Connections: Full-faced, integral steel flanges with steel retaining rings.

4. Expansion Compensators:

a. Minimum Pressure Rating: 1200-kPa (175-psig), with internal guides, antitorque device, and removable end clip for positioning.
b. End Connections for DN50 (NPS 2) and Smaller: Threaded.
c. End Connections for DN65 (NPS 2-1/2) and Larger: Flanged.
d. Joints for Copper Piping: Two-ply, phosphor-bronze bellows and brass shroud.
e. Joints for Steel Piping: Two-ply, stainless-steel bellows and carbon-steel shroud.

B. Packed Expansion Joints:

1. Slip Expansion Joints:

a. Description: Carbon-steel, packing-type pipe expansion joint designed for repacking under pressure and with compound limit stops.
b. Minimum pressure rating: 1725 kPa at 204 deg C .
c. Packing: Asbestos-free polytetrafluoroethylene.
d. Double-Slip Type: With base.
e. End Connections: flanged or weld ends to match piping system, and flanged-end connections, unless otherwise indicated.

2. Flexible Ball Joints:

a. Standard: Comply with ASME Boiler and Pressure Vessel Code: Section II, "Materials Specifications," and with ASME B31.9, "Building Services Piping," for materials and design of pressure-containing parts and bolting.
b. Description: Carbon-steel assembly with asbestos-free composition packing, designed for 360-degree rotation and angular deflection.
c. Minimum Pressure Rating: 1725 kPa at 204 deg C .
d. End Connections for DN50 and Smaller: Threaded.
e. End Connections for DN65 and Larger: Flanged.
f. Joints for DN150 and Smaller: 30-degree angular deflection minimum.

g. Joints for DN200 and Larger: 15-degree angular deflection minimum.

C. Alignment Guides and Anchors:

1. Alignment Guides: Steel, factory fabricated.
2. Anchor Materials:

a. Steel shapes and plates: ASTM A36/A36M
b. Bolts and nuts: ASME B18.10 or ASTM A183, steel hex head.
c. Washers: ASTM F844, steel, plain, flat washers.
d. Wedge-type mechanical anchor fasteners.

1) Stud: Threaded, zinc-coated carbon steel.
2) Expansion Plug: Zinc-coated steel.
3) Washer and Nut: Zinc-coated steel.

e. Insert-type chemical anchor fasteners.

1) Bonding Material: ASTM C881/C881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
2) Stud: ASTM A307, zinc-coated carbon steel with continuous thread on stud.
3) Washer and Nut: Zinc-coated steel.

f. Concrete: Portland cement mix, 21 MPa minimum. Refer to Section "Cast-in-Place Concrete" for formwork, reinforcement, and concrete.
g. Grout: ASTM C 1107/C 1107M, Grade B, factory-mixed and -packaged nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1) Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout.
2) Properties: Nonstaining, noncorrosive, and nongaseous.
3) Design Mix: 34.5-MPa, 28-day compressive strength.

END OF SECTION 220516

SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

1.1 QUALITY ASSURANCE

Retain first 2 Paragraphs below for projects in Saudi Arabia.

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials and installation for sleeves and sleeve seals for plumbing piping, as listed in, but not limited to, the “Saudi Building Code – General“, SBC 201, and “Saudi Sanitary Code-Plumbing”, SBC 701, and the standards listed below in this section; whichever is more stringent.

1.2 SLEEVES WITHOUT WATERSTOP

A. Cast-Iron Pipe Sleeves: Cast or fabricated ductile iron, with plain ends.

B. Steel Pipe Sleeves: Hot-dip galvanized, ASTM A53/A53M, Type E, Grade B, Schedule 40, with plain ends.

C. PVC Pipe Sleeves: ASTM D1785, Schedule 40.

D. PVC Pipe: ASTM D1785, Schedule 40.

E. Molded-PVC Sleeves: With nailing flange.

F. Molded-PE or -PP Sleeves: Removable, with nailing flange.

1.3 SLEEVES WITH WATERSTOP

A. Cast-Iron Pipe Sleeves: Cast or fabricated ductile iron, with plain ends and integral waterstop collar.

B. Steel Pipe Sleeves: Hot-dip galvanized, ASTM A53/A53M, Type E, Grade B, Schedule 40, with plain ends.

C. PVC Pipe Sleeves: ASTM D1785, Schedule 40.

D. PVC Pipe: ASTM D1785, Schedule 40.

E. Molded-PVC Sleeves: With nailing flange.

F. Molded-PE or -PP Sleeves: Removable, with nailing flange.

1.4 STACK-SLEEVE FITTINGS

A. Manufactured, galvanized cast-iron sleeve with integral cast flashing flange, with underdeck clamp.

1.5 SLEEVE-SEAL SYSTEMS

A. Field-assembled, modular sealing-element unit for filling annular space between piping and sleeve.

1. Sealing Elements: Nitrile (Buna N).
2. Pressure Plates: Stainless steel.
3. Connecting Bolts and Nuts: Stainless steel.

1.6 GROUT

A. Nonshrink, factory packaged; ASTM C1107/C1107M, Grade B.

1.7 SILICONE SEALANTS

A. Silicone Sealant, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

B. Silicone Sealant, S, P, T, NT: Single-component 25, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT.

1.8 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Exterior Concrete Walls above Grade: Sleeves with waterstops.

1. Piping Smaller than NPS 6 (DN 150): Galvanized Steel pipe sleeves
2. Piping NPS 6 (DN 150) and Larger: Galvanized Steel pipe sleeves

B. Exterior Concrete Walls below Grade: Sleeves with waterstops.

1. Piping Smaller Than NPS 6 (DN 150): Galvanized Steel pipe sleeves with sleeve-seal system.
2. Piping NPS 6 (DN 150) and Larger: Galvanized Steel pipe sleeves with sleeve-seal system.

C. Concrete Slabs-on-Grade: Sleeves with waterstops.

1. Piping Smaller Than NPS 6 (DN 150) : Galvanized Steel pipe sleeves with sleeve-seal system.
2. Piping NPS 6 (DN 150) and Larger: Galvanized Steel pipe sleeves with sleeve-seal system.

D. Concrete Slabs above Grade that are Not Fire Rated nor Smoke Rated: Sleeves with waterstops.

1. Piping Smaller Than NPS 6 (DN 150): Galvanized Steel pipe sleeves.
2. Piping NPS 6 (DN 150) and Larger: Galvanized Steel pipe sleeves.

E. Interior Walls and Partitions that are Not Fire Rated nor Smoke Rated: Sleeves without waterstops.

1. Piping Smaller Than NPS 6 (DN 150): Galvanized Steel pipe sleeves
2. Piping NPS 6 (DN 150) and Larger: Galvanized-steel sheet sleeves.

END OF SECTION 220517

SECTION 220518 - ESCUTCHEONS FOR PLUMBING PIPING

1.1 SUMMARY

A. Section includes:

1. Escutcheons.
2. Floor plates.

1.2 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations, for materials, and installation for escutcheons for plumbing piping, and as per the standards listed below in this section; whichever is more stringent.

1.3 PRODUCTS

A. Escutcheons for New Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One-piece deep pattern.
2. Chrome-Plated Piping: One-piece steel with polished, chrome-plated finish.
3. Insulated Piping: One-piece steel with polished, chrome-plated finish or One-piece cast brass with polished brass finish.
4. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish or One-piece cast brass with polished brass finish.
5. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish or One-piece cast brass with polished brass finish.
6. Bare Piping in Unfinished Service Spaces: One-piece steel with polished, chrome-plated finish or One-piece cast brass with rough-brass finish.
7. Bare Piping in Equipment Rooms: One-piece steel with polished, chrome-plated finish One-piece cast brass with rough brass finish.

B. Floor Plates: Split-plate, stamped steel with concealed hinge.

END OF SECTION 220518

SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.”

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, installation, and identification for meters and gages, as listed in the “Saudi Mechanical Code-”, SBC 501, and the standards listed below in this section; whichever is more stringent.

1.2 PRODUCTS

A. Thermometers, General

1. Scale Range: Temperature ranges for services listed are as follows:

a. Domestic Hot Water: 0 to 115 deg C, with 1-degree scale divisions .
b. Domestic Cold Water: minus 18 to plus 38 deg C, with 1-degree scale divisions .

B. Bimetallic-Actuated Thermometers:
1. Standard: ASME B40.200.
2. Case: Liquid-filled and sealed type(s); stainless steel; 127-mm diameter.
3. Dial: Nonreflective aluminum with etched scale in deg C.
4. Connector Type(s): Union joint, adjustable angle.
5. Connector Size: 13 mm, with ASME B1.1 screw threads.
6. Window: Plain glass or plastic.
7. Accuracy: Plus or minus 1 percent of range span or plus or minus one scale division to maximum of 1.5 percent of range span.

C. Filled-System Thermometers:

1. Direct-Mounted, Metal-Case, Vapor-Actuated Thermometers:
a. Standard: ASME B40.200.
b. Case: Sealed type, cast aluminum or drawn steel; 114-mm diameter.
c. Movement: Mechanical precision geared, brass.
d. Dial: Nonreflective aluminum with etched scale in deg C.
e. Window: Glass.
f. Ring: Metal or Stainless steel.
g. Connector Type(s): Union joint, adjustable, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device with ASME B1.1 screw threads.
h. Accuracy: Plus or minus 1 percent of range span or plus or minus one scale division to maximum of 1.5 percent of range span.

2. Remote-Mounted, Metal-Case, Vapor-Actuated Thermometers:
a. Standard: ASME B40.200.
b. Case: Sealed type, cast aluminum or drawn steel; 114-mm diameter with back or front flange for panel mounting.
c. Dial: Nonreflective aluminum with etched scale in deg C.
d. Window: Glass.
e. Ring: Metal or Stainless steel.
f. Connector Type(s): Union joint, back or bottom; with ASME B1.1 screw threads.
g. Tubing: Bronze, double-braided, armor-over-copper capillary; of length to suit installation

h. Accuracy: Plus or minus 1 percent of range span or plus or minus one scale division to maximum of 1.5 percent of range span.

D. Liquid-in-Glass Thermometers:

1. Metal-Case , Liquid-in-Glass Thermometers:

a. Standard: ASME E1-14.
b. Case: Die cast aluminum finished in baked epoxy enamel, glass front, spring secured 230 mm long; 152-mm size.
c. Adjustable Joint: Finish to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.
d. Tube: Glass with magnifying lens and blue or red organic liquid.
e. Tube Background: Nonreflective aluminum with etched scale in deg C.
f. Window: Glass or platic.
g. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

E. Insertion Dial Thermometers
1. Description: ASME B40.200, bimetal type.
2. Dial: 25-mm diameter.
3. Case: Stainless steel.
4. Stem: Dustproof and leakproof 3-mm- diameter, tapered-end stem with nominal length of 125 mm .

F. Separable Sockets
1. Description: Fitting with protective socket for installation in threaded pipe fitting to hold fixed thermometer stem.
a. Material: Brass, for use in copper piping.
b. Material: Stainless steel, for use in steel piping.
c. Extension-Neck Length: Nominal thickness of 50 mm , but not less than thickness of insulation. Omit extension neck for sockets for piping not insulated.
d. Insertion Length: To extend to center of pipe.
e. Cap: Threaded, with chain permanently fastened to socket.
f. Heat-Transfer Fluid: Oil or graphite.

G. Thermowells:

1. Standard: ASME B40.200.
2. Material for Use with Copper Tubing: Brass.
3. Material for Use with Steel Piping: Stainless steel.
4. Type: Stepped shank unless straight or tapered shank is indicated.
5. External Threads: DN 15, DN 20, or NPS 25, ASME B1.20.1 pipe threads.
6. Extension-Neck Length: Nominal thickness of 50 mm , but not less than thickness of insulation. Omit extension neck for wells for piping not insulated.
7. Internal Threads: 13, 19, and 25 mm, with ASME B1.1 screw threads.
8. Heat-Transfer Medium: Oil or graphite.

H. Pressure Gages:

1. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:
a. Standard: ASME B40.100.
b. Case: Liquid-filled-case type for booster sets and pumps type(s); cast aluminum, brass, or drawn steel; 114-mm or 152-mm diameter.
c. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
d. Pressure Connection: Brass, with DN 8 or DN 15, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
e. Dial: Nonreflective aluminum with etched scale in kPa.
f. Window: Glass.

g. Ring: Metal.
h. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.
i. Range: Comply with the following:
1) Vacuum: 100 kPa of vacuum to 103 kPa of pressure .
2) Fluids under Pressure: Two times the operating pressure.

I. Gage Attachments:

1. Snubbers: ASME B40.100, brass; with DN 8 or DN 15, and porous-metal-type surge-dampening device. Include extension for use on insulated piping.
2. Siphons: Loop-shaped section of brass pipe with DN 8 pipe threads.
3. Valves: Brass or stainless steel needle, with DN 8 or DN 15, pipe threads.

J. Test Plugs: Test-station fitting made for insertion into piping tee fitting.

K. Test-Plug Kits: Furnish one test-plug kit(s) containing two thermometer(s), one pressure gage and adapter, and carrying case.

L. Sight Flow Indicators:

1. Construction: Bronze or stainless steel body, with sight glass andplastic pelton wheel indicator.
2. Minimum Pressure Rating: 860 kPa.
3. Minimum Temperature Rating: 93 deg C.

M. Flowmeters:

1. Pitot-Tube Flowmeters:

a. Sensor: Insertion type; for inserting probe in piping and measuring flow directly in liters per second.

1) Minimum Pressure Rating: 1035 kPa.
2) Minimum Temperature Rating: 121 deg C.

b. Display: Shows rate of flow, with register to indicate total volume in liters.

2. Turbine Flowmeters:

a. Sensor: Impeller turbine; for inserting in pipe fitting or for installing in piping and measuring flow directly in liters per second.

1) Minimum Pressure Rating: 1035 kPa.
2) Minimum Temperature Rating: 82 deg C.

b. Display: Shows rate of flow, with register to indicate total volume in liters.

3. Venturi Flowmeters:

a. Sensor: Venturi-type, calibrated, flow-measuring element; for installation in piping.

1) Minimum Pressure Rating: 1725 kPa.
2) Minimum Temperature Rating: 121 deg C.

b. Indicators:

1) Scale: Liters per second.

4. In-Line Vortex-Shedding Flowmeters:

    a. Sensor: Inline type; for installing between pipe flanges and measuring flow directly in liters per second.

        1) Minimum Pressure Rating: 6900 kPa.
        2) Minimum Temperature Rating: 260 deg C.

    b. Indicator:

        1) Display: Shows rate of flow, with register to indicate total volume in liters.

    c. Accuracy: Plus or minus 7/10 percent for liquids and 1-1/4 percent for gases.

5. Insertion Vortex-Shedding Flowmeters:

    a. Sensor: Insertion type; for installing in pipe measuring flow directly in liters per second.

        1) Minimum Pressure Rating: 6900 kPa.
        2) Minimum Temperature Rating: 260 deg C.

    b. Indicator: Hand-held meter, either an integral part of sensor or a separate meter.

        1) Display: Shows rate of flow, with register to indicate total volume in liters.

    c. Accuracy for installation in pipe: Plus or minus 1 percent for liquids and 1.5 percent for gases.

N. WATER METERS

1. Description: AWWA C700-03, displacement type, bronze case. Registers flow in liters or cubic meters as required by utility.
2. Description: ANSI/AWWA C701-07, turbine type. Registers flow in liters or cubic meters as required by utility.
3. Description: ANSI/AWWA C702-01, compound type, bronze case. Registers flow in liters or cubic meters as required by utility.
4. Description: ANSI/AWWA C703-96 (2004), UL-listed, FM-approved, main-line, proportional, detector type; 1035-kPa working pressure; with meter on bypass. Registers flow in liters or cubic meters as required by utility.
    a. Bypass Meter: ANSI/AWWA C702-01, compound type, bronze case; size not less than one-half nominal size of main-line meter.
    b. Bypass Meter: ANSI/AWWA C701-07, turbine type, bronze case; size not less than one-half nominal size of main-line meter.
5. Description: ANSI/AWWA C703-96 (2004), UL-listed, FM-approved, main-line-turbine, detector type; 1200-kPa working pressure; with strainer and with meter on bypass. Registers flow in liters or cubic meters as required by utility.
    a. Bypass Meter: ANSI/AWWA C701-07, turbine type, bronze case; not less than DN50 .
6. Remote Registration System: Utility's standard; direct-reading type complying with ANSI/AWWA C706-96 (R2005); modified with signal transmitting assembly, low-voltage connecting wiring, and remote register assembly.
7. Remote Registration System: Utility's standard; encoder-type complying with ANSI/AWWA C707-05; modified with signal transmitting assembly, low-voltage connecting wiring, and remote register assembly.
    a. Data-Acquisition Units: Comply with utility's requirements for type and quantity.
    b. Visible Display Units: Comply with utility's requirements for type and quantity.

END OF SECTION 220519

SECTION 220523.12 - GLOBE VALVES FOR PLUMBING PIPING

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.”

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, installation, and identification for valves, as listed in the “Saudi Sanitary Code-Plumbing”, SBC 701, and the standards listed below in this section; whichever is more stringent.

C. Single-Source Responsibility: Comply with the requirements specified in Division 1 Section "Products Requirements", under "Source Limitations" Paragraph.

1.2 PERFORMANCE REQUIREMENTS

A. Standards:

1. Domestic water valves intended to convey or dispense water for human consumption must comply with the requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or must be certified to be in compliance with NSF 61 and NSF 372 (by an ANSI-accredited third-party certification body) that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.18 for cast copper solder-joint connections.

a. Caution: Where soldered end connections are used, use solder having a melting point below 450 deg C for gate, globe, and check valves; below 216 deg C for ball valves.

3. ASME B16.1 for flanges on iron valves.
4. ASME B16.5 for flanges on steel valves.
5. ASME B16.24 for flanges on bronze valves.
6. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
7. ASME B31.1 for power piping valves.
8. ASME B31.9 for building services piping valves.

a. Exceptions: Domestic hot- and cold-water piping valves unless referenced.

C. Grooved: With grooves according to AWWA C606.

D. Operators: Use specified operators and handwheels, except provide the following special operator features:

1. Handwheels: For valves other than quarter turn.
2. Lever Handles: For quarter-turn valves DN150 and smaller.
3. Gear-Drive Operators: For quarter-turn valves DN200 and larger.

E. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valves in Insulated Piping: With (50-mm) stem extensions.

H. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.

