

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and Divisions 00 and 01, apply to this section.
- B. Related Sections include the following:
 - 1. Division 23.
 - 2. Division 22.
 - 3. Division 26.

1.2 SUMMARY

- A. This Section includes pumps for the building plumbing systems.

1.3 DEFINITIONS

- A. Domestic Water Piping: Piping inside building that conveys potable cold and hot water to fixtures and equipment throughout the building.
- B. Non-Potable Water Piping: Piping inside building that conveys non-potable water to fixtures and equipment throughout the building.

1.4 SUBMITTALS

- A. General: See Division 23 for general requirements of Product Data, Shop Drawings, Reports and Certificates, and Operation and Maintenance data submittals.
- B. Product Data: Provide submittals of the following:
 - 1. Compact circulators.
 - 2. In-line circulators.
 - 3. Horizontal in-line pumps.
 - 4. Vertical in-line pumps.
 - 5. Compact, packaged booster pumps.
 - 6. Constant-speed-drive, packaged booster pumps.
 - 7. Variable-speed-drive, packaged booster pumps.
 - 8. Quick-disconnect-system, submersible sewage pumps.
 - 9. Packaged, sewage pump units.
 - 10. Wet-pit-mounted, vertical sump pumps.
 - 11. Submersible sump pumps.
 - 12. Compact, submersible sump pumps.
 - 13. Plastic, sump pump basins.
 - 14. Package, drainage pump units.

1.5 CODES AND STANDARDS

- A. Codes and Standards shall be the current version adopted by the Authority Having Jurisdiction.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain same type of pumps through one source from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- C. Comply with the Reduction of Lead in Drinking Water Act of 2011. This act redefines "lead free" as "not containing more than 0.2 percent lead when used with respect to solder and flux and not more than a weighted average of 0.25 percent lead when used with respect to wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures". Products required to be "lead free" shall have NSF 61-G or NSF 372 certification.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Retain shipping flange protective covers and protective coatings during storage.
- B. Protect bearings and couplings against damage.

PART 2 – PRODUCTS

2.1 PUMPS, GENERAL

- A. Description: Factory-assembled and -tested, single-stage, centrifugal pump units; complying with UL 778; suitable for potable-water service; with all-bronze or stainless steel construction and components in contact with water made of corrosion-resistant materials.
- B. Motors: Provide with built-in thermal-overload protection appropriate for motor size and duty.
- C. End Connections for NPS 2 and Smaller: Threaded. Pumps available only with flanged ends may be furnished with threaded companion flanges.
- D. End Connections for NPS 2-1/2 and Larger: Flanged.
- E. Finish: Manufacturer's standard paint applied to factory-assembled and -tested units before shipping.
- F. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles.
- G. Plumbing pumps that are used for domestic water piping systems shall be "lead free".
- H. Soldered Lead Free End Connections: Copper alloys with silicone content greater than 0.005% are not allowed.

2.2 COMPACT CIRCULATORS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Armstrong Pumps, Inc.
 - 2. Grundfos Pumps Corp.
 - 3. ITT Fluid Technology Corp.; ITT Bell & Gossett Div.

4. Taco, Inc.
 5. Or Approved Equal.
- B. Description: Horizontal or vertical, in-line, replaceable-cartridge-design circulator; rated for 125-psig minimum working pressure and minimum continuous water temperature of 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.
 4. Volute: Cast bronze or non-magnetic stainless steel.

2.3 IN-LINE CIRCULATORS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Armstrong Pumps, Inc.
 2. ITT Fluid Technology Corp.; ITT Bell & Gossett Div.
 3. Taco, Inc.
 4. Or Approved Equal.
- B. Description: Horizontal or vertical, in-line circulator, close coupled, rated for 175-psig minimum working pressure and minimum continuous water temperature of 225 deg F.
1. Construction: Radially split, all-bronze casing.
 2. Impeller: ASTM B 584, cast bronze; overhung, single suction, and keyed or taper fit to shaft.
 3. Seal: Mechanical.
 4. Shaft and Sleeve: Steel shaft, with copper sleeve.
 5. Motor Bearings: Oil-lubricated, bronze-journal or permanently lubricated ball bearing.
 6. Motor: Single speed and rigid mounted to pump casing.
 - a. Motor Size: For motors larger than 1/2 hp, select motor size that will not overload through full range of pump performance curve.
 7. Automatic Timers: Bell and Gossett or approved equal.

2.4 HORIZONTAL IN-LINE PUMPS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Armstrong Pumps, Inc.
 2. ITT Fluid Technology Corp.; ITT Bell & Gossett Div.
 3. Taco, Inc.
 4. Or Approved Equal.
- B. Description: Horizontal, in-line, separately coupled pump; rated for 175-psig minimum working pressure and minimum continuous water temperature of 225 deg F; and complying with HI 1.1-1.5 for in-line centrifugal pumps.

