**SECTION 21 30 00**

**FIRE PUMPS**

**BASED ON DFD SPECIFICATION DATED 10/1/12**

***This section has been written to cover most (but not all) situations that you will encounter. Depending on the requirements of your specific project, you may have to add material, delete items, or modify what is currently written. The Division of Facilities Development expects changes and comments from you.***

**P A R T 1 - G E N E R A L**

**SCOPE**

This section includes specifications for fire suppression system components and accessories.

***The consultant is responsible for showing sprinkler head locations, fire dept. connections, fire pump test connections, fire hose valve and cabinet locations, fire pumps, pump controllers, air compressors, flow switch locations, inspectors test station locations, local alarm bells and control valve locations.***

PART 1 - GENERAL

 Scope

 Related Work

 Reference

 Reference Standards

 Quality Assurance

 Shop Drawings

 Certifications

 Delivery, Storage and Handling

 Design Criteria

 Electrical Coordination

PART 2 - PRODUCTS

 Horizontal Split Case Centrifugal Fire Pump

 Horizontal Multi-Stage Centrifugal Pressure Booster Pump

 Horizontal Turbine Pressure Booster Pump

 Fire Pump Controller

 Pressure Booster Pump Controller

PART 3 - EXECUTION

 Installation

 Construction Verification Items

**RELATED WORK**

Section 01 91 01 or 01 91 02 – Commissioning Process

Section 21 08 00 – Commissioning of Fire Suppression

Section 21 05 00 – Common Work Results for Fire Suppression

Section 21 05 29 – Hangers and Supports for Fire Suppression Piping and Equipment

Section 21 10 00 – Water-Based Fire Suppression Systems

Division 26 - Electrical.

**REFERENCE**

Applicable provisions of Division 1 shall govern work under this section.

**REFERENCE STANDARDS**

ASSE 1015 Double Check Valve Backflow Preventers.

NFPA 13 Installation of sprinkler systems. (Latest prevailing edition)

NFPA 14 Installation of standpipe and hose systems. (Latest prevailing edition)

NFPA 20 Installation of centrifugal fire pumps. (Latest prevailing edition)

NFPA 71 Installation, maintenance and use of signaling systems for central station service (Latest prevailing edition)

NFPA 72 Installation, maintenance and use of protective signaling systems (Latest prevailing edition)

**QUALITY ASSURANCE**

Substitution of Materials: Refer to Section GC - General Conditions of the Contract, Equals and Substitutions..

**SHOP DRAWINGS**

Submit fabrication drawings showing pipe sizes, fittings, devices and locations. Submit corresponding hydraulic calculations.

Include data concerning dimensions, capacities, materials of construction, ratings, certifications, weights, pump curves, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

**CERTIFICATIONS**

Fire protection system components to be UL listed and labeled. All components to be Factory Mutual approved with the exception of sprinkler heads, double check valves and air compressors. All system components shall be in conformance with NFPA rulings.

**DELIVERY, STORAGE, AND HANDLING**

Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

**DESIGN CRITERIA**

Fire protection system components to be rated for minimum operating pressure of 175 psig.

Component design, construction and installation to comply with requirements of reference standards.

**ELECTRICAL COORDINATION**

All relays, wire, conduit, pushbuttons, pilot lights, and other devices required for the power side of the control of fire protection motors or electrical equipment shall be furnished by the Electrical Contractor, except as specifically noted elsewhere in this division of specifications.

Electrical drawings and/or specifications show number and horsepower rating of all motors furnished by this Contractor. Should any change in size, horsepower rating or means of control be made to any motor or other electrical equipment after contracts are awarded, Contractor is to immediately notify the Electrical Contractor of this change and pay any costs due to this change.

Electrical Contractor shall provide all power wiring and the Fire Suppression Contractor shall provide all control wiring. Control wiring shall conform to Division 16 requirements for Control Wiring.

Furnish wiring diagrams to Electrical Contractor for all equipment and devices furnished by this Contractor and indicated to be wired by the Electrical Contractor.

**P A R T 2 - P R O D U C T S**

**HORIZONTAL *(VERTICAL)* SPLIT CASE CENTRIFUGAL FIRE PUMP**

Manufacturer: Allis Chalmers, Aurora, Fairbanks Morse, ITT A-C, Patterson, Peerless, Systecon, Weil.

Type: Horizontal ***(Vertical)*** shaft, single stage, single or double suction, horizontal split casing, 175 psig working pressure at operating temperature of 225F continuous, 250F intermittent.

Casing: Cast iron with suction and discharge gauge ports, renewable bronze wear rings, vent and drain plugs, flanged suction and discharge connections.