I. All valves shall be in an accessible location. If not, suitable means of access shall be provided.

1.3 BRONZE GLOBE VALVES

A. Bronze Globe Valves, Class 125:

1. Description:

a. Standard: MSS SP-80, Type 1.
b. NPS 2-1/2 (DN 65) and smaller, CWP Rating: (1380 kPa).
c. Body Material: ASTM B62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Silicon-bronze alloy.
f. Disc: Rubber, Bronze, or PTFE.
g. Packing: Teflon-impregnated, asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

B. Bronze Globe Valves, Class 150:

1. Description:

a. Standard: MSS SP-80, Type 2.
b. NPS 2-1/2 (DN 65) and smaller, CWP Rating: (2070 kPa).
c. Body Material: ASTM B62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded.
e. Stem: Silicon-bronze alloy.
f. Disc: Rubber, Bronze, or PTFE.
g. Packing: Teflon-impregnated, asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

1.4 IRON GLOBE VALVES

A. Iron Globe Valves, Class 125:

1. Description:

a. Standard: MSS SP-85, Type I.
b. NPS 3 (DN 80) and larger, CWP Rating: (1380 kPa).
c. Body Material: ASTM A126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Fittings: Bronze.
f. Disc and Seat: Renewable, bronze.
g. Stem: Brass alloy, outside screw and yoke.
h. Packing and Gasket: Teflon-impregnated, asbestos free, with cast-iron follower.
i. Operator: Handwheel or chainwheel.

1.5 CHAINWHEELS

A. Description: Valve actuation assembly with sprocket rim, chain guides, chain, and attachment brackets for mounting chainwheels directly to handwheels.

1. Sprocket Rim with Chain Guides: Ductile or cast iron, of type and size required for valve. Include zinc or epoxy coating.
2. Chain: Hot-dip-galvanized steel, Brass or Stainless steel, of size required to fit sprocket rim.

1.6 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe (DN 65) and Smaller:

1. Bronze globe valve, Class 125, bronze / rubber / PTFE disc with threaded or solder ends.

B. Pipe (DN 80) and Larger:

1. Iron globe valve, Class 125, with flanged or grooved ends.

END OF SECTION 220523.11

SECTION 220523.12 - BALL VALVES FOR PLUMBING PIPING

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.”

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, installation, and identification for valves, as listed in the “Saudi Sanitary Code-Plumbing”, SBC 701, and the standards listed below in this section; whichever is more stringent.

1.2 PERFORMANCE REQUIREMENTS

A. Standards:

1. Domestic water valves intended to convey or dispense water for human consumption must comply with the requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or must be certified to be in compliance with NSF 61 and NSF 372 (by an ANSI-accredited third-party certification body) that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.18 for cast copper solder-joint connections.
3. ASME B16.22 for wrought copper and copper alloy solder-joint connections.
4. ASME B16.34 for flanged and threaded end connections
5. ASME B31.9 for building services piping valves.

a. Exceptions: Domestic hot- and cold-water[, **sanitary waste, and storm drainage**] piping valves unless referenced.

C. Provide bronze valves made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

D. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

E. Valve Sizes: Same as upstream piping unless otherwise indicated.

F. Valve Actuator Type:

1. Gear Actuator: For quarter-turn valves DN 200 and larger.
2. Hand Lever: For quarter-turn valves smaller than DN 150.

G. Valves in Insulated Piping:

1. Provide 50-mm extended neck stems.
2. Extended operating handles with nonthermal-conductive covering material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
3. Memory stops that are fully adjustable after insulation is applied.

1.3 BRONZE BALL VALVES

A. Bronze Ball Valves, Two Piece with Full Port and Bronze or Brass Trim, Threaded or Soldered Ends:
1. Standard: MSS SP-110; MSS SP-145.
2. CWP Rating: 4140 kPa.
3. Body Design: Two piece, blowout proof.
4. Body and Bonnet Material: ASTM B584 Bronze.
5. Ends: Threaded or soldered.
6. Seats: PTFE.
7. Stem: Bronze or brass.
8. Ball: Chrome plated brass.
9. Port: Full.
10. Operator: Steel handwheel.
11. Operator: Vinyl-covered steel lever handle.
12. Operator: Vinyl-covered steel tee handle.
13. Operator: Lever operators with lock.

B. Bronze Ball Valves, Two Piece with Regular Port and Bronze or Brass Trim, Threaded Ends:
1. Standard: MSS SP-110; MSS SP-145.
2. CWP Rating: 4140 kPa.
3. Body Design: Two piece.
4. Body and Bonnet Material: Bronze.
5. Ends: Threaded or soldered.
6. Seats: PTFE.
7. Stem: Bronze or brass.
8. Ball: Chrome-plated brass.
9. Port: Regular.
10. Operator: Steel handwheel.
11. Operator: Vinyl-covered steel lever handle.
12. Operator: Vinyl-covered steel tee handle.
13. Operator: Lever operators with lock

1.4 CPVC BALL VALVES

A. CPVC Union Ball Valves:
1. Standard: MSS SP-122.
2. Pressure Rating and Temperature: [**860 kPa**] [**1035 kPa**] <**Insert value**> at [**23 deg C**] <**Insert temperature**>.
3. Body Material: CPVC.
4. Body Design: Union type.
5. End Connections for Valves DN 50 and Smaller: Detachable, socket or threaded.
6. End Connections for Valves DN 65 to DN 100: Detachable, socket or threaded.
7. Ball: CPVC; full port.
8. Seals: PTFE or EPDM-rubber O-rings.
9. Handle: Tee shaped.

1.5 LOW-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE - 1035 kPa OR LESS

A. Pipe DN 50 and Smaller:
1. Bronze ball valves, two piece with full or regular port, and bronze or brass trim, and 4140-kPa minimum WOG pressure rating.

1.6 HIGH-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE - 1035 TO 1380 kPa
1. Bronze ball valves, two piece with full or regular port, and bronze or brass trim, and 4140-kPa minimum WOG pressure rating.

1.7 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe DN 15 and Smaller:
   1. Bronze ball valves, two piece with regular port, and bronze or brass trim. Provide with threaded or solder-joint ends, with stem extension.

B. Pipe DN 20 and Larger:
   1. Bronze ball valves, two piece with full port, and bronze or brass trim. Provide with threaded or solder-joint ends, with stem extension.

C. CPVC Pipe DN 80 and Smaller: Union ball valve.

END OF SECTION 220523.12

SECTION 220523.13 - BUTTERFLY VALVES FOR PLUMBING PIPING

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, installation, and identification for valves, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing”, SBC 701, and the standards listed below in this section; whichever is more stringent.

1.2 SOURCE LIMITATIONS

A. Obtain each type of valve from single source from single manufacturer.

1.3 PERFORMANCE REQUIREMENTS

A. Standards:

1. Domestic water piping specialties intended to convey or dispense water for human consumption must comply with the requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or must be certified to be in compliance with NSF 61 and NSF 372 (by an ANSI-accredited third-party certification body) that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. Design: Rising stem or rising outside screw and yoke stems, except as specified below.

1. Non-rising stem valves may be used only where headroom prevents full extension of rising stems.

C. Internal and external parts of all cast-iron and ductile-iron valves installed underground or above ground, and or exposed to outdoors shall be factory coated with 7.5 mm fusion (300 micron) bonded epoxy coating.

D. ASME Compliance:

1. ASME B16.1 for flanges on iron valves.
2. ASME B16.5 for flanges on steel valves.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B31.9 for building services valves.

a. Exceptions: Domestic hot- and cold-water piping valves unless referenced

E. MSS Compliance: Comply with the various MSS Standard Practice documents referenced.

F. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

G. Operators: Use specified operators and handwheels, except provide the following special operator features:

1. Handwheels: For valves other than quarter turn.
2. Lever Handles: For quarter-turn valves DN150 and smaller.
3. Gear-Drive Operators: For quarter-turn valves DN200 and larger.

H. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

I. Valve Sizes: Same as upstream piping unless otherwise indicated.

J. Valve Actuator Types:

1. Gear Actuator: For valves DN 200 and larger.
2. Hand lever: For valves DN 150 and smaller.
3. Chainwheel: Device for attachment to gear, handlever, or stem; of size and with chain for mounting height, according to "Installation of Valves" Article.

K. Valves in Insulated Piping: Provide 50-mm extended neck stems.

1.4 IRON BUTTERFLY VALVES

A. Iron, Butterfly Valves with Aluminum-Bronze Disc:

1. Standard: MSS SP-67, Type I.
2. CWP Rating: 1035 kPa maximum pressure differential, 1380 kPa CWP.
3. Body Design: Extended neck, field-replaceable sleeve and stem seals, lug, or grooved style.
4. Body and Bonnet Material: ASTM A126, cast iron.
5. Seat: EPDM or NBR.
6. Stem: One- or two-piece stainless steel.
7. Disc: Aluminum bronze.
8. Operator for Sizes DN50 to DN150: Standard lever handle.
9. Operator for Sizes DN50 to DN150: Standard lever handle with memory stop.
10. Operator for Sizes DN50 to DN150 : Lever handle with latch lock.
11. Operator for Sizes DN200 to DN600: Gear operator with position indicator.
12. Operator for Sizes DN200 to DN600: Gear operator with position indicator and chain wheel.
13. Operator for Sizes DN200 and Larger, 2400 mm or Higher above Floor: Chain-wheel operator.

B. Iron, Butterfly Valves with Ductile-Iron Disc:

1. Standard: MSS SP-67, Type I.
2. CWP Rating: 1035 kPa maximum pressure differential, 1380 kPa CWP.
3. Body Design: Extended neck, field-replaceable sleeve and stem seals, lug, or grooved style.
4. Body and Bonnet Material: ASTM A126, cast iron.
5. Seat: EPDM or NBR.
6. Stem: One- or two-piece stainless steel.
7. Disc: Nickel-plated [**or –Epoxy-coated or Elastomer-coated**] ductile iron.

    a. Operator for Sizes DN50 to DN150: Standard lever handle.
    b. Operator for Sizes DN50 to DN150: Standard lever handle with memory stop.
    c. Operator for Sizes DN50 to DN150: Lever handle with latch lock.
    d. Operator for Sizes DN200 to DN600: Gear operator with position indicator.
    e. Operator for Sizes DN200 to DN600: Gear operator with position indicator and chain wheel.

8. Operator for Sizes DN200 and Larger, 2400 mm or Higher above Floor: Chain-wheel operator.

1.5 STAINLESS STEEL, GROOVED-END BUTTERFLY VALVES

A. Standard: MSS SP-67, Type I.

B. CWP Rating, DN 200 and Smaller: 2070 kPa.

C. CWP Rating, DN 250 and Larger: 1380 kPa.

D. Body Material: Type 316 stainless steel, ASTM A743/A743M.

E. Stem: Type 416 stainless steel.

F. Disc: Type 316 stainless steel or ductile iron, encapsulated with Grade "EN" EPDM.

G. Seal: EDPM.

1.6 CPVC BUTTERFLY VALVES

A. Pressure Rating and Temperature: 860 kPa at 23 deg C.

B. Body Material: CPVC.

C. Body Design: Lug or flangeless (wafer) type.

D. Seat: EPDM rubber.

E. Seals: PTFE or EPDM-rubber O-rings.

F. Disc: CPVC.

G. Stem: Stainless steel.

H. Handle: Lever.

1.7 CHAINWHEELS

A. Description: Valve actuation assembly with sprocket rim, chain guides, chain, and attachment brackets for mounting chainwheels directly to handwheels.

1. Sprocket Rim with Chain Guides: Ductile or cast iron, of type and size required for valve. Include zinc or epoxy coating.
2. Chain: Hot-dip, galvanized steel, Brass, or Stainless steel, of size required to fit sprocket rim.

1.8 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe DN 65 and Larger:

1. Iron, Butterfly Valves: 200 CWP, EPDM or NBR seat, and aluminum-bronze,or elastomer-coated or nickel plated ductile-iron disc.
2. Stainless Steel Pipe: Stainless steel, grooved-end butterfly valve.

B. CPVC Pipe DN 80 and Larger: CPVC butterfly valve.

END OF SECTION 220523.13

SECTION 220523.14 - CHECK VALVES FOR PLUMBING PIPING

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, installation, and identification for valves, as listed in, but not limited to the “Saudi Sanitary Code-Plumbing”, SBC 701, and the standards listed below in this section; whichever is more stringent.

1.2 PERFORMANCE REQUIREMENTS

A. Standards:

1. Domestic water piping check valves intended to convey or dispense water for human consumption are to comply with the requirements of authorities having jurisdiction, and NSF 61/NSF 372, or to be certified in compliance with NSF 61/NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. Design: Rising stem or rising outside screw and yoke stems, except as specified below.

1. Non-rising stem valves may be used only where headroom prevents full extension of rising stems.

C. Internal and external parts of all cast-iron and ductile-iron valves installed under ground or above ground, and or exposed to outdoors shall be factory coated with 7.5 mm fusion bonded epoxy coating.

D. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.5 for flanges for metric standard piping.
4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
5. ASME B16.18 for cast-copper solder joint.
6. ASME B16.22 for wrought copper solder joint.
7. ASME B16.51 for press joint.
8. ASME B31.9 for building services piping valves.

E. AWWA Compliance: Comply with AWWA C606 for groove-end connections.

F. Provide bronze valves made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are unacceptable.

G. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

H. Valve Sizes: Same as upstream piping unless otherwise indicated.

I. Valve Bypass and Drain Connections: MSS SP-45.

J. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.

1.3 BRONZE SWING CHECK VALVES

A. Bronze, Swing Check Valves with Bronze Disc, Class 125:

1. Description:

a. Standard: MSS SP-80.
b. CWP Rating: (1380 kPa).
c. Body Design: Horizontal flow.
d. Shape: Y pattern.
e. Body and Cap Material: ASTM B62, cast-bronze.
f. Ends: Threaded or soldered. See valve schedule articles.
g. Disc: Rotating bronze with rubber seat or composition seat.

B. Bronze, Swing Check Valves with Bronze Disc, Class 150:

1. Description:

a. Standard: MSS SP-80.
b. CWP Rating: (2070 kPa).
c. Body Design: Horizontal flow.
d. Shape: Y pattern.
e. Body and cap Material: ASTM B62, bronze.
f. Ends: Threaded or soldered.
g. Disc: Rotating bronze with rubber seat or composition seat.

1.4 IRON, SWING CHECK VALVES

A. Iron, Swing Check Valves with Metal Seats, Class 125:

1. Description:

a. Standard: MSS SP-71.
b. CWP Rating: (1380 kPa).
c. Body Design: Horizontal flow.
d. Body Material: ASTM A126, gray iron with bolted cap.
e. Ends: Flange or grooved.
f. Disc: Bronze, weighted non-slam.
g. Gasket: Asbestos free.

1.5 IRON, WAFER, SPRING-LOADED CHECK VALVES

A. Iron, Wafer, Check Valves with Metal Seat, Class 125:

1. Description:

a. CWP Rating: (1380 kPa).
b. Body Material: ASTM A126, cast-iron.
c. Style: Wafer.
d. Disc and Plate: Bronze, non-slam.
e. Seal: Buna N installed between flanges.
f. Pins and springs: stainless steel.

1.6 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe (DN 565 and Smaller:

1. Bronze, swing check valves with bronze disc, Class 125 or Class 150 as required, with soldered or threaded end connections.

B. Pipe (DN 80) and Larger:

1. Iron, swing check valves with closure control lever and weight, Class 125, with grooved or flange end connections.
2. Iron, center-guided check valves with compact wafer, Class 125 or Class 300 as required.

END OF SECTION 220523.14

SECTION 220523.15 - GATE VALVES FOR PLUMBING PIPING

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, installation, and identification for valves, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing”, SBC 701, and the standards listed below in this section; whichever is more stringent.

1.2 PERFORMANCE REQUIREMENTS

A. Standards:

1. Domestic water piping check valves intended to convey or dispense water for human consumption are to comply with the requirements of authorities having jurisdiction, and NSF 61/NSF 372, or to be certified in compliance with NSF 61/NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. Design: Rising stem or rising outside screw and yoke stems, except as specified below.

1. Non-rising stem valves may be used only where headroom prevents full extension of rising stems.

C. Internal and external parts of all cast-iron and ductile-iron valves installed under ground or above ground, and or exposed to outdoors shall be factory coated with 7.5 mm fusion bonded epoxy coating.

D. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.5 for flanges on metric standard piping.
4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
5. ASME B16.18 for cast-copper solder joint.
6. ASME B16.22 for wrought copper solder joint.
7. ASME B16.51 for press joint.
8. ASME B31.9 for building services piping valves.

E. AWWA Compliance: AWWA C606 for groove-end connections.

F. Operators: Use specified operators and handwheels, except provide the following special operator features:

1. Handwheels: For valves other than quarter turn.
2. Lever Handles: For quarter-turn valves DN150 and smaller.
3. Gear-Drive Operators: For quarter-turn valves DN200 and larger.

G. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

H. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

I. Valve Sizes: Same as upstream piping unless otherwise indicated.

J. Valves in Insulated Piping: With 50-mm stem extensions.

K. Valve Bypass and Drain Connections: MSS SP-45.

1.3 BRONZE GATE VALVES

A. Bronze Gate Valves, RS, Class 125:
1. Description:

a. Standard: MSS SP-80.
b. DN 65 and smaller, CWP Rating: 1380 kPa.
c. Body Material: ASTM B62 Bronze body and bonnet with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Rising, copper silicon alloy.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free, Teflon impregnated with bronze packing unit.
h. Handwheel: Malleable iron, or aluminum.

B. Bronze Gate Valves, NRS, Class 150:
1. Description:

a. Standard: MSS SP-80.
b. DN 65 and smaller, CWP Rating: 2070 kPa.
c. Body Material: ASTM B62 Bronze body and bonnet with integral seat and union-ring bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Rising copper silicon alloy.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free, Teflon impregnated with bronze packing.
h. Handwheel: Malleable iron, or aluminum.

1.4 IRON GATE VALVES

A. Iron Gate Valves, NRS, Class 150:
1. Description:

a. Standard: MSS SP-7.
b. DN 80 and larger, CWP Rating: 1380 kPa.
c. Body Material: ASTM A126, cast-iron with bolted bonnet.
d. Ends: Flange.
e. Stem: Rising, Brass alloy.
f. Trim: Bronze.
g. Disc: Solid cast-iron wedge.
h. Packing and Gasket: Asbestos free, Teflon impregnated packing with 2 piece packing gland assembly. Bronze packing nut.
i. Handwheel: Cast-iron.

1.5 CHAINWHEELS

A. Description: Valve actuation assembly with sprocket rim, chain guides, chain, and attachment brackets for mounting chainwheels directly to hand wheels.