1. Construction: Radially split, all-bronze casing.
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, closed, overhung, single suction, and keyed or taper fit to shaft.
3. Shaft and Sleeve: Steel shaft, with oil-lubricated copper sleeve.
4. Shaft and Sleeve: Stainless-steel shaft, with copper sleeve.
5. Mechanical Seal: Carbon-steel rotating ring, stainless-steel spring, ceramic seat, and rubber bellows and gasket. Include water slinger on shaft between motor and seal.
6. Pump Bearings: Oil-lubricated, bronze-journal or ball type.
7. Shaft Coupling: Flexible, capable of absorbing torsional vibration and shaft misalignment.
8. Motor: Single speed, with built-in thermal-overload protection; grease-lubricated ball bearings; and resiliently mounted to pump casing.
9. Motor: Energy-efficient design; single speed, with built-in thermal-overload protection; grease-lubricated ball bearings; and resiliently mounted to pump casing.
 - a. Motor Size: For motors larger than 1/2 hp, select motor size that will not overload through full range of pump performance curve.

2.5 VERTICAL IN-LINE PUMPS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Armstrong Pumps, Inc.
 2. ITT Fluid Technology Corp.; ITT Bell & Gossett Div.
 3. Taco, Inc.
 4. Or Approved Equal.
- B. Description: Vertical, in-line; rated for 175-psig minimum working pressure and minimum continuous water temperature of 225 deg F; and complying with HI 1.1-1.5 for in-line centrifugal pumps.
1. Construction: Radially split, all-bronze casing.
 2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, closed, overhung, single suction, and keyed to shaft.
 3. Shaft and Sleeve: Steel shaft, with copper or bronze sleeve.
 4. Shaft and Sleeve: Stainless-steel shaft, with copper or bronze sleeve.
 5. Mechanical Seal: Carbon-steel rotating ring, stainless-steel spring, ceramic seat, and rubber bellows and gasket. Include water slinger on shaft between motor and seal.
 6. Motor: Single speed, with built-in thermal-overload protection; grease-lubricated ball bearings; and directly mounted to pump casing.
 7. Motor: Energy-efficient design; single speed, with built-in thermal-overload protection; grease-lubricated ball bearings; and directly mounted to pump casing.
 - a. Motor Size: For motors larger than 1/2 hp, select motor size that will not overload through full range of pump performance curve.
 - b. Lifting and Supporting Lug: Directly mounted in top of motor enclosure.

2.6 PACKAGED BOOSTER PUMPS, GENERAL

- A. Description: Factory-assembled and -tested, packaged booster pump units; complying with UL 778; suitable for potable-water service.

- B. Piping: ASME B31.9 for piping materials and installation.
 - 1. NPS 4 and Smaller: ASTM B 88, Type L, drawn, copper, water tube with copper, solder-joint, pressure fittings and brazed joints.
 - 2. Header End Connections NPS 2 and Smaller: Threaded.
 - 3. Header End Connections NPS 2-1/2 and Larger: Flanged.
- C. Piping Option: Piping, including valves and other components, may have grooved ends for grooved joints.
- D. Shutoff Valves, NPS 2 and Smaller: MSS SP-80, Class 125, bronze, rising-stem gate valve or MSS SP-110, 600-psig minimum CWP, bronze ball valve with ends matching piping.
- E. Shutoff Valves, NPS 2-1/2 and Larger: MSS SP-70, Class 125, bronze-trim, OS&Y, cast-iron gate valve with flanged ends or MSS SP-67, Type I for tight shutoff, 175-psig CWP, single-flanged, cast-iron butterfly valve.
- F. Check Valves, NPS 2 and Smaller: MSS SP-80, Class 125, bronze, swing check valve.
- G. Check Valves, NPS 2-1/2 and Larger: MSS SP-71, Class 125, bronze-trim, cast-iron, swing check valve.
- H. Dielectric Fittings: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and to stop corrosion.
 - 1. NPS 2 and Smaller: Factory-fabricated union assembly, for 250-psig minimum working pressure at 180 deg F.
 - 2. NPS 2-1/2 and Larger: Factory-fabricated, companion-flange assembly; for 150- or 300-psig minimum working pressure as required to suit system pressures.
- I. Sensors: [Pressure switches][Current sensors][Flow switches].
- J. Control Panel: Automatic, with load control and protection functions. Comply with NEMA ICS 2 and UL 508.
 - 1. Mounting and Wiring: Factory installed and connected as an integral part of unit.
 - 2. Enclosure: NEMA ICS 6, Type 12.
 - 3. Motor Controller: Full-voltage, combination-magnetic type with undervoltage release feature, motor-circuit-protector-type disconnect, and short-circuit protective device.
 - a. Control Voltage: 120-V ac, using integral control power transformer.
 - 4. Motor Overload Protection: Overload relay in each phase.
 - 5. Starting Devices: Hand-off-automatic selector switch in cover of control panel, plus pilot device for automatic control.
 - 6. Duplex, Automatic Alternating Starter: Switches lead pump to lag main pump and to two-pump operation.
 - 7. Triplex, Sequence (Lead-Lag-Lag) Starter: Switches lead pump to one lag main pump and to three-pump operation.
 - 8. Instrumentation: Unit suction and discharge pressure gages.
 - 9. Alarm Signal Device: Sounds alarm when backup pumps are operating.
 - 10. Instrumentation: Unit suction and discharge pressure gages.

