



**State of Rhode Island  
Department of Administration / Division of Purchases  
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**Solicitation Information  
September 3, 2015**

**ADDENDUM # 2**

**RFP# 7549796**

**TITLE: IMPROVEMENTS ALTON JONES CAMPUS FIRE PROTECTION,  
UNIVERSITY OF RHODE ISLAND**

**Submission Deadline: Wednesday September 16, 2015 11:00 am**

**Notice to Vendors:**

**Attached includes questions received with responses and additional information**

**Tom Bovis  
Interdepartmental Project Manager**

*Interested parties should monitor this website, on a regular basis, for any additional information that may be posted.*

**SECTION 00 9000 – ADDENDUM #2**

**1. PARTICULARS**

- A. Date: September 1, 2015
- B. Project: Improvements Alton Jones Campus Fire Protection, University of Rhode Island (AJ.G.WHIS.2014.001)
- C. Project Number: 1MJB00329.002/003
- D. Owner: University of Rhode Island
- E. Engineer: Hughes-Associates, Inc.

**2. TO: PROSPECTIVE BIDDERS**

- A. This addendum forms a part of the Contract Documents and Modifies the Bidding Documents Dated December 12, 2014, with amendments and additions as noted below.
- B. Acknowledge receipt of this addendum in the space provided in the Bid Form. Failure to do so may disqualify the Bidder.
- C. This addendum consists of two (2) pages and the following new or reissued documents:
  - 1. Section 13 0927 – Automatic Fire Pump System, revised September 1, 2015
  - 2. SKU-1 – Underground Conduit Installation – Dated September 1, 2015
  - 3. SKP-1 – Domestic Water Piping – Sycamore Lodge – Dated September 1, 2015

**3. CHANGES TO ADDENDA**

- A. There are no changes to prior addenda.

**4. CHANGES TO THE PROJECT MANUAL**

- A. Replace the following sections:
  - 1. Section 13 0927 – Automatic Fire Pump System, revised September 1, 2015

**5. CHANGES TO THE DRAWINGS**

- A. Add the following drawings:
  - 1. SKU-1 – Underground Conduit Installation – Dated September 1, 2015
  - 2. SKP-1 – Domestic Water Piping – Sycamore Lodge – Dated September 1, 2015

**6. QUESTIONS AND ANSWERS**

Question 1. Is there a specification for the prefab pump house as shown on the drawings? Is there a basis for design?

Answer 1. The specifications related to the fire pump house are contained in specification section 13 0927. Additional requirements are depicted on the drawings. The revised specification clarifies dimensional discrepancies between the specification and the drawings.

**7. SUBSTITUTION REQUESTS**

- A. No substitution requests were requested.

**8. ADDITIONAL INFORMATION**

- A. The Contractor shall be responsible for providing water for initial filling of the underground water storage tank. Additionally, the Contractor shall be responsible to replenish all water within the underground storage tank used for initial system testing and acceptance. The tank shall be full at time of system turnover. The water must be provided through tank shuttle and be clean and treated. Raw water will not be acceptable.

## 1.0 GENERAL

### 1.1 General Requirements

- A. These specifications describe the performance and installation requirements for a new, complete diesel-engine driven automatic vertical turbine fire pump system and associated equipment including jockey pump, for the University of Rhode Island Alton Jones Campus located at in West Greenwich, RI. This unit shall be installed in a new pump house as indicated in the design drawings.
- B. At the time of bid, all exceptions taken to these specifications, variances from these specifications and any substitutions of equipment specified shall be listed in writing and forwarded to Hughes Associates, Inc. (engineer) and The University of Rhode Island (owner). Any such exceptions, variances, or substitutions, which were not listed at the time of bid and are identified in the submittal, shall be grounds for immediate disapproval without comment.
- C. The installing contractor shall be responsible for all electrical work, including the fire alarm system requirements listed in this specification. This means that all required disconnects and switches, and all electrical circuitry for ancillary equipment such as lights and heat. The contractor is responsible for interfacing with the site fire alarm system maintenance and installation contractor for the purpose of connecting all new fire alarm points generated by the fire pump system to the existing fire alarm system.

### 1.2 Quality Assurance

- A. This specification describes the essential functional requirements of the new diesel-engine driven fire pump for installation at the Alton Jones site. Each manufacturer's equipment shall comply with or exceed the functional intent of this specification.
- B. The diesel-engine driven fire pump and associated components shall be listed as a product by the manufacturer under the appropriate category for the intended use by Underwriter's Laboratories, Inc. (UL), and shall bear the "UL" label; all components and systems shall also be Factory Mutual Global (FM) approved, and shall be appropriately listed in the latest edition of the FM Approvals Guide.
- C. All materials and equipment shall be new and unused.
- D. All equipment shall be first quality and capable of complying with all requirements of this specification and shall have been in continuous production and in service in commercial applications for at least one year. Obsolete equipment shall not be used.
- E. Any case of error, omission, discrepancy or lack of clarity shall be promptly identified to the engineer and owner.

### 1.3 Scope of Work

- A. The work covered by this Specification shall include the installation of a new and complete diesel-engine driven fire pump and connection to the new fire service main, implemented with

UL listed and FM approved components to be performed by the Fire Pump System Contractor in a new fire pump enclosure. The work consists of the following:

1. Installation of a new vertical turbine fire pump, rated to deliver 500 gallons per minute (gpm) at a net rated pressure of 130 pounds per square inch (psi).
  2. Fabrication/construction of a new fire pump house. Pump house shall be part of a pre-packaged pump assembly. The location of the pump house on the design drawing is approximate. Pump house shall be provided with, but not limited to;
    - a. Heat and monitoring of temperature;
    - b. Ventilation to allow for the proper aspiration of the diesel driver
    - c. Reserve space for a future 3,000 gal domestic water storage tank
    - d. Spare capacity in electrical panel for connection of new fire alarm system and associated equipment. Fire alarm system and associated equipment to be provided by others.
  3. Installation of new 6" discharge piping connecting the discharge flange of the pump to the new fire protection service main, as indicated on the design drawings
  4. Installation of a new UL listed/FM approved diesel-engine driver connected to the above fire pump, sized to deliver the necessary horsepower and torque to drive the fire pump so that the fire pump output as required by NFPA 20-2010, and listed herein is achieved.
  5. The connection between the pump and driver shall be UL listed.
  6. Installation of a new fire pump controller listed/approved for use with diesel-engine driven fire pumps.
  7. Installation of new discharge piping from the discharge flange of the pump, to the new underground yard main system supply. The point of connection shall be field determined based on the overall size and piping requirements of the new fire pump installation.
  8. Installation of an indicating gate valve for control of pump discharge piping.
- B. Work shall include all labor, materials, tools, equipment, transportation, and temporary construction necessary to install and test the new diesel-engine driven fire pump, controllers and appurtenances in accordance with this specification, the referenced codes and standards, and the requirements of the AHJ.
- C. The pump, diesel-engine driver, all controls, and necessary attachments specified herein, shall be purchased under a unit contract. The pump manufacturer representative shall assume unit responsibility and shall provide the services of a qualified engineer to supervise the installation of equipment, check coupling alignment, and conduct the final acceptance test. The installing contractor shall include these services in bid.
- D. The scope of work also includes training the designated University of Rhode Island personnel on the operation of the system, required maintenance tasks and frequencies, and the locations of all valves, flow switches and equipment necessary to maintain and operate the diesel-engine driven fire pump. The installing contractor shall also present the owner new copies of the most current editions of NFPA 20 and NFPA 25.

