

UNIVERSITY OF NORTH TEXAS

FIRE PUMPS SECTION 213000

PART 1 - GENERAL

1.1 SUMMARY

- A. This section addresses electric fire pump motors, fire and jockey pumps, respective related controllers and specialty accessories incorporated into a building fire sprinkler system.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- 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. Fire and jockey pump cut sheets with all pump capacities, UL/FM approval, pump characteristics, features and accessories clearly indicated. Include pump motor brand name and performance data.
 2. Pump curves with selection point clearly indicated.
 3. Fire and jockey pump motors must be listed for fire pump use and meet NFPA 20 standards. Provide Totally Enclosed, Fan Cooled (TEFC) fire pump motors. Provide complete motor specifications and data.
 - a. U.S. Motor is not an acceptable motor manufacturer for fire pump motors.
 4. Fire Pump Controller Automatic Transfer Switch and cut sheets with features and options clearly indicated, wiring diagrams, nameplate text and a written system operational sequence.
 5. Jockey pump controller wiring diagram.
- C. Product Certificates: For each fire pump, from manufacturer.
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. 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.
- B. NFPA Compliance: Comply with NFPA 20, "Installation of Stationary Pumps for Fire Protection."

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pumps, controllers, automatic transfer switch, and accessories in factory-fabricate water resistant wrapping.
- B. Handle pumps, controllers, automatic transfer switch, and accessories carefully to avoid damage to material components, enclosure, and finish.
- C. Store pumps, controllers, automatic transfer switch, and accessories in a clean, dry space and protect from the weather.

1.5 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Fire Pump:
 - a. S.A. Armstrong Limited.
 - b. A-C Fire Pump Systems; a business of ITT Industries.
 - c. Aurora.
 - d. Peerless Pump, Inc.
 - e. Patterson Pump Company; a subsidiary of the Gorman-Rupp Company.
 - 2. Electric Fire Pump Motor:
 - a. Lincoln
 - b. WEG
 - c. Marathon
 - 3. Jockey Pump:
 - a. Grundfos.
 - b. Goulds.
 - c. S.A. Armstrong Limited.
 - 4. Fire Pump Controller:
 - a. Master.
 - b. Firetrol, Inc.
 - c. Metron.
 - d. Torna Tech

2.2 ELECTRIC FIRE PUMP SYSTEM

- A. General:
 - 1. Provide a complete and operational fire pumping system consisting of horizontal split case electric fire pump, jockey pump, combination fire pump controller/automatic transfer switch, jockey pump controller, flow testing equipment and associated components as specified and as scheduled and shown on Drawings.
 - 2. Equipment furnished and the complete installation shall be in accordance with NFPA 20. Pump and controller/automatic transfer switch shall bear the UL label.
 - 3. Refer to schedule on Drawings for pump size and design characteristics. Size of the fire pump is to be based on flow test information.
- B. Fire Pump:
 - 1. Electric driven fire pump shall be a horizontal split case centrifugal type, UL Listed, FM-approved and in compliance with all requirements of NFPA 20.

2. Pump shall be of bronze-fitted construction with Class 30 cast iron casing, bronze impeller, renewable bronze sleeves and bronze wear rings, packed stuffing boxes and grease lubricated ball bearings in motor.
 3. Pump shaft shall be high strength steel.
 4. Pump shaft deflection shall not exceed 0.002 inch at the stuffing boxes when operating at ± 25 percent of the best operating point.
- C. Pump suction flange shall be rated for 125 psi working pressure on inlet side and the discharge flange shall be rated for 250 psi working pressure.
1. Fire pump shall be factory mounted on a pedestal and connected through a rigid split coupling. Motor shall have a 1.15 service factor shall be sized so as to not exceed the permissible loading limits of NFPA 20 at any point on the pump performance curve.
 2. Locked rotor current shall not exceed the values specified in NFPA 20.
 3. Each motor shall be of such capacity that at rated voltage under any pump operating condition, the full load ampere rating shall not be exceeded except as permitted by the service factor stamped on the motor nameplate.
 4. Motors shall be compatible with the specified motor controller.
 5. Motor electrical characteristics and capacity shall be as scheduled and shown on the Drawings.
- D. Fire pump capacity shall be as scheduled on Drawings.
- E. Pump shall be hydrostatically tested at 1.5 times the maximum working pressure but in no case less than 250 psig.
- F. Shutoff head of fire pump must exceed dead head of fire pump by 10 psi.
- G. Accessories:
1. Provide pump accessories per NFPA 20, including, but not limited to:
 - a. 3/4" minimum casing overheat relief.
 - b. 3-1/2" dial liquid filled compound suction pressure gauge.
 - c. 3-1/2" dial liquid filled discharge pressure gauge.
 - d. Eccentric tapered suction reducer.
 - e. Concentric tapered discharge increaser.
 - f. Base-mounted coupling guard.
 - g. Fire pump accessories shall be approved for domestic water use.
 - h. All relief drains to floor drains.
- H. Factory Testing: Fire pump shall be factory tested and certified in accordance with NFPA 20. Certified performance test results and curves shall be delivered to the Owner for review prior to final fire pump acceptance.
- I. Field Service: Pump supplier shall provide pump checkout, start-up, testing and adjusting of system components and shall perform field certification testing on the installed fire pump. The pump supplier shall also train the Owners Engineer in the proper operation and maintenance of the fire pump system.

