PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The requirements of the General Conditions, Supplementary Conditions and the following Specification sections apply to all Work herein:
1. Section 21 00 10 - General Requirements
2. Section 21 00 20 - Fire Suppression Scope of Work
3. Section 21 05 07 - Design Conditions
4. Section 21 05 13 - Motor Requirements for Fire Suppression Equipment
5. Section 21 05 48 - Vibration and Seismic Controls for Fire Suppression Piping and Equipment
6. Section 21 05 93 - Testing
7. Section 21 07 00 - Fire Suppression System Insulation
8. Section 21 11 00 - Connection to Utilities
9. Section 21 12 00 - Fire Suppression Standpipe Systems
10. Section 21 13 00 - Fire Suppression Sprinkler Systems
11. Section 21 30 00 - Fire Pumps and Controllers
12. Section 21 41 00 - Fire Suppression Water Storage Tank
13. Section 23 21 13 - Pipes, Valves, Fittings and Accessories
14. Section 26 05 19 - Electrical Conductors - 600 Volts
15. Division 28 - Fire Detection, Alarm, and Communication System Specifications

1.2 SUMMARY

A. Furnish and install all pumps and controllers as specified herein and as indicated by the Drawings.

1.3 REFERENCE STANDARDS

A. Each fire pump, jockey pump, controller and all components shall be designed, manufactured, and tested in accordance with the following latest applicable standards:
1. NFPA 20 – Installation of Centrifugal Fire Pumps
2. UL Standard 448A – Flexible Couplings and Connecting Shafts for Stationary Fire Pumps
3. NFPA 70 – National Electrical Code (NEC)
4. ANSI C62.1 and C62.11
5. NEMA ICS 1-109 – Test and Test Procedures for Automatic Transfer Switches
6. NEMA ICS2-447 – A. C. Automatic Transfer Switch
7. UL Standard 1008 – Automatic Transfer Switches
8. ANSI/IEEE C37.90a Voltage Surge Withstand Capabilities
9. NFPA 110 – Emergency and Standby Power Systems
10. [Factory Mutual]

B. All equipment and material to be furnished and installed on this Project shall be UL listed, in accordance with the requirements of the authorities having jurisdiction and suitable for its intended use on this Project.

1.4 SUBMITTALS AND PROPOSALS

A. The following submittal data shall be furnished according to the General Conditions and Section 21 00 10 and shall include, but not be limited to:
1. Electric Fire Pump and Controller*: Complete with Underwriters Laboratories and FM Standards certification, capacity curves, test data, seals, construction details, motor horsepower, coupling and guard, electrical characteristics, rotation, fire pump controller and automatic transfer switch, accessories, casing temperature relief devices, etc.
2. Jockey Pump and Controller*: Complete with capacity curves, test data, seals, construction details, motor horsepower, coupling and guard, rotation, jockey pump controller, accessories, etc.
3. Diesel Fire Pump and Controller*: Complete with Underwriters Laboratories and FM Standards certification, capacity curves, test data, seals, construction details, motor horsepower, engine muffler, coupling and guard, rotation, fire pump controller, accessories, casing temperature relief devices, fuel oil system, etc.

4. Proposed test procedures, recording forms, test equipment, and list of personnel and qualifications for all tests proposed. Refer to Section 21 05 93 titled "Testing" for additional requirements.
5. Factory Test Reports.
6. Field Test Reports.

B. All items or equipment listed above with asterisks (*) shall be certified by the manufacturer using Manufacturer Certification "MCA" as set forth in Section 21 00 10. See Section 21 00 10 for certification requirements.