1. Sprocket Rim with Chain Guides: Ductile or cast iron, of type and size required for valve. Include zinc or epoxy coating.
2. Chain: Hot-dip galvanized steel, Brass, or Stainless steel, of size required to fit sprocket rim.

1.6 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe DN 65 and Smaller:

1. Bronze gate valves, RS, Class 125 or Class 150 as required with soldered or threaded ends.

B. Pipe DN 80 and Larger: Cast-Iron gate valves, RS, Class 125 with flange ends.

END OF SECTION 220523.15

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

1.1 SUSTAINABILITY REQUIREMENTS

A. Comply with the requirements as specified in Section 0181134.14 “Sustainability Design Requirements.”

1.2 PERFORMANCE REQUIREMENTS

A. Pipe hangers and equipment supports designed by Contractor.

B. Seismic-restraint hangers and supports designed by Contractor and approval obtained from Engineer.

1.3 SUBMITTALS

A. Shop Drawings: Signed and sealed by a professional engineer for trapeze pipe hangers, metal framing system, pipe stands, and equipment supports.

1.4 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) for materials, tests, and installation, as listed in the “Saudi Sanitary Code-Plumbing”, SBC 701, and the standards listed below in this section; whichever is more stringent.

C. AWS D1.1/D1.1M.

D. 2015 ASME Boiler and Pressure Vessel Code, Section IX.

1.5 COMPONENTS

A. Metal Pipe Hangers and Supports:

1. Carbon-Steel Pipe Hangers and Supports:

    a. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
    b. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.
    c. Nonmetallic Coatings: Plastic coated or epoxy powder coated.
    d. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
    e. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel with same coating as Hangers or stainless steel.

2. Stainless-Steel Pipe Hangers and Supports:

    a. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
    b. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.

c. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

3. Copper Pipe and Tube Hangers:

a. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
b. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel or stainless steel.

B. Trapeze pipe hangers: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly, made from structural-carbon-steel shapes, with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts..

C. Metal Framing Systems: MFMA manufacturer.

1. Standard: Comply with MFMA-4, factory-fabricated components for field assembly.

D. Thermal hanger-shield inserts.

1. Insulation-Insert Material for Cold Piping: ASTM C552, Type II cellular glass with 100-psig (688-kPa) minimum compressive strength and vapor barrier.
2. Insulation-Insert Material for Hot Piping: Water-repellent-treated, ASTM C533, Type I calcium silicate with 100-psig (688-kPa) minimum compressive strength.

E. Fastener Systems: Powder-actuated fasteners and mechanical-expansion anchors.

F. Pipe Stands: Compact; Low type, single pipe; High type, single pipe; High type, multiple pipes; Curb-mounted type; as applicable.

G. Pipe-positioning systems: IAPMO PS 42 positioning system.

H. Equipment supports: Welded, shop- or field-fabricated equipment support made from structural-carbon-steel shapes.

1.6 MATERIALS

A. Aluminum: ASTM B221 (ASTM B221M).

B. Carbon Steel: ASTM A1011/A1011M.

C. Structural Steel: ASTM A36/A36M carbon-steel plates, shapes, and bars; black and galvanized.

D. Stainless Steel: ASTM A240/A240M.

E. Grout: ASTM C1107/C1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

END OF SECTION 220529

SECTION 220548 - VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for vibration and seismic controls, as listed in, but not limited to, the “Saudi Building Code-General”, SBC 201, “Saudi Mechanical Code” SBC 501, and “Saudi Fire Code” SBC 801, and the standards listed below in this section; whichever is more stringent.

C. Professional Engineer Qualifications: A professional engineer who is legally registered and qualified to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of vibration isolation bases and seismic restraints that are similar to those indicated for this Project in material, design, and extent.

D. Manufacturer’s recommendations shall be considered in selection of vibration and seismic restraints. All selection shall be certified by manufacturer.

E. Manufacturer Seismic Qualification Certification: Submit certification that all specified equipment will withstand seismic forces identified in "Performance Requirements" Article below. Include the following:

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

    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
    b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.2 PERFORMANCE REQUIREMENTS

A. Wind-Restraint Loading:

1. Applicable Wind-Restraint Loading Reference: Comply with ASCE/SEI 7-10.
2. Basic Wind Speed (3 second gust): 45 m/s.
3. Risk Category: II as per SBC 201.
4. Exposure Category: D as per SBC 201.
5. .

B. Seismic-Restraint Loading:

1. Applicable Seismic-Restraint Reference: Comply with SBC and ASCE 7-10.
2. Building Site Classification: D.

3. Building importance factor = 1.
4. Design Spectral Response Acceleration at Short Periods (0.2 Second): 5% Critical damping Ss=0.55g.
5. Design Spectral Response Acceleration at Short Periods (1.0 Second): 5% Critical damping S1 =0.13g.

1.3 COMPONENTS

A. Vibration Isolators:

1. Elastomeric Isolation Pads: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area. Material to be oil and water resistant with elastomeric properties.

    a. Sandwich Core Material: Resilient and elastomeric.
    b. Surface Pattern: Smooth, ribbed, or waffle pattern.
    c. Infused nonwoven cotton or synthetic fibers.
    d. Load-bearing metal plates adhered to pads.

2. Double-Deflection, Elastomeric Isolation Mounts: Molded, oil- and water-resistant rubber, neoprene, or other elastomeric material.
3. Restrained Elastomeric Isolation Mounts: All-directional isolator with seismic restraints; molded, oil-resistant elastomeric material with cast-ductile-iron or welded-steel housing.
4. Open-Spring Isolators: Freestanding, laterally stable, with not less than 80 percent of the compressed height of the spring at rated load.

    a. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
    b. Baseplates: Factory-drilled steel plate for bolting to structure and bonded to a 6 mm thick elastomeric isolator pad attached to the underside. Baseplates shall limit floor load to 500 psig (3447 kPa).

5. Housed-Spring Isolators: Freestanding, laterally stable, in two-part telescoping housing.

    a. Steel housing base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig (3447 kPa).

6. Restrained-Spring Isolators: Freestanding, laterally stable, open-spring isolators with vertical-limit stop restraint.

    a. Steel housing base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig (3447 kPa).

7. Housed-Restrained-Spring Isolators: Freestanding, steel, open-spring isolators with vertical-limit stop restraint in two-part telescoping housing.

    a. Steel housing base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig (3447 kPa).

8. Thrust Restraints: Combination spring and elastomeric restraints with coil spring and elastomeric insert in compression. Factory set for thrust.
9. Pipe-Riser Resilient Support: All-directional, acoustical pipe anchor of two steel tubes separated by a minimum 1/2-inch- (13-mm-) thick neoprene.

    a. Steel and neoprene vertical-limit stops.
    b. Maximum Load Per Support: 3.45 MPa on isolation material providing equal isolation in all directions.

10. Resilient pipe guides: Telescopic arrangement of two steel tubes or post and sleeve arrangement separated by a minimum 1/2-inch- (13-mm-) thick neoprene.
11. Elastomeric hangers.
12. Spring Hangers: Combination coil-spring and elastomeric-insert hangers with spring and insert in compression and with vertical-limit stop.

    a. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

B. Seismic-Restraint Devices:

1. Snubbers: Welded structural-steel shapes and replaceable resilient isolation washers and bushings.

    a. Post-installed Concrete Anchor Bolts: Secure to concrete surface with post-installed concrete anchors. Anchors to be seismically prequalified in accordance with ACI 355.2 testing and designated in accordance with ACI 318-14 Ch. 17 for 2015 or 2018 IBC. Preset concrete inserts: Seismically prequalified in accordance with ICC-ES AC446 testing.
    b. Anchors in Masonry: Design in accordance with TMS 402.
    c. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
    d. Resilient Cushion: Maximum 1/4-inch (6-mm) air gap, and minimum 1/4 inch (6 mm) thick.

2. Restraint Channel Bracings: Shop- or field-fabricated bracing assemblies made of ANSI/AISI S110-07-S1 slotted steel channels, ANSI/ASTM A53/A53M steel pipe as per NFPA 13, or other rigid steel brace member.
3. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections or Reinforcing steel angle clamped to hanger rod. Non-metallic stiffeners are unacceptable.
4. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.
5. Anchor Bolts: Mechanical or Adhesive type, seismic rated, tested according to ASTM E488/E488M.
6. Post-installed concrete anchors must comply with all requirements of ASCE/SEI 7-10 Ch. 13.

    a. Prequalify post-installed anchors in concrete in accordance with ACI 355.2 or other approved qualification testing procedures.

END OF SECTION 220548

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, installation, identification for domestic water distribution of plumbing systems piping and equipment, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing”, SBC 701 and 702, and the standards listed below in this section; whichever is more stringent. Color coding of identification labels to follow SBC, local authorities having jurisdiction, or as per ASME as specified below.

C. Quality Standard for Piping Identification: ASME A13.1.

1.2 PRODUCTS

A. Equipment Labels: Brass,0.8 mm stainless steel, 0.64 mm aluminum, 0.8 mm or anodized aluminum, 0.8 mm, minimum thickness, with fasteners.

B. Plastic Warning Signs and Labels: Warning signs and labels to comply with requirements of the local authorities having jurisdiction (AHJ) pertaining to the type of warning label. In absence of AHJ requirements, the specifications in the below subparagraphs are to be followed.

1. ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated, 3-mm thick unless otherwise indicated, with predrilled holes for attachment hardware with fasteners.

C. Warning Tape: Warning tape to comply with requirements of the local authorities having jurisdiction (AHJ) pertaining to the type of warning label. In absence of AHJ requirements, the specifications in the below subparagraphs are to be followed.

1. Vinyl tape with waterproof adhesive backing suitable for indoor or outdoor use, 40 mm on pipes with OD, including insulation, less than 150 mm; 65 mm for larger pipes.

D. Pipe Labels: Pretensioned.

E. Stencils: Brass.

F. Valve Tags: Polished brass or aluminum, 0.8 mm minimum thickness, with predrilled or stamped holes for attachment hardware of brass wire, link chain, beaded chain, or S-hook fasteners.

1. Valve Schedules: For each piping system, on (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

a. Include valve-tag schedule in operation and maintenance data.

2. Valve Schedule Frames: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Include screws.

a. Frame: Extruded aluminum.

b. Glazing: ASTM C 1036, Type I, Class 1, Glazing quality B, 2.5-mm, single-thickness glass.

G. Warning Tags: Warning tape to comply with requirements of the local authorities having jurisdiction (AHJ) pertaining to the type of warning label. In absence of AHJ requirements, the specifications in the below subparagraphs are to be followed.

1. 85 by 145 mm; brass grommet and wire fasteners.

END OF SECTION 220553

SECTION 220716 - PLUMBING EQUIPMENT INSULATION

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.”

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, and installation, for plumbing equipment insulation, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing”, SBC 701, and the standards listed below in this section; whichever is more stringent.

C. Surface-Burning Characteristics: Flame-spread index of 25, and smoke-developed index of 50 for insulation installed indoors and 75, and smoke-developed index of 150 for insulation installed outdoors, according to ASTM E 84, UL 723, or NFPA 225.

D. Mockup of each type of equipment insulation and finish.

1.2 SUSTAINABILITY REQUIREMENTS

A. Comply with the requirements as specified in Section 0181134.14 “Sustainability Design Requirements.”

1.3 INSULATION MATERIALS

A. Products do not contain asbestos, lead, mercury, or mercury compounds.

B. Products that come into contact with stainless steel have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C871.

C. Insulation materials for use on austenitic stainless steel are qualified as acceptable in accordance with ASTM C795.

D. Foam insulation materials do not use CFC or HCFC blowing agents in the manufacturing process.

E. Flexible Elastomeric: Closed-cell, sponge or expanded-rubber materials; suitable for maximum use temperature between minus 57 deg C and 104 deg C. Comply with ASTM C534/C534M, Type II for sheet materials.

F. Mineral-Fiber Blanket: Glass fibers bonded with a thermosetting resin; suitable for maximum use temperature up to 232 deg C in accordance with ASTM C411). Comply with ASTM C553, Type II, and ASTM C1290, Type I, unfaced..

G. Closed-Cell Phenolic-Foam Insulation: Block insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type II, Grade 1.

1.4 ADHESIVES

A. Materials are compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Flexible Elastomeric and Polyolefin Adhesive: Solvent-based adhesive. Comply with MIL-A-24179A, Type II, Class I.

1. Flame-spread index is 25 or less and smoke-developed index is 50 or less as tested in accordance with ASTM E84.
2. Wet Flash Point: Below minus 18 deg C
3. Service Temperature Range: 4 to plus 93 deg C.

C. Mineral-Fiber and Mineral Wool Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

D. Grade A for bonding insulation jacket lap seams and joints.

1.5 MASTICS AND COATINGS

A. Materials are compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

B. Vapor-Barrier Mastic, Water Based: Suitable for indoor use on below-ambient services.

1. Water-Vapor Permeance: Comply with ASTM E96/E96M Procedure B, 0.009 metric perm at 1.09-mm dry film thickness.
2. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.

C. Vapor-Barrier Mastic, Solvent Based, Indoor Use: Suitable for indoor use on below-ambient services.

1. Water-Vapor Permeance: Comply with ASTM F1249, 0.03 metric perm at 0.9-mm dry film thickness.
2. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.

D. Vapor-Barrier Mastic, Solvent Based, Outdoor Use: Suitable for outdoor use on below-ambient services.

1. Water-Vapor Permeance: Comply with ASTM F1249, 0.033 metric perm at 0.8-mm dry film thickness.
2. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.

E. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 1.2 metric perms at 1.6-mm dry film thickness.

1.6 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A, and be compatible with insulation materials, jackets, and substrates.

1.7 SEALANTS

A. Materials are as recommended by the insulation manufacturer and are compatible with insulation materials, jackets, and substrates.

1.8 FIELD-APPLIED JACKETS

A. Field-applied jackets comply with ASTM C1136, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim, flame-retardant, all purpose, with kraft-paper backing.

C. Metal Jacket:

1. Aluminum Jacket: Comply with ASTM B209M, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

1.9 FIELD QUALITY CONTROL

A. Field Inspections: By Contractor-engaged agency.

1.10 INDOOR EQUIPMENT INSULATION SCHEDULE

A. Domestic Hot-Water Pump Insulation: mineral wool blanket.

B. Domestic Hot-Water Storage Tank Insulation: flexible elastomeric, closed-cell phenolic foam, or mineral wool blanket.

C. Piping System Filter-Housing Insulation: mineral wool blanket.

1.11 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Equipment, Concealed: Aluminum.

B. Equipment, Exposed, up to 1200 mm in Diameter or with Flat Surfaces of up to 1800 mm: Aluminum.

C. Equipment, Exposed, Larger Than 1200 mm in Diameter or with Flat Surfaces Larger Than 1800 mm Aluminum.

1.12 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Equipment, Concealed: Aluminum.

B. Equipment, Exposed, up to 1200 mm in Diameter or with Flat Surfaces of up to 1800 mm: Aluminum.

C. Equipment, Exposed, Larger Than 1200 mm in Diameter or with Flat Surfaces Larger Than 1800 mm: Aluminum.

END OF SECTION 220716

SECTION 220719 - PLUMBING PIPING INSULATION

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.”

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, and installation, for plumbing piping insulation, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing”, SBC 701, and the standards listed below in this section; whichever is more stringent.

1.2 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics for insulation and related materials, noncombustible, as defined by NFPA 220 and tested according to ASTM E 84, UL 723, and NFPA 225:
1.
2. All Insulation Installed Indoors and Outdoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

B. Mockup of each type of pipe insulation and finish.

C. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.3 SUSTAINABILITY REQUIREMENTS

A. Comply with the requirements as specified in Section 0181134.14 “Sustainability Design Requirements.”

1.4 INSULATION MATERIALS

A. Materials shall be compatible and shall not contribute to corrosion, soften, or otherwise attack surfaces to which they are applied in either the wet or dry state.

B. Products do not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come into contact with stainless steel have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C871.

D. Insulation materials for use on austenitic stainless steel are qualified as acceptable in accordance with ASTM C795.

E. Foam insulation materials do not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric: Closed-cell, sponge or expanded-rubber materials; suitable for maximum use temperature between minus 57 deg C and 104 deg C. Comply with ASTM C534/C534M, Type I for tubular materials and Type II for sheet materials.

1. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.

G. Mineral-Fiber, Preformed Pipe: Glass fibers bonded with a thermosetting resin; suitable for maximum use temperature up to 454 deg C in accordance with ASTM C411. Comply with ASTM C547.

1. Preformed Pipe Insulation: Type I, Grade A, with factory-applied, all-purpose, vapor-retarder FSK jacket.
2. Blanket Insulation: Comply with ASTM C 553, Type II, without facing.
3. Fabricated shapes in accordance with ASTM C450 and ASTM C585.
4. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1.5 ADHESIVES

A. Materials are compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Flexible Elastomeric Adhesive: Solvent-based adhesive.

1. Comply with MIL-A-24179A, Type II, Class I.
2. Flame-spread index is 25 or less and smoke-developed index is 50 or less as tested in accordance with ASTM E84.
3. Wet Flash Point: Below minus 18 deg C.

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

D. FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A, for bonding insulation jacket lap seams and joints.

1.6 MASTICS AND COATINGS

A. Materials are compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

B. Vapor-Barrier Mastic, Water Based: Suitable for indoor use on below-ambient services.

1. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249, Procedure B, 0.009 metric perm at 1.09-mm dry film thickness.
2. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.

C. Vapor-Barrier Mastic, Solvent Based, Indoor Use: Suitable for indoor use on below-ambient services.

1. Water-Vapor Permeance: Comply with ASTM F1249, 0.03 metric perm at 0.9-mm dry film thickness.
2. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.

D. Vapor-Barrier+- Mastic, Solvent Based, Outdoor Use: Suitable for outdoor use on below-ambient services.

1. Water-Vapor Permeance: Comply with ASTM F1249, 0.033 metric perm at (0.8-mm) dry film thickness.
2. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.

E. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Water-Vapor Permeance: ASTM F1249, 1.2 metric perms at (1.6-mm) dry film thickness.

1.7 LAGGING ADHESIVES

A. Adhesives comply with MIL-A-3316C, Class I, Grade A, and are compatible with insulation materials, jackets, and substrates.

1.8 FIELD-APPLIED JACKETS

A. Field-applied jackets comply with ASTM C1136, Type I, unless otherwise indicated.

B. FSK Jacket: Laminated, Aluminum-foil-face, fiberglass-reinforced scrim, flame-retardant all purpose, with kraft-paper backing.