#### 1.4 Contractor's Responsibilities

A. The Contractor's responsibilities are as follows:

1. The Contractor is responsible to design a new and complete diesel-engine driven fire pump for installation in a new, to-be constructed fire pump house, at the University of Rhode Island Alton Jones Campus, as outlined in the previous section.
2. Contractor shall verify soil conditions, and concrete slab requirements to properly support the fire pump equipment, and pump house structure. Written results of this study shall be forwarded to the engineer and owner.
3. The Contractor shall develop working drawings for the diesel-engine driven fire pump and associated piping and appurtenances installation in accordance with the applicable codes, cited in Section 1.9 of this specification. The Contractor shall submit the working drawings for:
  - a. Review and approval by the engineer and owner (Note: Drawings shall not be submitted to the AHJ until approved in writing by the engineer and owner.)
  - b. Submission to the AHJ for review, permit issuance and approval for installation,
  - c. Submission to the insurance authorities for approval,
  - d. Field installation of the diesel-engine driven fire pump and associated piping and appurtenances, after the engineer, owner and the AHJ have reviewed and approved the drawings and submittals, and the permit has been issued for the installation of the diesel-engine driven fire pump and associated piping and appurtenances.
4. The Contractor shall be responsible to prepare a minimum of eight (8) complete submittal packages identifying quantities and technical information for fire pump, driver, controller, fittings, pipe, valves, etc. to be provided. Complete electrical information, including drawings and components shall be provided. Complete manufacturer's technical specifications shall be provided for all substitute components to those identified in these specifications. Substitutions must be approved in writing by the engineer and owner prior to installation or purchase.
5. The Contractor shall be responsible to pay all permit fees required for the installation of the diesel-engine driven fire pump and associated piping and appurtenances and to obtain the permit from the State Building Code Commissioner.
6. The Contractor shall be responsible for the entirety of the diesel-engine driven fire pump and associated piping and appurtenances from the point of connection to the new underground piping.
7. The Contractor shall be required to coordinate the installation of the diesel-engine driven fire pump and associated piping and appurtenances with any other trades that may be required, the owner and the AHJ. The services of other trades will be the responsibility of the Contractor.
8. The Contractor shall be responsible to determine all cut lengths of pipe and fitting take-out dimensions prior to pipe fabrication.
9. The Contractor shall be responsible for the installation of water flow and valve supervisory switches. Valve supervisory switches shall be provided for all valves

controlling any portion of the fire pump and associated piping and appurtenances. The quantities and locations of all valves shall be forwarded to the engineer, owner and the site Fire Alarm System Contractor.

10. The Contractor shall be responsible for all required for the connection and testing of all water flow and valve supervisory switches to the building fire alarm system.
11. The Contractor shall be responsible for the installation of all required drain valves, drain lines, low-point drains, floor drains, auxiliary drains, and test header connections.
12. The Contractor shall furnish and install signs, approved by the owner, to identify the location and function of all valves. Pressure gauges shall be provided on the fire pump.
13. The Contractor is responsible to record field changes to the working plans and prepare as-built drawings in the latest version of Autodesk AutoCAD, showing all field changes to the working drawings. Once all changes have been reviewed by the engineer and the drawings are recorded as accurate, eight (8) copies of the as-built drawings shall be presented to the owner for distribution to the AHJ and other necessary parties.

#### **1.5 Qualification of Bidders**

- A. All Subcontractors connected with the captioned project shall provide proof of competence of both their company and the individual foreman that will be assigned to this project, in the area of installing diesel-engine driven fire pumps and associated piping and appurtenances for at least five (5) years and acceptable to the owner. Once assigned, the Contractor's foreman shall not be changed without the approval of the owner.
- B. The Contractor shall be licensed in the State of Rhode Island and experienced in the installation of diesel-engine driven fire pumps and associated piping and appurtenances that are similar to those required for this project, and has obtained design and inspection approvals for similar projects from the AHJ and similar public authorities.
- C. The Contractor shall have a professional engineer or minimum NICET Level III certified technician who is legally qualified to practice in State of Rhode Island and is experienced in providing fire protection engineering services. The professional engineer or minimum NICET Level III certified technician shall perform and be responsible for the design of the diesel-engine driven fire pump and associated piping and appurtenances. Engineering services are defined as those performed for installations of diesel-engine driven fire pumps and associated piping and appurtenances that are similar to those indicated for this project in material, design, and extent.
- D. The Contractor shall have a service organization, which will provide a service technician on-site at the University of Rhode Island Alton Jones site, within 4 hours of a request for on-site service.

#### **1.6 Codes and Standards**

- A. The diesel-engine driven fire pump and associated piping and appurtenances shall comply with all applicable state and local codes.

- B. All equipment and devices shall be labeled and listed for the intended use in Underwriters Laboratories, Inc. (UL), UL FPED-2014 *Fire Protection Equipment Directory*.
- C. All equipment and devices shall be labeled and listed for the intended use in the latest edition of FM Global (FM) Approvals Guide.
- D. Installation shall be made in accordance with the applicable provisions of the published edition of the following:
  - 1. NFPA 13-2010, *Installation of Sprinkler Systems*.
  - 2. NFPA 20-2010, *Standard for the Installation of Stationary Pumps for Fire Protection*.
  - 3. NFPA 25-2008, *Standard for Inspection, Testing and Maintenance of Water-Based Fire Protection Systems*.
  - 4. NFPA 70-2008, *National Electrical Code*.
  - 5. NFPA 72-2010, *National Fire Alarm Code*.
  - 6. Factory Mutual Global (FM) Data Sheet 3-7, *Fire Protection Pumps*
  - 7. The equipment manufacturer's guidelines, specifications and field installation diagrams.
- E. The systems shall be tested in accordance with the following:
  - 1. NFPA 20-2010, *Standard for the Installation of Stationary Pumps for Fire*.
  - 2. NFPA 25-2008, *Standard for Inspection, Testing and Maintenance of Water-Based Fire Protection Systems*.
  - 3. The equipment manufacturer's guidelines.

#### **1.7 Related Documents**

- A. General provisions of the Contract, including General and Supplementary, apply to this Section.
- B. Documents, including shop drawings and material specifications prepared according to NFPA 20-2010 shall be required for obtaining approval by the engineer, owner, the owner's insurance carriers and the AHJ.
- C. The requirement of building permits and authorization to proceed shall become part of this specification. The building permits and authorization to proceed shall be obtained and paid for by the Contractor, where applicable.
- D. Prior to commencement and after completion of work, the Contractor shall provide written notification to the AHJ.
- E. The Contractor shall notify the engineer and owner, in writing, when the system is ready for the Demonstration Test and the Acceptance Test. Notification shall be a minimum of two weeks in advance of the planned tests. The system shall be considered ready for the

Demonstration Test, only after all preliminary tests have been made by the Contractor, and all deficiencies have been found and corrected. In addition, two (2) copies of the Contractor's Materials and Test Certificate shall be submitted to the engineer before the owner shall agree to the scheduling of the Demonstration Test.

### 1.8 Order of Precedence

- A. Should conflicts arise out of discrepancies between documents referenced in this specification, the most stringent requirement shall apply; however, should a level of stringency be indeterminable, the discrepancies shall be resolved as follows:
1. State and local codes shall take precedence over this specification.
  2. The *National Fire Protection Association Standards* shall take precedence over this specification.
  3. FM Data sheets shall take precedence over this specification.
  4. This specification shall take precedence over any drawings for this project. Drawings for this project shall reflect the requirements of this specification. Design drawings provided with this specification are not intended to reflect exact locations, and shall not be used as installation drawings. They are conceptual only.

### 1.9 Submittals

- A. The Contractor is responsible to prepare a minimum of eight (8) complete submittal packages, including all products proposed for installation and working drawings sealed by the Contractor's professional engineer or minimum NICET Level III certified technician. The submittal package shall identify quantities and technical information for all equipment listed below. Complete Manufacturer's technical specifications shall be provided for all components. The Contractor shall forward the submittals to the engineer and owner for review and approval. Submittal packages must be approved in writing by the engineer and owner and the AHJ prior to installation or purchase.
- B. Product Data shall be submitted for the following:
1. Diesel-engine driver.
  2. Vertical Turbine fire pump.
  3. Fire Pump Controller.
  4. Fire Pump House, including ventilation, heat and lighting.
  5. Pipe and fitting materials and methods of joining for piping.
  6. Pipe hangers and supports.
  7. Right angle gear assembly – pump to driver.
  8. Valves, including relief valves, specialty valves, accessories, and devices.

