

SECTION 213113

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, split-case fire pumps.
 - 2. Fire-pump accessories and specialties.
 - 3. Flowmeter systems.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. 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. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring 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. Qualification Data: Comply with Division 21 Section "Water-Based Fire Suppression Systems".
- C. Product Certificates: For each fire pump, from manufacturer.
- D. Source quality-control reports.
- E. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 20.

1. Approval Test Report: For final fire pump system installation approval. Include the following:
 - a. Field test notes signed and dated by the Installer and Owner's representative; and including the following:
 - 1) Test start and stop times.
 - 2) Gauge and meter readings.
 - 3) Gauge and meter serial numbers for verification of calibration certificates.
 - 4) Serial numbers for fire pump, driver motor, pressure maintenance pump, and controllers.
 - 5) Completed checklist of visual inspections made.
 - 6) Visual observations of pump performance.
 - 7) Number of pump starts and stops including indication of power supply utilized as well as starting method (manual pressure drop, controller start button).
 - b. Manufacturer's certified pump curve.
 - c. Testing gauge calibration certificates.
 - d. Graph of unadjusted suction and discharge pressure readings over tested pressure range.
 - e. Separate graph of net pump boost adjusted for measured pump speed superimposed over manufacturers certified pump curve for comparison.
 - f. Summary sheet of equipment nameplate data, flow measurements, and pressure measurements.
 - g. Photographs of pump and testing gauge configuration and water discharge configuration.

F. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Record Drawings: Complete Shop Drawing re-submittal updated to reflect actual final system installation integral to Division 21 "Water-Based Fire Suppression Systems" record drawing submittal.
- B. Operation and Maintenance Data: For fire pumps to include in operation and maintenance manuals. Include the following:
 1. Manufacturer's certified pump curves.
 2. Fire pump acceptance test reports.
 3. Project specific summary of NFPA required inspections, testing and maintenance.
 4. Project specific summary of pump and driver recommended maintenance intervals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Comply with Division 21 Section "Water-Based Fire Suppression Systems".
- B. Certified Engineering Technician Qualifications: Comply with Division 21 Section "Water-Based Fire Suppression Systems".

- C. Delegated Design Professional Qualifications: Comply with Division 21 Section "Water-Based Fire Suppression Systems".
- D. Factory Testing: Pumps tested, inspected, and rated according to UL 448 requirements for "Operation Test" and "Manufacturing and Production Tests."
- E. Source Limitations: Obtain products for each product category from a single manufacturer.
- F. Product Standards: Listed in the "Fire Protection Equipment Directory" published by UL or the "Approval Guide" published by FM Global.
 - 1. Subject to compliance with requirements, indication of a UL product requirement within Part 2 shall be construed to be inclusive of a corresponding FM Global approved product, with or without UL listing.
- G. NFPA Compliance: Comply with NFPA 20 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-suppression water-service piping.
- H. 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.

1.7 COORDINATION

- A. Definition, "Coordinate": Where Sections of the Work interact, the Contractor responsible for this Section of the Work initiates verbal and/ or written communication with one or more different Contractors responsible for other interacting Sections of the Work for the purposes of establishing a coordinated approach of product selections and installation sequencing that satisfies the individual requirements of the interacting Sections of the Work as well as the requirements of the Work as a whole.
- B. Coordinate construction operations with those of other Sections of the Work and other entities to ensure efficient and orderly installation of each part of the Work.
 - 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 - 2. Coordinate electrical connections for the fire pump and controller, including control wiring between the controller and emergency generator with Division 26.
 - 3. Coordinate floor drain location for casing relief, air release and casing drains with Division 22.
- C. Coordinate operations and product selections of this Section with operations and product selections included in different Sections that depend on each other for proper installation, connection, and operation.
- D. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
- E. Coordinate installation of different components with other Sections of the Work to ensure maximum performance and accessibility for required maintenance, service, and repair.
- F. Make adequate provisions to accommodate items scheduled for later installation.
- G. Coordination Drawings: Contribute to preparation of Coordination Drawings; indicate facility fire suppression water service piping Work coordinated with other Sections of the Work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Comply with NFPA 20.

- 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".

- C. Pump Equipment, Accessory, and Specialty Pressure Rating: 175 psig minimum unless higher pressure rating is indicated.

2.2 HORIZONTALLY MOUNTED, SPLIT-CASE FIRE PUMPS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1. A-C Fire Pump Systems; a business of ITT Industries.
 - 2. Patterson Pump Company; a subsidiary of the Gorman-Rupp Company.
 - 3. Peerless Pump, Inc.
 - 4. Pentair Pump Group; Aurora Pump.

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

- C. 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.