C. Metal Jacket:

1. Aluminum Jacket: Comply with ASTM B209M, Alloy 3003, Temper H-14.
2. Stainless Steel Jacket: ASTM A666, Type 304 or 316; 2.5 mm thick.

D. Underground Direct-Buried Jacket: 3.2-mm- thick vapor barrier and waterproofing membrane, consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.

1.9 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Cloth: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 270 g/sq. m.

1.10 FIELD QUALITY CONTROL

A. Field Inspections: By Contractor-engaged agency.

1.11 PIPING INSULATION SCHEDULE, GENERAL

A. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

1.12 INTERIOR INSULATION APPLICATION SCHEDULE

A. Service: Domestic hot and recirculated hot water.

1. Insulation Material: Mineral fiber; except for pipe drops to fixtures within walls, use flexible elastomeric.
2. Field-Applied Jacket: Foil and paper where concealed; aluminum jacket where exposed to view or in mechanical rooms.
3. Vapor Retarder Required: No.
4. Finish: None.

B. Service: Domestic cold water.

1. Insulation Material: Flexible elastomeric.
2. Field-Applied Jacket: None where concealed; aluminum jacket where exposed to view or in mechanical rooms.
3. Vapor Retarder Required: No.

4. Finish: None.

C. Service: Roof drain bodies and horizontal rainwater piping directly under roof slab.

1. Insulation Material: Flexible elastomeric.
2. Field-Applied Jacket: None.
3. Vapor Retarder Required: No.
4. Finish: None.

D. Service: Exposed sanitary drains and domestic water supplies and stops for fixtures for the disabled.

1. Insulation Material: Flexible elastomeric.
2. Field-Applied Jacket: SS 316, Smooth 2B Finish.
3. Finish: None.

E. Service: Floor Drains, Traps, and Sanitary Drain Piping within (3 m) of Drain Receiving Condensate and Equipment Drain Water Below (16 Deg C).

1. Insulation Material: Flexible elastomeric.
2. Field-Applied Jacket: None.
3. Vapor Retarder Required: No.
4. Finish: None.

1.13 EXTERIOR INSULATION APPLICATION SCHEDULE

A. This application schedule is for aboveground insulation outside the building.

B. Service: Domestic water.

1. Insulation Material: Flexible elastomeric.
2. Field-Applied Jacket: Aluminum.
3. Vapor Retarder Required: No.
4. Finish: None.

1.14 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION 220719

SECTION 221116 - DOMESTIC WATER PIPING

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, installation, identification for domestic water distribution piping, as listed in, but not limited to the “Saudi Sanitary Code-Plumbing”, SBC 701, and the standards listed below in this section; whichever is more stringent.

C. Comply with ANSI/ASME B31.9, "Building Services Piping," for materials, products, and installation.

D. Comply with NSF/ANSI 61, "Drinking Water System Components--Health Effects," Sections 1 through 9 for potable-water piping and components.

E. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372. Include marking "NSF-pw" on piping.

1.2 SUSTAINABILITY REQUIREMENTS

A. Comply with the requirements as specified in Section 0181134.14 “Sustainability Design Requirements.”

1.3 GALVANIZED-STEEL PIPE AND FITTINGS

A. Galvanized-Steel Pipe:

1. ASTM A53/A53M, Type E or S, Grade A or B, Schedule 40.
2. Include ends matching joining method.

B. Galvanized, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern, with threads according to ANSI/ASME B1.20.1. Furnish Class 250 fittings if required to match piping..

C. Appurtenances for Grooved-End, Galvanized-Steel Pipe:

1. ASTM Fittings for Grooved-End, Galvanized-Steel Pipe: Galvanized, ASTM A47/A47M, malleable-iron casting; ASTM A106/A106M, steel pipe; or ASTM A536, ductile-iron casting; with dimensions matching steel pipe.
2. AWWA Fittings for Grooved-End, Galvanized-Steel Pipe:

    a. AWWA C606 for steel-pipe dimensions.

1.4 POLYPROPYLENE (PP-R) PIPE AND FITTINGS

A. Polypropylene Pipe: ASTM F2389, pipe pressure rating to comply with temperature and pressure ratings of code requirements for the applicable service.

1. Polypropylene Fittings: ASTM F2389, socket fusion, butt fusion, electrofusion, or fusion outlet fittings to be used for fusion-welded joints between pipe and fittings.

2. Mechanical fittings and transition fittings to be used where transitions are made to other piping materials or to valves and appurtenances.
3. Polypropylene pipe is to be unthreaded. Threaded transition fittings per ASTM F2389 to be used where a threaded connection is required.

B. Smoke and Fire Ratings:

1. Where indicated on the Drawings that a plenum-rated piping system is required, the pipe is to be wrapped and/or insulated with fiberglass or mineral wool pipe insulation, and field installed.
2. The system is to have a flame spread classification of less than 25 and smoke development rating of less than 50.
3. Pipe, wrap, or insulation as a system to meet the requirements of ASTM E84, or UL 2846.
4. For insulation required for thermal and condensation reasons, see Section 220719 "Plumbing Piping Insulation."

C. PP-R Socket Fittings: ASTM F2389.

1.5 PIPING JOINING MATERIALS

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

B. Steel, Keyed Couplings: ANSI/AWWA C606-06 for steel-pipe dimensions. Include ferrous housing sections, gasket suitable for hot water, and bolts and nuts.

1.6 TRANSITION FITTINGS

A. Sleeve-Type Transition Coupling: AWWA C219.

1.7 ABOVEGROUND DOMESTIC WATER PIPING

A. General:
1. Polypropylene (PP-R); socket fusion, fusion outlet, or electrofusion fittings and joints.

B. Inside pump rooms: Use the following:

1. DN50 : Galvanized steel pipe and cast-iron, threaded fittings.
2. DN65 to DN300 : Galvanized steel pipe with grooved ends; galvanized steel, grooved-end fittings; and galvanized steel, keyed couplings.

END OF SECTION 221116

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, installation, identification for domestic water distribution piping, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing”, SBC 701, and the standards listed below in this section; whichever is more stringent.

C. Quality Standards: NSF 61 and NSF 372.

1.2 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Domestic water piping specialties intended to convey or dispense water for human consumption are to comply with the requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or to be certified in compliance with NSF 61 and NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

1.3 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 860 kPa unless otherwise indicated.

1.4 PRODUCTS

A. Vacuum Breakers:

1. Pipe-Applied, Atmospheric-Type Vacuum Breakers ASSE 1001: Chrome-plated finish.
2. Hose-Connection Vacuum Breakers: ASSE 1011 Chrome- or nickel-plated finish.
3. Pressure vacuum breakers, ASSE 1020.
4. Spill-resistant vacuum breakers, ASSE 1056.

B. Backflow Preventers:

1. Intermediate Atmospheric-Vent Backflow Preventers:

    a. Standard: ASSE 1012.
    b. End Connections: Solder joint.
    c. Finish: Chrome plated.

2. Reduced-Pressure-Principle Backflow Preventers:

    a. Standard: ASSE 1013.
    b. Body: Bronze for DN 50 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for DN 65 and larger.
    c. End Connections: Threaded for DN 50 and smaller; flanged for DN 65 and larger.
    d. Configuration: Horizontal, straight through.

3. Double-Check Backflow-Prevention Assemblies:

a. Standard: ASSE 1015.
b. Body: Bronze for DN 50 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for DN 65 and larger.
c. End Connections: Threaded for DN 50 and smaller; flanged for DN 65 and larger.
d. Configuration: Horizontal, straight through.

4. Beverage-dispensing-equipment backflow preventers, ASSE 1022.
5. Dual-check-valve backflow preventers, ASSE 1024.
6. Carbonated-beverage-dispenser, dual-check-valve backflow preventers, ASSE 1032.
7. Hose-connection backflow preventers, ASSE 1052.
8. Backflow-preventer test kits.

C. Water Pressure-Reducing Valves:

1. Water Regulators:

a. Standard: ASSE 1003.
b. Body: Bronze with chrome-plated finish for DN 50 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for DN 65 and DN 80.
c. Valves for Booster Heater Water Supply: Include integral bypass.
d. End Connections: Threaded for DN 50 and smaller; flanged for DN 65 and DN 80.

2. Water Control Valves:

a. Pressure Rating: Initial working pressure of 1035 kPa minimum with AWWA C550 or FDA-approved, interior epoxy coating. Include small pilot-control valve, restrictor device, specialty fittings, and sensor piping.
b. Main Valve Body: Cast- or ductile-iron body with AWWA C550 or FDA-approved, interior epoxy coating; or stainless steel body.
c. Main Valve Body: Globe-valve design.
d. End Connections: Threaded for DN 50 and smaller; flanged for DN 65 and larger.

D. Automatic Water Shutoff Valves:

1. Shutoff Control Ball Valves and Actuators:

a. Size: DN 50 and smaller.
b. Control Valve: Two-piece, full-port brass ball valve, MSS SP-110.
c. End Connections: Threaded, female.
d. CWP Rating: 4140 kPa.
e. Valve Actuator: Motor operated, with or without gears, electric and electronic. Capable of closing valve against inlet pressure. Direct mount, fails closed.

2. Shutoff Control Butterfly Valves and Actuators:

a. Size: DN 65 to DN 100.
b. Compliance: MSS SP-67.
c. Full-port, epoxy-coated, ductile-iron lug body.
d. Face-to-Face Flange: API 609.
e. Valve Actuator: Motor operated, with or without gears, electric and electronic. Capable of closing valve against inlet pressure. Direct mount, fails closed.

3. Accessories:

a. Electrical Plug Interrupter: Plugs into standard 120 V ac wall outlet.
b. Gas Flow Interrupter: ECO connector with female spade connectors. Factory prewired, 2.44 m.
c. Gas Interface Cable: Interface cable with male and female connectors.

d. Step-Down Transformer: 240 V ac to 24 V ac with mounting plate, 3.66-m plenum wire to power, and 2.44-m plenum wire to sensor.

1) Liquid Level Sensors: Monitor fluid levels in addition to detecting plumbing leaks

e. Auto Dialer: Send and receive automatic alerts when a fault condition occurs. Standard output contacts trigger up to nine predetermined telephone number calls.
f. Cellular text notification system.

E. Balancing Valves:

1. Copper-Alloy Calibrated Balancing Valves: Ball valve.
2. Cast-iron calibrated balancing valves.
3. Accessories: Meter kit.
4. Memory-stop balancing valves.
5. Automatic flow control balancing valves.

F. Temperature-Actuated Water Mixing Valves:

1. Water-Temperature Limiting Devices:

a. Standard: ASSE 1070.
b. Connections: Threaded union inlets and outlet.
c. Finish: Chrome plated.

2. Primary, Thermostatic, Water Mixing Valves:

a. Standard: ASSE 1017.
b. Type: Exposed mounted or Cabinet type.
c. Connections: Threaded union inlets and outlet.
d. Finish: Chrome plated.
e. Piping: Chrome plated.
f. Cabinet: Recessed or Surface mounted.

3. Primary, Electronic, Water Mixing Valve Assemblies:

a. Standard: ASSE 1017.
b. Type: Exposed, electronically controlled, water mixing valve.
c. Finish: Bronze.
d. Digital temperature control and monitoring module.

4. Manifold, Thermostatic, Water Mixing Valve Assemblies:

a. Description: Cabinet-type or Exposed-mounted assembly.
b. Cabinet: Recessed or Surface mounted.
c. Finish: Chrome plated.
d. Piping: Chrome plated.
e. Thermostatic Mixing Valves: Comply with ASSE 1017. Include check stops on hot- and cold-water inlets and shutoff valve on outlet.
f. Water Regulator(s): Comply with ASSE 1003. Include pressure gauge on inlet and outlet.

5. Photographic-process, thermostatic, water mixing valve assemblies, ASSE 1017.
6. Individual-fixture, water tempering valves, ASSE 1016.
7. Primary water tempering valves, ASSE 1017.

G. Strainers for Domestic Water Piping:

1. Body: Bronze for DN 50 and smaller; cast iron with interior lining and epoxy coating for DN 65 and larger.
2. Connections: Threaded DN 50 and smaller; flanged for DN 65 and larger.
3. Screen: Stainless steel with round perforations unless otherwise indicated.

H. Hose Stations:

1. Single-Temperature-Water Hose Stations, ASSE A112.18.1:

a. Body: Bronze with stainless steel wetted parts.
b. Finish: Rough bronze, chrome plated.
c. Mounting: Wall, with reinforcement or Floor, with stainless steel pedestal.
d. Hose: 15 m long.

I. Hose Bibbs, ASSE A112.18.1 for sediment faucets:

1. Vacuum Breaker: Integral or field installation.
2. Finish for Service Areas: Chrome or nickel plated.
3. Operation for Service Areas: Wheel handle.
4. Operation for Finished Rooms: Wheel handle.
5. Wall flange with each chrome- or nickel-plated hose bibb.

J. Drain Valves: Ball-valve, MSS SP-110 type, MSS SP-110.

K. Water Hammer Arresters: Metal bellows, ASSE 1010 or PDI-WH 201.

L. Air Vents: Bolted construction.

M. Trap-Seal Primer Devices: Supply, ASSE 1018 type.

N. Trap-Seal Primer Systems, ASSE 1044:

1. Cabinet: Recessed with stainless steel cover.
2. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120 V ac power.
3. Number Outlets: Four.

O. Water Meters: Displacement type, AWWA C700.

END OF SECTION 221119

SECTION 221123.13 - DOMESTIC-WATER PACKAGED BOOSTER PUMPS

1.1 QUALITY ASSURANCE

A. Products and equipment shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, installation, identification for domestic water packaged booster pumps, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing”, SBC 701, and the standards listed below in this section; whichever is more stringent.

C. Quality Standards for Packaged Booster Pumps: UL 508, UL 508A, UL 778, and UL 1995.

D. Drinking Water System Components: NSF 61 and NSF 372.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, and relevant IEC/EN standards, by a testing agency acceptable to Engineer.

F. Booster pumps listed and labeled as packaged pumping systems by testing agency acceptable to authorities having jurisdiction.

1.2 MANUFACTURED UNITS

A. Multiplex, Constant-Speed Booster Pumps:

1. Pumps:

a. Type: End suction as defined in HI 1.1-1.2 and HI 1.3 for end-suction, close coupled, single stage, overhung impeller, centrifugal.
b. Casing: Radially split; bronze.
c. Impeller: Closed, ASTM B584 cast bronze, statically and dynamically balanced and keyed to shaft.
d. Shaft and Shaft Sleeve: Steel shaft, with copper-alloy shaft sleeve and deflector.
e. Seal: Mechanical.
f. Orientation: Mounted horizontally or vertically.
g. The internal surface of the volute shall be coated with 300 micron fusion bonded epoxy coating applied at the factory.

2. Motors: Single speed, with grease-lubricated or pre-greased, permanently shielded, ball-bearings.
3. Control Logic: Electromechanical system with switches, relays, and other devices in the controller.
4. Motor Controller: NEMA ICS 2, general-purpose, Class A, full-voltage, combination-magnetic type with undervoltage release feature, motor-circuit-protector-type disconnect, and short-circuit protective device.

a. Control Voltage: 120 or 220 V ac, with integral control-power transformer.

5. Enclosure: NEMA 250, Type 12.
6. Motor Overload Protection: Overload relay in each phase.
7. Starting Devices: Hand-off-automatic selector switch for each pump in cover of control panel, plus pilot device for automatic control.

a. Duplex, Automatic, Alternating Starter: One acting, one standby; equal start (at each start pump shall be alternated)..

8. Pump Operation and Sequencing: pressure-sensing method.

9. Instrumentation: Suction and discharge pressure gauges.
10. Lights: Running light for each pump.
11. Alarm Signal Device: Sounds alarm when backup pumps are operating.

12. Thermal-bleed cutoff.
13. Low-suction-pressure cutout.
14. High-discharge-pressure cutout.
15. Base: Structural steel.

B. Multiplex, Variable-Speed Booster Pumps:

1. Pumps:

a. Type: End suction as defined in HI 1.1-1.2 and HI 1.3 for end suction, close coupled, single stage, overhung impeller, centrifugal.
b. Casing: Radially split; bronze.
c. Impeller: Closed, ASTM B584-08a cast bronze statically and dynamically balanced and keyed to shaft.
d. Shaft and Shaft Sleeve: Stainless steel shaft, with copper-alloy shaft sleeve and deflector.
e. Seal: Mechanical.
f. Orientation: Mounted horizontally or vertically.

2. Motors: Single speed, with grease-lubricated or pre-greased, permanently shielded, ball-bearings.
3. Piping: Galvanized-steel pipe and cast-iron fittings.
4. Control Logic: Solid-state system with transducers, programmable microprocessor, VFC, and other devices in controller. Install VFC for pump motors larger than 25 hp in separate panel; same type as motor control panel enclosure.
5. Motor Controller: NEMA ICS 2, variable-frequency, solid-state type.

a. Control Voltage: 120 or 220 V ac, with integral control-power transformer.

6. Enclosure: NEMA 250, Type 12.
7. Motor Overload Protection: Overload relay in each phase.
8. Starting Devices: Hand-off-automatic selector switch for each pump in cover of control panel, plus pilot device for automatic control.

a. Duplex, Automatic, Alternating Starter: Switches lead pump to lag main pump and to two-pump operation.
b. Triplex, Sequence (Lead-Lag-Lag) Starter: Switches lead pump to one lag main pump and to three-pump operation.

9. Pump Operation and Sequencing: pressure-sensing method for lead pump and flow-sensing method for lag pumps.

a. Time Delay: Controls pump on-off operation; adjustable from 1 to 300 seconds.

10. VFC: Voltage-source, pulse-width, modulating-frequency converter for each pump.
11. Manual Bypass: Magnetic contactor arranged to transfer to constant-speed operation upon VFC failure.
12. Instrumentation: Suction and discharge pressure gauges.
13. Lights: Running light for each pump.
14. Alarm Signal Device: Sounds alarm when backup pumps are operating.

a. Time Delay: Controls alarm operation; adjustable from 1 to 300 seconds, with manual reset.

15. Thermal-bleed cutoff.
16. Low-suction-pressure or Water-storage-tank, low-level cutout.
17. High-suction-pressure cutout.
18. Low-discharge-pressure cutout.
19. High-discharge-pressure cutout.
20. Building Automation System Interface: Provide auxiliary contacts for interface to building automation system. Include the following:

    a. On-off status of each pump.
    b. Alarm status.
21. Base: Structural steel.

