

SECTION 213116
ELECTRIC-DRIVE, CENTRIFUGAL, FIRE PUMPS

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The specification sections "General Conditions of Contract", "Special Conditions" and "Division 1 - General Requirements" form a part of this section by this reference thereto, and shall have the same force and effect as if printed herewith in full.
- B. Additional Related Sections Include:
 - 1. Division 21 Section "Commissioning of Fire Protection" for commissioning of systems and equipment.

1.2 RELATED DOCUMENTS

- A. Section 210800 - Sprinkler Systems Commissioning

1.3 SUMMARY

- A. This Section includes electric-drive, in-line centrifugal packaged fire pump system including the following:
 - 1. Full-service, soft start, in-line vertical fire-pump with controllers and automatic transfer switches.
 - 2. Fire-pump accessories and specialties.
 - 3. Pressure-maintenance jockey pumps, controllers, accessories, and specialties.

1.4 PERFORMANCE REQUIREMENTS

- A. Delete this Article if not required or edit to suit Project.
 - 1. Pump, Equipment, Accessory, Specialty, and Piping Pressure Rating: 175-psig minimum working-pressure rating, unless otherwise indicated.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, certified pump performance curves with each selection point indicated, operating characteristics, and furnished accessories and specialties for each fire pump and pressure-maintenance pump.
- B. Shop Drawings: For fire pumps and drivers, fire-pump controllers, fire-pump accessories and specialties, pressure-maintenance pumps, pressure-maintenance-pump controllers, and pressure-maintenance-pump accessories and specialties. Include plans, elevations, sections, details, and attachments to other work.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Wiring Diagrams: Power, signal, and control wiring.
 - a. Product Certificates: For each type of fire pump and fire-pump controller, signed by product manufacturer.
 - b. Source quality-control test reports.
 - c. Field quality-control test reports.
 - d. Operation and Maintenance Data: For fire pumps and drivers, pressure-maintenance pumps, controllers, accessories and specialties, to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire pumps, pressure-maintenance pumps, and controllers through one source from a single manufacturer for each type of equipment.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of fire pumps, pressure-maintenance pumps, and controllers and are based on specific systems indicated. Refer to Division 1 Section "Product Requirements."
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with standards of authorities having jurisdiction pertaining to materials, hose threads, and installation.
- E. Comply with NFPA 20, "Stationary Pumps for Fire Protection," for fire pumps, drivers, controllers, accessories, and their installation.

1.7 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 PACKAGED CENTRIFUGAL FIRE PUMPS

- A. Description, General: Packaged fire pump unit, UL 448, factory-assembled and -tested, electric-drive, centrifugal fire pump system capable of furnishing not less than 150 percent of rated capacity at not less than 65 percent of total rated head and with shutoff head limited to 140 percent of total rated head.
1. Finish: Manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping.
 2. Nameplate: Complete with capacities, characteristics, and other pertinent data.
 3. Packaged Fire Pump System: Armstrong Pump Model VIL-6x4LA-F, or approved equal.
- B. In-Line Fire Pumps: Vertically mounted type with electric-motor driver directly mounted to pump casing.
1. Available Manufacturers: Subject to compliance with specified requirements provide products by one of the following, or equal products by another single manufacturer, as approved by the Professional in accordance with the requirements of the General Conditions of the Contract:
 - a. Armstrong Pump.
 - b. A-C Pump; ITT Industries.
 - c. Fairbanks Morse; Pentair Pump Group.
 - d. Patterson Pump Company.
 - e. Or equal as approved by the Professional.
 2. Pump: Radially split cast-iron casing with suction and discharge flanges machined to ASME B16.1, Class 125 dimensions, unless otherwise indicated.
 - a. Impeller: Cast bronze of construction to match fire pump, statically and dynamically balanced, and keyed to shaft.
 - b. Wear Rings: Replaceable, bronze.
 - c. Shaft and Sleeve: Steel shaft with bronze sleeve.
 - 1) Shaft Bearings: Grease-lubricated ball bearings in cast-iron housing.
 - 2) Seals: Stuffing box with minimum of four rings of graphite-impregnated braided yarn and bronze packing gland.
 3. Driver: UL-listed, NEMA MG 1, open-dripproof, squirrel-cage, induction motor complying with NFPA 20 and NFPA 70. Include wiring compatible with controller used.
 4. Available Manufacturers: Subject to compliance with specified requirements provide products by one of the following, or equal products by another single manufacturer, as approved by the Professional in accordance with the requirements of the General Conditions of the Contract:
 - a. Emerson; U.S. Electrical Motors.
 - b. Lincoln Electric Company (The).
 - c. Marathon Electric, Inc.
 - d. Or equal as approved by the Professional.
- C. Fire-Pump Characteristics and Specialty Data:
1. Fire-Pump:
 - a. Basis of Design: Patterson