- K. Finish: Manufacturer's standard paint applied to factory-assembled and -tested units before shipping.
- L. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembling and testing. Protect flanges, pipe openings, and nozzles.

2.7 COMPACT, PACKAGED BOOSTER PUMPS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. ITT Fluid Technology Corp.; ITT Bell & Gossett Div.
 - 2. PACO Pumps, Inc.
 - 3. Canariis.
 - 4. Or Approved Equal.
- B. Description: Simplex packaged unit, with pump, piping, valves, sensor, hydropneumatic tank, and controls for constant-speed operation.
 - 1. Minimum Pressure Rating: 125 psig.
 - 2. Pump: Comply with HI 1.1-1.5, "Centrifugal Pumps," for close-coupled, end-suction centrifugal pumps.
 - a. Construction: Single stage, radially split, bronze fitted.
 - b. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, closed, overhung, single suction, and keyed to shaft.
 - 3. Control Valve: Adjustable, automatic, direct-acting pressure regulator on pump discharge.
 - 4. Relief Valve: [Temperature][Pressure]-relief type on pump discharge.
 - 5. Hydropneumatic Tank: Minimum [10-gal.][xx-gal.] water-volume capacity, precharged, diaphragm or bladder tank.

2.8 CONSTANT-SPEED-DRIVE, PACKAGED BOOSTER PUMPS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Armstrong Darling, Inc.
 - 2. Canariis.
 - 3. ITT Fluid Technology Corp.; ITT Bell & Gossett Div.
 - 4. PACO Pumps, Inc.
 - 5. SynchroFlo, Inc.
 - 6. Or Approved Equal.
- B. Description: Multiplex packaged unit, with pumps, piping, valves, sensors, and controls for constant-speed operation.
 - 1. Minimum Pressure Rating: 175 psig.

2. Pump Arrangement: [Duplex, with two equal size pumps][Triplex, with one small lead and two large equal size lag main pumps][Triplex, with three equal size pumps].
3. Pumps: Comply with HI 1.1-1.5, "Centrifugal Pumps," for close-coupled, end-suction centrifugal pumps.
4. Pumps: Comply with HI 1.1-1.5, "Centrifugal Pumps," for close-coupled, in-line centrifugal pumps.
 - a. Construction: Single stage, radially split, bronze fitted.
 - b. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, closed, overhung, single suction, and keyed to shaft.
5. Pumps: Comply with HI 2.1-2.5, "Vertical Pumps," for multistage barrel pumps.
 - a. Construction: Multistage, bronze fitted.
 - b. Impellers: ASTM B 584, cast bronze; statically and dynamically balanced, closed or semiopen, and keyed to shaft.
6. Control Valve: Adjustable, automatic, direct-acting, pressure regulator for each pump discharge.
7. Control Valve: Adjustable, automatic, pilot-operated, pressure regulator for each pump discharge.

2.9 VARIABLE-SPEED-DRIVE, PACKAGED BOOSTER PUMPS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Canariis.
 2. ITT Fluid Technology Corp.; ITT Bell & Gossett Div.
 3. SynchroFlo, Inc.
 4. Or Approved Equal.
- B. Description: Multiplex packaged unit, with pumps, piping, valves, sensors, controls, and adjustable-speed-drive units for variable-speed operation.
 1. Minimum Pressure Rating: 175 psig.
 2. Pump Arrangement: [Duplex, with two equal-size pumps][Triplex, with three equal size pumps].
 3. Pumps: Comply with HI 1.1-1.5, "Centrifugal Pumps," for close-coupled, end-suction centrifugal pumps.
 4. Pumps: Comply with HI 1.1-1.5, "Centrifugal Pumps," for close-coupled, in-line centrifugal pumps.
 - a. Construction: Single stage, radially split, bronze fitted.
 - b. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, closed, overhung, single suction, and keyed to shaft.
 5. Variable-Speed-Drive Controllers: Adjustable-speed-drive unit for each pump.

2.10 SEWAGE PUMPS, GENERAL

- A. Description: Factory-assembled and -tested, single-stage, centrifugal, end-suction sewage pump units complying with UL 778. Include motor, operating controls, and construction for permanent installation.
- B. Discharge Pipe End Connections NPS 2 and Smaller: Threaded. Pumps available only with flanged-end discharge pipe may be furnished with threaded companion flanges.
- C. Discharge Pipe End Connections NPS 2-1/2 and Larger: Flanged.
- D. Motors: Single speed, with grease-lubricated ball bearings, and non-overloading through full range of pump performance curves.
- E. Finish: Manufacturer's standard paint applied to factory-assembled and -tested units before shipping.
- F. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembling and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

