SECTION 213113 – FIRE PUMPS AND CONTROLLERS

Latest Edition: 09-09-2022 See Underlined Text for Edits

(Engineer shall edit specifications and blue text in header to meet project requirements. This includes but is not limited to updating Equipment and/or Material Model Numbers indicated in the specifications and adding any additional specifications that may be required by the project. Also turn off all "Underlines".)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section and all other sections of Division 21.

1.2 SUMMARY

A. This section includes the requirements for the following:

1. Fire pumps.
2. Fire pump controllers and automatic transfer switches.
3. Pressure maintenance (jockey) pumps.
4. Pressure maintenance (jockey) pumps controllers.
5. Fire pump test header.
6. Concrete housekeeping pads.
7. Grout.

1.3 ACTION SUBMITTALS

A. Product Data: For each specified product, include manufacturers cut sheets, dimensional data, 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 as part of the shop drawing requirements for Division 21 Specification Section "Fire Protection Sprinkler and Standpipe Systems".

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Include a copy of each approved submittal along with any applicable maintenance data in the project operation and maintenance manual.

B. Product Certificates: For each fire pump, from manufacturer.

1.5 QUALITY ASSURANCE

A. All fire pumps, controllers, and accessories shall be installed using new materials designed and built in accordance with the best practices of the industry. Each major piece of equipment shall bear the manufacturer's name, serial number, UL label, maintenance instructions, etc., if applicable.

B. Each item shall be capable of performing its function over an extended period of time with minimum attention and maintenance.

C. 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.

D. NFPA Compliance: Comply with NFPA 20, "Standard for the Installation of Stationary Pumps for Fire Protection."

1.6 COORDINATION

A. Coordinate sizes and locations of concrete pads with equipment provided.

1.7 WARRANTY/GUARENTEE

A. See Division 21 Specification Section "Basic Fire Protection Requirements" for warranty and guarantee requirements.

PART 2 - PRODUCTS

2.1 GENERAL PRODUCTS REQUIREMENTS

A. Equipment Design and Selection: Fire Pump, jockey pump, controls and specialties shall be designed and selected, for the intended use, in accordance with the scheduled capacities on the drawings and the requirements of this specification.

B. Acceptable Manufacturers: Subject to compliance with requirements, provide products as follows:

1. Fire Pump: Provide the fire pump by one (1) of the following manufacturers:
   a. Aurora.
   b. Fairbanks-Morse.
   c. Patterson.
   d. Peerless.

2. Fire Pump Controller with Integral Automatic Transfer Switch: Provide the fire pump controller with integral automatic transfer switch by one (1) of the following manufacturers:

a. Firetrol.
b. Hubbell.
c. Tornatech

3. Fire Pump Controller Integral Automatic Transfer Switch: Provide integral fire pump automatic transfer switch for the pump controller by one (1) of the following manufacturers:

a. ASCO Power Technologies.
b. Square D.
c. ABB.

4. Jockey Pump: Provide the jockey pump controller by one (1) of the following manufacturers:
a. Aurora.
b. Fairbanks-Morse.
c. Patterson.

5. Jockey Pump Controller: Provide the jockey pump controller by one (1) of the following manufacturers:
a. Firetrol.
b. Sylvania.

C. Fire Pump Test Header: Provide the fire pump test header by Potter-Roemer Series 586 Fire Pump Test Header Assembly.

2.2 FIRE PUMP

A. Furnish and install Fire Pump System where shown on drawings, complete with pump, electric driver, controller and all related accessories. The pump unit shall be UL listed and FM approved. The fire pump shall be of capacity indicated on drawings.

B. Fire pump manufacturer shall assume unit responsibility and shall provide the services of a factory trained engineer to supervise the fire pump installation and also be available to conduct final field testing and acceptance.

C. The fire pump unit shall include the following accessories:

1. Eccentric tapered suction reducer.
2. Concentric tapered discharge increaser.
3. Coupling guard.
4. Hose valves.
5. Caps and chains.
6. Fire pump test header.
7. Pressure gauges.

8. Circulation relief valve.
9. Automatic air release valve.
10. Balldrip valve.

D. Performance Requirements:

1. Fire pump shall deliver not less than 65% of the rated pressure while performing at 150% of rated capacity.
2. Fire pump shutoff pressure shall not exceed 120% of rated pressure.
3. Fire pump maximum speed shall not be less than 3,560 RPM.
4. Locked rotor current shall not exceed the values specified in NFPA 20.
5. Capacities and Characteristics: For capacity and power requirements see drawings.
6. Fire pump start pressure shall be 5 psi less than the pressure maintenance pump start point.
7. Fire pump motor shall be completely assembled, wired and tested by the manufacturer before shipment from the factory. Fire pump, controller(s), and all accessories shall be purchased under a unit contract. Fire pump shall be given a complete performance test with Positive Suction Pressure. Certified performance curves for both conditions shall be prepared and submitted for approval prior to shipment. Fire pump shall also be hydrostatically tested to twice the shutoff pressure, but in no case less than 250 psi.