END OF SECTION 221123.13

SECTION 221123.21 - INLINE, DOMESTIC-WATER PUMPS

1.1 QUALITY ASSURANCE

A. Products and equipment shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, installation, identification for inline domestic water pumps, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing”, SBC 701, and the standards listed below in this section; whichever is more stringent.

C. Source Limitations: Obtain same type of pumps through one source from a single manufacturer.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in SBC 401 and relevant IEC/EN standards, by a testing agency acceptable to Engineer.

E. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.2 PRODUCTS

A. Compact Circulators: Horizontal, in-line, replaceable-cartridge-design circulator; rated for 860-kPa minimum working pressure -subject to suit system’s operating pressure- and minimum continuous water temperature of 107 deg C (225 deg F).

1. Pump and Motor Assembly: On common shaft in hermetically sealed unit without stuffing box or mechanical seal, and with manufacturer's standard cooling and lubrication system.
2. Impeller: Corrosion-resistant material.
3. Motor: Single speed, unless otherwise indicated.

B. Controls:

1. Thermostats: Electric; adjustable for control of hot-water circulation pump.

a. Type: Water-immersion temperature sensor, for installation in piping.
b. Operation of Pump: On or off.

2. Timers: Electric, for control of hot-water circulation pump.

a. Type: Programmable, clock with manual override on-off switch.
b. Operation of Pump: On or off.

END OF SECTION 221123.21

SECTION 221316 - SANITARY WASTE AND VENT PIPING

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) for the latest applicable local regulations for materials, tests, installation, identification for sanitary waste drainage and vent piping, as listed in, but not limited for, the “Saudi Sanitary Code-Plumbing”, SBC 701, and the standards listed below in this section; whichever is more stringent.

C. Provide listing/approval stamp, label, or other marking on piping made to specified standards.

D. Comply with ANSI/ASME B31.9, "Building Services Piping," for materials, products, and installation.

E. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

F. Comply with International Plumbing Codes & Standards such as Uniform Plumbing Code "UPC" and American Society of Plumbing Engineers "ASPE" data books.

1.2 SUSTAINABILITY REQUIREMENTS

A. Comply with the requirements as specified in Section 0181134.14 “Sustainability Design Requirements.”

1.3 PERFORMANCE REQUIREMENTS

Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to SBC 201 and ASCE/SEI 7, "Minimum Design Loads for Buildings and Other Structures."

1.4 HDPE PIPE AND FITTINGS

A. HDPE – High Density Polyethylene pipe to BS EN 1519-1 of suitable grade for above and underground applications, corrosion resistant, hot water resistant, extensive resistance for chemicals and shall have proven added components that protect the pipes from UV degradation. Fittings are to be of the electro fusion weld sleeve coupling type for various installations. HDPE pipes and fittings shall be from same manufacturer.

B. HDPE Gravity Pipes: Pipe shall be manufactured from a PE 3408 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The resin material shall meet the specifications of ASTM D3350-02, or relevant BS/EN Standards with a minimum cell classification of PE345464C. The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects. Gravity HDPE pipes and fittings shall be rated for minimum DR-26 (64 psi, 4.4 bar), or to suit systems’ operating pressure whichever is greater.

C. HDPE Pressure Pipes: Pipes and fittings shall be manufactured from a PE 3408 resin, and shall be rated for minimum DR-11 (160 psi, 11 bar), or to suit systems' operating pressure whichever is greater.

D. Electro fusion HDPE Fittings: Electro fusion Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-02, or relevant BS/EN Standards and be the same base resin as the pipe. Electro fusion Fittings shall have a manufacturing standard of ASTM F1055, or relevant BS/EN Standards. All fittings shall be pressure rated to provide a working pressure rating no less than that of the pipe.

E. Tie-ins to other piping systems and/or equipment shall be with HDPE flange adapters and metal back-up rings, unless otherwise specified by the engineer on the drawings. Mechanical compression or clamp style fittings are not allowed.

F. Electro-fusion sleeve welded: All joints except where expansion joints are required when there is a need to use the manufacturer's purpose made seal ring joint expansion fitting

G. Flanged and Mechanical Joint HDPE Adapters: Flanged and Mechanical Joint Adapters shall be PE 3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-02, or relevant BS/EN Standards and be the same base resin as the pipe. Flanged and mechanical joint adapters shall have a manufacturing standard of ASTM D3216, or relevant BS/EN Standards. All adapters shall be pressure rated to provide a working pressure rating no less than that of the pipe.

H. Mechanical Restraint: Mechanical restraint for HDPE may be provided by mechanical means separate from the mechanical joint gasket sealing gland. The restrainer shall provide wide, supportive contact around the full circumference of the pipe and be equal to the listed widths. Means of restraint shall be machined serrations on the inside surface of the restrainer equal to or greater than the listed serrations per inch and width. Loading of the restrainer shall be by a ductile iron follower that provides even circumferential loading over the entire restrainer. Design shall be such that restraint shall be increased with increases in line pressure.

1.5 LOW NOISE DRAINAGE SYSTEM

A. General: Complete system of a wide range of pipes, fitting, clamps and accessories providing a soundproof waste drainage system for use inside the buildings

B. Product shall comply with EN 1451

C. Joint: socket connection, push fit system with manufacturer standard high quality sealing ring

D. Performance requirements:

1. Sound performance: maximum of 15 dB(A) at a flow rate of 2 m/s when tested according to EN 14366
2. Chemical resistance: system shall be capable of transporting waste of PH values between 2 and 12
3. Mechanical resistance : Approved for high impact resistance at low temperatures of -20 °C
4. Hot water temperature resistance: long term performance up to 90°C
5. Meets the requirements of DIN 4102 with a fire classification of B2, or D when tested according to EN 13501-1
6. Material shall be recyclable

E. Minimum diameter range: complete range from 32mm to 160 mm

F. Pipe and fitting shall be of the same Material with proper transition fittings for connection to other waste systems UPVC**.**

G. Pipe shall be impact resistance and UV protected from outside and with a very smooth internal surface that prevents the build-up of internal deposits

H. Complete range of tested and approved fire collars for the use with all pipe sizes

I. Installation: All products must be installed as per manufacturer issued instructions

J. Quality management: ISO 9001-2008, pipes and fitting shall be properly marked

K. Warranty: minimum 10 years that the product will be free from defects in material and workmanship under normal use and service.

1.6 LAGGING FOR DRAINAGE PIPING

A. High performance sound sheathing material for reducing noise breakout from [cast iron], [Plastic] soil, and waste drainage piping:

1. Designed for sound reduction in drainage piping
2. Density: 5 kg/m2
3. Thickness: maximum 25 mm
4. Operating temperature: operate continuously to a maximum temperature of 100°C
5. Low VOC emitting product
6. Acoustic Performance: Insertion loss 25 dB(A)
7. To be used with manufacturer recommended adhesive and tape and installed as per manufacturer issued instructions.

B. Lagging shall have a performance of B-S1, d0 when tested under DIN EN ISO 13823 or 0.0.0.3 when tested according to AS 1530, Part 3 or a Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less as determined by testing according to ASTM E 84, UL-723, or NFPA 225, by a testing and inspecting agency acceptable to Engineer. Factory label with appropriate markings of applicable testing and inspecting agency.

1.7 APPLICATIONS

A. Aboveground, Horizontal run inside the wet areas use HDPE plastic pipes, HDPE socket fittings.

B. Aboveground, Horizontal runs ceiling suspended at basement levels use HDPE plastic pipe, HDPE socket fittings

C. Aboveground, Forced main pipes use HDPE plastic pipe, HDPE socket fittings

D. Underground, Forced main pipes use HDPE plastic pipe, HDPE socket fittings

E. Underground, Horizontal runs buried under basement slab or under slabs on grade use HDPE plastic pipe, HDPE socket fittings.

F. For kitchen and Laundry drainage use HDPE plastic pipe, HDPE socket fittings

G. Vent pipes for all use HDPE plastic pipes, HDPE socket fittings.

H. For sewage Force Mains use HDPE plastic pipe, HDPE socket fittings.

END OF SECTION 221316

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, installation, and identification, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing”, SBC 701, and the standards listed below in this section; whichever is more stringent.

C. Quality Standard for Plastic Piping: NSF 14.

1.2 PRODUCTS

A. Backwater Valves: Horizontal, cast iron, ASME A112.14.1.

B. Cleanouts: Cast iron exposed, ASME A112.36.2M.

C. Air-Admittance Valves: Fixture air-admittance valves, ASSE 1051.

D. Miscellaneous Sanitary Drainage Piping Specialties:

1. Open drains, shop or field fabricated from ASTM A 74 Service Class, hub-and-spigot, cast-iron, soil-pipe fittings.
2. Cast-iron or bronze deep-seal traps.
3. Floor-drain, trap-seal primer fittings.
4. Floor-drain, inline trap seal, ASSE 1072.
5. Air-gap fittings, ASME A112.1.2.
6. Sleeve flashing devices.
7. Stack flashing fittings.
8. Cast-iron body vent caps.
9. Frost-resistant vent terminals.
10. Expansion joints, ASME A112.6.4.

END OF SECTION 221319

SECTION 221319.13 - SANITARY DRAINS

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, and installation, as listed in, but not limited to the “Saudi Sanitary Code-Plumbing”, SBC 701 and702, and the standards listed below in this section; whichever is more stringent.

1.2 DRAIN ASSEMBLIES

A. Quality Standard for Plastic Drains: NSF 14.

1.3 DRAINS

A. Cast-Iron Floor Drains:

1. Standard: ASME A112.6.3.
2. Pattern: Floor.
3. Backwater Valve: Drain-outlet type.
4. Acid-resistant enamel.
5. Sediment bucket.
6. Top or Strainer Material: Stainless steel.
7. Top of Body and Strainer Finish: Rough bronze Stainless steel.
8. Top Loading Classification: Heavy Duty.
9. Funnel.

B. Plastic Floor Drains:

1. Standard: ASME A112.6.3.

2. Material: PVC.
3. Outlet: Bottom or Side.
4. Top or Strainer Material: Stainless steel.
5. Top of Body and Strainer Finish: Rough bronze.
6. Top Shape: Round or Square.
7. Trap Material: Plastic drainage piping.
8. Trap Pattern: Standard P-trap.

C. Trench Drains:

1. Standard: ASME A112.6.3 for trench drains.

2. Outlet: Bottom or End.
3. Grate Material: Ductile iron or gray iron.
4. Grate Finish: Painted.
5. Top Loading Classification: Heavy Duty.

1.4 CHANNEL DRAINAGE SYSTEMS

A. Stainless-steel channel drainage systems, ASME A112.3.1.

B. Narrow, sloped-invert, polymer-concrete channel drainage systems.

C. Wide, level-invert, polymer-concrete channel drainage systems.

D. FRP channel drainage systems.

E. HDPE or PE channel drainage systems.

F. PP channel drainage systems.

G. PVC channel drainage systems.

H. HDPE, PE, PP, or PVC channel drainage systems.

1.5 GARAGE DRAINS

A. Garage Drain:

1. Standard: ASME A112.6.3 for parking garage drains.
2. Heavy duty suitable for car trench loading, coated cast iron, (300 mm) diameter top drain,
3. Bottom outlet,
4. Seepage pan and combination flashing clamp and frame for heavy duty, deep flange slotted grate.
5. Grate finish: Painted

END OF SECTION 221319.13

SECTION 221323 - SANITARY WASTE INTERCEPTORS

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, installation, and identification for sanitary waste interceptors, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing” SBC 701, and the standards listed below in this section; whichever is more stringent

1.2 PRODUCTS

A. Precast-Concrete Grease Interceptors:

1. Heavy-traffic structural design loads.
2. Resilient pipe connectors.
3. Individual FRP steps, FRP ladder, or ASTM A615/A615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D4101, PP steps.
4. Grade rings.
5. Manhole frames and covers.

B. Cast-Iron or Steel Grease Interceptors:

1. Standard: PDI G101 and ASME A112.14.3.
2. PDI Seal: Required.
3. Interior Lining: Corrosion-resistant enamel.
4. Exterior Coating: Corrosion-resistant enamel.
5. Body Extension: Required.

C. Precast Concrete Oil Interceptors:

1. Standard: ASTM C913.
2. Resilient pipe connectors.
3. Steps: Individual FRP steps, FRP ladder, or ASTM A615/A615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D4101, PP.
4. Reinforced-concrete grade rings.
5. Ductile- or Gray-iron manhole frames and covers with indented top design with lettering.

D. Cast-Iron or Steel Oil Interceptors:

1. Hub, hubless, or threaded inlet, outlet, vent, and waste-oil outlet piping connections.
2. Cast-iron or steel shroud extension.
3. Cast-iron or steel cover.

E. Sand Interceptors: Factory-fabricated cast iron or steel.

1. Piping Connection: Hub, hubless, or threaded outlet.
2. Grate: Cast iron or steel with reinforcement.

F. Cast-Iron or Steel Lint or Sediment Solids Interceptors:

1. Interior Separation Device: Baffles or Screens.
2. Interior Lining: Corrosion-resistant enamel.

3. Exterior Coating: Corrosion-resistant enamel.
4. End Connections: Threaded.
5. Mounting: Above-flooror Inline.

END OF SECTION 221323

SECTION 221329 - SANITARY SEWERAGE PUMPS

1.1 QUALITY ASSURANCE

A. Products and equipment shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, installation, and identification for sanitary sewerage pumps, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing” SBC 701, and the standards listed below in this section; whichever is more stringent.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to Engineer.

D. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.2 PRODUCTS

A. Submersible, Fixed-Position, Double-Seal Sewage Pumps:

1. Description: Submersible, direct-connected sewage pump complying with HI 1.1-1.2 and HI 1.3 for submersible sewage pumps.
2. Number of Pumps: Two.
3. Pump Casing: Cast iron, with open inlet.
4. Impeller: cast bronze and stainless steel, nonclog, open, or semiopen design.
5. Pump and Motor Shaft: Stainless steel.
6. Seals: Mechanical.
7. Moisture-sensing probe.
8. Motor: Hermetically sealed, capacitor-start type.

    a. Motor Housing Fluid: Air or Oil.
9. Pump Discharge Piping: Factory or field fabricated, ASTM A 53/A 53M, Schedule 40, galvanized-steel pipe, bronze pipe, or copper tube.

10. Controls: Pedestal-mounted float switch with float rods and rod buttons.
11. High-water alarm.
12. Control-Interface Features:

    a. Remote alarm contacts.
    b. Building Automation System Interface:

        1) On-off status of pump.
        2) Alarm status.

B. Sewage-pump, reverse-flow assemblies.

C. Sewage-Pump Basins and Basin Covers:

1. Basins:

    a. Material: Cast iron or Fiberglass.
    b. Reinforcement: Mounting plates for pumps, fittings, guide-rail supports if used, and accessories.
    c. Anchor flange.

2. Basin Covers:

    a. Inlet Type: Flanged, Hubbed, or Threaded outside.
    b. Sidewall Outlet Type: Hubbed inside or Hubbed outside.
    c. Cover Material: Steel with bituminous coating.

D. Packaged, Submersible, Nonclog, Sewage-Pump Units:

1. Number of Pumps: Two.
2. Pump Casing: Cast iron.
3. Impeller: Brass or cast iron.
4. Motor: Hermetically sealed, capacitor-start type.
5. Controls: Automatic, with mechanical- or mercury-float switches and alternator.
6. Pump Discharge Piping: Galvanized-steel pipe with gray-iron threaded fittings.
7. Basin: Watertight.

END OF SECTION 221329

SECTION 221343 – FACILITY PACKAGED SEWAGE PUMP STATIONS

1.1 SYSTEM PERFORMANCE REQUIREMENTS

A. Pressure Rating of Sewage Pumps and Discharge Piping Components: At least equal to sewage pump discharge pressure, but not less than 16bars.

B. Pressure Rating of Other Piping Components: At least equal to 1.5 times the system operating pressure.

C. Flow: the pumping station shall comprise a duplex pump set where each pump is rated to handle the received peak flow at the calculated head. the second pump shall act as a standby unit or when the received flow surpass the calculated ones.

1.2 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged sewage pumping stations that fail in materials or workmanship within specified warranty period

1.3 DESCRIPTION

A. Underground, wet-pit pump station with separate, dry, valve compartment; made for underground installation and factory assembled as a unit with chambers, sewage pumping equipment, controls, accessories, odor control unit, piping, and wiring.

1.4 MATERIALS

A. Wet pit Chamber: glass fiber reinforced plastic.

B. Valve Chamber: glass fiber reinforced plastic

C. Cover: Glass reinforced plastic with concrete ring to withstand applicable loads.

D. Vent pipe: HDPE or stainless steel ANSI 304 grade subject to engineer approval

E. Pipes: HDPE rated to 1.5 time the pump head but not less PN 16.

F. Gate Valves, cast iron; solid wedge disc; nonrising stem; flanged ends; bronze trim; Class 125.

G. Check Valves, cast iron; swing check, metal-to-metal seat; flanged ends; bronze trim; Class 125Odor Control Unit: Activated carbon type

1.5 SEWAGE PUMPS

A. Description: Manufacturer's standard duplex-arrangement pumps.

B. Configuration: Submersible sewage pumps, with guide-rail, quick-disconnect system, controls, and piping. Include ASTM A 48/A 48M, Class 25, nonclog, cast-iron impellers capable of passing solids with 65-mm minimum diameter; hermetically sealed motor with moisture-sensing probe, mechanical seals, and waterproof power cable. For small flow, pump with grinder impeller shall be adopted.

1.6 CONTROLS

A. Description: Manufacturer's standard duplex-pump controls, except where specific features or requirements are indicated.

1.7 VENTILATION SYSTEM:

A. Activated carbon Adsorbers skid-mounted, pre-assembled systems. Vessels shall be of polypropylene or fiberglass reinforced plastic (FRP) . Blowers shall be sized to perform a minimum ventilation rate of 12 ACH and shall be made of stainless steel . The carbon media type is selected based on the specific application. The system shall be able to remove 99% of the inlet hydrogen sulfide and are designed to provide one or more years of bed life. System shall be complete with ducting, cabling control panel and all related accessories.

1.8 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section "Earth Moving."

1.9 INSTALLATION

A. Construct concrete, pump station bases of dimensions indicated, or otherwise required, but not less 300 mm in both directions from base of pump station. Use 21-MPa, 28-day, compressive-strength concrete and reinforcement as specified in Section "Cast-in-Place Concrete."

B. Secure pump station chambers to concrete base, with at least 4 anchor devices.

C. Install identifying labels permanently attached to equipment.

D. Arrange for installing detectable warning tape over outside edges of underground packaged sewage pumping stations. Tape materials and their installation are specified in Section "Earth Moving"

E. Make electrical connections for power to electrical equipment and devices specified in this Section. Refer to Division 26 for electrical power, wiring, and devices.