2.11 QUICK-DISCONNECT-SYSTEM, SUBMERSIBLE SEWAGE PUMPS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Aurora/Hydromatic Pumps, Inc.
 - 2. Chicago Pump Co.
 - 3. PACO Pumps, Inc.
 - 4. Weil Pump Co.
 - 5. Or Approved Equal.
- B. Description: Submersible, direct-connected sewage pump complying with HI 1.1-1.5 for submersible sewage pumps. Include quick-disconnect system.
 - 1. Pump Arrangement: [Simplex][Duplex].
 - 2. Casing: Cast iron, with cast-iron legs that elevate pump to permit flow into impeller, and discharge companion flange arranged to connect to quick-disconnect-system discharge-elbow fitting.
 - 3. Impeller: [ASTM A 48, Class No. 25 A or higher cast iron; statically and dynamically balanced, open or semi-open nonclog design, overhung, single suction, keyed to shaft, and secured by locking cap screw][ASTM B 584, cast bronze; statically and dynamically balanced, open or semi-open nonclog design, overhung, single suction, keyed to shaft, and secured by locking cap screw][ASTM A 532/A 532M, abrasion-resistant cast iron; statically and dynamically balanced, open or semi-open nonclog design, overhung, single suction, keyed to shaft, and secured by locking cap screw].
 - 4. Pump and Motor Shaft: Stainless steel, with factory-sealed, grease-lubricated ball bearings.
 - 5. Seals: Double mechanical seals.
 - 6. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor waterproof power cable of length required, with grounding plug and cable-sealing assembly for connection at pump.
 - 7. Moisture-Sensing Probe: Internal moisture sensor, moisture alarm, and waterproof cable of length required, with cable-sealing assembly for connection at pump.

8. Pump Discharge Piping: Factory or field fabricated, ASTM A 53, Schedule 40, galvanized-steel pipe, bronze pipe, or copper tube.
9. Basin Cover: Cast iron or steel and suitable for supporting controls. Refer to "Sewage Pump Basins" Article for other requirements.
10. Quick-Disconnect System: Include the following:
 - a. Guide Rails: Two galvanized-steel or other corrosion-resistant vertical pipes or structural members, attached to baseplate and basin sidewall or cover.
 - b. Baseplate: Corrosion-resistant metal plate, attached to basin floor, supporting guide rails and stationary elbow.
 - c. Pump Yokes: Pump-motor-mounted or casing-mounted yokes or other attachments for aligning pump during connection of flanges.
 - d. Movable Elbow: Pump discharge-elbow fitting with flange, seal, and positioning device.
 - e. Stationary Elbow: Fixed discharge-elbow fitting with flange that mates to movable-elbow flange and support attached to baseplate.
 - f. Lifting Cable: Stainless-steel cable attached to pump and basin cover at manhole.
11. Controls: NEMA 250, Type 1 enclosure, pedestal mounted, unless wall mounting is indicated; with two micropressure switches in NEMA 250, Type 6 enclosures; mounting rod; and electric cables.
12. Controls: NEMA 250, Type 1 enclosure, pedestal mounted, unless wall mounting is indicated; with three micropressure switches in NEMA 250, Type 6 enclosures; mounting rod; and electric cables. Include automatic alternator to alternate operation of pump units on successive cycles and to operate both units if one pump cannot handle load.
13. Controls: NEMA 250, Type 1 enclosure, pedestal mounted, unless wall mounting is indicated; with two mercury-float switches in NEMA 250, Type 6 enclosures; mounting rod; and electric cables.
14. Controls: NEMA 250, Type 1 enclosure, pedestal mounted, unless wall mounting is indicated; with three mercury-float switches in NEMA 250, Type 6 enclosures; mounting rod; and electric cables. Include automatic alternator to alternate operation of pump units on successive cycles and to operate both units if one pump cannot handle load.
15. Controls: NEMA 250, Type 1 enclosure, pedestal-mounted float switch; with float, float rod, and rod buttons.
16. Controls: NEMA 250, Type 1 enclosure, pedestal-mounted float switch; with floats, float rods, and rod buttons. Include automatic alternator to alternate operation of pump units on successive cycles and to operate both units if one pump cannot handle load.
17. Float-Guide Pipe: Guide pipe or other restraint for floats and rods in basins of depth greater than 60 inches.
18. High-Water Alarm: [Cover-mounted, compression-probe alarm, with electric bell; 120-V ac, with transformer and contacts for remote alarm bell, unless battery operation is indicated][Rod-mounted, NEMA 250, Type 6 enclosure with micropressure-switch alarm matching control and electric bell; 120-V ac, with transformer and contacts for remote alarm bell, unless battery operation is indicated][Rod-mounted, NEMA 250, Type 6 enclosure with mercury-float-switch alarm matching control and electric bell; 120-V ac, with transformer and contacts for remote alarm bell, unless battery operation is indicated].