1.5 WARRANTY

A. Comply with the requirements of the General Conditions and Section 21 00 10.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. If it complies with these Specifications, one of the following electric fire pump manufacturers will be acceptable:
1. Aurora
2. Fairbanks-Morse
3. ITT A-C
4. Patterson
5. Sterling/Peerless

B. If it complies with these Specifications, one of the following electric fire pump controller manufacturers will be acceptable:
1. Firetrol
2. Lexington Hubbell
3. Joselyn-Clark

C. If it complies with these Specifications, one of the following fire pump controller automatic transfer switch manufacturers will be acceptable:
1. Asco Bulletin 940
2. Russelectric
3. Zenith

D. If it complies with these Specifications, one of the following jockey pump manufacturers will be acceptable:
1. Aurora
2. Fairbanks-Morse
3. Grundfos
4. Sterling / Peerless
5. Burke

2.2 GENERAL

A. The fire pumps and fire pump controllers/automatic transfer switches shall be furnished by the pump manufacturer as a complete package as shown on the Drawings and in accordance with these specifications. Fire pump and controllers/automatic transfer switches shall be UL listed and FM approved.

2.3 ELECTRIC FIRE PUMP

A. The fire pumps shall be designed to deliver the capacities listed in the schedules on the Contract Documents, with suction condition as scheduled and a flow of one hundred (100%) percent of the rated pump capacity. The pump shall also deliver not less than one hundred fifty (150%) percent of rated capacity at a pressure not less than sixty-five (65%) percent of rated head. The shutoff head shall not exceed one hundred and twenty (120%) percent of the rated head.

B. The pump shall be of the horizontal split case, double suction type.

C. The pump unit and controller/transfer switch shall meet all requirements of the National Fire Protection Association (NFPA) Standard 20 and shall be listed by Underwriters Laboratories and Factory Mutual approved. The following accessories shall be included with the pump unit:
1. Suction and discharge gauges with snubbers and stop valves,
2. Automatic air release valve,
3. Discharge or casing relief valve,
4. Main relief valve if required,
5. Concentric discharge increaser,
6. Eccentric suction reducer,
7. Positive engagement coupling,
8. OSHA coupling guard, and
9. Discharge tee for connection to piping, if required for fire pump testing.

D. Pumps, casing, and seals shall be suitable for operation with the head of the system listed in the schedules on the Contract Documents. Pumps shall be full ball bearing grease-lubricated types.

E. Pump and motor shall be mounted on a drip lip type cast iron or fabricated structural steel base. The base shall have provisions for grouting, anchor bolts, and collection of all seal leakage. A threaded outlet of 1/2" minimum size shall be provided for field piping to drain.

F. Pump and motor shall be connected with a steel "fail-safe" type positive engagement coupling similar to Lovejoy Type "L", KTR Corporation Rotex® curved jaw, or approved equal jaw type couplings. Coupling shall be provided with a nitrite butadiene (Buna N) or urethane solid center flexible insert designed for fire pump service. Coupling and insert shall have a minimum service factor of 1.25 and shall be UL 448A listed for fire pump service. Provide a removable sheetmetal coupling guard, which complies with OSHA requirements. Plastic coupling guards are not acceptable.

G. Face and radial coupling alignment and pump vibration shall be field checked on pumps driven by a motor over 50 H.P. See Section 23 05 93 titled "Testing, Balancing and Adjusting" for alignment and vibration tests. After final alignment, the pump and motor shall be doweled to the fabricated structural steel base with tapered pins.

H. The pump motor shall be standard efficiency open drip-proof type specifically listed for fire pump use and shall be wound for 460V, three (3) phase, 60 hertz current, 1750 or 3600 rpm as listed in the schedules on the Contract Documents. Motors 75 HP and smaller shall be across-the-line starting. Motors 100 HP and larger shall have all leads brought out to facilitate wye-delta closed transition starting. Locked rotor current shall not exceed the values specified in NFPA 20. 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 as permitted by the service factor stamped on the motor nameplate.

