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1. Design & Performance Criteria:

- a. Products must comply with NFPA 20
- b. Pumps shall be factory assembled and factory tested.
- c. Fire pump systems include horizontal or vertical fire pumps, jockey pumps, and fire pump controllers.
- d. The UVM standard is the horizontal fire pump. Deviations from this standard (due to available space, etc.) require review and approval by the UVM Fire Marshal and UVM Physical Plant Department Life Safety Systems.
 - i. For a vertical fire pump alternative to be approved, a permanent structure and equipment to provide a means of lifting the fire pump for maintenance will be provided.
- e. Pump systems shall be Factory Mutual Global approved.

2. Reference Standards:

- a. To be specified by the design consultant
- b. NFPA 20 “Standard for the Installation of Stationary Pumps for Fire Protection”
- c. NFPA 70 “National Electrical Code”
- d. UL218 “Standard for Fire Pump Controllers”
- e. Factory Mutual Global Approval Standard 1311
- f. Factory Mutual Global Data Sheet 3-07

3. Submittals to be reviewed by University:

- a. Product data
- b. Shop Drawings
 - i. Include plans, elevations, sections, and mounting and attachment details
 - ii. Include details of equipment assemblies, indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations and sizes of each field connection.
 - iii. Include diagrams for power, signal, and control wiring
- c. Seismic Qualification Certificates
- d. Product certificates for each type of pump, from the manufacturer.
- e. Jockey Pump Shop drawings shall include
 - i. Certified dimensional prints
 - ii. Bill of material, curves of performance characteristics.

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- iii. Test report indicating pumps have been hydrostatically tested to twice the shut-off pressure or to 250 psi, whichever is greater.

4. **Products, Materials & Equipment:**

a. **Horizontal Pumps**

- i. Pumps to be finished in red paint.
- ii. Electrical components shall be listed and labeled as defined in NFPA 70
- iii. Pump base shall resist movement of pump during seismic events.
- iv. Horizontal Pump Manufacturers:
 - 1. Patterson Pump Company (Gorman-Rupp)
 - 2. Peerless Pump company
 - 3. Aurora
 - 4. A-C Fire Pump (Xylem)
 - 5. Fairbanks
- v. UL Ratings
 - 1. Split Case pump: UL 448
 - 2. Driver: UL 1004A
- vi. Casing shall be axially split, cast iron, with ASME B16.1 pipe-flange connections
- vii. Impeller: double suction, cast bronze, statically and dynamically balanced, and keyed to shaft
- viii. Wear rings: replaceable bronze
- ix. Shaft and Sleeve, Alloy steel shaft with bronze sleeve
 - 1. Shaft Bearings: Grease-lubricated ball bearings in cast-iron housing
 - 2. Seals: stuffing box with minimum of four rings of graphite impregnated braided yarn and bronze packing gland.
- x. Mounting: mount pump and driver shafts on same base.
- xi. Coupling shall be flexible and capable of absorbing torsional vibration and shaft misalignment. Include metal coupling guard
 - 1. Coupling must be FM Global approved.
- xii. Driver motor shall be electric: NEMA MG1, polyphase Design B.
- xiii. Gallons-per-minute: Pump must be capable of 1,500 GPM against a total head of 75 PSI and deliver 150 percent of rated capacity at no less than 65 percent of rated pressure.
- xiv. Suction Pressure: pump shall withstand 100 psig suction pressure.

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- xv. Shut-off pressure: not to exceed 120 percent of rated pressure.
 - xvi. Pump Motor: horizontal, foot-mounted, open drip-proof, 100 HP ball bearing type “P” face, 1770 RPM, Solid State Soft Start squirrel cage induction motor, wound for 460 V, AC, three phase, 60 hz. Locked rotor current shall not exceed values specified in NFPA-20.
 - xvii. Pump accessories:
 - 1. Two pressure gauges on suction and discharge
 - 2. One circulation relief valve, $\frac{3}{4}$ inch
 - 3. One automatic air release valve, $\frac{1}{2}$ inch
 - 4. One concentric discharge increase
 - 5. One eccentric suction reducer
 - 6. One automatic ball drip valve
 - 7. One coupling guard
- b. Jockey Pump**
- i. Type: multi-stage
 - ii. Capacity: 12 GPM at 85 PSI
 - iii. Basis-of-design Manufacturer: Grundfos: Model: CR3-9
- c. Fire Pump Controller**
- i. Basis-of-Design Manufacturer: Firetrol
 - ii. Pump controller shall be factory assembled, wired, and tested as a unit.
 - iii. Pump controller shall conform to the requirements of NFPA 20 and NFPA 70
 - iv. Pump controller shall be UL218 Listed.
 - v. Controller door shall have locking handle with three-point cam and roller vault hardware.
 - vi. Controller to be provided with HOA switch, fusible disconnect, pressure switch, control circuit transformer, power available light, and minimum run period timer in a drip-proof wall-mounted NEMA 2 enclosure
 - vii. Spare parts: must be locally available.
 - viii. Operator Interface:
 - 1. User keypad type
 - 2. Monitoring and displaying motor operating conditions, all alarms, events, and pressure conditions.
 - 3. Time and date stamp shall be included on alarms, events, and pressure conditions