2.12 PACKAGED, SEWAGE PUMP UNITS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Goulds Pumps, Inc.
 2. Little Giant Pump Co.
 3. PACO Pumps, Inc.
 4. Weil Pump Co.
 5. Or Approved Equal.
- B. Description: Packaged, automatic-operation, submersible sewage pump complying with HI 1.1-1.5 for submersible sewage pumps; with cast-iron body, brass nonclog impeller, plastic basin, control panel, and high-water-level alarm.
- C. Description: Packaged, automatic-operation, duplex-arrangement, submersible sewage pumps complying with HI 1.1-1.5 for submersible sewage pumps; with cast-iron bodies, brass nonclog impellers, plastic basin, control panel with alternator, and high-water-level alarm.
- D. Description: Packaged, automatic-operation, suspended-type, submersible, grinder sewage pump complying with HI 1.1-1.5 for wet-pit-volute sewage pumps; with cast-iron body, stainless-steel grinder-type impeller and shredding ring, plastic basin, and control panel.
- E. Description: Packaged, automatic-operation, duplex-arrangement, grinder sewage pumps complying with HI 1.1-1.5 for wet-pit-volute sewage pumps; with cast-iron bodies, stainless-steel grinder-type impellers and shredding rings, pump alternation, two-compartment plastic basin, and control panel.
1. Pump Seals: Mechanical type.
 2. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; and three-conductor waterproof power cable of length required, with grounding plug and cable-sealing assembly for connection at pump.
 3. Basin: Watertight with inlet pipe connection and gastight cover with vent and pump discharge connections.
 4. Controls: Automatic, with mercury-float switches and 20-foot, waterproof, electrical power cables.
 5. Pump Discharge Piping: [ASTM A 53, Schedule 40, galvanized-steel pipe][Manufacturer's standard steel pipe, copper tube, or plastic pipe].
 6. Valves: Factory- or field-installed check and shutoff valves on each pump discharge.

2.13 SUMP PUMPS, GENERAL

- A. Description: Factory-assembled and -tested, single-stage, centrifugal, end-suction sump pump units complying with UL 778. Include motor, operating controls, and construction for permanent installation.
- B. Discharge Pipe End Connections NPS 2 and Smaller: Threaded. Pumps available only with flanged-end discharge pipe may be furnished with threaded companion flanges.
- C. Discharge Pipe End Connections NPS 2-1/2 and Larger: Flanged.
- D. Motors: Single speed, with grease-lubricated ball bearings, and non-overloading through full range of pump performance curves.
- E. Finish: Manufacturer's standard paint applied to factory-assembled and -tested units before shipping.

- F. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembling and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

2.14 WET-PIT-MOUNTED, VERTICAL SUMP PUMPS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Armstrong Pumps, Inc.
 2. Aurora Pump.
 3. Chicago Pump Co.
 4. PACO Pumps, Inc.
 5. Peerless Pump Co.
 6. Weil Pump Co.
 7. Or Approved Equal.
- B. Description: Vertical, separately coupled, suspended sump pump complying with HI 1.1-1.5 for wet-pit-volute sump pumps.
1. Pump Arrangement: [Simplex][Duplex].
 2. Casing: Cast iron, with cast-iron inlet strainer.
 3. Impeller: [ASTM A 48, Class No. 25 A or higher cast iron; statically and dynamically balanced, open or semi-open nonclog design, overhung, single suction, keyed to shaft, and secured by locking cap screw][ASTM B 584, cast bronze; statically and dynamically balanced, open or semi-open nonclog design, overhung, single suction, keyed to shaft, and secured by locking cap screw][ASTM A 532/A 532M, abrasion-resistant cast iron; statically and dynamically balanced, open or semi-open nonclog design, overhung, single suction, keyed to shaft, and secured by locking cap screw].
 4. Pump Shaft and Sleeve Bearings: Stainless-steel shaft with bronze sleeve bearings. Include oil-lubricated, intermediate sleeve bearings at 48-inch maximum intervals if basin depth is greater than 48 inches, and grease-lubricated, ball-type thrust bearings.
 5. Pump and Motor Shaft Coupling: Flexible, capable of absorbing torsional vibration and shaft misalignment.
 6. Pump Discharge Piping: Manufacturer's standard galvanized-steel or bronze pipe.
 7. Basin Cover: Cast iron or steel and suitable for supporting pumps, motors, and controls. Refer to "Sump Pump Basins" Article for other requirements.
 8. Cover Shaft Seal: Stuffing box, with graphite-impregnated braided-yarn rings and bronze packing gland.
 9. Motor: Mounted vertically on cast-iron pedestal.
 10. Thermal Overload Protection: Built into pump motors or starters, as appropriate, according to size.
 11. Controls: NEMA 250, Type 1, pedestal-mounted float switch; with float, float rod, and rod buttons.
 12. Controls: NEMA 250, Type 1, pedestal-mounted float switch; with floats, float rods, and rod buttons. Include automatic alternator to alternate operation of pump units on successive cycles and to operate both units if one pump cannot handle load.
 13. Float-Guide Pipe: Guide pipe or other restraint for floats and rods in basins of depth greater than 60 inches.
 14. High-Water Alarm: Cover-mounted, compression-probe alarm, with electric bell; 120-V ac, with transformer and contacts for remote alarm bell, unless battery operation is indicated.