E. Fire Pump Construction:

1. Fire pump shall be a horizontal base mounted, horizontal split case, bronze fitted, single stage, double suction centrifugal unit.
2. Casing shall be of cast iron having a minimum tensile strength of 35,000 pounds. Bearing housing supports, suction and discharge flanges shall be integrally cast with lower half of casing. Removal of the upper half of the casing must allow the rotating element to be removed without disconnecting the suction and discharge flanges.
3. Impellers shall be of the enclosed type of vacuum cast bronze. Impellers shall be dynamically balanced, keyed to the drive shaft and held in place with threaded shaft sleeves.
4. Fire pump shaft shall be made of SAE 1045 steel or equal, accurately machined to give a true running rotating element. The shaft shall be protected by bronze sleeves which shall be key-locked and threaded so that the sleeves tighten with the rotation of the shaft. A gasket shall seal between the impeller hub and the shaft to protect the pump shaft.
5. The electric driver shall be a horizontal mounted, open drip proof ball bearing type, AC induction squirrel cage motor, wound for 460 volts-3 phase-60 cycles.
6. The fire pump shall be equipped with renewable casing rings designed such that hydraulic pressure will seat the rings against a shoulder in the pump case around the full periphery of the wearing ring. The wearing ring shall be locked in place by dowling to prevent rotation. The rotating element shall use grease lubricated

ball bearings and shall be equipped with water slingers. Bearing housings shall be designed to flush the lubricant through the bearings.

7. All packed pumps shall be provided with a lantern ring connected to the pressure side of the fire pump by cored passage in the parting flange of the pump. Stuffing boxes shall be equipped with split packing glands designed for easy removal for packing inspection and maintenance.

2.3 FIRE PUMP CONTROLLER WITH INTEGRAL AUTOMATIC TRANSFER SWITCH

A. The complete assembly consisting of fire pump controller with integral automatic transfer switch shall be listed for fire pump service.

B. Fire Pump Controller Performance Requirements:

1. The fire pump controller shall be combined manual/automatic type suitable for open transition wye-delta starting. Fire pump controller shall be a completely factory assembled, wired unit specifically meeting the requirements of NFPA 20 and NFPA 70. The controller shall be UL listed and FM approved and be supplied in a NEMA Type 3R enclosure. The fire pump controller shall be tested by the manufacturer prior to shipment from the factory and shall be identified as a "Fire Pump Controller".
2. The fire pump controller shall be rated for fire-pump-driver horsepower.
3. The fire pump controller shall have both an isolating switch and a circuit breaker that are motor rated and capable of interrupting the motor locked rotor current. Isolation switch and circuit breaker assembly shall be mechanically interlocked to operate with a single externally operated handle, with the enclosure door open or closed. Operating assembly shall also be mechanically interlocked to the enclosure door.
4. The circuit breaker shall accommodate a short circuit potential of not less than 100,000 amperes RMS at 480 volts. Circuit breaker trip functions shall be self-contained within the circuit breaker case and not require additional current transformers or voltage sources to accomplish the trip function. Circuit breaker trip curve adjustments shall be capable of being field tested after field installation to verify pick-up, locked rotor, and instantaneous trip points without disturbing line or load wiring.
5. The fire pump controller shall have a front mounted "Power On" pilot light, a "Start" and "Stop" push-button, and an "Emergency Run" mechanism. The "Power On" light shall indicate loss of control transformer power as well as line power. An ATA200C factory-installed alarm system shall be provided, giving an audible alarm for "Pump Running" or "Power Failure", and a visual alarm for "Supervisory Power Failure". Additional power failure and pump running alarm contacts shall also be wired to terminals for remote alarm at fire alarm control panel as provided in Division 28.
6. Method of Automatic Start: A water-pressure-actuated switch and pressure transducer with independent high- and low-calibrated adjustments responsive to

water pressure in fire-protection piping shall be provided with a minimum pressure differential setting of 6 psi. A minimum running period timer shall be provided.

7. Method of Stopping: Automatic and nonautomatic shutdown after automatic starting.
8. VFD's: VFD's shall not be used in fire pump controllers.