2.3 FIRE PUMP CONTROLLER/AUTOMATIC TRANSFER SWITCH

- A. The fire pump controller/automatic transfer switch shall be of the combined manual and automatic type, solid state reduced voltage, minimum, 100,000 amp withstand rated, full service, and UL listed and FM approved per NFPA 20 currently enforced. The fire pump controller/automatic transfer switch shall be housed in a NEMA 2 floor-mounted, non-vented enclosure, mounted on a 4" thick concrete pad, and include the following:

1. Isolation switch with a separate NEMA operating handle interlocked with circuit breaker.
 2. Time delay circuit breaker set at 300 percent motor full load current with external LED supervised locked rotor protector, instant and time delay trip test switch, and external NEMA operator handle.
 3. Differential adjustable pressure switch with energize to start relay.
 4. Minimum run timer, 10 minutes non-adjustable, with timed out LED indicator.
 5. POWER AVAILABLE and PHASE REVERSAL pilot lights wired to the line side of the motor starter. Indicating lights shall be long life LEDs.
 6. Digital ammeter and voltmeter with three phase selector switch, calibrated traceable to NBS standards.
 7. Built in alarm panel and supervisory power pilot light powered from separate reliable 120 VAC power source with lights, bell, silence button, and lamp test switch for indication of PUMP RUNNING, POWER FAILURE, PHASE REVERSAL, TRANSFER SWITCH IN EMERGENCY, ISOLATION SWITCH OPEN. A status panel for start and run demands shall also be included. All indicating lights shall be long life LEDs with lamp test feature.
 8. START and STOP pushbuttons for manual control.
 9. Two sets each of dry form "C" contacts for remote indication at main fire alarm panel for PUMP RUNNING, POWER FAILURE, PHASE REVERSAL, TRANSFER SWITCH IN EMERGENCY, ISOLATION SWITCH OPEN, and SUPERVISORY POWER FAILURE.
 10. Digital paperless alarm recorder.
 11. Three non-fused control power transformers, surge protector wired to the load side of the isolation switch with short circuit protection, magnetic contactors with externally operable mechanical start mechanism, and restart delay timer.
 12. Automatic transfer switch housed in a separate compartment of the fire pump controller. The transfer switch shall have normal power light and monitors, emergency power light and monitor, test switch, and time delays for generator start, transfer to emergency, and retransfer to normal. All control and monitor components shall be individually serviceable. Unit shall have, as a minimum, a 5 year warranty on parts and a 2 year warranty on labor.
 13. The fire pump controller and transfer switch shall be for fire pump scheduled horsepower, UL 1008 listed, 3 phase motor, rating for highest low voltage (i.e. 208, 240, 460) available at site. Manufactured by Firetrol No. FTA1900, or approved equal by Master or Metron.
- B. The fire pump controller/ATS shall also have the following control functions:
1. Provide an interlock between the fire pump controller and ATS that will, when the fire pump is running, inhibit the automatic transfer switch from "TRANSFERRING-TO-NORMAL" power source as long as the fire pump is operating on the "EMERGENCY" source.
 2. Interlock control wiring from the Fire Pump Controller to the Fire Pump Automatic Transfer Switch shall be factory-installed.

2.4 FIRE PUMP WIRE

- A. Electrical wiring for fire pump, jockey pump and associated controllers shall be installed by a Texas Department of Licensing and Regulations (TDLR) registered and licensed Electrical Contractor.
- B. Electrical supply conductors for the fire pump motor shall be sized according to NFPA 70 for Fire Pumps.
- C. Electrical supply conductors for the fire pump motor shall be capable of maintaining integrity and operation for a minimum of two hours under fire exposure condition. Acceptable wire is as follows:

1. Lifeline[®] Power Cable RHW-2 Two-Hour Fire Resistive Cable;
2. VitaLink[®] MC Two Hour Fire Rated Power Cable.

2.5 FLOW TESTING EQUIPMENT

- A. The fire pump supplier shall furnish a FM approved flow meter for testing the fire pump.
- B. The flow meter shall be flanged venturi type BV as manufactured by Aeroquip, or approved equal.
- C. The installing contractor shall submit approval drawings of the proposed piping layout, which shall conform to the requirements prescribed by the flow meter manufacturer.

