SECTION 21 31 13 – fire pumps

1. GENERAL
   * + 1. RELATED DOCUMENTS
          1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
          2. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.
       2. SUMMARY
          1. This Section covers providing all labor and materials for the installation of electric motor driven fire and jockey pumps complete with controllers, valves, piping, supports, alarms and supplementary items necessary for a complete, operational, code compliant and approved system.
       3. REFERENCE STANDARDS
          1. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
          2. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
          3. All materials, installation and Workmanship shall comply with the applicable requirements and standards addressed within the following references:

Factory Mutual System (FM) - Approval Guide and Loss Prevention Data Sheets

NEMA MG‑1 ‑ Motors and Generators

NEMA 250 ‑ Enclosures for Electrical Equipment (1000 Volt Maximum)

NFPA 20 ‑ Installation of Centrifugal Fire Pumps

NFPA 70 – National Electric Code

UL ‑ Fire Protection Equipment Directory

UL 448 ‑ Pumps for Fire Protection Service

UL 778 ‑ Motor Operated Water Pumps

UL 1478 ‑ Fire Pump Relief Valves

* + - 1. regulatory requirements
         1. Conform to NFPA 20 and FM Data Sheet 3-7N for installation and testing of fire pumps, drivers and controllers.
         2. State of Missouri, State Fire Marshal Rules
         3. Authorities Having Jurisdiction (AHJ), Fire Department Standards
      2. QUALITY ASSURANCE
         1. Perform Work in accordance with NFPA 20 and FM Guidelines.
         2. Obtain and become familiar with requirements of Owner's insurance underwriter and incorporate all applicable provisions for compliance.
         3. Thoroughly and clearly document all Project related communications with code and regulatory agents and expediently forward communication documentation to the BJC Project Manager.
         4. Equipment and components shall bear UL and FM label or marking.
         5. Maintain at least one copy of all system related documents on Site.
         6. Manufacturer’s Qualifications: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience. The manufacturer shall supply all necessary pump accessories (controller, driver and accessories, gauges, etc.) to provide a complete pump installation, as detailed in FM Global Property Loss Prevention Data Sheets. The pump manufacturer shall be held accountable for the complete pump package and installation.
         7. Installer's Qualifications: The system shall be installed by a firm having minimum three years experience regularly engaged in the installation of automatic fire pump systems in accordance with requirements of the National Fire Protection Association and the State of Missouri Fire Marshal’s office.
         8. The manufacturer of the fire pump system shall be responsible for compliance with all applicable codes.
      3. SUBMITTALS
         1. General:

No Work shall be performed until the Shop Drawings, calculations and product data have been approved by BJC PD&C and the project fire protection engineer consultant.. This will require early processing of all submittals. The Contractor is solely liable for any Work performed or material purchases made prior to this approval.

* + - * 1. Product Data:

Provide manufacturers literature including general assembly, pump curves showing performance characteristics with pump and system with operating point indicated, NPSH curve, controls, wiring diagrams, and service connections.

* + - * 1. Record Documents:

Shop Drawings: Indicate layout, general assembly, components, dimensions, weights, clearances, and methods of assembly.

Manufacturer's Certificate: Certify that fire pump(s) meet or exceed specified requirements at specified operating conditions. Submit summary and results of shop tests performed in accordance with NFPA 20.

Field Reports: Indicate summary of hydrostatic test and field acceptance tests performed in accordance with NFPA 20.

Manufacturer's Installation Instruction: Indicate support details, connection requirements, and include start‑up instructions for fire pump system.

Provide certificate of compliance from authority having jurisdiction indicating approval of field acceptance tests.

Provide full written description of manufacturer’s warranty.

* + - * 1. Operation and Maintenance Data:

A complete set of instructions covering the installation, maintenance and operation of the fire pump system shall be bound in booklet form and furnished to the Owner.

Operation Data: Include manufacturer’s instructions, start‑up data, trouble‑shooting check lists, for pumps, drivers, and controllers.

Maintenance Data: Include manufacturer’s literature, cleaning procedures, preventive maintenance recommendations and procedures, replacement parts lists, and repair data for pumps, drivers and controllers.

* + - 1. DELIVERY, STORAGE and HANDLING
         1. Accept fire pumps and components on site in factory packing. Inspect for damage. Comply with manufacturers rigging and installation instructions.
         2. Protect fire pumps and components from physical damage including effects of weather, water, and construction debris.
         3. Provide temporary inlet and outlet caps, and maintain in place until installation.
      2. maintenance service
         1. Furnish service and maintenance of fire pump, driver, and controller for one year from date of Substantial Completion.
         2. Provide one complete set of gaskets, screens and seals for each pump type and model supplied.