2.15 SUBMERSIBLE SUMP PUMPS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Chicago Pump Co.
 2. Grundfos Pumps Corp.
 3. Little Giant Pump Co.
 4. PACO Pumps, Inc.
 5. Weil Pump Co.
 6. Zoeller.
 7. Or Approved Equal.
- B. Description: Submersible, direct-connected sump pump complying with HI 1.1-1.5 for submersible sump pumps.
1. Pump Arrangement: [Simplex][Duplex].
 2. Casing: Cast iron with cast-iron inlet strainer, legs that elevate pump to permit flow into impeller, and discharge companion flange suitable for plain-end pipe connection arranged for vertical discharge.
 3. Impeller: [ASTM A 48, Class No. 25 A or higher cast iron; statically and dynamically balanced, open or semi-open nonclog design, overhung, single suction, keyed to shaft, and secured by locking cap screw][ASTM B 584, cast bronze; statically and dynamically balanced, open or semi-open nonclog design, overhung, single suction, keyed to shaft, and secured by locking cap screw][ASTM A 532/A 532M, abrasion-resistant cast iron; statically and dynamically balanced, open or semi-open nonclog design, overhung, single suction, keyed to shaft, and secured by locking cap screw].
 4. Construction: Stainless steel with stainless-steel or other corrosion-resistant impeller, stainless-steel inlet strainer, legs that elevate pump to permit flow into impeller, and discharge companion flange suitable for plain-end pipe connection arranged for vertical discharge.
 5. Pump and Motor Shaft: Stainless steel, with factory-sealed, grease-lubricated ball bearings.
 6. Seals: Double mechanical seals.
 7. Motor: Hermetically sealed, capacitor-start type, with built-in overload protection; and three-conductor waterproof power cable of length required, with grounding plug and cable-sealing assembly for connection at pump.
 8. Moisture-Sensing Probe: Internal moisture sensor, moisture alarm, and waterproof cable of length required, with cable-sealing assembly for connection at pump.
 9. Pump Discharge Piping: Factory or field fabricated, ASTM A 53, Schedule 40, galvanized-steel pipe, bronze pipe, or copper tube.
 10. Basin Cover: Cast iron or steel and suitable for supporting controls. Refer to "Sump Pump Basins" Article for other requirements.
 11. Controls: NEMA 250, Type 1 enclosure, pedestal mounted, unless wall mounting is indicated; with two micropressure switches in NEMA 250, Type 6 enclosures; mounting rod; and electric cables.
 12. Controls: NEMA 250, Type 1 enclosure, pedestal mounted, unless wall mounting is indicated; with three micropressure switches in NEMA 250, Type 6 enclosures; mounting rod; and electric cables. Include automatic alternator to alternate operation of pump units on successive cycles and to operate both units if one pump cannot handle load.
 13. Controls: NEMA 250, Type 1 enclosure, pedestal mounted, unless wall mounting is indicated; with two mercury-float switches in NEMA 250, Type 6 enclosures; mounting rod; and electric cables.

14. Controls: NEMA 250, Type 1 enclosure, pedestal mounted, unless wall mounting is indicated; with three mercury-float switches in NEMA 250, Type 6 enclosures; mounting rod; and electric cables. Include automatic alternator to alternate operation of pump units on successive cycles and to operate both units if one pump cannot handle load.
15. Controls: NEMA 250, Type 1 enclosure, pedestal-mounted float switch; with float, float rod, and rod buttons.
16. Controls: NEMA 250, Type 1 enclosure, pedestal-mounted float switch; with floats, float rods, and rod buttons. Include automatic alternator to alternate operation of pump units on successive cycles and to operate both units if one pump cannot handle load.
17. Float-Guide Pipe: Guide pipe or other restraint for floats and rods in basins of depth greater than 60 inches.
18. High-Water Alarm: [Cover-mounted, compression-probe alarm, with electric bell; 120-V ac, with transformer and contacts for remote alarm bell, unless battery operation is indicated][Rod-mounted, NEMA 250, Type 6 enclosure with micropressure-switch alarm matching control and electric bell; 120-V ac, with transformer and contacts for remote alarm bell, unless battery operation is indicated][Rod-mounted, NEMA 250, Type 6 enclosure with mercury-float-switch alarm matching control and electric bell; 120-V ac, with transformer and contacts for remote alarm bell, unless battery operation is indicated].

2.16 COMPACT, SUBMERSIBLE SUMP PUMPS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Grundfos Pumps Corp.
 2. Little Giant Pump Co.
 3. Weil Pump Co.
 4. Zoeller.
 5. Or Approved Equal.
- B. Description: Simplex, submersible, direct-connected sump pump.
1. Casing: Cast iron or stainless steel with metal inlet strainer. Include discharge companion flange suitable for plain-end pipe connection arranged for vertical discharge.
 2. Impeller: Cast iron, bronze, brass, or stainless steel.
 3. Casing: Cast iron with inlet strainer and discharge companion flange suitable for plain-end pipe connection arranged for vertical discharge.
 4. Impeller: Cast iron, bronze, brass or stainless steel.
 5. Construction: Stainless steel with stainless-steel or other corrosion-resistant impeller, stainless-steel inlet strainer, legs that elevate pump to permit flow into impeller, and discharge companion flange suitable for plain-end pipe connection arranged for vertical discharge.
 6. Pump and Motor Shaft: Steel, with factory-sealed, grease-lubricated ball bearings.
 7. Seal: Mechanical type.
 8. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; and three-conductor waterproof power cable of length required, with grounding plug and cable-sealing assembly for connection at pump.
 9. Pump Discharge Piping: Factory or field fabricated, ASTM A 53, Schedule 40, galvanized-steel pipe or copper tube.
 10. Cover: With holes and gaskets.
 11. Controls: NEMA 250, Type 6, 120-V ac, micropressure or mercury-float switches, mounted on discharge piping.