2.6 FIRE PUMP TEST HEADER

- A. Provide wall mounted ductile iron body outlet fire pump test connection, complete with polished chrome plated exposed surfaces, with plate lettered "Pump Test Connection".
- B. Chrome plated brass NRS hose gate valves, with loose bonnet caps and chains, 2-1/2 inch gate valves with local fire department threads, back outlet, manufactured by Potter Roemer No. 5864-D-2, or approved equal.

2.7 JOCKEY PUMP

- A. General: Provide a complete and operational electric driven fire jockey pump and jockey pump controller as specified herein and as scheduled and as shown on the Drawings.
- B. Pump:
 1. The jockey pump shall be a centrifugal multi-stage pump with stainless steel impeller and shaft, and cast iron base, and EPDM O-rings.
 2. Jockey pump capacities shall be as scheduled on the Drawings.
 3. Pumps, casings, flanges, and mechanical seals shall be rated for operation with the working pressures scheduled.
- C. The jockey pump shall be mounted on a fabricated cast iron drip lip base and shall be close-coupled or flexible coupled to an energy efficient, high efficiency open drip-proof motor. Motor electrical characteristics and capacity shall be as scheduled or listed on the drawings.
- D. Relief Valve: Provide the fire jockey pump with a factory-mounted bypass relief valve complete with piping. Set relief valve to relieve at a pressure of 25 psig above design total dynamic head to prevent motor overload and system damage.
- E. Jockey Pump Controller: The electric jockey pump controller shall be UL listed and NFPA 70 compliant. Unit shall include a circuit breaker, magnetic starter with overloads, 0-300 psig pressure switch, H-O-A selector switch, minimum run timer, dual fused control transformer, two sets of remote form "C" contacts for pump running, and a NEMA 2 enclosure, Master control Model PMC series, or Firetrol Model FTA500, or Metron.
- F. Field Service: The pump supplier shall provide pump checkout, start-up, testing and adjusting of system components and shall perform field certification testing on the installed jockey pump. The pump supplier shall also train the Owners Representatives in the proper operation and maintenance of the jockey pump system.

2.8 GROUT

- A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement 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.

2.9 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 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.

3.2 INSTALLATION

- A. Fire-Pump Installation Standard: Comply with NFPA 20 for installation of fire pumps, relief valves, and related components.
- B. Equipment Mounting: Install fire pumps and jockey pumps on concrete bases.
 - 1. Where not otherwise indicated, install 4 inch thick concrete foundation pads for indoor floor-mounted equipment, except where direct floor mounting is allowed by prior approval.
 - 2. For equipment mounted outdoors, provide concrete foundations a minimum of 6 inches above grade.
 - 3. Provide reinforcing steel as recommended by the structural engineer and as detailed on the Drawings.
 - 4. Pour pads on roughened floor slabs, sized so that outer edges extend a minimum of 3 inches beyond equipment. Trowel pads smooth and chamfer edges to a 1-inch bevel. Secure equipment to pads as recommended by the manufacturer.
 - 5. Anchor Bolts. Furnish and install galvanized anchor bolts for equipment placed on concrete equipment pads or on concrete slabs. Bolts shall be of the size and number recommended by the manufacturer of the equipment and shall be located by means of suitable templates. When equipment is placed on vibration isolators, the equipment shall be secured to the isolator and the isolator secured to the floor, pad, or support as recommended by the vibration isolation manufacturer.
 - a. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18" centers around the full perimeter of concrete base.

- b. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
- c. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
- d. Install anchor bolts to elevations required for proper attachment to supported equipment.
- 6. Setting of Equipment. Provide permanent and temporary shoring, anchoring, and bracing required to make parts stable and rigid; even when such shoring, anchoring, and bracing are not explicitly called for.
 - a. Equipment must be leveled and set plumb.
- 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.
- F. Install pressure gauges on fire-pump suction and discharge flange pressure-gauge tappings.
- G. Install piping hangers and supports, anchors, valves, gages, and equipment supports according to NFPA 20.
- H. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not factory mounted. Furnish copies of manufacturers' wiring diagram submittals to Electrical Contractor.
- I. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- J. Engage a factory-authorized service representative to perform startup service.
- K. Complete installation and startup checks according to manufacturer's written instructions.

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 and to tolerances specified by manufacturer.

3.4 CONNECTIONS

- A. Comply with requirements for piping and valves specified in Section 21 13 13, 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 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

Project Name, Project Location
Architect Name, Project No.

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- A. Test each fire pump with its controller as a unit.
- 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 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.
- D. 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.
 - 6. Components, assemblies, and equipment will be considered defective if they do not pass tests and inspections.
 - 7. Prepare test and inspection reports.
- E. 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 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire pumps. Coordinate training with Owner.
- B. Training of the Owner's operation and maintenance personnel is required in cooperation with the Owner's Representative. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems. The instruction shall be scheduled in coordination with the Owner's Representative after submission and approval of formal training plans.

END OF SECTION