2.4 ELECTRIC FIRE PUMP MOTOR CONTROLLER

A. The fire pump motor control equipment shall be completely assembled, wired, and tested at the factory, and the assembly shall be listed by the Underwriters Laboratories [and FM approved] for fire pump purposes and so labeled. The controller shall be marked "Electric Fire Pump Controller". All equipment shall be enclosed in one or more approved drip-tight, NEMA 2, front access enclosures. The controller shall be across-the-line type for motors 75 HP and smaller, and wye-delta closed circuit transition or reduced voltage type for motors 100 HP and larger. The fire pump controller shall incorporate the following:
1. Voltage surge arresters complying with ANSI C62.1 or C62.11 connected to each line terminal of the isolating switch and ground,
2. Integral isolating switch - externally operable quick break type,
3. Circuit breaker - externally operable, with trips in all phases sized pursuant to the NFPA-20 requirements. Trip function shall be initiated by the power monitor.
4. Motor controller - capable of being energized automatically through a pressure switch or manually by means of an externally operable handle,
5. Pressure switch - set to maintain at least [sixty-five (65)] [one hundred (100)] psig at upper most fire hose valve, or roof manifold in accordance with the requirements of the local Fire Department or the requirements of the authorities having jurisdiction,
6. Running period timer - set to keep motor in operation when started automatically for a minimum period of ten (10) minutes,

7. Pilot lamp - to indicate circuit breaker closed and power available,
8. Provisions shall be made within the controller to permit the use of test instruments for measuring all line voltages and currents without disconnecting any conductors within the controller pursuant to the NFPA-20 requirements,
9. Means shall be provided on the exterior of the controller to read all line currents and all line voltages with an accuracy within ±5 percent of motor nameplate voltage and current.
10. Alarm relays - with dedicated dry contacts within a factory built in alarm panel to energize remote alarms. Alarms shall indicate pump running "power/phase failure", "phase reversal", "emergency isolation switch open", and "transfer switch in emergency" through an independent standby source of 120V power. Refer to Division 25 Building Management and Control System for requirements, and Division 28 FDAC System Specifications,
11. Manual selection station - push-buttons marked Start-Stop and an emergency start handle shall be provided on the enclosure, and
12. The entire fire pump controller assembly shall be suitable for the available short-circuit (fault) current withstand rating sufficient for the available rms symmetrical amperes at the line terminals of the controller assembly as shown on the Drawings or indicated in these Specifications. Fire pump controller assembly shall be so marked in accordance with NFPA 20 and shall be so certified by the fire pump controller manufacturer in accordance with the requirements in Section 21 00 10 hereinbefore.

B. Automatic Transfer Switch: Automatic transfer switch shall be as follows:
1. The automatic transfer switch shall be rated for a normal source of 460V, three (3) phase and three (3) wire power as indicated on the Drawings. The full load continuous duty ratings shall not exceed allowable NEMA Standards. The switch shall be capable of transferring six hundred (600%) percent rated current at 0.50 power factor between the 460V AC sources, as required by NFPA-20. The time of transfer shall not exceed 1/6th of a second and shall be accomplished without any evidence of source to source arc over. Automatic transfer switch shall be suitable for either bus or cable connections with compression lugs, and UL listed as such, as indicated on the Drawings. All cables shall be terminated using compression fittings. Compression fittings shall be provided by the automatic transfer switch manufacturer, installed on the switch at the factory, and as required in the Division 26 Section 26 05 19 titled "Electrical Conductors – 600 Volts". The manufacturer shall provide detailed Shop Drawings for each switch indicating the orientation of both the compression fittings and any necessary adapter plates. The fire pump controller automatic transfer switch shall also comply with the requirements of Division 26 Section 26 36 23 titled "Automatic Transfer Switches". See Section 21 00 10 for additional Shop Drawing requirements.
    a. The switch shall be able to close on in-rush current as required by NFPA-20 without excessive burning or welding of the contacts. The switch shall be suitable for the available short-circuit current at the line terminals of the switch assembly as indicated by the Drawings in accordance with UL-1008 standards, shall be so marked in accordance with NFPA 20, and shall be so certified by the fire pump controller manufacturer in accordance with the requirements in Section 21 00 10 hereinbefore.
    b. The main contacts shall be silver alloy, protected by arc barriers and arc quenchers. Switches 600 amps and over shall have separate arcing contacts and segmented type main contacts.
    c. The switch shall be specifically designed and listed by Underwriters Laboratories and FM approved for fire pump automatic transfer switch service. The switch shall be located in a barriered section of the fire pump controller or in an adjacent enclosure attached to the fire pump controller and marked "Fire Pump Power Transfer Switch". The entire assembly of fire pump controller and automatic transfer switch shall comply with the requirements of NFPA 20, latest edition. The entire assembly of fire pump controller and automatic transfer switch shall consist of factory-installed self-contained isolation switching assemblies and wiring to accomplish the arrangement shown in Figure A-7-8 of NFPA 20, Appendix A. Switches utilizing adapted devices such as molded case circuit breakers, circuit interrupters, disconnect switches, etc., which were not originally intended to repeatedly open and close load current to six hundred (600%) percent of rated current at 0.4 to 0.5 power factor are not acceptable.
    d. The switch shall be electrically operated and mechanically held in each direction by a solenoid or motor mechanism momentarily energized from the source to which the load is to be transferred. The operating mechanism shall mechanically lock the switch in each position without the use of hooks, latches, springs or semi-permanent magnets. Disarrangement of any part or failure of any coil shall not permit either a neutral position nor shall it cause both sides to be closed at the same time. The switch must be inherently double throw with both sets of main contacts moving simultaneously. The operating mechanism shall not be dependent upon critical mechanical and/or electrical adjustments or utilize miniature type limit switches or similar non-industrial type