Impeller: Bronze, hydraulically and dynamically balanced, keyed and locked to pump shaft, and protected by a replaceable bronze shaft sleeve.

Bearings: Oil or grease lubricated ball or roller bearings, single row inboard and double row outboard.

Shaft: Alloy steel with copper, bronze, or stainless steel shaft sleeve.

Seal: Stuffing box with split bronze packing gland, graphite impregnated TFE packing rings and water seal.

Drive: Flexible spacer type coupling or coupling with extended hub to allow for pump service. Provide guard for shaft/coupling assembly.

Motor: Provide pump with a motor sized for non-overloading over the entire pump curve. Motors to be 1750 rpm, open drip proof, squirrel cage induction.

Baseplate: Cast iron or fabricated steel with integral drain rim and grout base.

Accessories: Suction and discharge gauges and gauge cocks, casing relief valve, automatic air release valve and eccentric suction reducer.

Furnish each pump and motor with a nameplate giving the manufacturer's name, serial number of pump, capacity in GPM and head in feet at design condition, horsepower, voltage, frequency, speed and full load current. The manufacturer shall certify all pump ratings.

**HORIZONTAL *(VERTICAL)* MULTI-STAGE CENTRIFUGAL PRESSURE BOOSTER PUMP**

Manufacturer: Fairbanks Morse, Grundfos, ITT A-C, Peerless, Weil.

Type: Horizontal ***(Vertical)*** direct coupled shaft, multiple stage, inline design, 200 ***(300)***psig maximum working pressure at operating temperature of 225F. continuous, 250F. intermittent.

Casing: Cast iron or stainless steel with suction and discharge gauge ports, vent and drain plugs, flanged suction and discharge connections.

Impeller: Bronze or stainless steel, nested configuration, keyed and locked to the shaft, hydraulically and dynamically balanced.

Bearings: Oil or grease lubricated ball or roller bearings.

Shaft: Alloy or stainless steel with copper, bronze, or stainless steel shaft sleeve.

Seal: Mechanical type shaft seal with carbon steel rings and ceramic seats.

Provide pump with a motor sized for non-overloading over the entire pump curve. Motors to be 3450 rpm unless specified otherwise.

Accessories: Suction and discharge gauges and gauge cocks and relief valve.

Furnish each pump and motor with a nameplate giving the manufacturer's name, serial number of pump, capacity in GPM and head in feet at design condition, horsepower, voltage, frequency, speed and full load current. The manufacturer shall certify all pump ratings.

**HORIZONTAL TURBINE PRESSURE BOOSTER PUMP**

Manufacturer: Aurora, Pacific (Paco), Roth, or approved equal.

Type: Horizontal direct coupled shaft, basemount design, 300 psig maximum working pressure.

Casing: Cast iron with threaded suction and discharge connections.

Impeller: Bronze turbine with bronze bushing, keyed and locked to the shaft, hydraulically and dynamically balanced.

Shaft: Stainless steel with bronze or stainless steel shaft sleeve.

Seal: Mechanical type shaft seal with carbon steel rings and ceramic seats.

Provide pump with a motor sized for non-overloading over the entire pump curve. Motors to be 1750 rpm unless specified otherwise.

Accessories: Suction and discharge gauges and gauge cocks and relief valve.

Furnish each pump and motor with a nameplate giving the manufacturer's name, serial number of pump, capacity in GPM and head in feet at design condition, horsepower, voltage, frequency, speed and full load current. The manufacturer shall certify all pump ratings.

**FIRE PUMP CONTROLLER**

Manufacturer: ITT, Josyln/Clark, Master Control Systems

General: Select fire pump controller with electrical characteristics matching pump motor. Factory fabricate and test fire pump controller assembly. Identify assembly with "Fire Pump Controller" label on control panel face. Permanently attach wiring diagrams to inside of cabinet. Provide cabinet and door mounted nameplates identifying each device or switch mounted within cabinet and on door, panel manufacturer and model number.

Enclosure: Floor mounted formed and welded steel, NEMA 12, with hinged and latched door, phosphatized and baked enamel finish.

Motor Starter: Class A, NEMA ICS 2, across-the-line magnetic full voltage starting, non-reversing type ***(part winding, primary reactor, open transition wye-delta, closed transition wye delta, autotransformer)***. Capable of automatic start initiated by low water pressure switch, remote starting by a normally closed contact and manual starting by front panel mounted control.

***Verify type of starter appropriate for system with electrical designer.***

Overcurrent Protection: Circuit breakers with test switch and self-contained electronic trip circuit designed and listed for fire pump locked rotor application. Connect directly to HOA switch load side.

