SECTION 21 31 13 - ELECTRIC-DRIVE, CENTRIFUGAL FIRE PUMPS

PART 1 - GENERAL

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

1.2 SUMMARY
A. Section Includes:
   1. Horizontally mounted, single-stage, split-case fire pumps.
   2. Fire-pump accessories and specialties.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product. Include rated capacities, operating characteristics, performance curves, electrical characteristics, and furnished specialties and accessories.
B. Shop Drawings: For fire pumps, motor drivers, and fire-pump accessories and specialties.
   1. Include plans, elevations, sections, and mounting and attachment details.
   2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS
A. Seismic Qualification Certificates: For fire pumps, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   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.
B. Product Certificates: For each type of fire pump, from manufacturer.
C. Source quality-control reports.
D. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire pumps to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS


B. Seismic Performance: Fire pumps shall withstand the effects of earthquake motions determined according to 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."

2. Component Importance Factor: 1.5.

C. Pump Equipment, Accessory, and Specialty Pressure Rating: 250 psig minimum unless higher pressure rating is indicated.

D. 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.

2.2 GENERAL REQUIREMENTS FOR CENTRIFUGAL FIRE PUMPS

A. Description: Factory-assembled and -tested fire-pump and driver unit.

B. Base: Fabricated and attached to fire-pump and driver unit, with reinforcement to resist movement of pump during seismic events when base is anchored to building substrate.

C. Finish: Red paint applied to factory-assembled and -tested unit before shipping.

2.3 HORIZONTALLY MOUNTED, SINGLE-STAGE, SPLIT-CASE FIRE PUMPS

A. Pump:

1. Standard: UL 448, for split-case pumps for fire service.
3. Impeller: Double suction, cast bronze, statically and dynamically balanced, and keyed to shaft.
5. Shaft and Sleeve: Alloy steel shaft with bronze sleeve.
   a. Shaft Bearings: Grease-lubricated ball bearings in cast-iron housing.
   b. Seals: Stuffing box with minimum of four rings of graphite-impregnated braided yarn and bronze packing gland.

6. Mounting: Pump and driver shafts are horizontal, with pump and driver on same base.

B. Coupling: Flexible and capable of absorbing torsional vibration and shaft misalignment. Include metal coupling guard.

C. Driver:
   1. Standard: UL 1004A.
   2. Type: Electric motor; NEMA MG 1, polyphase Design B.

D. Capacities and Characteristics:
   1. Rated Capacity: 2,500 gpm.
   2. Total Rated Head: 200 psig.
   3. Inlet Flange: Class 250.
   4. Outlet Flange: Class 250.
   5. Suction Head Available at Pump: 2 feet.
   7. Motor Speed: 1,785 rpm.
   8. Electrical Characteristics:
      a. Volts: 460 V.
      b. Phase: Three.
      c. Hertz: 60.
      d. Full-Load Amperes: 515 A.

2.4 FIRE-PUMP ACCESSORIES AND SPECIALTIES

A. Automatic Air-Release Valves: Comply with NFPA 20 for installation in fire-pump casing.

B. Circulation Relief Valves: UL 1478, brass, spring loaded; for installation in pump discharge piping.

C. Relief Valves:
   1. Description: UL 1478, bronze or cast iron, spring loaded; for installation in fire-suppression water-supply piping.

D. Inlet Fitting: Eccentric tapered reducer at pump suction inlet.
E. Outlet Fitting: Concentric tapered reducer at pump discharge outlet.

F. Discharge Cone: Closed or open type.

G. Hose Valve Manifold Assembly:
   5. Manifold:
      a. Test Connections: Comply with UL 405; however, provide outlets without clappers instead of inlets.
      b. Body: Exposed type, brass, with number of outlets required by NFPA 20.
      c. Escutcheon Plate: Brass or bronze; round.
      d. Hose Valves: UL 668, bronze, with outlet threaded according to NFPA 1963 and matching local fire-department threads. Include caps and chains.
      e. Exposed Parts Finish: Rough brass.
      f. Escutcheon Plate Marking: Equivalent to "FIRE PUMP TEST."