C. Fire Pump Automatic Transfer Switch Requirements:

1. Automatic transfer switch shall accommodate short circuit of 35,000 amperes RMS.
2. Automatic transfer switch shall be housed in a dedicated compartment of the fire pump controller identified as "Automatic Transfer Switch". Built-in emergency power transfer switch equipment shall be factory-assembled, wired and tested as a unit. Built-in emergency power transfer switch equipment shall be furnished with the fire pump controller, specifically meeting the requirements of NFPA 20 and NFPA 70. Automatic transfer switch equipment shall be UL listed and FM approved and be supplied in a NEMA Type 4 enclosure.
3. Automatic transfer switch sensing circuitry shall be capable of sensing both normal and emergency power sources. Normal power source pick-up shall be set to 95% and the drop-out at 85% for nominal voltage. Emergency power source shall be set to pick-up at 90% nominal voltage and 95% frequency. Transfer signal shall be delayed for one second to override momentary normal power outages, delaying the transfer and engine start signals.
4. A normally open and normally closed auxiliary contact shall be provided for engine starting if normal power failure occurs. Auxiliary contacts shall also be wired to terminals to indicate the transfer switch position for remote alarm at fire alarm control panel provided by Division 28. Automatic transfer switch shall be electrically operated and also capable of being operated by manual transfer at the switch under load.
5. Automatic Transfer Switch shall have separate pilot lights for "Transfer Switch Normal", "Transfer Switch Emergency", and "Emergency Isolating Switch Off" shall be provided. Test and transfer bypass switches, an alarm bell, and a "Silence Alarm" push-button shall be mounted on the front of the enclosure.

2.4 PRESSURE MAINTENANCE (JOCKEY) PUMPS

A. Furnish and install Pressure Maintenance Pump with capacity and electrical characteristics where shown on drawings, complete with pump, electric driver, controller and all related accessories. The pump unit shall be UL listed and FM approved.

B. Pressure maintenance pump shall be equipped with mechanical seals and open drip proof motor.

C. The pressure maintenance pump controller shall be installed in NEMA 4 enclosure. Pressure maintenance pump controller shall include fusible disconnect switch, magnetic

A-T-L starter, control transformer, H-O-A selector switch, and necessary circuitry to provide automatic start and stop from pressure switch. Pressure relief valve and pressure gauges shall be provided in system.

D. Pressure maintenance pump stop point shall equal the sum of the fire pump churn pressure and minimum static supply pressure.

E. Pressure maintenance pump start point shall be no less than 10 psi less than the pressure maintenance pump stop point.

2.5 PRESSURE MAINTENANCE (JOCKEY) PUMP CONTROLLERS

A. The pressure maintenance pump controller shall be a completely factory assembled, wired unit specifically meeting the requirements of NFPA 20 and NFPA 70. The controller shall be UL listed and FM approved and be supplied in a NEMA Type 3R enclosure.

B. The fire pump controller shall be tested by the manufacturer prior to shipment from the factory and shall be identified as a "Jockey Pump Controller".

C. Rate controller for scheduled horsepower and include the following:

1. Fusible disconnect switch.
2. Pressure switch.
3. H-O-A selector switch.
4. Pilot light.
5. Running period timer.

2.6 FIRE PUMP TEST HEADER

A. Fire Pump Test Header Construction:

1. Test header assembly shall have a cast-brass assembly body and hose gate-type test valves.
2. The hose gate-type test valves shall be turned over to UMB.
3. The number of test ports shall be determined with consideration for the capacity of the installed fire pump. Each test port shall have a flow capacity of 250 gpm.
4. Wall plate shall have polished chrome-plated finish with polished chrome-plated caps and chain for each test port. Wall plate shall be lettered "FIRE PUMP TEST HEADER". The ductile iron body of the wall assembly shall have either side inlet or back inlet threaded connection as required as part of the fire protection piping design.
5. Coordinate the location of the test header with the University and the UMB Fire Marshal during the project design phase.

2.7 CONCRETE HOUSEKEEPING PADS

A. Provide concrete required for housekeeping pads under Division 23 unless otherwise noted.

B. Concrete shall be 3,500 psi twenty-eight (28) day compressive strength concrete and reinforcement bars as specified in the architectural specifications.

2.8 GROUT

A. Grout shall be non-shrink, high strength type, free of iron or chlorides and suitable for use in contact with all metals, without caps or other protective finishes complying with ASTM C 1107, Grade B and the following:

1. Characteristics: Post hardening, volume adjusting, dry, hydraulic cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5,000 psi (34.50MPa), twenty eight (28) day compressive strength.
3. Packaging: Premixed and factory-packaged.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Install all equipment, valves, fittings, and controls as required in accordance with NFPA 13, NFPA 20 and NFPA 70.