- b. Rated Capacity: 500 gpm.
 - c. Total Rated Head: 95 ft/hd.
 - d. Inlet Size: 5-inch.
 - e. Outlet Size: 3-inch.
 - f. Outlet Flange Class: 125.
- 2. Speed: Same as driver.
- 3. Electric-Motor Driver: 20 hp, 3525 rpm, 3 phase, 60 Hz., 208 V.
- 4. Test Header Size: 4-inch.
- a. Hose Valves Required: Two.
 - b. Hose Valve Size: NPS 2-1/2.

2.3 FIRE-PUMP CONTROLLERS

- A. Fire-Pump Controllers, General: UL 218 and NFPA 20; listed for electric-drive, fire-pump service and service entrance; soft start, combined automatic and manual operation; factory assembled and wired; and factory tested for capacities and electrical characteristics.
 - 1. Available Manufacturers: Subject to compliance with specified requirements provide products by one of the following, or equal products by another single manufacturer, as approved by the Professional in accordance with the requirements of the General Conditions of the Contract:
 - a. Firetrol, Inc.
 - b. Hubbell Industrial Controls, Inc.
 - c. Joslyn Clark.
 - d. Master Control Systems, Inc.
 - e. Metron, Inc.
 - f. Or equal as approved by the Professional.
 - 2. Basis of Design: Master Control Systems, Inc.- Model #MCSTZ80-20-20
 - 3. Enclosure: UL 50, Type 2, dripproof, indoor, unless special-purpose enclosure is indicated. Include manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping.
 - 4. Controls, devices, alarms, functions, and operations listed in NFPA 20 as required for drivers and controller types used, and specific items listed.
 - a. Isolating means and circuit breaker.
 - b. "Power on" pilot lamp.
 - c. Fire-alarm system connections for indicating motor running condition, loss-of-line power, and line-power phase reversal.
 - d. Automatic and manual operation, and minimum run-time relay to prevent short cycling.
 - e. Water-pressure-actuated switch with independent high and low calibrated adjustments responsive to water pressure in fire-suppression piping.
 - f. Automatic and manual shutdown.
 - g. System pressure recorder, electric ac driven with spring backup.
 - 5. Nameplate: Complete with capacity, characteristics, approvals and listings, and other pertinent data.
 - 6. Controller Sensing Pipes: Fabricate pipe and fittings according to NFPA 20 with nonferrous-metal sensing piping, NPS 1/2, with globe valves for testing controller

mechanism from system to pump controller as indicated. Include bronze check valve with 3/32-inch orifice in clapper or ground-face union with noncorrosive diaphragm having 3/32-inch orifice.

B. Full-Service Rated Fire-Pump Controllers:

1. Type Starting: Soft start.

C. Automatic Transfer Switches: UL 218 and UL 1008 and requirements for and attached to fire-pump controllers. Include enclosure complying with UL 50, Type 2, with automatic transfer switch with rating at least equal to fire-pump driver-motor horsepower. Include ampere rating not less than 115 percent of motor full-load current and suitable for switching motor-locked rotor current.

2.4 FIRE-PUMP ACCESSORIES AND SPECIALTIES

A. Match fire-pump suction and discharge ratings as required for fire-pump capacity rating. Include the following:

1. Automatic air-release valve.
2. Circulation relief valve.
3. Suction and discharge pressure gages.
4. Eccentric-tapered reducer at suction inlet.
5. Concentric-tapered reducer at discharge outlet.
6. Test-Header Manifold: Ductile-iron or brass body for hose valves. Include nozzle outlets arranged in single line; horizontal, flush-wall mounting attachment; and rectangular, rough brass finish escutcheon plate with lettering equivalent to "PUMP TEST CONNECTION."
7. Hose Valves: UL 668, straightway pattern, and bronze with cap and chain. Include NFPA 1963 hose thread that complies with local fire department standards and finish same as for test-header-manifold escutcheon plate.
8. Ball Drip Valve: UL 1726.
9. Finish: Manufacturer's standard factory-applied red paint unless brass or other finish is specified.