1. PRODUCTS
   * + 1. GENERAL
          1. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
          2. Pressure ratings of pumps, pipe, fittings, valves, gauges and all other water carrying appurtenances shall be suitable for the anticipated system pressures in which they are installed.
          3. The Contractor shall ascertain for himself the space and access available for the installation of a factory assembled packaged unit and as an option may assemble the various components in place at the Site in lieu of providing a factory assembled unit. However, all components of the system shall be compatible and be furnished by a single source manufacturer and all electrical services and interconnecting equipment wiring must be provided for within this Contractors bid.
          4. All of the equipment listed herein, shall be mounted on a structural steel base that is equipped with grout holes. All wiring and piping including pressure sensing lines, bypass with check valve and shut-off valves, as well as approved pump suction and discharge valves shall be furnished firmly anchored to the steel base by means of structural steel supports and arranged such that single point connections are required for piping and power supply.
          5. The packaged pumping system shall include all electrical wiring between components and shall be completed and tested at the factory prior to shipment. The entire assembly shall be painted red after hydrostatic and electrical tests.
          6. All pilot lights and visual indicators shall be illuminated from the rear by long life LED lamps. Neon and incandescent lamps are not acceptable.
          7. All similar components shall be of one manufacturer, (i.e., controllers).
          8. Refer to fire and jockey pump schedules on Contract Drawings for required pump capacities and electrical characteristics.
       2. fire pump
          1. The fire pump shall deliver not less than 150% of the rated capacity at a pressure of not less then 65% of the rated head. The shutoff head shall not exceed 140% of the rated head.
          2. The pump shall be a horizontal split case, double-suction, bronze-fitted, centrifugal pump with the pump driver complete with flexible coupling and coupling guard. The pump shall have a common horizontal centerline between the suction and discharge connections. The suction and discharge connections shall be the same size, thus eliminating the need for pipe increasers or decreasers.
          3. Casing: Cast iron, with suction and discharge gage ports, renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction and discharge.
          4. Impeller: Bronze double suction fully enclosed, balanced and keyed to shaft.
          5. Bearings: Grease lubricated ball bearings, greaseable and replaceable without opening casing, selected for minimum 50,000 hour life.
          6. Shaft: Alloy steel with replaceable bronze shaft sleeve.
          7. Seal: Packing gland with minimum four rings graphite impregnated packing and bronze lantern rings, 230 degrees F maximum continuous operating temperature.
          8. Baseplate: Cast iron with integral drain rim.
          9. The following manufacturers are acceptable provided their products meet or exceed these Specifications and the Contract drawing schedules: Aurora, Peerless, Patterson or Allis-Chalmers.
       3. fire pump accessories
          1. Eccentric suction reducer and OS&Y gate on suction side of pump. No butterfly valve shall be installed on suction side of pump.
          2. Concentric increaser and check valve in pump discharge and OS&Y gate or butterfly valve on system side of check valve.
          3. Fire pump bypass fitted with normally open and supervised OS&Y gate or butterfly valves and double-check valve assembly.
          4. Suction pressure gauge, 3-1/2 inch minimum diameter dial with snubber, valve cock and lever handle.
          5. Discharge pressure gauge mounted on board attached to pump, 3-1/2 inch minimum diameter dial with snubber, valve cock and lever handle.
          6. Float operated ¾-inch automatic air release valve.
          7. Venturi flow meter system, FM approved, meter reading in GPM, flow sensor, and all required accessories.
          8. Fire pump test header with number and size of hose valves per NFPA 20.
       4. Fire pump electric motor drive
          1. The electric motor for the fire pump shall be a standard NEMA design B, open drip proof, continuous duty rated, suitable for wye-delta start with 1.15 service factor and UL listed for fire pump applications. The locked rotor current shall not exceed the values specified in NFPA 20. The motor shall be wound for 480 volts, three phase, 60 cycles operation, 1750 rpm with operating horsepower as scheduled on Contract Drawings and as required by the fire pump to meet NFPA Standards.
       5. Electric fire pump controller
          1. The controller shall be UL listed and FM approved for fire pump service and shall meet or exceed all the requirements of the latest editions of NFPA 20 and the National Electric Code, NFPA 70. The fire pump controller shall be of the combined manual and automatic type designed for wye/delta reduced voltage closed transition type operation having the same horsepower, voltage, phase, and frequency rating as required of the motor, be housed in a NEMA 3R enclosure and include the following:

Time delay circuit breaker set at 300 percent motor full load current.

Isolation switch with single external operating handle interlocked with circuit breaker. Operating mechanism shall be flange or side mounted.

Nonfused control power transformer.

START and STOP pushbuttons for manual control.

Ammeter test links and voltmeter test studs.

POWER AVAILABLE pilot light to indicate power on the load side of the circuit breaker and PHASE REVERSAL pilot light for the line side of the motor starter. Pilot lights shall be mounted externally.