B. The work under this contract shall be coordinated with that of all trades so that all work may be installed in the most direct and workmanlike manner and so that interference between piping, ducts, equipment, architectural and structural features will be avoided.

C. The fire pump contractor shall install all supervisory devices and other system equipment designed to be electrically interconnected with into the building fire alarm system but shall not inter-connect to the fire alarm system.

D. All electrical devices incorporating electrical components installed by the fire pump contractor as part of the Fire Pump System shall be interconnected electrically under another section of these specifications.

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 FIRE PUMP

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

B. The fire pump and electric motor shall be securely mounted with bolts on a common base of formed steel. Pump and motor shall be inspected for proper alignment after the unit has been installed on its base and grouted in place.

C. Support piping and fire pump separately so weight of piping does not rest on fire pump.

3.4 PRESSURE MAINTENANCE (JOCKEY) PUMP

A. The pressure maintenance pump and electric motor shall be securely mounted with bolts on a common base of formed steel. Pump and motor shall be inspected for proper alignment after the unit has been installed on its base and grouted in place.

3.5 FIRE PUMP AND PRESSURE MAINTENANCE PUMP CONTROLLER

A. All required wiring between pumps, controls and control panel shall be the responsibility of the Contractor.

3.6 FIRE PUMP TEST HEADER

A. Install the fire pump test header were indicated on the contract design documents. Fire pump test header shall be installed level and aligned with the horizontal and vertical edges of adjacent exterior building finishes such as brick, stone, pre-cast panels, etc. Seal the perimeter of the test header with an approved exterior sealant for a water/weatherproof installation.

3.7 CONCRETE HOUSEKEEPING PADS

A. General: Construct concrete housekeeping pads to support equipment were indicated and as detailed on the drawings and as specified herein. Engage the services of the Structural or General Contractor, and pay for them, to provide the concrete housekeeping pads. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations.

B. Housekeeping Pads: Set all floor-mounted equipment on four (4) inch high concrete housekeeping pads, unless otherwise shown or specified.

1. Housekeeping Pads: Pads shall be a minimum of four (4) inches wider and longer than vibration isolation base or structural base of equipment being set on pad.

3.8 GROUTING

A. Install nonmetallic nonshrink grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's printed instructions.

B. Clean surfaces that will come into contact with grout.

C. Provide forms for placement of grout, as required.

D. Avoid air entrapment when placing grout.

E. Place grout to completely fill equipment bases.

F. Place grout on concrete bases to provide a smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout according to manufacturer's printed instructions.

3.9 HOLE SAW DISCS

A. If the contractor is required to make openings in the piping by means of a hole saw, the contractor shall remove the resultant discs (slugs) and hang the discs adjacent to the hole cut. Failure by the contractor to display discs will result in the contractor being required to disassemble the sprinkler system to satisfy the Engineer that the discs are not in the fire protection system piping.

3.10 INSTALLATION, TESTING, AND ACCEPTANCE

A. Installation, testing, and final acceptance shall be in accordance with all applicable codes and the UMB Fire Marshal.

B. All required tests shall be performed by the contractor as part of this contract. The contractor shall see that proper representatives of the Owner, the Engineer, the UMB Fire Marshal, and Office of Facilities Management, and anyone else desiring to witness the tests shall be informed no less than five (5) business days prior to the scheduled test time.

C. Fire Pump Acceptance Test

1. When fire pump(s) are completely installed, make arrangements for fire pump acceptance test as follows:

a. Set date and time that is satisfactory to the Engineer, UMB Fire Marshal, and Fire Pump Manufacturer, who shall witness the tests.
b. Provide the following equipment properly connected for tests:

1) Ammeter
2) Voltmeter
3) Tachometer

c. Test quality water pressure gauges.
d. Pretest pumps in the field at least one day before acceptance test and make necessary adjustments.

2. The following materials shall be furnished to the University by the contractor at the conclusion of the final acceptance test:

a. Operating and maintenance instructions of fire pump(s), controllers, etc.
b. Acceptance test results.

3.11 FIELD QUALITY CONTROL – FIRE PUMP SYSTEMS

A. Manufacturer's Field Service: Provide services of factory-authorized service representative to supervise field assembly of components, installation of fire pump units and pressure-maintenance pump units, including piping and electrical connections, field acceptance tests. Report test results in writing.

B. Check suction line connections for tightness to avoid drawing air into pumps.

C. Perform field-acceptance tests for each fire pump unit (fire pump, driver, and controller) and system piping when fire pump unit installation is complete. Comply with operating instructions and procedures of 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 specified and as indicated, then retest to demonstrate compliance. Verify that each fire pump unit performs as specified and as indicated.

END OF SECTION 213113