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4. Display: 128 x 64 backlit LED minimum, capable of customized graphics and Cyrillic character display.
 5. Display and interface shall be NEMA rated for Type 2, 3R, 4, 4X, and 12 protection.
 6. Display shall be fully accessible when controller door is closed.
 7. Minimum password levels: 3
 8. Display shall show true RMS digital motor voltage and current measurements for all three phases simultaneously, not toggled through individually.
- ix. Type: combined manual and automatic designed for Solid State Soft Starting.
 - x. Controller components shall be front-mounted, front-wired, and front-accessible for maintenance.
 - xi. Minimum withstand rating: not less than 200,000 Amps RMS Symmetrical at 200-600 Volts
 - xii. Communication ports: two independent ports shall be provided to allow connectivity to computers, modems, or building management systems.
 - xiii. Solid State Pressure Transducer shall be used for display of system pressure and control of fire pump controller. Range shall be 0-300 psi; Analog pressure devices or mercury switches are not acceptable.
 1. START, STOP and SYSTEM PRESSURE shall be digitally displayed on the user interface and adjustable via the same.
 2. Mounting: The transducer shall be mounted inside the controller to prevent damage. The transducer shall be directly pipe mounted to a bulkhead coupling.
 - xiv. Disconnect switch/circuit breaker shall be:
 1. rated for motor power
 2. combination isolating type
 - a. capable of being padlocked in OFF position
 - b. capable of being padlocked in ON position without affecting the tripping characteristics of the circuit breaker.
 3. mechanically interlocked
 - a. enclosure door shall not be opened when handle is in ON position except by a hidden tool operated defeater mechanism
 4. operated with a single externally mounted handle

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- a. handle operation requirements [OFF to ON]
 - i. Isolating disconnect switch to ON
 - ii. Circuit breaker
 - b. Handle operation requirements [ON to OFF]
 - i. Circuit breaker OFF
 - ii. Isolating disconnect switch OFF
5. Circuit breaker trip curve: adjustment shall be factory set, tested and sealed for the full load amps of the connected motor.
 6. Circuit breaker field testing shall be capable of: verification of actual pick-up, locked rotor, and instantaneous trip points. Incoming line and load conductors shall not be disturbed by post-installation field testing.
- xv. Voltage Measurement: True RMS, not average responding meters.
 - xvi. LED indicators on front panel shall be visible with door closed and include:
 1. Power on
 2. Pump running
 3. Alarm
 4. Deluge open
 5. Phase failure
 6. Interlock on
 7. Emergency Isolation Switch Open
 8. Low System Pressure
 9. Transfer Switch Normal
 10. Transfer Switch Emergency
 11. Phase Reversal
 - xvii. Information to be logged
 1. Motor calls/starts
 2. Elapsed Motor Run Time
 3. Last Trip Currents
 4. Elapsed power on time
 5. Last breaker trip
 6. Max and min run currents
 7. Max and min voltages
 8. Last motor run time
 9. Last phase failure

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- 10. Last start currents
- 11. Last Phase reversal
- 12. Max and min frequency
- 13. Max and min pressure
- xviii. Memory: controller shall record all operational and alarm events to system memory. All events shall be time and date stamped with an index number. Storage of 3000 events shall be accommodated. User shall have access to the event log from the user interface. User shall be able to scroll through events in groups of 1, 10, or 100.
- xix. USB Memory Stick: included to save operational and alarm events as well as settings and values.

d. Fire Pump Transfer Switch

- i. Basis-of-design manufacturer: Firetrol; Model: FTA950
- ii. Mounting: housed in fire pump controller enclosure or in adjacent NEMA 2 drip-proof enclosure.
- iii. Operation: electrically operated and mechanically held.
- iv. Positions: normal and emergency (no neutral position).
- v. Contacts: Silver
- vi. Contact Inspection: from front of switch without disassembly.
- vii. Display: 4 line, 20 character LCD with keypad for all available data and setting parameters.
- viii. Voltage monitoring: continuous
- ix. Frequency monitoring: continuous.
- x. Pilot Light shall indicate
 - 1. Normal and Emergency positions
 - 2. Normal switch accepted
 - 3. Emergency source accepted
 - 4. Emergency isolation switch open
- xi. Remote alarm contacts
 - 1. Emergency source isolation switch open
 - 2. Normal power available
 - 3. Transfer switch position
- xii. Audio alarm
 - 1. Emergency isolation switch open
 - 2. Transfer switch in emergency
- xiii. Silence alarm push-button: required.