F. Ground packaged sewage pump station steel chambers, piping, and accessories. Grounding is specified in Section "Grounding and Bonding for Electrical Systems."

1.10 COMMISSIONING

A. Engage a factory-authorized service representative to perform startup service and report results in writing.

END OF SECTION 221343

SECTION 221413 - FACILITY STORM DRAINAGE PIPING

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) for the latest applicable local regulations for materials, tests, installation, identification for sanitary waste drainage and vent piping, as listed in, but not limited for, the “Saudi Sanitary Code-Plumbing”, SBC 701, and the standards listed below in this section; whichever is more stringent.

C. Comply with ANSI/ASME B31.9, "Building Services Piping," for materials, products, and installation.

D. Comply with International Plumbing Codes & Standards such as Uniform Plumbing Code "UPC" and American Society of Plumbing Engineers "ASPE" data books.

1.2 SUSTAINABILITY REQUIREMENTS

A. Comply with the requirements as specified in Section 0181134.14 “Sustainability Design Requirements.”

1.3 PERFORMANCE REQUIREMENTS

Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to SBC 201 and ASCE/SEI 7, "Minimum Design Loads for Buildings and Other Structures."

1.4 MATERIALS

A. Hubless, cast-iron soil pipe and CISPI, hubless piping couplings.

1. Couplings:

a. Couplings shall bear CISPI collective trademark.
b. Standards: ASTM C 1277 and CISPI 310.
c. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

1.5 HDPE PIPE AND FITTINGS

A. HDPE – High Density Polyethylene pipe to BS EN 1519-1 of suitable grade for above and underground applications, corrosion resistant, hot water resistant, extensive resistance for chemicals and shall have proven added components that protect the pipes from UV degradation. Fittings are to be of the electro fusion weld sleeve coupling type for various installations. HDPE pipes and fittings shall be from same manufacturer.

B. HDPE Gravity Pipes: Pipe shall be manufactured from a PE 3408 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The resin material shall meet the specifications of ASTM D3350-02, or relevant BS/EN Standards with a minimum cell classification of PE345464C. The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of

the same specification from the same raw material. The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects. Gravity HDPE pipes and fittings shall be rated for minimum DR-26 (64 psi, 4.4 bar), or to suit systems' operating pressure whichever is greater.

C. HDPE Pressure Pipes: Pipes and fittings shall be manufactured from a PE 3408 resin, and shall be rated for minimum DR-11 (160 psi, 11 bar), or to suit systems' operating pressure whichever is greater.

D. Electro fusion HDPE Fittings: Electro fusion Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-02, or relevant BS/EN Standards and be the same base resin as the pipe. Electro fusion Fittings shall have a manufacturing standard of ASTM F1055, or relevant BS/EN Standards. All fittings shall be pressure rated to provide a working pressure rating no less than that of the pipe.

E. Tie-ins to other piping systems and/or equipment shall be with HDPE flange adapters and metal back-up rings, unless otherwise specified by the engineer on the drawings. Mechanical compression or clamp style fittings are not allowed.

F. Electro-fusion sleeve welded: All joints except where expansion joints are required when there is a need to use the manufacturer's purpose made seal ring joint expansion fitting

G. Flanged and Mechanical Joint HDPE Adapters: Flanged and Mechanical Joint Adapters shall be PE 3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-02, or relevant BS/EN Standards and be the same base resin as the pipe. Flanged and mechanical joint adapters shall have a manufacturing standard of ASTM D3216, or relevant BS/EN Standards. All adapters shall be pressure rated to provide a working pressure rating no less than that of the pipe.

H. Mechanical Restraint: Mechanical restraint for HDPE may be provided by mechanical means separate from the mechanical joint gasket sealing gland. The restrainer shall provide wide, supportive contact around the full circumference of the pipe and be equal to the listed widths. Means of restraint shall be machined serrations on the inside surface of the restrainer equal to or greater than the listed serrations per inch and width. Loading of the restrainer shall be by a ductile iron follower that provides even circumferential loading over the entire restrainer. Design shall be such that restraint shall be increased with increases in line pressure.

1.6 LOW NOISE DRAINAGE SYSTEM

A. General: Complete system of a wide range of pipes, fitting, clamps and accessories providing a soundproof waste drainage system for use inside the buildings

B. Product shall comply with EN 1451

C. Joint: socket connection, push fit system with manufacturer standard high quality sealing ring

D. Performance requirements:

1. Sound performance: maximum of 15 dB(A) at a flow rate of 2 m/s when tested according to EN 14366
2. Chemical resistance: system shall be capable of transporting waste of PH values between 2 and 12
3. Mechanical resistance : Approved for high impact resistance at low temperatures of -20 °C
4. Hot water temperature resistance: long term performance up to 90°C
5. Meets the requirements of DIN 4102 with a fire classification of B2, or D when tested according to EN 13501-1
6. Material shall be recyclable

E. Minimum diameter range: complete range from 32mm to 160 mm

F. Pipe and fitting shall be of the same Material with proper transition fittings for connection to other waste systems UPVC**.**

G. Pipe shall be impact resistance and UV protected from outside and with a very smooth internal surface that prevents the build-up of internal deposits

H. Complete range of tested and approved fire collars for the use with all pipe sizes

I. Installation: All products must be installed as per manufacturer issued instructions

J. Quality management: ISO 9001-2008, pipes and fitting shall be properly marked

K. Warranty: minimum 10 years that the product will be free from defects in material and workmanship under normal use and service.

1.7 LAGGING FOR DRAINAGE PIPING

A. High performance sound sheathing material for reducing noise breakout from [cast iron], [Plastic] soil, and waste drainage piping:

1. Designed for sound reduction in drainage piping
2. Density: 5 kg/m2
3. Thickness: maximum 25 mm
4. Operating temperature: operate continuously to a maximum temperature of 100°C
5. Low VOC emitting product
6. Acoustic Performance: Insertion loss 25 dB(A)
7. To be used with manufacturer recommended adhesive and tape and installed as per manufacturer issued instructions.

B. Lagging shall have a performance of B-S1, d0 when tested under DIN EN ISO 13823 or 0.0.0.3 when tested according to AS 1530, Part 3 or a Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less as determined by testing according to ASTM E 84, UL-723, or NFPA 225, by a testing and inspecting agency acceptable to Engineer. Factory label with appropriate markings of applicable testing and inspecting agency.

1.8 APPLICATIONS

A. Aboveground exterior piping: Hubless cast-iron soil pipe and fittings, with heavy duty Type 304 stainless steel couplings.

B. Aboveground, Horizontal run inside the wet areas use HDPE plastic pipes, HDPE socket fittings.

C. Aboveground, Horizontal runs ceiling suspended at basement levels use HDPE plastic pipe, HDPE socket fittings

D. Aboveground, Forced main pipes use HDPE plastic pipe, HDPE socket fittings

E. Underground, Forced main pipes use HDPE plastic pipe, HDPE socket fittings

F. Underground, Horizontal runs buried under basement slab or under slabs on grade use HDPE plastic pipe, HDPE socket fittings.

END OF SECTION 221413

SECTION 221513 - GENERAL-SERVICE COMPRESSED-AIR PIPING

1.1 SUMMARY

A. Piping and related specialties for systems operating at 1380 kPa or less.

1.2 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, installation, and identification for compressed air piping, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing” SBC 701, “Saudi Fire Code” SBC 801, and the standards listed below in this section; whichever is more stringent

C. Quality Standard for High- and Low Pressure, Compressed-Air Piping: ASME B31.1.

D. Quality Standard for Low-Pressure, Compressed-Air Piping: ASME B31.9.

E. Quality Standard for Brazing: ASME Boiler and Pressure Vessel Code: Section IX, or AWS B2.2.

F. Quality Standard for Welding: ASME Boiler and Pressure Vessel Code: Section IX.

1.3 PRODUCTS

A. Pipes, tubes, and fittings:

1. Schedule 40, Steel Pipe: ASTM A53/A53M, Type E or S, Grade B, black or hot-dip zinc coated with ends threaded in accordance with ASME B1.20.1.

    a. Steel Nipples: ASTM A733, made of ASTM A53/A53M or ASTM A106, Schedule 40, galvanized seamless steel pipe. Include ends matching joining method.
    b. Malleable-Iron Fittings: ASME B16.3, Class 150 or 300, threaded.
    c. Malleable-Iron Unions: ASME B16.39, Class 150 or 300, threaded.
    d. Steel Flanges, Threaded: ASME B16.5, Class 150 or 300, carbon steel, threaded.
    e. Steel Flanges: ASME B16.5, Class 150 or 300, carbon steel.

2. PVC Pipe: ASTM D 1785, Schedule 40.

    a. PVC Fittings: ASTM D 2466, Schedule 40, socket type.
    b. Cement solvent ASTM D 2564. Include primer complying with ASTM F 656

B. Special-Duty, Compressed-Air Valves: Include PTFE seats and comply with the following:

1. Ball Valves, 2-Inch NPS (DN50) and Smaller: MSS SP-110; 2-piece bronze body with blowout-proof stem; regular or full port; chrome-plated, solid-brass or -bronze ball; threaded ends; and 4140-kPa minimum WOG pressure rating.
2. Butterfly Valves, DN65 and Larger: MSS SP-67; Type I (bubble tight); single-flange (lug-type), cast-iron body with ductile-iron disc, and 1380-kPa minimum WOG pressure rating.
3. Check Valves, DN50 and Smaller: MSS SP-80; Type 4 or nonstandard T-pattern, swing check; Class 125, bronze body with composition-to-metal seat and threaded ends.

4. Check Valves, DN65 and Larger: MSS SP-71, Type II full-waterway or Type IV clear-waterway, cast-iron body with composition-to-metal seat and flanged ends.
5. Globe Valves, DN50 and Smaller: MSS SP-80, Class 125, Type 2, bronze body with composition-to-metal seat and threaded ends.

C. Dielectric Fittings:

1. Dielectric Unions: ASSE 1079 1035 kPa or 1725 kPa minimum working pressure at 82 deg C.
2. Dielectric Flanges: ASSE 1079 1035 or 2070 kPa minimum working pressure.
3. Dielectric-flange insulating kits.

D. Flexible Pipe Connectors: Bronze.

E. Specialties:

1. Safety valves.
2. Air-Main Pressure Regulators: Pilot operated, 1725 kPa inlet pressure.
3. Air-Line Pressure Regulators, Bronze Body: Diaphragm or pilot operated, 1380 kPa minimum inlet pressure.
4. Air-Line Pressure Regulators, Aluminum Alloy or Plastic Body: Diaphragm operated, 1380 kPa minimum inlet pressure.
5. Automatic Drain Valves: Stainless steel body and internal parts, rated for 1380 kPa minimum working pressure, capable of automatic discharge of collected condensate.
6. Coalescing Filters: Activated carbon capable of removing water and oil aerosols; with color-change dye to indicate when carbon is saturated and warning light to indicate when selected maximum pressure drop has been exceeded.
7. Mechanical Filters: Two-stage, mechanical separation filters equipped with deflector plates, resin-impregnated-ribbon filters with edge filtration, and drain cock.
8. Air-Line Lubricators: With drip chamber and sight dome; with oil-feed adjustment crew and quick-release collar; with automatic feed device for supplying oil to lubricator.

F. Quick Couplings: Automatic shutoff or Valveless.

G. Hose Assemblies:

1. Reinforced single or double-wire-braid hose.
2. Stainless steel hose clamps or bands.
3. Hose couplings.
4. Hose splicers.

1.4 PIPING APPLICATIONS

A. Piping between Air Compressors and Receivers:

1. DN 50 and Smaller: Schedule 40, galvanized-steel pipe, threaded joints.
2. DN 65 to DN 100: Schedule 40, galvanized-steel pipe, threaded joints.
3. DN 125 and Larger: Schedule 40, galvanized-steel pipe, threaded joints.

B. Low-Pressure Distribution Piping:

1. DN 50 Insert pipe size and Smaller: Schedule 40, galvanized-steel pipe, threaded joints.
2. DN 65 to DN 100: Schedule 40, galvanized-steel pipe, threaded joints.
3. DN 125 and DN 150: Schedule 40, galvanized-steel pipe, threaded joints.
4. DN 125 and Larger: Schedule 40, galvanized-steel pipe, grooved joints.

C. High-Pressure Distribution Piping:

1. DN 50 and Smaller: Schedule 40, galvanized-steel pipe, threaded joints.
2. DN 65 to DN 150: Schedule 40, galvanized-steel pipe, threaded joints.
3. DN 200 and Larger: Schedule 40, galvanized-steel pipe, grooved joints.

D. Drain Piping: PVC piping and socket fittings.

END OF SECTION 221513

SECTION 221519 - GENERAL-SERVICE PACKAGED AIR COMPRESSORS AND RECEIVERS

1.1 SYSTEM DESCRIPTION

A. Quality Standard for Receiver Tanks: ASME Boiler and Pressure Vessel Code.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.2 QUALITY ASSURANCE

A. Products and equipment shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, installation, and identification for compressed air piping, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing” SBC 701, “Saudi Fire Code” SBC 801, and the standards listed below in this section; whichever is more stringent

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design compressed-air equipment mounting.

1.4 MANUFACTURED UNITS

A. Control Panels: Automatic control station with load control and protection functions compliant with NEMA ICS 2 and UL 508, and enclosure according to NEMA ICS 6 Type 12.

1. Automatic control switches to alternate lead-lag compressors for duplex, and sequence lead-lag compressors for multiplex air compressors.

B. Receivers: Steel tank constructed according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, with corrosion resistant interior finish.

C. Oil-Free, Reciprocating Air Compressors:

1. Submerged gear-type oil pump.
2. Oil filter.
3. Combined high discharge-air temperature and low lubrication-oil pressure switch.
4. Belt guard totally enclosing pulleys and belts.

D. Oilless, Reciprocating Air Compressors:

1. High discharge-air temperature switch.
2. Belt guard totally enclosing pulleys and belts.

E. Inlet-Air Filters: Combination inlet-air filter-silencer for each or multiple air compressor(s).

F. Aftercoolers: Air cooled.

G. Compressed-Air Dryers: Refrigerant or Desiccant type.

H. Wall-mounting, computer interface cabinet with internal wiring capable of interfacing 20 alarm signals.

END OF SECTION 221519

SECTION 223100 - DOMESTIC WATER SOFTENERS

1.1 QUALITY ASSURANCE

A. Products, material and equipment shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, installation, and identification for domestic water softeners, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing” SBC 701, and the standards listed below in this section; whichever is more stringent.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to Engineer.

D. ASME Compliance for Steel Tanks: Fabricate and label mineral tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, where indicated.

E. ASME Compliance for FRP Tanks: Fabricate and label mineral tanks to comply with ASME Boiler and Pressure Vessel Code: Section X, where indicated.

F. UL Compliance: Fabricate and label water softeners to comply with UL 979, "Water Treatment Appliances."

1.2 WARRANTY

A. Manufacturer's Warranty: Provide written warranty, signed by manufacturer agreeing to repair or replace components of water softeners that fail in materials or workmanship within specified warranty period. Include coverage for the following:

1. Attrition loss of resin not to exceed 3 percent per year.
2. Resin not to be washed out of system during service run or backwashing period.
3. Effluent turbidity not to be greater and color not to be darker than incoming water.
4. Underdrain system, gravel, and resin not to become fouled, with turbidity or by dirt, rust, or scale from softener equipment or soft water, while operating according to manufacturer's written operating instructions.

5. Warranty Period: 3 years from date of Substantial Completion

1.3 WATER SOFTENERS

A. Description: Factory-assembled, pressure-type water softener, NSF or WRAS compliant.

B. Configuration: Twin unit with two mineral tanks and one brine tank, factory mounted on skids.

C. Wetted Components: Suitable for water temperatures from 5 to at least 49 deg C.

D. Mineral Tanks: FRP, pressure-vessel quality. Include hydrostatic test at minimum of one and one-half times pressure rating.

1. Pressure Rating: 690 kPa minimum.
2. Freeboard: 50 percent minimum for backwash expansion above normal resin bed level.

E. Mineral Tanks: Steel, electric welded; pressure-vessel quality. Include hydrostatic test at minimum of one and one-half times pressure rating.

1. Pressure Rating: 690 kPa minimum.
2. Freeboard: 50 percent minimum for backwash expansion above normal resin bed level.
3. Finish: Hot-dip galvanized on exterior and interior after fabrication, or Exterior spray-painted with rust-resistant prime coat. Interior lined with epoxy-polyamide coating.

F. Seismic Requirements: Fabricate supports and attachments to tank to resist seismic forces.

G. Controls: Fully automatic; factory mounted on unit.

H. Main operating valves.

I. Flow control.

J. Brine Tank: Combination measuring and wet-salt storing system.

1. Tank and Cover Material: Fiberglass or molded PE.
2. Size: Large enough for at least four regenerations at full salting.

END OF SECTION 223100

SECTION 223200 - DOMESTIC WATER TREATMENT EQUIPMENT

1.1 QUALITY ASSURANCE

A. Products, material and equipment shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, installation, and identification for water filtration equipment, as listed in, but not limited to the “Saudi Sanitary Code - Plumbing” SBC 701, and the standards listed below in this section; whichever is more stringent.

C. Welding: ASME Boiler and Pressure Vessel Code: Section IX.

D. Electrical Components, Devices, and Accessories: NFPA 70.

E. Components in Contact with Potable Water: NSF 61 Annex.

F. Circulating Pumps: UL 778, HI 1.1-1.2, and HI 1.3.

1.2 ULTRA-VIOLET (UV) STERILIZING UNIT:

A. Description: Unit to include 304 stainless-steel sterilizing chambers with removable head. UV lamps to slide into high purity sleeves. Sleeves are attached to chamber head so that they may be easily removed as a bundle for inspection or cleaning. Flow regulator on discharge line to maintain flow to ensure an exposure dosage of 30,000 micro-watt-sec/cm². Sterilizer to include high powered ballast, fuse, power safety switch, all inside white enamel housing with stainless-steel cover and electrical cord. Unit shall have NEMA 3R electrical enclosure.

B. UV unit minimum pressure rating to be 850 KPa, subject to suit system operating pressure.

C. UV unit shall be completed with the following features:

1. UV intensity sensor and meter with safe/unsafe zones to indicate UV below effective range, mounted on sterilizer housing.
2. Elapsed time meter indicating hours of run time.
3. Overheat safety controls.