2.5 PRESSURE-MAINTENANCE PUMPS

A. Pressure-Maintenance Jockey Pumps, General: Factory-assembled and -tested pumps with electric-motor driver, controller, and accessories and specialties. Include cast-iron or stainless-steel casing and bronze or stainless-steel impellers, mechanical seals, and suction and discharge flanges machined to ASME B16.1, Class 125 dimensions unless Class 250 flanges are indicated and except that connections may be threaded in sizes where flanges are not available.

1. Finish: Manufacturer's standard color paint applied to factory-assembled and -tested unit before shipping.
2. Nameplate: Complete with capacity, characteristics, and other pertinent data.
 - a. Multistage, Pressure-Maintenance Pumps: Multiple-impeller type complying with HI 1.1-1.2 and HI 1.3 requirements for multistage centrifugal pumps. Include base.
3. Available Manufacturers: Subject to compliance with specified requirements provide products by one of the following, or equal products by another single manufacturer, as approved by the Professional in accordance with the requirements of the General Conditions of the Contract:

- a. A-C Pump; ITT Industries.
 - b. Armstrong Darling, Inc.
 - c. Grundfos Pumps Corp.
 - d. Sterling Peerless Pump; Sterling Fluid Systems Group.
 - e. Taco, Inc.
 - f. Or equal as approved by the Professional.
 4. Basis of Design: Grundfos - Model #CR1-6343620-T
 5. Driver: NEMA MG 1, open-dripproof, squirrel-cage, induction motor complying with NFPA 20 and NFPA 70. Include wiring compatible with controller used.
- B. Controllers: UL 508; factory-assembled, -wired, and -tested, across-the-line type for combined automatic and manual operation.
1. Available Manufacturers: Subject to compliance with specified requirements provide products by one of the following, or equal products by another single manufacturer, as approved by the Professional in accordance with the requirements of the General Conditions of the Contract:
 - a. Firetrol, Inc.
 - b. Hubbell Industrial Controls, Inc.
 - c. Joslyn Clark.
 - d. Master Control Systems, Inc.
 - e. Metron, Inc.
 - f. Or equal as approved by the Professional.
 2. Basis of Design: Master Control Systems - Model # JPCV-3/4-3-20
 3. Enclosure: UL 508 and NEMA 250, Type 2, wall-mounting type for field electrical wiring.
 - a. Finish: Manufacturer's standard color paint applied to factory-assembled and -tested unit before shipping.
 4. Rate controller for scheduled horsepower and include the following:
 - a. Fusible disconnect switch.
 - b. Pressure switch.
 - c. Hand-off-auto selector switch.
 - d. Pilot light.
 - e. Running period timer.
- C. Accessories and Specialties: Match pressure-maintenance-pump suction and discharge ratings as required for pump capacity rating. Include the following:
1. Circulation relief valve.
 2. Suction and discharge pressure gages.
- D. Pressure-Maintenance-Pump Characteristics and Specialty Data:
1. Rated Capacity: 10 gpm.
 2. Total Rated Head: 54 psig.
 3. Pump Speed: 3450 rpm.
 4. Electric-Motor Driver Size: 0.75 hp, 3600 rpm, 3 phase, 60 Hz., 208 V.

2.6 ALARM PANELS

- A. Description: Factory-assembled and -wired remote panel complying with UL 508 and requirements in NFPA 20. Include audible and visible alarms matching controller type.
1. Available Manufacturers: Subject to compliance with specified requirements provide products by one of the following, or equal products by another single manufacturer, as approved by the Professional in accordance with the requirements of the General Conditions of the Contract:
 - a. Cutler-Hammer.
 - b. Firetrol, Inc.
 - c. Hubbell Industrial Controls, Inc.
 - d. Joslyn Clark.
 - e. Master Control Systems, Inc.
 - f. Metron, Inc.
 - g. Or equal as approved by the Professional.
 2. Enclosure: NEMA 250, Type 2, remote wall-mounting type.
 - a. Finish: Manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping.
 3. Features: Include manufacturer's standard features and the following:
 - a. Motor-operating condition.
 - b. Loss-of-line power.
 - c. Phase reversal.
 - d. Low-water alarm.