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

- E. Pump:

- 1. Standard: UL 448, for split-case pumps for fire service.
 - 2. Casing: Axially split case, cast iron with ASME B16.1 pipe-flange connections.
 - 3. Impeller: Cast bronze, statically and dynamically balanced, and keyed to shaft.
 - 4. Wear Rings: Replaceable bronze.
 - 5. Shaft and Sleeve: 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 stainless-steel packing gland.

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

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

- 1. Coupling shall be UL-Listed and FM Approved for use with the connected fire pump.
 - 2. Failure of elastomeric components shall not prevent transfer of power from driver shaft to impeller shaft.

- G. Driver:

- 1. Standard: UL 1004A.
 - 2. Type: Electric motor; NEMA MG 1, polyphase Design B.
 - 3. Driver shall include grounding ring listed for use with fire pumps.

- H. Capacities and Characteristics:

1. Comply with Drawings.

2.3 FIRE-PUMP ACCESSORIES AND SPECIALTIES

- A. Automatic Air-Release Valves: Comply with NFPA 20 for installation in fire-pump casing.
- B. Casing Relief Valves: Comply with NFPA 20 for installation in fire-pump casing
- C. Inlet Fitting: Eccentric tapered reducer at pump suction inlet.
- D. Outlet Fitting: Concentric tapered reducer at pump discharge outlet.
- E. Discharge Cone: Closed or open type.
- F. Fire Pump Pressure Gauges
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMETEK; U.S. Gauge Division
 - b. Ashcroft, Inc.
 - c. Brecco Corporation
 - d. WIKA Instrument Corporation
 2. Approvals: Approved by authority having jurisdiction (AHJ); NRTL listing not required by NFPA 13 and NFPA 20.
 3. Type: Glycerin filled, bronze bourdon tube.
 4. Case Material: Stainless steel.
 5. Dial Size: 3 1/2"-inch diameter.
 6. Pressure Gage Range: 0 to 250 psig minimum.
 7. Water System Piping Gage: Include "WATER" label on dial face.
- G. Test Manifold Assembly:
 1. Standard: Comply with requirements in NFPA 20.
 2. Minimum Pressure Rating: 300 psig.
 3. Header Pipe Downstream of Test Valve: Schedule 40 galvanized-steel pipe with cut-groove ends, galvanized grooved fittings and couplings.
 4. Automatic Drain Valve: UL 1726.
 5. Manifold:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) American Fire Hose & Cabinet.
 - 2) Elkhart Brass Mfg. Company, Inc.
 - 3) Fire-End & Croker Corp.
 - 4) Guardian Fire Equipment, Inc.
 - 5) Potter Roemer Fire Pro.
 - b. Body Material: Cast brass.
 - c. Connection Style: Vertical NHS, free-standing.

- d. Outlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, and brass lugged swivel connections.
- e. Caps: Brass, lugged type, with gasket and chain.
- f. Escutcheon: Brass; with brass pipe sleeve for free-standing applications.
- g. Escutcheon Marking: Similar to "FIRE PUMP TEST" as approved by authority having jurisdiction.
- h. Exposed Parts Finish: Polished brass.

2.4 FLOWMETER SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Fire Research Corp.
 - 2. Gerand Engineering Co.
 - 3. Hydro Flow Products, Inc.
 - 4. Meriam Process Technologies.
 - 5. Reddy-Buffaloes Pump Company.
 - 6. Victaulic Company.
- B. Description: Fire-pump flowmeter system with capability to indicate flow to not less than 175 percent of fire-pump rated capacity.
- C. Minimum Pressure Rating: 300 psig.
- D. Sensor: Annubar probe, orifice plate, or venturi unless otherwise indicated. Sensor size shall match pipe, tubing, flowmeter, and fittings.
- E. 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.
- F. Portable Flowmeter: Compatible with flow sensor; with dial not less than 4-1/2 inches in diameter and with two 12-foot- long hoses in carrying case.

2.5 GROUT

- A. Comply with Division 21 "Common Work Results for Fire Suppression".

PART 3 - EXECUTION

3.1 PREPARATION

- A. Plan and coordinate pump base size and location with other affected Divisions prior to pouring of floor slab and equipment bases.
- B. Plan and coordinate fire pump room floor drain quantities and locations with Division 22 and other affected Divisions prior to pouring of floor slab and equipment bases.
- C. Plan and coordinate wiring between fire pump motor and controller with Division 26 and other affected Divisions prior to pouring of floor slab and equipment bases.

3.2 EXAMINATION

- A. Examine equipment bases and anchorage provisions, with Installer present, for compliance with requirements and for 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.