2.17 SUMP PUMP BASINS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. AK Industries, Inc.
 2. Armstrong Pumps, Inc.
 3. Ashland Plastics, Inc.
 4. Barnes Pumps, Inc.
 5. Federal Pump Corp.
 6. Fiberbasin, Inc.
 7. Goulds Pumps, Inc.
 8. Peerless Pump Co.
 9. Weil Pump Co.
 10. Or Approved Equal.
- B. Description: Factory fabricated with sump, pipe connections, and separate cover.
- C. Basin Sump: Fabricate watertight, with sidewall openings for pipe connections.
1. Material: [Fiberglass][Polyethylene][Steel, with bitumastic coating][Cast iron][Fiberglass, polyethylene, steel with bitumastic coating, or cast iron].
 2. Reinforcement: Mounting plates for pumps, fittings, and accessories.
 3. Anchor Flange: Same material as or compatible with basin sump, cast in or attached to sump, in location and of size required to anchor basin in concrete slab.
- D. Basin Cover: Fabricate with openings with gaskets, seals, and bushings, for access, pumps, pump shafts, control rods, discharge piping, vent connections, and power cables.
1. Material: [Fiberglass][Polyethylene][Steel, with bitumastic coating][Cast iron][Steel, with bitumastic coating or cast iron][Fiberglass, polyethylene, steel with bitumastic coating, or cast iron].
 2. Reinforcement: Steel or cast-iron reinforcement capable of supporting foot traffic for basins installed in foot-traffic areas.

2.18 SUMP PUMP PITS

- A. Description: Cast-in-place concrete with steel curb frames and covers. Refer to Division 03 Section "Cast-in Place Concrete."
- B. Curb Frames: Galvanized steel or steel with bitumastic coating of dimension to fit cover.
1. Pattern: [Angle-cross-section shape with flat top surface][Z-cross-section shape with raised outer rim of height matching cover for recessed mounting that will have installed cover flush with top of floor slab].
- C. Pit Cover: Fabricate with openings with gaskets, seals, and bushings, for access, pumps, pump shafts, control rods, discharge piping, vent connections, and power cables.

2.19 PACKAGED DRAINAGE PUMP UNITS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alyan Pump Co.
 2. Federal Pump Corp.
 3. Liberty Pumps.
 4. Little Giant Pump Co.
 5. Milton Roy Co.; Hartell Div.
 6. Myers: F.E. Myers Co.
 7. Sta-Rite Industries, Inc.
 8. Zoeller Pump Co.
 9. Or Approved Equal.
- B. Description: Packaged, automatic-operation, pedestal drainage pump; with aluminum or brass impeller, welded-steel or plastic basin, and float switch with 72-inch- minimum power cord and plug.
1. Motor: Mounted vertically on sump with built-in overload protection.
- C. Description: Packaged, automatic-operation, submersible drainage pump; with cast-iron body and brass impeller, plastic basin, and motor-mounted float switch with 72-inch- minimum power cord and plug.
1. Pump Seals: Mechanical type.
 2. Motor: Hermetically sealed, capacitor-start type, with built-in overload protection and three-conductor waterproof power cable of length required, with grounding plug and cable-sealing assembly for connection at pump.
- D. Description: Packaged, automatic-operation, submersible drainage pump; with plastic body, plastic impeller, plastic basin, and motor-mounted float switch with 72-inch- minimum power cord and plug.
1. Pump Seals: Mechanical type.
 2. Motor: Hermetically sealed, capacitor-start type, with built-in overload protection and three-conductor waterproof power cable of length required, with grounding plug and cable-sealing assembly for connection at pump.
 3. Basin: Watertight with inlet pipe connection and gastight cover with vent and pump discharge connections. Plug vent opening if vent piping connection is not required.
 4. Controls: Automatic, with mercury-float switches and electrical power cables.
 5. Pump Discharge Piping: Manufacturer's standard steel pipe, copper tube, or plastic pipe.
 6. Valves: Factory- or field-installed check and shutoff valves on each pump discharge.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of plumbing piping systems to verify actual locations of connections before pump installation.

3.2 WATER DISTRIBUTION PUMPS INSTALLATION

- A. Install pumps according to manufacturer's written instructions and with access for periodic maintenance, including removing motors, impellers, couplings, and accessories.
- B. Support pumps and piping so weight of piping is not supported by pumps.

- C. Suspend horizontal in-line pumps independent of piping. Use continuous-thread hanger rods and vibration isolation hangers of sufficient size to support pump weight. Fabricate brackets or supports as required.
- D. Suspend vertical in-line pumps independent of piping. Use continuous-thread hanger rods and vibration isolation hangers of sufficient size to support pump weight.

3.3 PACKAGED BOOSTER PUMPS INSTALLATION

- A. Install packaged booster pumps according to manufacturer's written instructions and with access for periodic maintenance, including removing motors, impellers, couplings, and accessories.
- B. Support packaged booster pumps using the following vibration-control devices, unless otherwise indicated.
 - 1. Install units with total of 7.5 hp or less, with rubber-isolator mount or spring-isolator vibration isolators.
 - 2. Install units with total of more than 7.5 hp, with concrete-filled, inertia-base vibration isolation bases and spring-isolator vibration isolators.
- C. Support connected piping so weight of water distribution piping is not supported by packaged booster pumps.