Controls: Front panel mounted hand-off-auto switch, 300 psi brass mercoid water pressure switch with low turn on and high turn off adjustable settings and exterior brass bulkhead connection, minimum run timer with manual stop switch, restart time delay. Provide phase reversal relay.

Alarms: Local audible and visual alarm indication as well as remote contacts for loss of power, and phase reversal along with alarm silence switch. Remote contact for fire pump operation (motor current greater than 20% FLA).

Wiring: Terminations for exterior power and control connections, space in cabinet for terminating incoming and outgoing cables at entry, identification of power and control wiring at terminals and ground bar.

When an emergency generator is installed on the project, call for an automatic transfer switch installation to be provided within the fire pump controller panel.

**PRESSURE BOOSTER PUMP CONTROLLER**

Manufacturer: ITT, Josyln/Clark, Master Control Systems.

General: Select booster pump controller with electrical characteristics matching pump motor. Permanently attach wiring diagrams to inside of cabinet.

Enclosure: Wall mounted formed and welded steel, NEMA 2, gasketed with driphood, hinged and latched door, phosphatized and baked enamel finish.

Motor Starter: Class A, NEMA ICS 2, across-the-line magnetic full voltage starting, non-reversing type with overload relays. Capable of automatic start initiated by low water pressure switch and manual starting by front panel mounted control.

Overcurrent Protection: Fusible disconnect switch with panel face mounted handle.

Controls: Front panel mounted hand-off-auto switch, 300 psi brass mercoid water pressure switch with low turn on and high turn off adjustable settings and exterior brass bulkhead connection, minimum run timer.

Alarms: Contacts for remote indication of pressure booster pump running (motor current greater than 20% FLA).

Wiring: Terminations for exterior power and control connections, space in cabinet for terminating incoming and outgoing cables at entry, identification of power and control wiring at terminals.

**P A R T 3 - E X E C U T I O N**

**INSTALLATION**

Install fire protection system components in accordance with NFPA rulings, listings and manufacturers recommendations. Locate where accessible for servicing and replacement.

Pumps: Set base mounted pumps on concrete bases, or concrete inertia base, level and bolt down prior to grouting. Fill the entire base with non-shrinking grout when required by the manufacturer's installation instructions.

Align all flexible coupled base-mounted pumps in accordance with the manufacturer's instructions.

Decrease from line size at pump connections with eccentric suction reducer offset with the top of the pipe level. All pump valves and piping specialties must be full line size. Support piping adjacent to pump such that no weight is carried on pump casings. For base mounted pumps, provide supports for elbows on pump suction and discharge piping 4" and over.

Provide automatic air vent, drain valve, relief valve and pressure gauges on pump casings.

Provide drains for bases and seals, piped to and discharging into floor drains.

Provide 1/2" Type L copper pressure sensor line from between pump discharge check valve and shutoff valve to pump controller pressure switch. Provide bronze swing check valve with 3/32" orifice in clapper along with two test valves and intermediate tee with 1/4" test plug at pump and at controller for testing and relieving pressure (NFPA 20, A-7-5.2.1). Each pump, including pressure booster pump, to have its own dedicated sensor line.

Lubricate pumps before startup.

Fire Pump Controller: Install on concrete housekeeping pad, leveled and bolted in place. Pipe pressure sensor line to controller. Coordinate wiring with electrical contractor. Startup, test and adjust for proper operation of alarms and operating controls. Adjust pressure switches in accordance with NFPA 20, A-11-4.

Pressure Booster Pump Controller: Mount securely on wall. Pipe pressure sensor line to controller. Coordinate wiring with electrical contractor. Startup, test and adjust for proper operation of alarms and operating controls. Adjust pressure switches in accordance with NFPA, A-11-4.

# CONSTRUCTION VERIFICATION ITEMS

Contractor is responsible for utilizing the construction verification checklists supplied under specification Section 21 08 00 in accordance with the procedures defined for construction verification in Section 01 91 01 or 01 91 02.

END OF SECTION

The following are examples of the kind of information that should be included in equipment schedules on the drawings.

Horizontal Split Case Centrifugal Fire Pump

No. Location Flow Head Motor RPM Voltage

FP1 \_\_ GPM \_\_' \_\_ HP \_\_\_\_ 208/60/3

Horizontal Multi-Stage Centrifugal Pressure Booster Pump

No. Location Flow Head Motor RPM Voltage

FBP1 \_\_ GPM \_\_' \_\_ HP \_\_\_\_ 208/60/3

Horizontal Turbine Pressure Booster Pump

No. Location Flow Head Motor RPM Voltage

FBP1 \_\_ GPM \_\_' \_\_ HP \_\_\_\_ 208/60/3