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- xiv. Selector switch for testing: for transfer to emergency and retransfer to normal power.

e. Jockey Pump Controller

- i. Basis-of-design: Manufacturer: Firetrol.
- ii. Interface shall have user keypad and display motor operating conditions, all alarms, events, and pressure conditions.
 - 1. NEMA rating: Type 2, 3R, 4, 4X, and 12.
 - 2. Display shall be available without opening controller door.
- iii. LED indicators, visible with door closed, shall indicate
 - 1. Power On
 - 2. Alarm
 - 3. Pump Running
- iv. Digital Display shall log the following data:
 - 1. Motor Calls/Starts
 - 2. Pump Total Run Time
 - 3. Pump last run time
 - 4. Total controller power on time
 - 5. Last pump start
 - 6. Max/Min system pressure
 - 7. Last phase fail/reverse
 - 8. Cycle counts
- v. Serial Communication port: RS485 for use with 2 or 4 wire Modbus communications
- vi. Solid state pressure transducer range: 0-300 psi. analog pressure devices or mercury switches will not be accepted.

5. Installation, Fabrication, and Construction:

- a. Horizontal Fire Pump:
 - i. Laser-align fire pump shaft by manufacturer during final installation.
- b. Jockey Pump
 - i. Provide jockey pump with all fire pump installations.
 - ii. Factory-trained Engineer shall supervise installation and conduct final field acceptance tests.
- c. Coordinate all shutdowns of fire alarm and sprinkler systems with owner.
- d. Provide minimum 2 feet clearance around all pump bases.

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- e. Owner will furnish and install all valve tags, charts, identification tags, and signs for pump related valves. Supplier, sub-contractor and GC to assist in coordination of this activity.
- f. All parts requiring inspection, operation, maintenance, and repair shall be installed so they are readily accessible as approved by the Owner.
- g. Controller to be set to manual pump shut down.
- h. Coordinate with fire alarm to send supervisory signal for fire pump running, fire pump trouble, AC power loss, and phase reversal.
 - i. In the City of Burlington, fire pump signals shall transmit from the fire alarm control panel to a master radio call box (MRCB). On approval of the AHJ, fire pump supervisory signals (except “Fire Pump Run” supervisory signal) may be combined into a single common “Fire Pump Supervisory” MRCB zone due to the presence of 24-hour UVM service technician availability, based on the number of MRCB zones out of 16 that are available.

6. **Pump Testing**

- a. Annual testing of fire pump systems: UVM’s third-party sprinkler testing agent typically tests fire suppression systems in buildings on a yearly schedule. When scheduled tests are set to occur and the sprinkler system is under construction/modification the sub-contractor performing the current changes will perform the annual test when their work on the system is complete.
- b. Testing of a fire pump system that is still under an installing contractor's post-construction warranty will be done by UVM's third-party testing agent. The installing contractor holding such warranty must witness the test to certify the warranty is maintained. This includes 3 quarterly tests and one annual test as they fall during the post-construction warranty. The third-party agency will coordinate invitation of the installing contractor.
- c. Warranty Maintenance Labeling: Installers of new systems shall provide identification in the form of a sign or label secured or adhered to wall adjacent to fire pumps.
 - i. Purpose: The identification helps the Owner avoid making repairs to systems that are currently under warranty by providing the contact information of the company holding the warranty.
 - ii. Durability of identification: The label shall be intended to last for the post-construction warranty period plus one year.
 - iii. Contents of Identification:

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1. Installing contractor company name
 2. Installing contractor contact phone number to be used to initiate or inquire about regular or emergency maintenance covered under the warranty
 3. Start and end dates of post-construction warranty coverage (coordinate start date with general contractor's warranty period)
 4. UVM contact information for regular or emergency maintenance issues after the installer's warranty expires. (UVM will provide the contact information to be used for each project)
 - d. Incorporate barcode labels to conform with University barcode program.
7. **Warranties:**
- a. Manufacturer's standard product warranty
 - b. Installer's one-year installation warranty