9. Alarm and supervisory devices. Include electrical data.
- C. Sprinkler System Drawings: Working plans, shall be prepared according to NFPA 13-2010, and approved by the engineer and owner, and the AHJ.
- D. Fire Pump System Drawings: Working plans, shall be prepared according to NFPA 20-2010, and approved by the engineer and owner, and the AHJ.
- E. Fire Pump Certified Performance curves, to be used for acceptance testing and commissioning of the fire pump installation.
- F. A manufacturer's information sheet, appropriately marked to indicate specific components, shall be provided for all components in the fire pump installation.
- G. Field Test Reports and Certificates shall indicate and interpret test results for compliance with performance requirements and as described in NFPA 20-2010.
- H. Maintenance Data: The Contractor shall provide the owner with a complete maintenance manual as identified in Section 1.12 of this specification.

#### **1.10 As-built Drawings**

- A. The Contractor shall be required to show the following on the plans for as-built drawings:
  1. The exact locations and installation details, in plan and section views, of all equipment and piping, installed as part of or connected to the fire pump system.
  2. The exact elevations of all piping and other equipment.
  3. Electrical wiring details and connections to controllers, drivers, and other devices and appliances.
  4. Contractor shall coordinate installation of fire alarm equipment with the fire alarm system contractor. Submission of fire alarm system components and details for the fire alarm installation shall be considered part of this contract
  5. Pump characteristic performance curves.
  6. Pump certification indicating that the pump(s) will perform as specified, signed by a representative of the manufacturer.

**Note:** The as-built drawings will not be accepted until "all" field changes have been added to the drawings.

#### **1.11 Training Requirements**

- A. Prior to final acceptance of the fire pump system, the Fire Pump System Contractor and supplier shall provide operational training to the owner's designated personnel.
- B. Each training session shall be a minimum of one (1) hour and shall be conducted on shift or at a time acceptable to the owner.

- C. Each session shall include an overview of the system, emergency procedures (including manual starting procedures), control panel operation, and safety requirements.
- D. Each session shall include a complete demonstration of the system.
- E. Dates and times of each training period shall be coordinated through the owner, not less than two weeks prior to the training session.
- F. The Contractor shall arrange for manufacturer's training representatives to provide the necessary factory training for operation, programming and troubleshooting of the installed equipment to the owner's maintenance personnel.

#### **1.12 Operation and Maintenance Manual**

- A. The Contractor shall provide the owner with a complete Operating and Maintenance (O&M) manual for the system. The maintenance manual shall describe in detail the purpose and function of all fire pump equipment and associated appurtenances. These O&M manuals shall include the following:
  - 1. The final Equipment List identifying the quantities and types of equipment, listed by manufacturer's part number.
  - 2. A detailed narrative description of the system functions, intended sequence of operations, testing procedures, and system limitations.
  - 3. An equipment datasheet (or specification sheet) on every piece of system equipment installed.
  - 4. Operator instructions for basic system operations.
  - 5. The results of the acceptance testing of all components.
  - 6. A detailed description of routine maintenance and testing as required and recommended and as would be provided under a maintenance contract.
  - 7. Detailed troubleshooting instructions for each "trouble" condition generated from the fire pump installation.
  - 8. A service directory, including a list of names and telephone numbers of those who provide service for the system.

#### **1.13 Warranty**

- A. The Contractor shall guarantee all equipment installed free from defects in workmanship and inherent mechanical defects for a period of one (1) year from the date of complete acceptance of the project by the owner.
- B. Upon completion of the installation of the diesel-engine driven fire pump and associated piping and appurtenances, the Contractor shall provide to the owner a signed written statement, substantially in the form as follows:

***"The undersigned, having been engaged as the Contractor for the installation of the diesel-engine driven fire pump and associated piping and appurtenances for the Alton Jones Campus at The University of Rhode Island in West Greenwich, RI confirms that the diesel-engine driven fire pump and associated piping and appurtenances was***

***installed in accordance with the diagrams, instructions, directions, and technical specifications provided to us by the manufacturer and the owner.”***

- C. The warranty period will begin on the date of substantial completion of the project.

## 2.0 PRODUCTS

### 2.1 Manufacturers

- A. Acceptable manufacturers subject to compliance with requirements herein shall be provided. Acceptable products are listed below. Any substitution of the products listed below requires approval by the engineer and owner in writing prior to installation.

1. Vertical Turbine Fire Pumps:
  - a. Aurora Pump Unit.
  - b. ITT A-C Pump Unit.
  - c. Patterson Pump Co.
  - d. Peerless Pump Co.
2. Fire Pump Controller:
  - a. Firetrol, Inc.
  - b. Hubbell Industrial Controls, Inc.
  - c. Joslyn Clark Controls, Inc.
  - d. Master Control Systems, Inc.
  - e. Metron, Inc.
3. Diesel-engine Driver
  - a. Clarke Fire Protection Products
  - b. Caterpillar
  - c. Cummins Diesel
4. Jockey Pump
5. Water-Flow Indicators, Pressure Switches and Supervisory Switches:
  - a. Potter Electric Signal Co. or equal
6. Indicator Valves:
  - a. McWane, Inc.; Kennedy Valve Div. or equal
7. Grooved Couplings and Fittings for Steel Piping:
  - a. Victaulic Fire Protection, Inc.
  - b. Tyco Fire and Building Products.
8. Flexible Drive Shaft:

- a. Clarke Fire Protection Products
9. Steel Welding Fittings:
  - a. Merit Manufacturing Corp. or equal
10. Pipe Hangers and Supports:
  - a. Michigan Hanger Co., Inc.
  - b. Tolco, Inc.
11. Fire Pump house shall be part of the fire pump package, delivered as part of a manufacturer's pump package assembly.

## 2.2 Fire Pump

- A. Pump to be a Peerless Model 10MAF-8 or equal, pit mounted vertical turbine type for Fire Pump service, constructed in accordance with NFPA-20, UL 448 and approved by U.L. and F.M
- B. Bowls ASTM A48 Class 30 cast iron, designed for maximum efficiency and long life. Pump shall consist of suction nozzle, bowl assembly and discharge case for connecting to the discharge column pipe
- C. Impellers ASTM B584-636 bronze, enclosed type with non-overloading characteristics. All water passages shall be smooth surfaces. Impellers shall be fastened to pump shaft by means of ASTM A562A I 655 collets or ASTM A582-303SS keys.
- D. Bowl Wear rings ASTM B144 bronze secured to the bowl with a pressed fit and shall be renewable.
- E. Bottom bearing ASTM 8505, alloy 836 bronze sleeve type fully enclosed in bearing shell provided with large grease reservoir. Bearing shall be packed with non-soluble grease or approved equal. A sand collar of ASTM B505-836 bronze shall be provided.
- F. Furnish intermediate bearing at each bowl assembly and shall be ASTM B505, alloy 836 bronze.
- G. Line shaft bearing will be synthetic rubber, water lubricated bearings shall be used. The bearing shall be held in an ASTM A48, Class 30 cast iron spider cast integral with pipe coupling and fitted with a bronze bearing retaining ring. Bearings shall have a maximum spacing of 10'0".
- H. Stuffing box ASTM A48, Class 30 cast iron stuffing box shall be provided containing an ASTM B505-836, bronze bearing, graphite impregnated backing with a bleed-off connection and grease lubricating connection to a lantern ring. A bronze, split type packing gland shall be employed. Separator rings shall be furnished between each ring of packing to prolong packing life.
- I. Column pipe shall be ASTM A53 steel pipe having screwed coupled connections. Coordinate required length with drawings and provide required supports.

- J. Discharge head shall be cast iron and furnished 125 pound discharge flange conforming to ANSI B 16.1. The head shall provide ridged mounting support for the complete pump assembly and the right angle gear.
- K. Strainer shall be bronze basket or cone type strainer is to be provided. The bowls and head shall be hydrostatically tested to twice the shut-off head, but not less than 250 PSI. The pump shall be given a complete laboratory performance test, recording not less than 5 points including shut-off head, dully point and 150% of rated capacity point at a head not less than 65% of rated head. Shut-off head shall not exceed 140% of rated head
- L. The pump shall be supplied with a manufacturer's nameplate, securely fixed to the pump base or pump casing.