1.3 SODIUM HYPOCHLORITE DOSING SYSTEM

A. Description: Sodium hypochlorite dosing package suitable to serve main domestic water storage tanks.

B. Disinfection and chlorine residual control shall take place by the use sodium hypochlorite (NaOCl) supplied ready to use at a concentration 12 – 15 %.

C. Chlorine dosing system shall be designed to ensure that the residual chlorine at the end user tap is from 0.3 mg/L to 0.5 mg/L.

D. The dosing package shall include a polypropylene tank with spill containment, a four float level control system with high/ low level controls, and chemical metering pumps.

E. Sodium Hypochlorite storage of 14 days in a room/facility that meets the manufacturer's storage requirements needs to be provided. In any case storage time should not exceed 20 days in order to prevent chlorine decay.

F. Chlorine solution shall be handled in polyvinyl chloride (uPVC) piping.

G. Two (2) diaphragm dosing pumps, 1 duty and 1 standby, shall be installed for the chlorine dosing system. The dosing system shall be complete with pulsation damping, valves, piping, controls, etc.

H. The pump(s) on the dosing package shall be able to receive a variable 4-20 mA or pulsed signal from a flow meter to ensure proper proportioned dosing of sodium hypochlorite solution.

I. The control of residual chlorine shall be done constantly by using a chlorine residual analyzer and automatically adjusting the chlorine dosing pumps to maintain the desired chlorine in the treated effluent.

J. All chlorination equipment shall be installed inside a closed building with adequate ventilation, temperature control, fire protection, emergency shower and all other necessary safety measures.

K. An emergency eye wash shall be provided.

L. The following is the estimated dosing equipment needed to achieve the requirement as mentioned in point 1.3.B. This needs to be confirmed on-site during operation.

1. Nbr of pumps: 1 duty + 1 standby
2. 85 liters storage tank for NaOCl solution
1. Pump capacity (each): 0 to 1 l/hr

M. System shall be completed with the following features:

1. Chemical level alarm.
2. Post pressure alarm.
3. Low pressure alarm.
4. Leak detection alarm.
5. Timer alarm.

END OF SECTION 223200

SECTION 223300 - ELECTRIC, DOMESTIC-WATER HEATERS

1.1 QUALITY ASSURANCE

A. Products and equipment shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, and installation, for electric water heaters, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing”, SBC 701, and the standards listed below in this section; whichever is more stringent.

C. Source Limitations: Obtain same type of water heaters through one source from a single manufacturer.

D. Performance Efficiency: ASHRAE/IES 90.1.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to Engineer.

F. ASME Compliance: ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

G. NSF Compliance: NSF 61 and NSF 372.

H. Acceptable alternative codes and standards for compliance:

1. Comply with EU Regulation 814/2013 with regard to ecodesign requirements for water heaters with rated heat output of up to 400kW and hot water storage tanks with a storage volume of up to 2000 litres regarding limiting standing loss and product information. Manufacturers to comply with the test methods in BS EN 50440 to measure the performance of electric storage water heaters.
2. All equipment and assemblies which fall within the scope of the Pressure Equipment Directive (PED) 2014/68/EU, must be tested by the manufacturers, and be certified as compliant with the Directive. Such compliance shall be evidenced by displaying the appropriate CE Mark on the equipment and assemblies
3. For appliances not exceeding 70kW and hot water storage capacity not exceeding 500 litres, manufacturer to have undertaken an assessment of performance of hot water delivery to BS EN 13203-1 and energy consumption to BS EN 13203-2.
4. Safety of electric storage water heater to BS EN 60335-2-21.
5. Safety of fixed electric immersion heater to BS EN 60335-2-73.

1.2 SUSTAINABILITY REQUIREMENTS

A. Comply with the requirements as specified in Section 0181134.14 “Sustainability Design Requirements.”

1.3 WARRANTY

A. Manufacturer’s Warranty: Provide written warranty, signed by manufacturer agreeing to repair or replace components of water heaters that fail in materials or workmanship within specified warranty period..

1. Failures include heating elements and storage tanks.

2. Warranty Period(s): from date of Substantial Completion:
   a. Heating elements: 5 years.
   b. Storage Tanks: 10 years.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Commercial domestic-water heaters shall withstand the effects of earthquake motions determined according to SBC 201 and ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 COMMERCIAL, ELECTRIC, DOMESTIC-WATER HEATERS

A. Commercial, Electric, Domestic-Water Booster Heaters:
1. Source Limitations: Obtain domestic-water booster heaters from single source from single manufacturer.
2. Standard: UL 1453, internally glass lined with heating element suitable for operating on voltage, phase and cycle, shown in the schedule on the Electrical Drawings.

3. Tank: Corrosion-resistant metal or steel.
4. Pressure Rating: 1035 kPa.
5. NSF 5 construction with Brackets for undercounter or Legs for floor installation.
6. Insulation: Comply with ASHRAE/IES 90.1, “Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.” Surround entire storage tank except connections and controls.

B. Commercial, Electric, Storage, Domestic-Water Heaters:
1. Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.
2. Standard: UL 1453.

3. Tank: ASME-code, steel.
4. Horizontal or Vertical arrangement.
5. Pressure Rating: 1035 kPa.
6. Insulation: Comply with ASHRAE/IES 90.1, “Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.” Surround entire storage tank except connections and controls.

7. Special Requirements: NSF/ANSI 5 construction.

C. Commercial, Light-Duty, Storage, Electric, Domestic-Water Heaters: Steel, vertical arrangement with 1035-kPa pressure rating.
1. Standard: UL 174, internally glass lined with heating element suitable for operating on voltage, phase and cycle, shown in the schedule on the Electrical drawings.
2. Insulation: Comply with ASHRAE/IES 90.1, “Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.” Surround entire storage tank except connections and controls.
   a. Special Requirements: NSF/ANSI 5 construction.

1.6 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Expansion Tanks: Steel tank with welded joints and butyl-rubber diaphragm; 1035-kPa pressure rating.

B. Drain Pans: Corrosion-resistant metal with raised edge.

C. Piping-type heat traps: Field-fabricated piping arrangement in accordance with ASHRAE/IES 90.1, “Energy Efficient Design of New Buildings except Low-Rise Residential Buildings” or ANSI/ASHRAE 90.2.

D. Heat-trap fittings.

E. Manifold kits.

F. Pressure-reducing valves.

G. Combination temperature-and-pressure relief valves: ASME rated and stamped and complying with PTC 25.

H. Pressure relief valves: ASME rated and stamped and complying with PTC 25.

I. Vacuum relief valves: complying with PTC 25.

J. Water Regulators: ASSE 1003, water-pressure reducing valve. Set at (172.5-kPa-) maximum outlet pressure.

K. Shock absorbers, ASSE 1010 or PDI-WH 201, Size A.

L. Domestic-water heater stands.

M. Domestic-water heater mounting brackets.

1.7 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect domestic-water heaters specified to be ASME-code construction, in accordance with ASME Boiler and Pressure Vessel Code.

B. Hydrostatically test domestic-water heaters to minimum of one and one-half times pressure rating before shipment.

C. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections.

END OF SECTION 223300

SECTION 224100 - RESIDENTIAL PLUMBING FIXTURES

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, and installation for plumbing fixtures, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing” SBC 701, and the standards listed below in this section; whichever is more stringent.

1.2 GENERAL REQUIREMENTS

A. Domestic water faucets intended to convey or dispense water for human consumption are to comply with the requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or to be certified in compliance with NSF 61 and NSF 372 by a third-party certification body accredited by the local authorities having jurisdiction, that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

1.3 BATHTUBS

A. Bathtubs with Shower standard CSA B45.5 & IAPMO Z124 : FRP or PMMA.

1. Size: as per interior designer.

1.4 BATHTUB FAUCETS

A. Bathtub Faucets NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

1. 1. Single Handle: Pressure balance or Thermostatic.
2. Mounting: Concealed or Exposed.

3. Operation: Single handle, push-pull [or] [twist or rotate] control, with hot- and cold-water indicators.
4. Spray Pattern: Adjustable
5. Shower-Arm, Flow-Control Fitting: 5.7 L/min. As per ASME A112.18.1/CSA B125.1 and ASSE 1016
6. Maximum Flowrate: 7 L/min.

1.5 LAVATORIES

A. Lavatories, vitreous china, counter mounted or Pedestal or Integral Bowl Countertop or Countertop-Mounted Bowl or

1. Standard:

a. ASME A112.19.2/CSA B45.1 for vitreous-china lavatories.

2. Type: Flat rim with ledge
3. Faucet Hole Punching: One or three holes.

4. Faucet-Hole Location:Rim.

1.6 LAVATORY FAUCETS

A. NSF Standard: Comply with NSF 61 and NSF 372 for faucet materials that will be in contact with potable water.

B. Lavatory Faucets: Single-control mixing or Two-handle mixing valve.

1. Description: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
2. Standard: ASME A112.18.1/CSA B125.1.
3. Body Material: General duty, copper or brass underbody with brass cover plate.
4. Finish: Polished chrome plate
5. Maximum Flow Rate: 1.9 L/min..
6. Centers: Adjustable.
7. Mounting: As per Architectural drawings and selection catalogue.
8. Spout: Rigid type.

1.7 SHOWERS

A. Standard Showers as per IAPMO Z124.1.2/ANSI Z214.1.2 FRP or PMMA with base and faucet.

1. FRP Surround: One piece or sealed, multiple piece.
2. PMMA Surround: One piece.

B. Accessible Showers as per IAPMO Z124.1.2/ANSI Z214.1.2 FRP or PMMA shower with seat, grab bar, base, and faucet.

1. FRP Surround: One piece or sealed, multiple piece.
2. PMMA Surround: One piece.
3. Accessibility Options: Grab bar and bench.

C. Cabinet Showers: Factory fabricated.

1. Color: as per Architectural selection catalogue.
2. Material: As per Architectural selection catalogue.
3. Accessibility Options: Grab bar and bench.

1.8 SHOWER FAUCETS

A. NSF Standard: Comply with NSF 61 and NSF 372 for faucet materials that will be in contact with potable water.

B. Shower Faucets: Single-handle, pressure-balance, mixing valve or Single-handle, thermostatic, mixing valve

1. Fixture: Include check stops and fixed shower head, arm, and flange or handheld head with arm, flange, hose and bracket.

a. Body Material: As per Architectural selection catalogue
b. Finish: As per Architectural selection catalogue.
c. Maximum Flow Rate: 7 L/min.
d. Backflow-Prevention Device for Hand-Held Shower: Not required.
e. Operation: manual.

2. Shower Head:

a. Type: Adjustable shower set with three settings, anti-scale system.
b. Shower Head Material: Metallic with polished chrome with chrome-plated finish.
c. Spray Pattern: Adjustable.
d. Shower-Arm, Flow-Control Fitting: 7 L/min.

1.9 KITCHEN SINKS

A. Kitchen Sinks - Counter Mounted: One bowl stainless steel.

1. Standard:

a. ASME A112.19.3/CSA B45.4 for stainless steel kitchen sinks.

2. Dimensions: As per Architectural drawings and selection catalogue.
3. Disposer: Not required.
4. Hot-Water Dispenser: Not required.

1.10 SINK FAUCETS

A. Sink Faucets: Solid brass, kitchen sink.

1. Finish: Polished chrome plate.
2. Maximum Flow Rate for Sink Faucets: 4.5 L/min unless otherwise indicated.
3. Mixing Valve: Single control or Two-lever handle.
4. Mounting: As per Architectural drawings and selection catalogue.
5. Handle(s): Lever or Knob or as per Architectural selection catalogue.
6. Spout Type: Swivel gooseneck.
7. Spout Outlet: Aerator or Laminar flow.
8. Drain: Stopper with chain.

1.11 LAMINAR-FLOW, FAUCET-SPOUT OUTLETS

A. Description: Chrome-plated-brass, faucet-spout outlet that produces nonaerating, laminar stream.

1.12 WATER CLOSETS

A. Water Closets: Floor mounted, floor outlet, close coupled (gravity tank), vitreous china.

1. Standards: ASME A112.19.2/CSA B45.1, ASME A112.19.14, and ASSE 1037/ASME A112.1060/CSA B125.16
2. Bowl Type: Siphon jet.
3. Height: Standard or Handicapped/elderly.
4. Rim Contour: Regular.
5. Water Consumption: Low Flow type 4.5 L/flush maximum.

1.13 TOILET SEATS

A. Toilet Seats:

1. Standard: IAPMO/ANSI Z124.5.
2. Material: Plastic.

3. Type: Residential.
4. Shape: As per ID.
5. Configuration: Closed front with cover.
6. Size: Regular.
7. Hinge Material: Noncorroding metal.
8. Seat Cover: Required.

END OF SECTION 224100

SECTION 224213.13 - COMMERCIAL WATER CLOSETS

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, and installation for plumbing fixtures, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing” SBC 701, and the standards listed below in this section; whichever is more stringent.

1.2 PERFORMANCE REQUIREMENTS

A. Standards:

1. Comply with ASME A112.19.2/CSA B45.1 for water closets.
2. Comply with ASME A112.19.5/CSA B45.15 for flush valves and spuds for water closets and tanks.
3. Comply with IAMPO/ANSI Z124.5 for water-closet (toilet) seats.
4. Comply with ASME A112.6.1M for water-closet supports.
5. Comply with ICC A117.1 for ADA-compliant water closets.
6. Comply with ASTM A1045 for flexible PVC gaskets used in connection of vitreous china water closets to sanitary drainage systems.
7. Comply with ASME A112.4.3 for plastic fittings used in connection of vitreous china water closets to sanitary drainage systems.

1.3 FLOOR-MOUNTED, BACK-OUTLET WATER CLOSETS

A. Water Closets: Floor mounted, back outlet, top or back spud.

1. Material: Vitreous china.
2. Type: Siphon jet.
3. Style: Flushometer valve.
4. Water Consumption: 4.8 L per flush.
5. Support: Waste-fitting assembly.
6.

1.4 WALL-MOUNTED WATER CLOSETS

A. Water Closets: Wall mounted, top or back spud.

1. Material: Vitreous china.
2. Type: Siphon jet.
3. Style: Flushometer valve.
4. Water Consumption: 4.5 L per flush.
5. Support: Waste-fitting assembly.

1.5 FLUSHOMETER VALVES

A. Lever-Handle, Diaphragm Flushometer Valves

1. Style: Exposed or Concealed.
2. Consumption: 4.5 per flush.

B. Hydraulic-Actuator, Push-Button, Diaphragm Flushometer Valves:

1. Style: Exposed or Concealed.
2. Consumption: 4.5 per flush.

1.6 TOILET SEATS

A. Toilet Seats:

1. Type: Standard
2. Shape: Elongated rim, open front or Elongated rim, closed front.
3. Seat Cover: Required.

END OF SECTION 224213.13

SECTION 224213.16 - COMMERCIAL URINALS

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, and installation for plumbing fixtures, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing” SBC 701, and the standards listed below in this section; whichever is more stringent.

1.2 WALL-HUNG URINALS

A. Urinals - Wall Hung, Back or bottom Outlet, Siphon Jet: .

1. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5/CSA B45.15.
2. Material: Vitreous china.
3. Type: Siphon jet.
4. Water Consumption: 0.5 :Lpf

B. Urinals - Wall Hung, Back Outlet, Washout: Accessible.

1. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5/CSA B45.15.
2. Material: Vitreous china.
3. Type: Washout with extended shields.
4. Water Consumption: 0.5 Lpf

1.3 FLUSHOMETER VALVES

A. Lever-Handle, Diaphragm Flushometer Valves: .

1. Standard: ASSE 1037/ASME 112.1037/CSA B125.37.
2. Style: Exposed or Concealed as per interior designer.
3. Consumption: 0.5 Lper flush.

B. Hydraulic-Actuator, Push-Button, Diaphragm Flushometer Valves:

1. Standard: ASSE 1037/ASME 112.1037/CSA B125.37.
2. Style: Exposed or Concealed.
3. Consumption: 0.5 L per flush.

END OF SECTION 224213.16

SECTION 224216.13 - COMMERCIAL LAVATORIES

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, and installation for plumbing fixtures, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing” SBC 701, and the standards listed below in this section; whichever is more stringent.

1.2 VITREOUS-CHINA, COUNTER-MOUNTED LAVATORIES

A. Lavatory - Rectangular, Oval, or Round as per Architectural drawings and selection catalogue, Self-Rimming, Vitreous China, Counter Mounted:

1. Standard: ASME A112.19.2/CSA B45.1.
2. Type: Self-rimming for above-counter mounting.
3. Nominal Size: As per Architectural drawings and selection catalogue.
4. Faucet-Hole Punching: One hole or three holes.
5. Faucet-Hole Location: Top.

B. Lavatory - Oval, Vitreous China, Undercounter Mounted:

1. Standard: ASME A112.19.2/CSA B45.1.
2. Type: For undercounter mounting.
3. Nominal Size: As per Architectural drawings and selection catalogue..
4. Faucet-Hole Punching: No holes.
5. Faucet-Hole Location: On countertop.

1.3 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

A. Lavatory - Vitreous China, Wall Mounted:

1. Standard: ASME A112.19.2/CSA B45.1.
2. Type: For wall hanging.
3. Nominal Size: As per Architectural drawings and selection catalogue.
4. Faucet-Hole Punching: One hole or three holes.
5. Faucet-Hole Location: Top.

B. Lavatory - Wheelchair, Vitreous China, Wall Mounted:

1. Standard: ASME A112.19.2/CSA B45.1.
2. Type: Slab or wheelchair.
3. Nominal Size: Rectangular, 686 by 508 mm.
4. Faucet-Hole Punching: Three holes, 51-mm centers.
5. Faucet-Hole Location: Top.

C. Lavatory - Corner Type, Vitreous China, Wall Mounted:

1. Standard: ASME A112.19.2/CSA B45.1.
2. Type: Three-sided-front apron with three-sided back.

3. Nominal Size: Corner, 406 by 406 mm.
4. Faucet-Hole Punching: Three holes, 51-mm centers.
5. Faucet-Hole Location: Back wall.
6. Faucet: Manufacturer's standard, solid brass; factory installed.

1.4 MANUALLY OPERATED FAUCETS

A. Lavatory faucets intended to convey or dispense water for human consumption are to comply with the with requirements of the Authority Having Jurisdiction (AHJ), and with NSF 61/NSF 372, or be certified in compliance with NSF 61/NSF 372 by an accredited third-party certification body, that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. Lavatory Faucets - Manual Type, Single-Control Mixing, Single-Control Nonmixing, or Two-Handle Mixing as per Architectural drawings and selection catalogue, General Duty,:

1. Body Material: Commercial, solid brass or die-cast housing with brazed copper and brass waterway.
2. Finish: Polished chrome plate.
3. Maximum Flow Rate: 2.5 L/min..
4. Mounting Type: as per Architectural drawings and selection catalogue.
5. Valve Handle(s): as per Architectural drawings and selection catalogue.
6. Spout: Rigid type.
7. Spout Outlet: Aerator or Laminar flow.
8. Drain: Not part of faucet.