components. A handle or knob for manual operation of the main poles shall be provided for maintenance purposes. The handle shall permit the operator to stop the contacts at any point of travel to properly inspect and maintain the contacts.

e. The normal source shall be monitored by solid state sensing technology or voltage sensitive relays in each switch adjusted to detect failure when any one (1) phase or leg drops below eighty-five (85%) percent of normal and to sense restoration when all phases or legs have returned to at least ninety (90%) percent of normal. A voltage frequency relay shall prevent transfer of the load to the emergency source until it has reached at least ninety (90%) percent of rated voltage and ninety-five (95%) percent of rated frequency. All relays shall have silver alloy contacts and all interface relays shall have a minimum rating of 10 amperes and adequate wiring space. They must meet or exceed NEMA and IEEE Standards for industrial type control relays. They must also be field adjustable and must have replaceable contacts. They shall operate without flutter or false response when the voltage is slowly varied to dropout and pickup values.

f. The switch shall include the following features and/or accessories:
   1) Switch shall be provided with a solid state timer to override momentary dips in the normal source and signal the generator to start after an adjustable time delay of 0.5 to 8 seconds, factory set at three (3) seconds. Provide a lockout relay to prevent transfer until the generating set has reached ninety (90%) percent of rated voltage and ninety-five (95%) percent of rated frequency.
   2) A separate adjustable 0 to 60 second time delay set at 0 seconds to delay transfer to emergency power. The load must remain connected to the normal source during this period.
   3) An in-phase monitor and fast action 60° window width relay with zero (0) time delay to control transfer switching in either direction between normal and emergency sources.
   4) An adjustable time delay on retransfer (0 to 30 minutes) to assure a stable normal source before returning the load to the normal source. A bypass circuit switch shall override this time delay in the event of simultaneous failure of the emergency source and availability of a suitable normal source.
   5) A manually operated test switch to test the complete system.
   6) Auxiliary contacts rated for 10 amperes (1 closed with the switch in the normal position and 1 closed with the switch in the emergency position).
   7) Engine cool down timer.
   8) Position indicator lights.
   9) Other accessories as may be required for automatic operation and/or specified elsewhere.

g. Transfer switch shall be furnished with a NEMA 2 enclosure or shall be located within the fire pump controller enclosure as specified hereinbefore.

h. The automatic transfer switch shall be the product of a quality manufacturer regularly engaged in the design, development and manufacture of electromagnetic switching devices with adequate testing facilities and a recognized quality control program to insure product output reliability, performance and safety. Through existing listings of automatic transfer switches in the current issue of the Electrical Construction Material List of the UL, a qualified manufacturer will have demonstrated his ability to produce such products applicable to all classes of loads as well as for use between a utility source and an emergency power source. A Certificate of Compliance shall be submitted upon request, verifying mechanical operation and electrical capabilities.