2.5 FLOWMETER SYSTEMS

A. Description: UL-listed or FM-Approved, fire-pump flowmeter system able to indicate flow to not less than 175 percent of fire-pump rated capacity.

B. Pressure Rating: 250 psig.

C. Sensor: Annubar probe, orifice plate, or venturi unless otherwise indicated. Sensor size shall match pipe, tubing, flowmeter, and fittings.

D. Permanently Mounted Flowmeter: Compatible with flow sensor; with dial not less than 4-1/2 inches in diameter. Include bracket or device for wall mounting.
   1. Tubing Package: NPS 1/8 or NPS 1/4 soft copper tubing with copper or brass fittings and valves.

2.6 GROUT


B. Characteristics: Nonshrink and recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.
2.7 SOURCE QUALITY CONTROL

A. Testing: Test and inspect fire pumps according to UL 448 requirements for "Operation Test" and "Manufacturing and Production Tests."

1. Verification of Performance: Rate fire pumps according to UL 448.

B. Fire pumps will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine equipment bases and anchorage provisions, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of fire pumps.

B. Examine roughing-in for fire-suppression piping systems to verify actual locations of piping connections before fire-pump installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Fire-Pump Installation Standard: Comply with NFPA 20 for installation of fire pumps, relief valves, and related components.

B. Equipment Mounting:

1. Install fire pumps on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete." Retain one of two subparagraphs below. Retain first for projects in seismic areas; retain second for projects not in seismic areas. Indicate vibration isolation and seismic-control device type and minimum deflection in supported equipment schedule on Drawings.

2. Comply with requirements for vibration isolation and seismic-control devices specified in Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."

C. Install fire-pump suction and discharge piping equal to or larger than sizes required by NFPA 20.

D. Support piping and pumps separately, so weight of piping does not rest on pumps.
E. Install valves that are same size as connecting piping. Comply with requirements for fire-protection valves specified in Section 211313 "Wet-Pipe Sprinkler Systems."

F. Install pressure gages on fire-pump suction and discharge flange pressure-gage tappings. Comply with requirements for pressure gages specified in Section 211313 "Wet-Pipe Sprinkler Systems."

G. Install piping hangers and supports, anchors, valves, gages, and equipment supports according to NFPA 20.

H. Install flowmeters and sensors. Install flowmeter-system components and make connections according to NFPA 20 and manufacturer's written instructions.

I. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not factory mounted. Furnish copies of manufacturers' wiring diagram submittals to electrical Installer.

J. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

3.3 ALIGNMENT

A. Align split-case pump and driver shafts after complete unit has been leveled on concrete base, grout has set, and anchor bolts have been tightened.

B. After alignment is correct, tighten anchor bolts evenly. Fill baseplate completely with grout, with metal blocks and shims or wedges in place. Tighten anchor bolts after grout has hardened. Check alignment and make required corrections.

C. Align piping connections.

D. Align pump and driver shafts for angular and parallel alignment according to HI 1.4 and to tolerances specified by manufacturer.

3.4 CONNECTIONS

A. Comply with requirements for piping and valves specified in Section 211313 "Wet-Pipe Sprinkler Systems." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to pumps and equipment to allow service and maintenance.

C. Connect relief-valve discharge to drainage piping or point of discharge.

D. Connect flowmeter-system meters, sensors, and valves to tubing.

E. Connect fire pumps to their controllers.
3.5 IDENTIFICATION

A. Identify system components. Comply with requirements for fire-pump marking according to NFPA 20.

3.6 FIELD QUALITY CONTROL

A. Test each fire pump with its controller as a unit. Comply with requirements for electric-motor-driver fire-pump controllers specified in Section 262933 "Controllers for Fire-Pump Drivers."

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative.
   1. After installing components, assemblies, and equipment, including controller, test for compliance with requirements.
   2. Test according to NFPA 20 for acceptance and performance testing.
   3. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   4. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Components, assemblies, and equipment will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

F. Furnish fire hoses in number, size, and length required to reach storm drain or other acceptable location to dispose of fire-pump test water. Hoses are for tests only and do not convey to Owner.

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.
   1. Complete installation and startup checks according to manufacturer's written instructions.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire pumps.

END OF SECTION 21 31 13