### 2.3 Diesel Driver

- A. Engine driven vertical turbine pumps shall be furnished with a Factory Mutual approved vertical hollow shaft right angle gear. The gear shall be direct connected to the engine by an approved flexible universal drive shaft with a torsional coupling and an enclosed guard as recommended by NFPA # 20. The gear shall be constructed so that the total hydraulic and static thrust of the pump's rotating assembly can be carried by the gear's thrust bearing(s). The gear shall mount directly on the pump discharge head with a registered fit to assure proper shaft alignment. It shall be equipped with a top drive coupling and nut for axial alignment of the impellers and shall be equipped with a non-reverse ratchet to prevent reversed rotation.
- B. The engine shall be a Clarke Model JU4H-UFAEE8 diesel engine or equal, UL Labeled and FM approved for fire service, dual battery automatic operation, rated for 64 BHP at 1760 RPM per SAE conditions. The engine shall be derated 3% for every 1000 feet above sea level elevation and 1% for every 10 degrees above 77 degrees ambient temperature. The engine shall be of adequate horsepower to be non- overloading throughout the pump's maximum design requirements. Performance curves that are "cut off" at the 150% point are not acceptable.
- C. The engine shall be equipped with an engine "jacket water heater", dual battery contactors capable of mechanical operation to energize the starting motor in the event of control circuit failure, heat exchanger, and an emergency manual fuel solenoid valve. The engine shall be 12 volt operation.
- D. The following engine accessories shall be included and provide by the system manufacturer:
  - 1. Heavy duty commercial Lead Acid Batteries for dual operation
  - 2. Battery rack
  - 3. Battery cables
  - 4. Residential muffler GT exhaust system
  - 5. Flexible exhaust connection
  - 6. 115 gallon double wall fuel tank with legs and including fittings, flash arrestor and vents

E. Instrumentation and Control

1. Governor:

- a. The engine speed shall be maintained within a ten percent range of rated conditions between full load and no flow conditions.
- b. The governor shall be field adjustable.
- c. The governor shall be set to maintain the rated pump speed at full load conditions by the manufacturer.

2. Overspeed shutdown device:

- a. The overspeed device shall be arranged to shut down the driver in the event of the driver speed exceeding 20% of rated pump speed.
- b. The overspeed device shall be manually reset.
- c. Overspeed shall be indicated on the fire pump controller.

3. Instrument panel:

- a. The instrument panel shall be mounted in such a position that it is easily visible when viewed from a normal floor position.
- b. Instruments/gauges shall include:
  - 1) Tachometer
  - 2) Hour meter
  - 3) Oil pressure gauge

F. Battery Contactors:

1. There shall be a battery contactor for each battery.
2. Each contactor shall be capable of manual mechanical starting of the fire pump.

G. Engine Cooling:

1. The engine cooling system shall use a heat exchanger.
2. The system shall include an opening for checking and adding coolant, per manufacturer's specifications.
3. Heat exchanger-type system:
  - a. The cooling water for the heat exchanger shall be taken from the pump discharge, prior to the discharge check valve. There shall be a normal feed and by-pass feed arrangement.
  - b. The cooling system piping shall use threaded piping. One connection shall be made to the pump discharge, and shall be "teed" into two connections prior to the installation of any valves on either feed piping.
  - c. The piping system shall use two indicating shut-off valves in both the normal and by-pass piping system from the discharge to the heat exchanger.
    - 1) These valves shall be marked to indicate their normal positions. On the normal cooling line, the valves shall be marked "normally open". The by-pass valves shall be marked "normally closed". Instructions shall be posted to indicate the operation of the valves in the event of the driver overheating.

- d. Located between the valves on the normal piping system shall be:
  - 1) An approved flushable strainer.
  - 2) A pressure regulator set to maintain the pressure in the piping to the heat exchanger at the manufacturer's recommended pressure.
  - 3) An automatic valve, closed when the engine is not operating, arranged to open upon the activation of the driver starting circuit. Power to this valve shall come from the diesel driver or its batteries, and not from pump house power.
- e. Located between these valves on the by-pass piping system shall be:
  - 1) A pressure regulator set to maintain the pressure in the piping to the heat exchanger at the manufacturer's recommended pressure.
- f. A pressure gauge shall be installed on the piping at a point about six inches from the entrance to the heat exchanger.
- g. The cooling water flow shall be set by the manufacturer so that the regulator maintains maximum ambient cooling flow to the heat exchanger.
- h. The heat exchanger shall be provided with a waste pipe, at least one size larger than the pipe supplying the heat exchanger. If the waste pipe is longer than 15 feet, an additional pipe size increase shall be applied.
  - 1) The waste pipe shall be as short as practical, and there shall be no valves in the waste line.
  - 2) The waste pipe exit point shall be visible, and be within six inches of the floor.

#### **2.4 Right Angle Driver**

- A. Amarillo Model #SL80A; 1:1 ratio complete with Clarke supplied flexible drive shaft and guard or equal.

#### **2.5 Fire Pump Accessories**

- A. The system manufacturer shall furnish accessories as follows:
- B. 1½" automatic air release valve
- C. Discharge pressure gauges for Fire Pump & Jockey Pump
- D. 6"x 8"-Concentric discharge increaser, if applicable
- E. 4" Potter-Roemer #5862-D-1-2-7 with caps & chains 125# flanges
- F. 4" fire dept. inlet connection w/ check valve & Siamese connection

#### **2.6 Diesel Fire Pump Controller**

- A. The controller shall be a UL/FM Firetrol FTA1100-J Mark II Digital Display and Data Acquisition Controller or equal.
- B. Voltages: Input: 110/120 VAC, Single Phase, 60 Hertz. Output: 12 VDC, Negative Ground, Lead Acid Batteries.

- C. Controller functions will offer Engine starting/stopping, alarm outputs and weekly test functions are operated by the Mark II unit integral to the controller. The FTA1100-JL controller provides a real time digital display of system pressure, engine status, time/date along with battery voltages and amps. The Mark II unit has a Non-Volatile Flash
- D. Memory that records a history of the previous 3000 events. (An event can be a system pressure status every hour, the last time the engine was run or one of many other types of data.) These events can be shown and scrolled through via the digital display on the front interface panel. A USB port is included as standard in the Mark II unit. A single USB will hold approximately 1 years worth of event data under normal conditions. Another feature is two fully automatic 200 amp-hour 4 step battery chargers.
- E. As a standard: NFPA Required Remote Alarm Contacts, Weekly Test Timer, A Safety Shutdown During Weekly Test, AC Power Failure Start, Sequential Starting and a NEMA type 12 enclosure.
- F. A large 2" operator shall be provided on the main selector switch. Two voltmeters and ammeters shall be provided, one for each battery bank. All relay contacts shall be rated for 10 amps. A Y-strainer shall be provided after the pressure switch connection and before the drain valve solenoid. The controller enclosure shall be constructed in accordance with NEMA 12 requirements.
- G. The fire pump controller shall be arranged to start the pump automatically or-manually, and be arranged for manual stop only.
- H. When started manually, the operation of the pump shall not be affected by the automatic starting mechanism.
- I. Failure of any automatic starting mechanism shall not affect manual operation.
- J. Fire pump controller shall be a UL listed, FM approved unit, factory assembled, wired and tested.
- K. The controller shall operate on 12 volts, with the exception of the battery chargers, which shall operate on 115 volts.
- L. The controller shall be mounted in a National Electrical Manufacturer's Association (NEMA) Type 2 enclosure.
- M. Pump base shall be on a concrete pad. Pump and engine shall be a minimum of 12" above finished floor.
- N. The controller shall be mounted at least twelve inches above finished floor elevation.
- O. The controller shall be placed in direct view of the fire pump unit, no further than ten (10) feet away from the driver.
- P. Battery Chargers
  - 1. Two fully automatic independent built-in battery chargers shall be provided.
  - 2. Separate charging circuits shall be provided.
  - 3. Chargers shall include separate AC input fuses or circuit breakers.
  - 4. Chargers shall include separate DC output fuses or circuit breakers.