3.3 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 Division 03.
 - 2. Setting and leveling of pump frame shall be in accordance with manufacturers recommendations
 - 3. Grouting of pump frame shall be in accordance with manufacturers recommendations
 - 4. Comply with requirements for vibration isolation and seismic control devices specified in Division 21.
- C. Install fire-pump suction and discharge piping equal to or larger than sizes required by NFPA 20.
 - 1. All valves on suction side of fire pump shall be OS&Y gate valves; butterfly or other valve types shall not be utilized between water service entrance and fire pump suction flange.
- D. Support piping and pumps separately so weight of piping does not bear on pumps.
- E. Install valves that are same size as connecting piping. Comply with requirements for fire-protection valves specified in Division 21.
- F. Install pressure gages on fire-pump suction and discharge flange pressure-gage tappings. Comply with requirements for pressure gages specified in Division 21.
 - 1. Pressure gauges shall be installed on three way valves to allow for bleeding and flushing of gauge piping.
 - 2. Pressure gauges on pump supply and discharge connections shall be liquid filled type.
- G. Install piping hangers and supports, anchors, valves, gages, and equipment supports according to NFPA 20.
 - 1. Pipe stands shall be bolted to floor slab.
- H. Install flowmeters and sensors. Install flowmeter-system components and make connections according to NFPA 20 and manufacturer's written instructions.
- I. Pipe casing drains to floor drains.
- J. Automatic air release valves and casing relief valves shall be independently piped to a floor drain.
- K. Piping to floor drains shall be arranged to minimize tripping hazard and shall not impede access to pumps, drivers and/or controllers.

- L. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not factory mounted. Furnish copies of manufacturers' wiring diagram submittals to electrical Installer.
- M. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

3.4 PUMP STUFFING BOX

- A. Inspect fire pump packing prior to running.
- B. If pump is not installed within 60 days of delivery packing shall be replaced with new in accordance with manufacturer's installation requirements.
- C. Packing seal water flowrate shall be adjusted to provide a minimum 40 – 60 drips per minute in accordance with manufacturer's installation recommendations.

3.5 ALIGNMENT

- A. Engage fire pump manufacturer certified technician to laser-align split-case pumps and driver shafts.
 - 1. Straight edge, or other visual alignment methods shall not be utilized.
- B. After alignment is correct, tighten anchor bolts evenly. Fill baseplate completely with grout, with metal blocks and shims or wedges in place.
- C. After baseplate has been grouted coupling alignment shall be verified via laser-alignment and adjust as required.
- D. Align pump and driver shafts for angular and parallel alignment according to HI 1.4 and to tolerances specified by manufacturer.

3.6 CONNECTIONS

- A. Comply with requirements for piping and valves specified in Division 21. 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.

3.7 IDENTIFICATION

- A. Identify system components. Comply with requirements for fire-pump marking according to NFPA 20.
- B. Fire Pump Equipment Labels:
 - 1. Description: In addition to factory nameplates provide application-specific fire pump equipment labels.
 - a. Material: Label shall be custom engraved multilayer, multicolor, plastic labels for mechanical engraving in accordance with Division 21 "Identification for Fire Suppression Piping and Equipment".
 - 2. Indications: Labels shall indicate the following summary information:
 - a. Fire pump equipment designation as indicated by Contract Documents.

- b. Fire pump net pressure boost from manufacturer's certified curve at the following flowrates:
 - 1) 0% of rated capacity (no flow).
 - 2) 100% of rated capacity.
 - 3) 150% of rated capacity.
- c. Fire pump suction, discharge, and net-boost pressures as recorded during the system acceptance test at the following flowrates:
 - 1) 0% of rated capacity (no flow).
 - 2) 100% of rated capacity.
 - 3) 150% of rated capacity.
- d. Required flow and pressure at fire pump discharge to satisfy the most demanding sprinkler system design criteria.
- e. Required flow and pressure at fire pump discharge to satisfy the most demanding standpipe system design criteria.
- f. Fire pump motor rated horsepower and service factor.
- g. Fire pump required horsepower.
- h. Date of system acceptance test.
- i. Fire pump installer contact information.

3.8 FIELD QUALITY CONTROL

- A. Test each fire pump with its controller as a unit. Comply with requirements for controller for fire-pump drivers specified in Division 21.
- B. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Prior to final acceptance test with Owner and authority having jurisdiction (AHJ) perform preliminary testing to adjust system and correct deficiencies prior to final acceptance testing.
- D. Prior to running of fire pump, fire pump suction line shall be flushed via the system bypass with pump suction control valve closed.
- E. Tests and Inspections:
 - 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.

- F. Components, assemblies, and equipment will be considered defective if they do not pass tests and inspections.
- G. 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.
- H. All gauges used in testing shall have been calibrated within 12 months of performance of the acceptance tests. Copies of gauge calibration certificates shall be included with test report for record.
- I. At the conclusion of testing pump packing shall be inspected and flowrate adjusted as necessary to meet manufacturer's recommendations.
- J. Prepare test and inspection reports.

3.9 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.

3.10 DEMONSTRATION

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

END OF SECTION