2.7 PRESSURE GAGES

- A. Description: UL 393, 3-1/2- to 4-1/2-inch-diameter dial with range of 0- to 250-psig minimum. Include caption "WATER" on dial face.
1. Available Manufacturers: Subject to compliance with specified requirements provide products by one of the following, or equal products by another single manufacturer, as approved by the Professional in accordance with the requirements of the General Conditions of the Contract:
 - a. AGF Manufacturing Co.
 - b. AMETEK, Inc.; U.S. Gauge.
 - c. Dresser Equipment Group; Instruments Div.
 - d. Marsh Bellofram.
 - e. Or equal as approved by the Professional.

2.8 GROUT

- A. Description: ASTM C 1107, 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, 28-day compressive strength.

2.9 SOURCE QUALITY CONTROL

- A. Test and inspect fire pumps with their controllers according to NFPA 20 for certified shop tests.
- B. Verification of Performance: Rate fire pumps according to requirements indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, concrete bases, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of fire pumps.
- B. Examine roughing-in for fire-suppression piping to verify actual locations of piping connections before fire-pump installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONCRETE BASES

- A. Coordinate sizes and locations of concrete bases. Verify structural requirements with structural engineer.
- B. Install concrete bases of dimensions indicated for fire pumps, pressure-maintenance pumps, and controllers. Refer to Division 21 Section "Common Work Results for Fire Protection."
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.
 - 2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
- C. Cast-in-place concrete materials and placement requirements are specified in Division 3.

3.3 INSTALLATION

- A. Install fire pump, pressure-maintenance pump, and controller according to NFPA 20.
- B. Install pumps and controllers to provide access for periodic maintenance including removal of motors, impellers, couplings, and accessories.
- C. Install suction and discharge piping equal to or greater than diameter of fire-pump nozzles.
- D. Install valves that are same size as piping connecting fire pumps, bypasses, test headers, and other piping systems.
- E. Install pressure gages on fire-pump suction and discharge at pressure-gage tapings.
- F. Support pumps and piping separately so weight of piping does not rest on pumps.

- G. Install piping accessories, hangers and supports, anchors, valves, meters and gages, and equipment supports.
- H. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted. Furnish copies of manufacturers' wiring diagram submittals to electrical Installer.

3.4 CONNECTIONS

- A. Install piping adjacent to pumps and equipment to allow service and maintenance.
- B. Connect controllers to pumps.
- C. Connect fire-pump controllers to building fire-alarm system. Refer to Division 26 Section "Fire Alarm Systems."
- D. Ground equipment according to Division 26 Section "Grounding and Bonding."
- E. Connect wiring according to Division 26 Section "Conductors and Cables."

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections. Report results in writing.
- B. Perform field tests for each fire pump when installation is complete. Comply with operating instructions and procedures in NFPA 20 to demonstrate compliance with requirements. Where possible, field correct malfunctioning equipment, then retest to demonstrate compliance. Replace equipment that cannot be satisfactorily corrected or that does not perform as indicated, then retest to demonstrate compliance. Verify that each fire pump performs as indicated.
- C. Perform the following field tests and inspections and prepare test reports:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Final Checks before Startup: Perform the following preventive-maintenance operations and checks:
 - a. Lubricate oil-lubrication-type bearings.
 - b. Remove grease-lubrication-type bearing covers, flush bearings with kerosene, and clean thoroughly. Fill with new lubricant according to manufacturer's written instructions.
 - c. Verify that pump is free to rotate by hand. If pump is bound or if it drags even slightly, do not operate until cause of trouble is determined and corrected.
 - 3. Starting procedure for pumps is as follows:
 - a. Prime pump by opening suction valve and closing drains, and prepare pump for operation.
 - b. Open sealing-liquid supply valves if pump is so fitted.
 - c. Start motor.
 - d. Open discharge valve slowly.

- e. Observe leakage from stuffing boxes and adjust sealing-liquid valve for proper flow to ensure lubrication of packing. Do not tighten gland immediately, but let packing run in before reducing leakage through stuffing boxes.
 - f. Check general mechanical operation of pump and motor.
- 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 5. Furnish fire hoses in number, size, and length required to reach storm drain or other acceptable location to dispose of fire-pump test water. Fire hoses are for field-acceptance tests only and are not property of the Client Agency.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Client Agency's maintenance personnel to adjust, operate, and maintain fire pumps, drivers, controllers, and pressure-maintenance pumps. Refer to Division 1 Section "Closeout Procedures or Demonstration and Training."

END OF SECTION