1.5 AUTOMATICALLY OPERATED LAVATORY FAUCETS

A. Lavatory faucets intended to convey or dispense water for human consumption are to comply with the with requirements of the Authority Having Jurisdiction (AHJ), and with NSF 61/NSF 372, or be certified in compliance with NSF 61/NSF 372 by an accredited third-party certification body, that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. Lavatory Faucets - Automatic-Type, Hardwired Electronic Sensor Operated, Mixing or Nonmixing as per Architectural drawings and selection catalogue:

1. Body Type: Single hole.
2. Body Material: Commercial, solid-brass, or die-cast housing with brazed copper and brass waterway.
3. Finish: Polished chrome plate.
4. Maximum Flow Rate: 2.5 L/min..
5. Mounting Type: As per Architectural drawings and selection catalogue.
6. Spout: Rigid type.
7. Spout Outlet: Aerator or Laminar flow.
8. Drain: Not part of faucet.

END OF SECTION 224216.13

SECTION 224216.16 - COMMERCIAL SINKS

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, and installation for plumbing fixtures, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing” SBC 701, and the standards listed below in this section; whichever is more stringent.

1.2 SERVICE SINKS

A. Service Sinks - Enameled Cast Iron, Trap Standard Mounted: <**Insert drawing designation**>.

1. Standard: ASME A112.19.1/CSA B45.2.
2. Type: Service sink with back.
3. Nominal Size: As per Architectural drawings and selection catalogue.
4. Color: White.
5. Mounting: DN 50 trap standard with grid strainer inlet, cleanout, and floor flange.
6. Rim Guard: On front and sides.

1.3 KITCHEN/UTILITY SINKS

A. Kitchen/Utility Sinks - Stainless Steel, Freestanding:

1. Standards: ASME A112.19.3/CSA B45.4 and NSF 2.
2. Type: Stainless steel, freestanding, sound-deadened unit with backsplash.
3. Number of Compartments: Two].
4. Material Thickness: 16 gauge, Type 304 stainless steel.
5. Compartment:
   a. Drain: Grid with tailpiece and twist drain or stopper

6. Each Compartment of Multiple Compartment Sinks:
   a. Drains: Grid with tailpiece and twist drain or stopper

7. Legs and Feet: Stainless steel tubing legs with adjustable bullet feet.
8. Faucet(s):

   a. Number Required: Two.
   b. Mounting: On backsplash.

9. Supply Fittings:

   a. Standard: ASME A112.18.1/CSA B125.1.
   b. Supplies: Chrome-plated brass compression stop with inlet connection matching water supply piping type and size.

      1) Operation: Loose key or Wheel handle
      2) Risers: DN 15, [ASME A112.18.6/CSA B125.6 braided- or corrugated-stainless steel flexible hose.

10. Waste Fittings:

a. Standard: ASME A112.18.2/CSA B125.2.
b. Trap(s):

1) Size: DN 40
2) Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 17-gauge brass tube to wall; and chrome-plated brass or steel wall flange.

c. Continuous Waste:

1) Size: DN 50.
2) Material: Chrome-plated, 17-gauge brass tube.

B. Kitchen/Utility Sinks - Stainless Steel, Counter Mounted: .

1. Standard: ASME A112.19.3/CSA B45.4.
2. Type: Stainless steel, self-rimming, sound-deadened unit less ledge back or with ledge back.
3. Number of Compartments: Two.
4. Overall Dimensions: As per Architectural drawings and selection catalogue.
5. Material: 18 gauge, Type 304 stainless steel.

6. Each Compartment of Multiple Compartment Sinks:

a. Dimensions: As per Architectural drawings and selection catalogue.
b. Drains: Grid with tailpiece and twist drain or stopper.
c. Depth: Standard or Wheelchair accessible as applicable.

7. Faucet(s): .

a. Number Required: One or Two as per Architectural drawings and selection catalogue.
b. Mounting: On ledge.

8. Supply Fittings:

a. Standard: ASME A112.18.1/CSA B125.1.
b. Supplies: Chrome-plated brass compression stop with inlet connection matching water-supply piping type and size.

1) Operation: Loose key or Wheel handle.
2) Risers: DN 15, ASME A112.18.6/CSA B125.6, braided- or corrugated-stainless-steel flexible hose.

9. Waste Fittings:

a. Standard: ASME A112.18.2/CSA B125.2.
b. Trap(s):

1) Size: DN 40.
2) Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 17-gauge brass tube to wall; and chrome-plated brass or steel wall flange.

c. Continuous Waste:

1) Size: DN 50.
2) Material: Chrome-plated, 17-gauge brass tube.

10. Mounting: On counter with sealant.

C. Kitchen/Utility Sinks - Stainless Steel, Freestanding: .

1. Standards: ASME A112.19.3/CSA B45.4 and NSF 2.
2. Type: Stainless steel, freestanding, sound-deadened unit with backsplash.
3. Number of Compartments: Two.
4. Overall Dimensions: As per Architectural drawings and selection catalogue.
5. Material Thickness: 16 gauge, Type 304 stainless steel.

6. Each Compartment of Multiple Compartment Sinks:

   a. Dimensions: As per Architectural drawings and selection catalogue.
   b. Drains: Grid with tailpiece and twist drain or stopper.

7. Legs and Feet: Stainless steel tubing legs with adjustable bullet feet.
8. Faucet(s): .

   a. Number Required: One or two as per Architectural drawings and selection catalogue.
   b. Mounting: On backsplash.

9. Supply Fittings:

   a. Standard: ASME A112.18.1/CSA B125.1.
   b. Supplies: Chrome-plated brass compression stop with inlet connection matching water supply piping type and size.

      1) Operation: Loose key or Wheel handle.
      2) Risers: DN 15, ASME A112.18.6/CSA B125.6 braided- or corrugated-stainless steel flexible hose.

10. Waste Fittings:

    a. Standard: ASME A112.18.2/CSA B125.2.
    b. Trap(s):

       1) Size: DN 40.
       2) Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 17-gauge brass tube to wall; and chrome-plated brass or steel wall flange.

    c. Continuous Waste:

       1) Size: DN 50.
       2) Material: Chrome-plated, 17-gauge brass tube.

1.4 HANDWASH SINKS

A. Handwash Sinks - Stainless Steel: .

1. Standards: ASME A112.19.3/CSA B45.4 and NSF 61.
2. Type: Wall-mounted or Pedestal-base stainless steel basin with radius corners, back for faucet, and support brackets.
3. Overall Dimensions: 432 by 406 by 127 mm.
4. Supply Fittings: Comply with requirements in "Supply Fittings" Article.
5. Waste Fittings: Comply with requirements in "Waste Fittings" Article.
6. Support: Type II sink carrier.
7. Mounting Height: Standard, Child, or Accessible in accordance with ICC A117.1.

1.5 SINK FAUCETS

A. Sink faucets intended to convey or dispense water for human consumption are to comply with requirements of the Authority Having Jurisdiction (AHJ), and with NSF 61 and NSF 372, or be certified in compliance with NSF 61 and NSF 372 by an ANSI-accredited third-party certification body, in that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. Commercial Sink Faucets - Automatic Type: Battery-powered orHard-wired electronic-sensor-operated, mixing

1. Standards: ASME A112.18.1/CSA B125.1 and UL 1951.
2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
4. Body Material: Commercial, solid brass, or die-cast housing with brazed copper and brass waterway.
5. Finish: Chrome plated or Polished chrome1 plate
6. Maximum Flow Rate: 4.5 L/min
7. Thermostatic Mixing Valve with check valves.
8. Control Module: water-resistant module with internal flow setting switches.
9. Drain: Not part of faucet

C. Commercial Sink Faucets - Manual Type: Single-control mixing.

1. Standard: ASME A112.18.1/CSA B125.1.
2. Body Material: Commercial, solid brass, or die-cast housing with brazed copper and brass waterway.
3. Finish: Chrome plated.
4. Maximum Flow Rate: 4.5 L/min.
5. Mounting Type: As per Architectural drawings and selection catalogue.
6. Spout Type: Swivel gooseneck.
7. Vacuum Breaker: Required for hose outlet.
8. Spout Outlet: Laminar flow or Hose thread in accordance with ASME B1.20.7 <**Insert type**>.
9. Pre-Rinse Unit: Combination rigid/flexible with riser, hose, spray valve and wall bracket.

D. Commercial Service Sink Faucets - Manual Type: .

1. Description: Wall/back mounted, brass body, with integral service stops, checks, spout with bucket/pail hook, 20-mm hose thread end, integral vacuum breaker, inlets 200 mm o.c., and two-handle mixing.
2. Standards: ASME A112.18.1/CSA B125.1, NSF 61 and NSF 372, ICC A117.1, ASSE 1001 (VB).
3. Finish: Rough chrome plated or Polished chrome plated.
4. Cartridges: Ceramic.
5. Brace: Adjustable top or bottom brace.

E. Commercial Sink Faucets - Automatic Type: Hard-wired, electronic-sensor-operated, mixing,.

1. Standards: ASME A112.18.1/CSA B125.1 and UL 1951.
2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
4. Body Material: Commercial, solid brass, or die-cast housing with brazed copper and brass waterway.
5. Finish: Chrome plated or Polished chrome1 plate.

6. Maximum Flow Rate: 4.5 L/min.
7. Mounting Type: As per Architectural drawings and selection catalogue.
8. Spout Type: Swivel, gooseneck.
9. Spout Outlet: Laminar flow.
10. Thermostatic Mixing Valve: , with check valves.
11. Control Module: Below deck, water-resistant module with internal flow setting switches.
12. Drain: Not part of faucet.

1.6 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF 61 and NSF 372 for supply-fitting materials in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated brass or chrome-plated copper tubing, including wall flange.

D. Supply Stops: Chrome-plated brass, one-quarter-turn, ball-type or compression valves.

1.7 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: DN 40, grid type.

C. Trap: DN 40, chrome-plated with wall flange.

END OF SECTION 224216.16

SECTION 224223 - COMMERCIAL SHOWERS

1.1 QUALITY ASSURANCE

A. Products and materials shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, and installation for plumbing fixtures, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing” SBC 701, and the standards listed below in this section; whichever is more stringent.

1.2 INDIVIDUAL SHOWERS

A. Individual FRP Showers: .

1. Standard Showers as per CSA B45.5 & IAPMO Z124.
2. Style: Standard.
3. Shower Nominal Size and Shape: As per Architectural drawings and selection catalogue.
4. Grab Bar: ASTM F446, mounted on support area back wall.

B. Individual PMMA Showers: .

1. Standard Showers as per CSA B45.5 & IAPMO Z124.
2. Style: Standard.
3. Shower Nominal Size and Shape: As per Architectural drawings and selection catalogue.
4. Grab Bar: ASTM F446, mounted on support area back wall.

C. Individual Cabinet Showers: .

1. Standard Showers as per CSA B45.5 & IAPMO Z124.
2. Nominal Size: As per Architectural drawings and selection catalogue.
3. Material: As per Architectural drawings and selection catalogue.
4. Accessibility Options: Grab bar and bench.
5. Shower Head and Shower Valve: Manufacturer's standard fitting assembly.

1.3 SHOWER HEADS AND SHOWER VALVES

A. Shower Head with Single-Handle Thermostatic Mixing Valve: .

1. Valve Body Material and Finish: Polished chrome plate, solid brass.
2. Mounting: As per Architectural drawings and selection catalogue.
3. Operation: Single-handle, push-pull or twist or rotate or metering control.
4. Antiscald Device: Integral with mixing valve.
5. Shower Head: Ball joint and head integral with mounting flange.
6. Shower Head Material: Metallic with chrome-plated finish.
7. EPA WaterSense: Required.
8. Shower Head Maximum Flow Rate: 7 L/min.

1.4 SHOWER BASINS

A. Shower Basins - FRP or PMMA

1. Type: Standard residential or Handicapped/accessible as applicable.
2. Nominal Size and Shape: As per interior designer

B. Shower Basins - FRP or PMMA: .

1. Type: Standard residential or Handicapped/accessible.
2. Nominal Size and Shape: As per Architectural drawings and selection catalogue.

END OF SECTION 224223

SECTION 224716 - PRESSURE WATER COOLERS

1.1 QUALITY ASSURANCE

A. Products and equipment shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, installation, and identification for water mineralizer and dispenser units, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing” SBC 701, and the standards listed below in this section; whichever is more stringent.

C. Certified to UKAS, WRAS and NSF 61 or 372, and CE marked and labeled.

1.2 INDOOR DISPENSING UNITS

A. Bottle Filling Station - Surface Wall-Mounted, or Recessed Stainless Steel, Remote Chiller:: .

1. Description: Chilled water dispensing system from manufacturer, with connection to remote chilled and mineralization unit, providing chilled and ambient temperature drinking water with water quality adhering to NEOM requirements; similar to system from Culligan or approved equal.
2. Plastic parts of dispenser shall be of antimicrobial ABS plastic.
3. Bottle Filler: Sensor.
4. Drain: Grid.
5. Supply: With shutoff valve.
6. Inlet Water Pressure: 2.5 to 4 bar.
7. Waste fitting.
8. UVC LED Filter.
9. Cooling System: For remote water chiller and mineralization unit, see Section 224723 "Remote Water Coolers."
10. Support: Provide manufacturer's support frame attached to substrate.
11. Mounting Height: Standard or Accessible in accordance with ICC A117.1.

B. Bottle Filling Station - Surface Wall-Mounted, or Recessed Stainless Steel: .

1. Description: Complete packaged chilled water dispensing system from manufacturer, including dispensing unit, chiller system, filtration, mineralizer and pumps, providing chilled or ambient temperature drinking water with water quality adhering to NEOM requirements; similar to system from Culligan or approved equal.
2. Plastic parts of dispenser shall be of antimicrobial ABS plastic.
3. Bottle Filler: Sensor, and Push button for hot water.
4. Drain: Grid.
5. Supply: With shutoff valve.
6. Inlet Water Pressure: 2.5 to 4 bar.
7. Waste fitting.
8. UVC LED Filter.
9. Cooling System: Electric, with hermetically sealed compressor with zero ODP refrigerant, and adjustable thermostat.
10. Support: Provide manufacturer's support frame attached to substrate.
11. Mounting Height: Standard or Accessible in accordance with ICC A117.1.

C. Bottle Filling Station - Countertop, Stainless Steel: .

1. Description: Complete packaged chilled water dispensing system from manufacturer, including dispensing unit, chiller system, filtration, mineralizer, and pumps, providing

chilled, ambient, or hot temperature drinking water with water quality adhering to NEOM requirements; similar to system from Culligan or approved equal.
2. Plastic parts of dispenser shall be of antimicrobial ABS plastic.
3. Bottle Filler: Sensor, and Push button for hot water.
4. Drain: Grid.
5. Supply: With shutoff valve.
6. Inlet Water Pressure: 2.5 to 4 bar.
7. Waste fitting.
8. UVC LED Filter.
9. Cooling System: Electric, with hermetically sealed compressor with zero ODP refrigerant, and adjustable thermostat.

D. Bottle Filling Station – Free-Standing Stainless Steel: .

1. Description: Complete packaged chilled water dispensing system from manufacturer, including dispensing unit, chiller system, filtration, mineralizer, and pumps, providing chilled, ambient, or hot temperature drinking water with water quality adhering to NEOM requirements; similar to system from Culligan or approved equal.
2. Plastic parts of dispenser shall be of antimicrobial ABS plastic.
3. Bottle Filler: Sensor, and Push button for hot water.
4. Supply: With shutoff valve.
5. Inlet Water Pressure: 2.5 to 4 bar.
6. UVC LED Filter.
7. Cooling System: Electric, with hermetically sealed compressor with zero ODP refrigerant, and adjustable thermostat.

1.3 OUTDOOR DISPENSING UNITS

A. Bottle Filling Station – Free-Standing Stainless Steel: .

1. Description: Complete packaged chilled water dispensing system from manufacturer, including dispensing unit, chiller system, filtration, mineralizer, and pumps, providing chilled drinking water with water quality adhering to NEOM requirements; similar to system from Culligan or approved equal.
2. Chassis: Galvanized or corrosion-resistant-coated steel, or stainless steel as per manufacturer.
3. Dispensing fixture: Stainless steel Type 316, or powder coated galvanized steel as per manufacturer.
4. Bottle Filler: Anti-vandal push button.
5. Supply: With shutoff valve.
6. Inlet Water Pressure: 2.5 to 4 bar.
7. UVC LED Filter.
8. Cooling System: Electric, with hermetically sealed compressor with zero ODP refrigerant, and adjustable thermostat.
9. Controls: Adjustable thermostat.
10. Cooled Water:

    a. Minimum production capacity of 0.042 L/s at 25 deg. C ambient temperature, and 20 deg. C water inlet temperature.
    b. Continuous supply of 0.022 L/s.

END OF SECTION 224716

SECTION 224723 - REMOTE WATER COOLERS

1.1 QUALITY ASSURANCE

A. Products and equipment shall demonstrate compliance with requirements specified in Section 016000 “Product Requirements.

B. Comply with the applicable requirements and recommendations of local Saudi Building Code (SBC) and the latest applicable local regulations for materials, tests, installation, and identification for water mineralizer units, as listed in, but not limited to, the “Saudi Sanitary Code-Plumbing” SBC 701, and the standards listed below in this section; whichever is more stringent.

C. Certified to UKAS, WRAS and NSF 61 or 372, and CE marked and labeled.

1.2 PRODUCTS

A. Remote Water Coolers: Remote chiller and water mineralization equipment.

1. Description: Complete system from manufacturer including chiller system, filtration, mineralizer, pump, and connections to dispensing points, providing chilled or ambient temperature drinking water with water quality adhering to NEOM requirements; similar to system from Culligan or approved equal.
2. Chassis: Galvanized or corrosion-resistant-coated steel, or stainless steel as per manufacturer.
3. Refrigeration System: Hermetically sealed compressor and air-cooled condensing unit, and zero ODP refrigerant.
4. Controls: Adjustable thermostat.
5. Cooled Water:

    a. Minimum production capacity of 0.078 L/s at 25 deg. C ambient temperature, and 20 deg. C water inlet temperature.
    b. Continuous supply of 0.05 L/s.

6. Ventilation Grille: Stainless steel
7. UV Filter on exit.

END OF SECTION 224723