3.4 SEWAGE PUMPS INSTALLATION

- A. Install pumps according to manufacturer's written instructions.
- B. Install pumps and arrange to provide access for maintenance, including removal of motors, impellers, couplings, and accessories.
- C. Support piping so weight of piping is not supported by pumps.
- D. Wet-Pit-Mounted, Vertical Sewage Pumps: Suspend pumps from basin covers. Make direct connections to sanitary drainage piping.
- E. Submersible Sewage Pumps: Set pumps on basin floor. Make direct connections to sanitary drainage piping.
 - 1. Anchor quick-disconnect systems to bottom of basins and basin sidewalls or covers. Install pumps so pump and discharge pipe disconnecting flanges make positive seals when pumps are dropped into place.
- F. Sewage Pump Basins: Install basins and connect to drainage and vent piping. Brace interior of basins according to manufacturer's written instructions to prevent distortion or collapse during concrete placement. Set basin cover and fasten to basin top flange. Install cover so top surface is flush with finished floor.
- G. Packaged Pump Units: Install and make direct connections to drainage and vent piping.

3.5 SUMP PUMPS INSTALLATION

- A. Install pumps according to manufacturer's written instructions.

- B. Install pumps and arrange to provide access for maintenance, including removal of motors, impellers, couplings, and accessories.
- C. Support piping so weight of piping is not supported by pumps.
- D. Wet-Pit-Mounted, Vertical Sump Pumps: Suspend pumps from basin covers. Make direct connections to storm drainage piping.
- E. Submersible Sump Pumps: Set pumps on basin, pit, or sump floor. Make direct connections to storm drainage piping.
- F. Sump Pump Basins: Install basins and connect to storm drainage piping. Brace interior of basins according to manufacturer's written instructions to prevent distortion or collapse during concrete placement. Set basin cover and fasten to basin top flange. Install so top surface of cover is flush with finished floor.
- G. Sump Pump Pits: Construct concrete pits and connect to storm drainage piping. Set basin cover and fasten to top edge of concrete pit. Install so top surface of cover is flush with finished floor.
- H. Packaged Drainage Pump Units: Install and make direct connections to storm drainage piping.

3.6 WATER DISTRIBUTION PUMP CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties. The following are specific connection requirements:
 - 1. Connect water distribution piping to pumps. Install suction and discharge pipe equal to or greater than size of pump nozzles.
 - 2. Install shutoff valve and strainer on suction side of pumps, and check valve and throttling valve on discharge side of pumps. Install valves same size as connected piping.
 - 3. Install pressure gages at suction and discharge of pumps. Install at integral pressure-gage tappings where provided or install pressure-gage connectors in suction and discharge piping around pumps.

3.7 PACKAGED BOOSTER PUMP CONNECTIONS

- A. Piping installation requirements are specified in Division 22. Drawings indicate general arrangement of piping and specialties. The following are specific connection requirements:
 - 1. Connect water distribution piping to pumps. Install suction and discharge pipe equal to or greater than size of unit suction and discharge headers.
 - 2. Install flexible pipe connectors on piping connections to unit suction and discharge headers. Install flexible pipe connectors same size as piping.
 - 3. Install shutoff valves on piping connections to unit suction and discharge headers. Install valves same size as unit suction and discharge headers.

3.8 SEWAGE PUMP OR SUMP PUMP CONNECTIONS

- A. Drawings indicate general arrangement of piping and specialties. The following are specific connection requirements.

1. Install discharge pipe sizes equal to or greater than diameter of pump nozzles, and connect to storm drainage piping.
2. Install swing check valve and gate or ball valve on each sump pump discharge. Include spring-loaded or weighted-lever check valves for piping NPS 2-1/2 and larger.
3. Install swing check valve and gate or ball valve on each automatic, packaged pump discharge.

3.9 START-UP PROCEDURES

- A. Check suction piping connections for tightness.
- B. Clean strainers on suction piping.
- C. Controls: Set for automatic starting and stopping operation.
- D. Final Checks before Starting: Perform the following preventive maintenance operations:
 1. Lubricate oil-lubricated-type bearings.
 2. Verify that pump is free to rotate by hand and that pump for handling hot liquids is free to rotate with pump hot and cold. Do not operate pump if it is bound or drags, until cause of trouble is determined and corrected.
 3. Verify that pump controls are correct for required application.
- E. Starting procedure for pumps is as follows:
 1. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
 2. Open circulating line valve if pump should not be operated against dead shutoff.
 3. Start motor.
 4. Open discharge valve slowly.
 5. Check general mechanical operation of pump and motor.
 6. Close circulating line valve once there is sufficient flow through pump to prevent overheating.

3.10 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain pumps as specified below:
 1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining pumps.
 2. Review data in maintenance manuals.
 3. Schedule [xx-hours][xx-days] of training with Owner with at least seven days' advance notice.

END OF SECTION