5. Two voltmeters and ammeters, or digital equivalents, shall be provided – one for each battery bank.
- Q. Signal Display
1. The controller shall provide both audible and visible indications of controller status.
  2. All visible signals shall be displayed as text display(s) or pilot lights.
  3. Audible signals shall sound at a level of at least 70 dBA at the control panel.
  4. The display shall provide independent signal status to cover the following conditions/items:
    - a. Low engine oil pressure
    - b. High engine temperature
    - c. Failure to start (minimum 4 attempts on each starting circuit)
    - d. Controller switch not in automatic start position
    - e. AC or charger failure (audible signal not required)
    - f. Battery 1 or 2 failure
    - g. Low pump house temperature
    - h. Low fuel level
    - i. Overspeed shutdown
    - j. Pump running
  5. Audible silencing of the above signals shall not be allowed.
- R. The controller shall be arranged to start the fire pump automatically upon a thirty-second power outage to the control panel.
- S. A spring wound pressure recorder, event recorder, or equivalent, shall be provided. The recorder shall be capable of seven-day continuous operation, without rewinding or resetting.
- T. The diesel engine controller shall not be used for any other wiring purposes, such as a junction box for other fire pump equipment service.
- U. A field-connection wiring diagram shall be permanently attached to the inside of the control panel door. Field terminals shall be plainly marked, and match the designations on the wiring diagram.
- V. Automatic starting
1. The controller shall be arranged to start the pump on a pressure drop in the fire protection system.
  2. The starting mechanism (pressure switch or transducer) shall not use any pressure restricting devices.
  3. The pressure-sensing element shall be designed to not lose its accuracy when subjected to a momentary 400-psi surge.
- W. Starting equipment arrangement

1. There shall be two lead-acid storage batteries, arranged so that either battery can start the driver.
2. Battery cables shall be sized per manufacturer's recommendations.
3. The starting current shall be provided by each battery one at a time, on a rotational basis, automatically switching between batteries.
4. An attempt-to-start cycle shall last for 8 attempts (4 on each battery). In the event that the driver fails to start, an audible and visible fail-to-start signal shall be initiated by the controller.
5. When one battery is missing or at an inoperative level, the controller shall "lock out" the bad battery.

#### **2.7 Jockey Pump**

- A. The jockey pump shall be a Grundfos or equal submersible pump with mechanical seal. Complete with a 3450 RPM, 1 HP, 230 volt, 1 phase, 60 cycle motor. (7 GPM @ 140 PSI)

#### **2.8 Jockey Pump Controller**

- A. The jockey pump controller shall be a Firetrol Model FTA-550F or equal complete with fusible disconnect, Hand-Off-Automatic selector switch and a pressure switch in a wall mounted NEMA 2 enclosure. The controller shall be rated for 1 HP, 1 phase, 60 cycle, 230 volt operation.
- B. Provide the following items:
  1. Running period timer
  2. Control circuit transformer
  3. Pump operating pilot light
  4. Power available pilot light

#### **2.9 Diesel Fuel Supply Arrangement**

- A. The fuel supply shall be dedicated to the fire pump driver.
- B. The fuel tank shall have a capacity of at least one gallon per driver horsepower, plus 10%.
- C. The fuel tank shall be located within a containment structure that has a minimum capacity of the entire contents of the fuel tank, plus 10%, or double wall tank per NFPA 20.
- D. The fuel tank shall be located as indicated on the design drawings, inside the building. They shall be elevated so that bottom of the tank is between 3 and 6 inches above the centerline of the driver's fuel pump. The engine manufacturer's fuel pump static head shall not be exceeded when the tank is full.

- E. The fuel supply piping to the pump shall exit the tank at a level that insures 5% of the fuel in the bottom of the tank can't leave the tank.
- F. There shall be a fuel return line, installed per the manufacturer's recommendations.
- G. Fuel level in the tank shall be continuously indicated. Sight tubes for this purpose shall not be allowed.
- H. The tank shall have suitable fuel fill, drain, and vent connections. Fill piping shall be arranged to allow filling only from outside the building.
- I. Fuel supply and return lines shall be arranged as follows:
  - 1. The supply line shall use a valve that can be locked at the exit from the tank. There shall be no valve in the fuel return line.
  - 2. Fuel supply and return piping shall be sized based on the driver manufacturer's specifications.
  - 3. Fuel lines shall be steel pipe; galvanized steel or copper shall not be used.
  - 4. Fuel piping shall be protected against physical damage as needed; piping protection cannot be installed in such a manner as to create a trip hazard.
  - 5. UL listed flame retardant flexible hoses shall be used at the connection of both the supply and return lines. These shall be installed at the fuel line connections to the driver.
- J. If an electric fuel-solenoid valve is provided to control the fuel supply to the driver, it shall be capable of manual mechanical operation, or capable of being by-passed in the event of the control circuit failure.

#### **2.10 Engine Exhaust**

- A. The pump driver shall have its own exhaust system, and shall not be connected to any other fuel fired equipment, such as a generator.
- B. The exhaust piping shall discharge outside the pump house at a safe location.
- C. There shall be a flexible section of stainless steel at the point of connection to the driver's exhaust manifold, connecting to the exhaust pipe.
- D. The exhaust pipe shall be as short as possible, and no smaller than the driver's exhaust outlet.
- E. A muffler shall be used, and the manufacturer of the driver shall certify that it will not create backpressure that exceeds manufacturer's specifications.
- F. There shall be no combustible construction or occupancy within two feet of the muffler or exhaust piping.
- G. The exhaust manifold, exhaust piping and turbocharger shall be arranged to avoid injury to personnel who may come in contact with these components.

**2.11 Test Header**

- A. The test header shall use six (4) inch piping, and be as indicated on the design drawing.
- B. A four-inch indicating gate valve shall be provided in the test header piping.
- C. The test header shall include three (2) 2-1/2-inch hose valves mounted on a horizontal oriented hose header.
- D. A drain shall be located in the piping to the hose header. The drain shall be a velocity drip-type valve, with no manual shutoff valve.
- E. Hose valve threads shall be the same as those used by the local emergency responders.

**2.12 Pipes**

- A. Steel Pipe
  - 1. Schedule 10 Steel Pipe: ASTM A 135 or ASTM A 795, Schedule 10 in NPS 4 (DN100) and smaller and NFPA 13 specified wall thickness in NPS 6 to NPS 10 (DN150 to DN250).
  - 2. Standard-Weight Steel Pipe: ASTM A 53, ASTM A 135, or ASTM A 795; Schedule 40 in NPS 6 (DN150) and smaller, and Schedule 30 in NPS 8 (DN200) and larger.

**2.13 Pipe and Tube Fittings**

- A. Cast-Iron Threaded Flanges: ASME B16.1. Malleable-Iron Threaded Fittings: ASME B16.3.
- B. Steel, Threaded Couplings: ASTM A 865.
- C. Steel Welding Fittings: ASTM A 234/A 234M, ASME B16.9, or ASME B16.11.
- D. Steel Flanges and Flanged Fittings: ASME B16.5.
- E. Steel, Grooved-End Fittings: UL-listed ASTM A 47 (ASTM A 47M), malleable iron or ASTM A 536, ductile iron; with dimensions matching steel pipe and ends factory grooved according to AWWA C606.

**2.14 Joining Materials**

- A. Refer to Manufacturer's specifications for grooved pipe fittings, pipe-flange gasket materials and welding filler metals.
- B. Joint compound or tape shall be applied to male pipe threads only for all threaded joints.
- C. Transition Couplings: AWWA C219, sleeve type, or other manufactured fitting the same size as, with pressure rating at least equal to, and with ends compatible with piping to be joined.