Surge protector wired to the line side of the isolation system.

Solid state pressure switch and transducer with energize to start relay. Pressure switch shall be differential adjustable type with LED indicators for trip and reset.

Minimum run time, adjustable 0 - 10 minutes with timed-out LED indicator. Per NFPA 20 and FM pump should be arranged for “manual stop” the run-timer and auto stop function must be disabled.

Magnetic contactors with externally operable mechanical start mechanism.

Two sets each of dry form "C" contacts for remote indication of PUMP RUNNING, POWER FAILURE and PHASE REVERSAL.

The electric fire pump controller shall also include an automatic start relay of the drop-out type, and a local built-in alarm panel powered from a separate reliable 120 VAC power source.

The local alarm panel shall have individual indicating lights with a common alarm bell and silence button for POWER FAILURE, PUMP RUNNING, PHASE REVERSAL, LOW DISCHARGE PRESSURE, TRANSFER SWITCH IN EMERGENCY, ISOLATION SWITCH OPEN and REMOTE START.

A local indicating light and two sets of remote alarm contacts shall be furnished to monitor SUPERVISORY POWER of the local alarm panel.

Two sets of dry form "C" remote alarm contacts shall be provided for LOW DISCHARGE PRESSURE, TRANSFER SWITCH IN EMERGENCY and ISOLATION SWITCH OPEN.

A separate pressure switch shall be supplied to monitor discharge pressure.

All indicators shall be illuminated from the rear by long life LED lamps. Incandescent lamps are not acceptable.

* + - * 1. The electric fire pump controller shall be manufactured by Metron, Firetrol or Master.
      1. AUTOMATIC TRANSFER SWITCH
         1. The automatic transfer switch shall be wired to the fire pump controller and mounted in a separate compartment with an isolation barrier. The automatic transfer switch shall include an isolation switch and externally operable handle, voltage and frequency sensitive relays for normal power, voltage and frequency sensitive relays for emergency power sensed from emergency control power transformer, normal and emergency control power transformers, and time delays for ENGINE START, TRANSFER TO EMERGENCY, RETRANSFER TO NORMAL and ENGINE COOLDOWN. The transfer switch shall also include provisions for preventing higher than inrush currents when transferring power in either direction, a TEST switch and pilot lights for NORMAL POWER and EMERGENCY POWER.
         2. The automatic transfer switch shall be manufactured by Metron, Firetrol or Master.
      2. PRESSURE MAINTENANCE (JOCKEY) PUMP
         1. Electrically operated, horizontal turbine close-coupled or vertical multi-stage centrifugal type with standard open drip‑proof motor.
         2. The following manufacturers are acceptable provided their products meet or exceed these Specifications and the Contract drawing schedules: Grundfos, Aurora, Peerless or Allis-Chalmers
      3. JOCKEY PUMP CONTROLLER
         1. The electric jockey pump controller shall include a circuit breaker, magnet starter with overloads, pressure switch, H-O-A selector switch, minimum run timer, dual fused control power transformer, START pushbutton, two sets of dry form "C" remote alarm contacts for PUMP RUNNING and NEMA 3R enclosure.
         2. The jockey pump controller shall be manufactured by Metron, Firetrol or Master.

1. EXECUTION
   * + 1. INSTALLATION
          1. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
          2. All installation shall be in accordance with manufacturer’s published recommendations.
          3. Provide access space around pumps for service. Provide no less than minimum as recommended by manufacturer.
          4. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings or pump suction and discharge.
          5. Flow meter shall discharge into atmospheric suction tank. Flow meter loop shall not circulate back to the pump suction line.
          6. Locate fire pump test hose valve header on exterior wall accessible from grade level.
          7. Provide piping to, and route discharge from all relief valves and drains to exterior of building and terminate at a location and in a manner to prevent any damage to surrounding areas.
          8. Provide full line size bypass with double-check valve assembly around surge tank and fire pump.
          9. Coordinate connection to electrical service.
       2. INSTRUCTIONS AND START-UP
          1. Contractor shall provide for the service of a competent factory-trained supervising agent from the fire pump manufacturer to inspect the completed installation, start the system and acquaint the operators with the proper operation and maintenance of the equipment.
       3. TESTING
          1. Perform acceptance and operation testing on entire system in accordance with NFPA 20.
          2. A field performance characteristic curve shall be produced and compared for verification to the factory performance curve.
          3. Submit verification of test results to Architect/Engineer and include within operation and maintenance manual.
          4. Check, align, lubricate and certify pumps per NFPA 20 prior to startup. Notify Owner 48 hours in advance of alignment check.
       4. warranty
          1. The complete system shall be warranted in writing against defects in materials or Workmanship under normal use and service for a period of one year after date of Substantial Completion.

END OF SECTION 21 31 13