2. Submit Shop Drawings for review as specified in Section 21 00 10.

2.5 JOCKEY PUMP AND CONTROLLER

A. Each jockey pump shall be designed to deliver at least 10 gpm or a higher capacity, if permitted by the local code and authorities having jurisdiction, as listed in the schedules on the Contract Documents.

B. Each pump shall be horizontal or vertical type multistage bronze fitted centrifugal or turbine type with bronze impeller, stainless steel shaft and grease lubricated ball bearings or water lubricated sleeve type bearings.

C. Pumps, casings, flanges and mechanical seals shall be suitable for operation with the working pressures indicated in the schedules on the Contract Documents.

D. Pump couplings shall be Omega “E” Series, E Woods Type “S” or the pump manufacturers’ standard two piece type couplings. Provide coupling guards, which comply with OSHA requirements.

E. The jockey pump shall be complete with a jockey pump control system to automatically maintain pressure on the standpipe system to prevent the fire pump from operating on small drops in pressure. The jockey pump control panel enclosure shall be UL listed and be in a NEMA Type 2 wall mounted enclosure, factory assembled, wired, tested and shall be finished with a baked enamel coating. Panel shall include at least the following equipment:
   1. One (1) nonfused disconnect switch or circuit breaker.
   2. One (1) magnetic motor controller. See Section 21 05 13 titled “Electric Motors and Controllers” for motor controller specification requirements.
   3. One (1) hand-off-automatic selector switch and red light indicating “pump running” mounted on panel door.
   4. 120V control power transformer with primary protection fused disconnect switch as required to operate controls in the panel.
   5. Run status contacts for remote alarms. Refer to Division 25.

F. Horizontal type pump and motor shall be mounted on a common baseplate of cast iron or structural steel with connection for field piping to drain.

G. The jockey pump shall be furnished with a field or factory-mounted bypass relief valve complete with piping. Set relief pressure above the design total dynamic head as required to prevent motor overload and damage to the system.

H. Pump motor shall be open drip-proof type with a maximum operating speed of 1750 or 3600 rpm unless otherwise indicated in the schedules on the Contract Documents. See Section 21 05 13 titled “Electric Motors and Controllers” for additional motor specifications.

I. If available the entire jockey pump controller assembly shall be suitable for the available short-circuit (fault) current withstand rating sufficient for the available rms symmetrical amperes at the line terminals of the controller assembly as shown on the Drawings or indicated in these Specifications. Jockey pump controller assembly shall be so marked in accordance with NFPA 20 and shall be so certified by the jockey pump controller manufacturer in accordance with the requirements in Section 21 00 10 hereinbefore

PART 3 EXECUTION

3.1 INSTALLATION

A. The complete fire pump installation shall be in accordance with NFPA 20, the manufacturer’s recommendations, and as indicated on the Drawings.

3.2 FACTORY TESTING

A. The pump shall be hydrostatically tested in accordance with the requirements of NFPA 20 to twice the working pressure, but in no case shall the test pressure be less than 250 psig.

3.3 FIELD TESTING

A. The Subcontractor shall test the fire pumps in accordance with NFPA 20 [on both normal utility power and standby power], in the presence of the Engineer and representatives of the local Fire Department and the Owner’s insurance agency. Test data shall include impeller trim check, capacity performance check at design flow and one hundred and fifty (150%) percent of design flow including suction and discharge pressures at each flow condition, and demonstration of the automatic control sequences and motor amperage in each phase at the design and 150% flow conditions. At the Contractor’s option, subject to the approval of the authorities having jurisdiction, a “Hose Monster” manufactured by Fire Sprinkler Fabricators (Riverside, MO) may be utilized for flow testing. Plot flow test data on the pump curve and submit to the Engineer, Owner and the Owner’s insurance agency for review. See Section 21 00 10 for requirements. The Contractor shall provide the required lengths of fire hose and an acceptable flow measuring device for testing.

B. Refer to Section 21 05 93 for additional testing requirements for fire pumps, jockey pumps and controllers.

END OF SECTION