**2.15 Valves**

- A. General: UL listed, with minimum 175-psig (1200-kPa) non-shock working-pressure rating. Valves for grooved-end pipe may be furnished with grooved ends instead flanged ends.
- B. Gate Valves, NPS 2 (DN50) and Smaller: UL 262; cast-bronze, threaded ends; solid wedge; OS&Y; and rising stem.
- C. Indicating Valves, NPS 2-1/2 (DN65) and Smaller: UL 1091; butterfly or ball-type, bronze body with threaded ends; and integral indicating device.
  - 1. Indicator: Visual.
  - 2. Indicator: Electrical 115-V ac, pre-wired, single-circuit, supervisory switch.
- D. Gate Valves, NPS 2-1/2 (DN65) and Larger: UL 262, iron body, bronze mounted, taper wedge, OS&Y, and rising stem. Include replaceable, bronze, wedge facing rings and flanged ends.
- E. Swing Check Valves, NPS 2-1/2 (DN65) and Larger: UL 312, cast-iron body and bolted cap, with bronze disc or cast-iron disc with bronze-disc ring and flanged ends.
- F. Ball Drip Valves: UL 1726, automatic drain valve, NPS 3/4 (DN20), ball check device with threaded ends.

**2.16 Alarm Devices**

- A. General: Types matching piping and equipment connections.
- B. Water-Flow Indicator: electrical-supervision, water-flow detector; with 250-psig (1725-kPa) pressure rating; and designed for horizontal or vertical installation. Include two single-pole, double-throw, circuit switches for isolated alarm and auxiliary contacts, 15 A, 125-V ac and 2.5 A, 30-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
- C. Valve Supervisory Switches: for electrical-supervision use single-pole, double throw; with normally closed contacts. Include design that signals controlled valve is in other than fully open position.

**2.17 Pipe Sleeves**

- A. General: Provide pipe sleeves where piping passes entirely through the floor and wall. Secure sleeves in position during construction. Provide sleeves of sufficient length to pass through entire thickness of the floor and wall. Provide 1-inch minimum clearance between exterior of piping and interior of sleeve or core-drilled hole. Firmly pack space with mineral wool insulation. Seal space at both ends of the sleeve or core-drilled hole with plastic waterproof cement, which will dry to a firm but pliable mass, or provide a mechanically adjustable segmented elastomeric material.

1. Sleeves in masonry and concrete floors: Provide hot-dip galvanized steel, ductile-iron, or cast-iron sleeves. Core-drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in the core-drilled hole are completely grouted smooth.
2. Sleeves in other than masonry walls: Provide 26 gauge galvanized steel sheet.

## **2.18 Pressure Gages**

- A. Water Pressure Gages: UL 393, 3-1/2- to 4-1/2-inch- (90- to 115-mm-) diameter dial.
- B. A discharge pressure gauge shall be provided, connected into or near the discharge flange.
  1. It shall be connected through a 0.25-inch to the discharge flange or piping, and shall be controlled by a valve, either indicating or non-indicating.
  2. The dial shall indicate a pressure range of zero to 200 psi, minimum.
  3. The dial shall indicate pounds per square inch, in the manufacturer's normal graduations.
- C. A compound suction pressure gauge shall be provided, connected into or near the suction flange.
  1. It shall be connected through a 0.25-inch to the suction flange or piping, and shall be controlled by a valve, either indicating or non-indicating.
  2. The dial shall indicate a pressure range of -30 inches Hg to 150 psi, minimum. The dial shall indicate pounds per square inch, in the manufacturer's normal graduations.

## **2.19 Fire Pump Factory Prefabrication**

- A. The fire pump unit shall be mounted on an open I-Beam structural steel skid having recessed inner support members. All piping, pressure sensing lines, shut off valves, header piping, relief valve piping, stuffing box, and casing relief drain lines shall be firmly anchored to the steel base by means of structural steel supports. All electrical wiring between drivers and controller shall be ran in rigid conduit, countersunk and ran through the center of the inner support members of the skid. See plans for bill of materials.
- B. All equipment shall be factory tested as a system by the system manufacturer in accordance with NFPA 20, UL and FM prior to shipment. Additionally, the entire package shall be hydrostatically tested by the system manufacturer prior to shipment. The unit shall be built and tested in an enclosed weatherproof shop.

## **2.20 Fire Pump House**

- A. Prefabricated Building
  1. Building Size shall be approximately 14' wide X 29' long X 10' high. Building is to be supplied complete with all necessary component parts, to form a complete building system and all parts shall be new and free from all defects or imperfections. The building width and length shall be measured from the outside of the building wall panels and the height of the building shall be the distance measured from the bottom surface of the base

channel to the exterior juncture of the roof and sidewall panels and will require a building state certification.

2. Factory exteriors color of building and roof to be Tan or White only as selected by architect.
3. Environmental enclosures shall be constructed with prefabricated wall and ceiling panels formed to exact size as described below and manufactured by Kysor Panel Systems, Fort Worth, TX or equal.

**B. Future Domestic Water Pump and 3,000 Tank Arrangement**

1. Space is included for the above system components that will be added and fitted by others in the future. Note if alternate #1 is accepted, the domestic water equipment shall be provided as part of the prefabricated assembly.

**C. Insulation**

1. Insulation shall be 100% rigid urethane with an at temperature conductivity factor (K factor) not to exceed 0.128 Btu/hr. Urethane is to be poured in place with a density of 2.2 pounds per cubic foot. Overall coefficient of heat transfer (U factor) and R value to be as follows:

“R” VALUE  
24(walls) and  
34(ceiling)

2. This insulation shall be a listed urethane with a rating of no more than 25 for flame spread and 450 for smoke developed per ASTM E84. This urethane shall also meet the ignition properties requirements of ASTM D-1929.

**D. Modular Panel Construction**

1. All panels to be constructed with die-formed interior and exterior metal pans securely fastened to a perimeter frame of kiln dried spruce-pine-fir (SPF) specie, #2 grade lumber. Perimeter frame to feature tongue and groove profile for positive alignment and sealing. Panel shall be filled with poured-in-place urethane, securely bonded to metal pans and perimeter frame to create a rigid structural panel with a tough, resilient, shock-resisting surface. Provide standard panels, interchangeable, for ease of assembly. Provide special panels, if required, manufactured to the size required to obtain a specified building-size. Provide pressure treated (Chemicals) perimeter bracing.

**E. Panel Fasteners**

1. Provide cam-lock fasteners to ensure a tight and positive seal, and reduce on-the-job installation time. Fastener material shall be steel housing, hook and pin with high-pressure die-cast zinc cam. Hardened steel hexagonal wrench is provided to tighten panel fasteners. The hook of the fastener shall engage over the pin when rotating the wrench and with cam-action, draw the panels tightly together. Polyethylene snap-in caps cover the wrench holes. Lock spacing shall not exceed 48" on center.

**F. Panel Gaskets**

1. Each joint shall exhibit a polyvinyl chloride (PVC) bulb type; compression gasket to eliminate water vapor permeability. All gaskets are factory installed and require no

additional handling. Gaskets shall be resistant to chemical corrosion and ultraviolet radiation. Gasket operating temperature shall be -34 degrees C to +71 degrees C (-30 degrees F to +160 degrees F).

#### G. Finishes

1. Provide interior and exterior metal pan as follows:
  - a. Galvanized Steel
  - b. Tan Embossed 22 gauge

#### H. Metal Commercial Doors

1. Doors shall be seamless, constructed of two face sheets of 18 gauge cold rolled steel, stretcher-leveled quality of flatness. Vertical edges of doors shall have neat hemmed edge seam mechanically interlocked for maximum structural integrity. All hinge reinforcements shall be of 8 gauge steel projection welded to door.

Door Widths	Louver Sizes
6'-0" wide X 7'-4" high Double	To suit exhaust fan

2. The number of doors (2), their location and direction of swing is shown on the plans.
3. Standard frames shall be double rabbeted 16 gauge cold rolled steel. Frames shall be mitered, face welded and ground smooth. All hinge reinforcements shall be of 8 gauge steel projection welded to frame. Reinforcements for strike and surface mounted hardware shall be a minimum of 14 gauge. Frames shall be furnished with a factory installed rubber mutes, 3 per strike jamb.
4. Doors and frames shall be factory painted with one coat of baked on primer. All doors shall be preassembled in their frames and hardware installed and tested prior to shipment. Field installation of the door unit shall not require any frame assembly, door handling or hardware installation.
5. Provide door hardware, including continuous hinges with individual lockset and accessories, for exterior doors as follows:
  - a. Hinges: Hinges shall be continuous hinges.
  - b. Keyed lockset with storeroom function (US 32D).
  - c. Hasp & Staple: 7" extra heavy type, cadmium plated.
  - d. Head Bolt: 6" long with 24" chain, cadmium finish.
  - e. Foot Bolt: 6" long, cadmium finish.
  - f. Weatherstripping
  - g. Threshold: aluminum
  - h. Door stop and latch

I. Roof Hatch

1. Roof hatch will be designed per the pump selection size.

J. Composite Testing

1. Provide panel systems that meet the requirements of the following:
  - a. Flame spread and smoke developed per UL-723, ASTM E-84 and Chapter 26 of the International Building Code
  - b. Ignition properties per ASTM D-1929
  - c. Factory Mutual Standard 4894

K. Regulations and Codes

1. All work and materials shall be in full accordance with local and State Building Code. Provide all items required by the regulations and codes, but not necessarily specified herein or shown on the drawings.

L. Caulking & Sealants

1. Insulated panels shall be set on galvanized "Z" base trim, secured to concrete slab, with non-drying butyl caulking. All openings and penetrations through insulated panels shall be sealed with silicone sealant. Clean and degrease applicable surfaces.

M. Installation

1. Install in complete accordance with the manufacturer's printed instructions.

N. Louvers

1. Louvers shall be the "fixed" type with insect screen. Louver frame shall be made from 22 gauge galvanized steel. Louvers shall be horizontally centered and set into 47" insulated panels.

O. Exhaust Fans

1. Provide manufacturer standard exhaust fan.

P. Roof System

1. Provide a prefabricated roof system for the enclosure, complete with roof hatch, to provide a waterproof covering for insulated ceiling panels.
2. Roof system shall be galvanized standing seam, 22 gauge, 16 inches wide sheet metal over ceiling panels with a slope of  $\frac{1}{4}$ " per foot. Fasteners shall be corrosion resistant rubber washers Tek screws with length and strength required for metal to be fastened.

Q. Gutters & Downspouts

1. Provide enclosure complete with gutters, downspouts, and standard metal finishes to match the finish on the insulated panels.

R. Equipment Support Blocking

1. Provide all blocking as required to support pump equipment indicated. Coordinate with pump supplier.

S. Skid Mount

1. Provide steel skid mount, to receive pump system, ready for casting in concrete floor.

T. Electrical Continuity

1. Grounding plate with threaded lugs and mechanically fastened continuity trim are available upon request.

U. Wall Openings

1. The building manufacturing is to supply all necessary framing and connectors to structurally replace the panel removed by any wall or roof openings. The supplier of the unit being installed shall provide all trim and flashing required to make weather-tight the unit placed in any opening.

V. Provide the Following Accessories

1. (3) KVA CFM space heaters with thermostat (sized for location)
2. (2) Motorized Damper – sized to suit application
3. (2) Duplex battery powered interior emergency lighting
4. (2) Duplex wall mounted GFCI convenience outlet
5. (1) Overhead automatic sprinkler system with flow sensor per NFPA 13
6. (1) 100-amp service entrance rated disconnects provided and installed per NEC and NFPA 20 for the FIRE PUMP UNIT ONLY.
7. (1) Exhaust Fan & Thermostat - sized to suit application
8. (5) 100W Fluorescent Vapor Tight Lights
9. (6) 15 AMP Single Pole Circuit Breakers
10. Exterior 70 W High Pressure Sodium Wall Pack with Photocell
11. Incoming power will be 208 volt, 3 phase, 60 Hz
12. Circuit breaker for fire alarm system and associated equipment.

W. Third Party Certification

1. All packaged equipment shall be independently Third Party labeled as a system suitable for the intended use by a Nationally Recognized Testing Laboratory (NRTL) in

accordance with OSHA Federal Regulations 29CFR1910.399 and NFPA 70, National Electric Code (NEC), Article 90-7.

#### X. Quality Assurance

1. The equipment and materials covered by these specifications are intended to be standard equipment of proven reliability and as manufactured by reputable manufacturers having experience in the production of such equipment. The equipment furnished shall be designed, constructed, and installed in accordance with the best practices and methods and shall operate satisfactorily when installed as shown on the contract drawings and operated per the manufacturer's recommendations.
2. It is intended that the manufacturer of the specified equipment shall be a business regularly engaged in the manufacture, assembly, construction, start up, and maintenance of fire pumping distribution equipment of the type required for this project. The manufacturer shall have at least ten (10) years of successful experience in providing stations of the type, design, function, and quality as required for this project. Equipment manufactured by an outside source or brokered equipment defined, as systems not assembled on the premises of the named manufacturer by that company's employees WILL NOT be allowed.
3. Provide pump system, including piping, valves, automatic devices, gauges, and all required accessories and appurtenances, as well as those required by the National Fire Protection Association (NFPA) Pamphlet No. 20; Provide automatic devices of the type and make identical with those labeled and/or listed by the Underwriters' Laboratories (UL) and FM.
4. Provide earthquake restraint systems as required by State Building Code.
5. Coordinate with drawings for additional information.

#### 2.20 Fire Pump House (cont.)

- A. The fire pump house shall be delivered and assembled as part of a packaged fire pump system.
- B. Construction shall conform to the requirements of the Rhode Island State Building Code, RISBC-1.
- C. Pump house shall be of substantial construction. Materials of construction shall be non-combustible. Acceptable construction shall be hollow concrete block walls, with non-combustible roofing; insulated metal panel roof and walls; other materials and designs shall be presented to the owner for approval.
- D. Minimum 115-volt electrical service to the building shall be provided to the extent necessary to provide adequate power for the following items. Location of the connection for the electrical supply for this circuit shall be coordinated with the owner. All electrical service shall conform the requirements of the NFPA 70.
  1. Building heat
  2. Engine heater

3. Pump control panels, including a separate circuit for the battery chargers in the engine control panel
  4. Air intake louver/ventilator
  5. Normal and emergency lighting
  6. Spare circuit for fire alarm system and associated equipment
- E. Electrical circuit to the fire pump house shall be dedicated to the fire pump house, completely independent of other electrical services. All breakers and controls for circuits shall be suitably marked, and made accessible to only authorized personnel.
- F. Minimum door width for equipment entry shall be minimum six-feet clear; a second personnel door shall be provided approximately opposite of the equipment entry. Doors shall be provided with positive locks and latches.
- G. A clear space of three feet shall be maintained around all equipment to allow access for maintenance and operation.
- H. Building shall be arranged to allow a clear path of view between pumps and controllers.
- I. Room shall be provided with automatic sprinklers, arranged as a wet pipe system. Refer to drawing for details.
- J. Room shall be placed on a suitable concrete pad. Contractor shall be responsible for the pad. Coordinate with others for construction and strength requirements for the pad.

#### **2.21 Tank Level and Pump Controls:**

- A. Provide tank fill control panel and probes as part of this system. Locate control panel in pump house and provide remote alarm panel inside building where directed.
- B. Provide BW Controller on 30,000-gallon storage tank, Model #6012-E3-S5-EP-3 or equal.
- C. Units to be all stainless steel, Type 316, rods, with spacers and electrodes.
- D. Controller to be complete with panel.
- E. Electrodes are to be installed to indicate the following signals per NFPA 72-10 Section 17.16.3:
  1. Normal water level EL: 226'-0
  2. Off normal water levels EL: 225'-9 and 226'-3
  3. Fill Valve Off ( Close ) EL: 226-0

4. Fill valve On ( Open ) also alarm that valve has opened EL: 225'-9
  5. Low water EL: 225'-0
- F. Provide separate alarm panel, located inside building where directed, complete with silencing button, light and bell.
- G. Provide rigid type alarms to avoid false alarms and pump operation.
- H. All equipment shall be purchased from one distributor he will guarantee the whole operation and supervise installation, and instruct Owner's personnel in operation of the system.
- I. Provide connection point in panel for connection to fire alarm system to send an alarm to the fire department central system, to notify fire department of various tank conditions. Coordinate all work with electrical contractor.

### **3.0 EXECUTION**

#### **3.1 Installation**

- A. Installation, workmanship, fabrication, assembly, erection, examination, inspection and testing shall be in accordance with NFPA 20-2010, except as modified herein. Install piping straight and true to bear evenly on hangers and supports. Keep the interior and ends of new piping and existing piping affected by Contractor's operation thoroughly cleaned of water and foreign matter. Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter. Inspect piping before placing into position.
- B. Welding: Perform all welding in the shop; the owner must approve field welding. The owner must approve all welding activities before they occur.
- C. Examine and verify actual locations of existing equipment and piping before submission of the submittal package to the engineer and owner.
- D. All examinations shall be coordinated with the owner.

#### **3.2 Piping Applications**

- A. Welded joints shall not be used with galvanized steel pipe.
- B. Flanges, unions, and transition and special fittings with pressure ratings the same as or higher than the systems pressure rating may be used in aboveground applications, unless otherwise indicated.

#### **3.3 Valve Applications**

- A. The following valve requirements apply:
1. Fire-Protection-Service Valves (for system control): UL listed for applications as follows
    - a. Shutoff Duty: Use gate valves.

2. General-Duty Valves (not to be used for system control): UL-listing not required.

a. Shutoff Duty: Use gate, ball, or butterfly valves.

b. Throttling Duty: Use globe, ball, or butterfly valves.

### **3.4 Joint Construction**

A. Refer to manufacturer's specifications for basic piping joint construction.

B. Dissimilar-Piping-Material Joints: Construct joints using adapters or couplings compatible with both piping materials. Use dielectric fittings if both piping materials are metal.

### **3.5 Piping Installation**

A. Deviations from approved working plans for piping requires written approvals from the engineer, owner and the AHJ.

B. All piping above ground shall be steel. Above ground piping shall not be lined.

C. Piping above ground shall be joined by means of mechanical grooved, threaded or flanged joints.

D. Discharge pipe and fittings

1. The pressure rating of the piping and fittings in the discharge of the fire pump shall be listed for 175 psi working pressure.

a. Discharge piping shall be hydrostatically tested to a pressure of 210 psi for a period of two hours.

b. The installing contractor shall provide a certificate hydrostatic testing prior to the demonstration test.

2. Discharge piping shall connect the pump discharge flange to the existing underground private fire service mains at a point to be determined in the field, and reflected on the drawings submitted with the initial submittal.

3. A listed check valve shall be installed in the pump discharge.

4. A listed gate valve shall be installed in the discharge piping, on the fire protection system side of the discharge check valve.

5. There shall be no pressure regulating valves in the pump discharge.

6. There shall be no pressure relief or flow limiting valves in the pump discharge.

### **3.6 Fire Pump Controller Sensing Lines**

- A. Fabricate pipe and fittings according to NFPA 20 with stainless steel sensing tubing, ½" size, with globe valves for testing controller mechanism from system to pump controller as indicated. Include a bronze check valve with 3/32" orifice in the clapper or a ground-face union with a non-corrosive diaphragm having a 3/32" orifice.

### **3.7 Connections**

- A. Connect the discharge piping to the new discharge piping, as mentioned previously in this specification.
- B. Connect piping to valves, test header, and accessories.
- C. Electrical Connections: Power wiring. Install per NFPA 70. (By electrical subcontractor)
- D. Connect alarm devices to fire alarm. (Coordinate with fire alarm contractor)

### **3.8 Labeling And Identification**

- A. Install labeling and pipe markers on valves, equipment and piping according to requirements in NFPA-20-2010.
- B. Signs and label styles and locations shall be coordinated with and approved by the owner and the AHJ prior to installation.

### **3.9 Field Quality Control**

- A. Perform hydrostatic test of entire system and inspect piping according to NFPA-20. Coordinate hydrostatic test date and time of test with the engineer, owner and the AHJ.
- B. Replace piping system components that do not pass test procedures and retest to demonstrate compliance. Repeat procedure until satisfactory results are obtained.
- C. Report test results promptly and in writing to the engineer, owner and the AHJ.

### **3.10 Testing Instructions**

- A. One week prior to final acceptance testing, the Fire Pump System Contractor shall deliver to the engineer and owner complete, simple, comprehensive, step-by-step testing instructions providing recommended and required testing frequency of all equipment, methods for testing equipment, and a complete troubleshooting manual explaining what might be wrong if a certain malfunction occurs and explaining how the malfunction may be corrected.

### **3.11 Demonstration and Acceptance Testing**

- A. Before the installation shall be considered completed and acceptable by the awarding authority, the Final Acceptance Test shall be performed. This test shall be coordinated and

performed by the Contractor's job foreman, the pump manufacturer's representative, and the engine manufacturer's representative in the presence of a representative of the owner, and the AHJ. In order to ensure attendance of the necessary representatives, prior to the final test, each representative scheduled to witness the test must be provided reasonable notification of the test date by the Contractor (at least two weeks). The test will not be conducted until all parties agree on the scheduled test date.

- B. At least two weeks prior to the Final Acceptance Test, a Demonstration Test shall be conducted in the presence of the engineer and an owner's representative.
- C. At least two (2) weeks prior to the scheduled commencement of the Demonstration Test, the Fire Pump System Contractor shall submit a Test Plan for Demonstration and Acceptance Tests that shall describe how the Contractor proposes to execute the Demonstration and Acceptance Tests.
  1. The Test Plan for Demonstration and Acceptance Tests shall include a step-by-step description of each test, the type and location of the test apparatus to be used, the type of data to be collected and what the criteria for acceptability are for the test being conducted.
  2. The Test Plan for Demonstration and Acceptance Tests shall show how the Acceptance Test will satisfy the criteria in NFPA 20-2010, and demonstrate that the operating and installation requirements of this Specification have been met.
  3. Demonstration and Acceptance Tests shall not be scheduled until the Test Plan for Demonstration and Acceptance Tests is approved by the engineer and the owner.
  4. The Fire Alarm System Contractor shall provide all the necessary personnel and equipment to conduct the Demonstration and Acceptance Tests.
  5. At a minimum, the Fire Pump System Contractor shall perform the Demonstration Test specified herein, and Acceptance Tests outlined in the NFPA 20-2010 chapter, covering Acceptance Testing, Performance & Maintenance, including:
    - a. The contractor shall make arrangements for the safe flow of the water required to be flowed during the Acceptance and Demonstration Tests. Plans should be developed that discharge all water back to the suction tank.
    - b. Testing of all controller functions, to be conducted as recommended by the controller manufacturer.
  6. At least six (6) manual and six (6) automatic starts.
  7. All of the tests shall be performed on the system by the Contractor prior to acceptance of the system that will be witnessed by the owner and AHJ. This means that all testing may actually be conducted twice: once by the Contractor as the Demonstration Test, and once during the actual Acceptance Test. The Contractor must make provision for both tests in the bid documents.
  8. Once the Demonstration Test has been completed, any revisions, repairs or modifications shall be made, and then the Final Acceptance Test shall be scheduled. The Final Acceptance test shall show the authority having jurisdiction that the entire fire pump system is installed and operates per the requirements of NFPA 20-2010 and these specifications.
  9. Upon satisfactory completion of the tests, the Contractor shall leave the fire pump system in proper working order and without additional expense to the owner, shall replace any defective materials or equipment provided by the Contractor under this Contract within one year from the date of final acceptance by the owner.

10. If additional testing is required by the AHJ due to system problems in installation or any other functional area of fire pump system, the contractor will be liable for the cost of the additional test(s). The cost shall be calculated based on the hourly rate of all required parties required for original testing.
11. When all testing has been completed to the satisfaction of the Contractor's job foreman, a notarized letter co-signed by the Contractor, attesting to the satisfactory completion of testing, shall be forwarded to the engineer and owner.

### **3.12 Final Acceptance**

- A. Final Acceptance by the owner shall indicate that:
  1. The fire pump system has been delivered completely operational and in conformance with this Specification and applicable codes and standards;
  2. All documentation has been submitted, as required by these Specifications; and
  3. All training, as required by these Specifications, has been completed to the satisfaction of the owner.

**END OF SECTION**