1. FUEL OIL PUMP SET
2. Acceptable manufacturers subject to compliance with the specifications:
3. Critical Fuel Systems
4. Viking Pump
5. IMO Pump
6. Provide and install a factory assembled "Packaged" Automatic Fuel Oil Transfer and Monitoring System to ensure a reliable supply of fuel oil to the emergency generators and/or boilers included in this project. System to be factory fabricated/tested and certified as a complete unit. Field assembled units are not acceptable. The pump set for generator applications must be provided by the same manufacturer as the day tank controls and sensors provided to assure that all the controls work together.
7. The system shall be provided with a duplex fuel oil transfer pump set (refer to schedule for flow rate and motor sizing) rated for full flow at the pressure shown on the equipment schedule.
8. Each duplex pump set shall be sized to provide full specified flow capacity from each pump. In order to ensure compliance with NFPA70e the pump set shall be provided with two separate electrical panels, 1) Electrical Motor Controller Module, and 2) 24vdc Logic Control Module installed as part of a skid package or as a wall mount cabinet associate with either a skid or enclosure type package. The pump set shall be preassembled and tested by the manufacturer at their facility; job site assembly will not be permitted. All piping shall be schedule 40, or heavier, black pipe suitable for use with fuel oil. Pipe fittings shall be malleable or steel fittings rated for 150 psi and suitable for use with fuel oil. The use of galvanized pipe or fittings is forbidden in the construction of these systems. Threaded connections are satisfactory except where noted on the drawings. On welded systems, where threaded connections are necessary by design of individual components, a threaded nipple and welded flange shall be used. The pump set shall be finished with industrial enamel, suitable for this application. All electrical conduits will be liquid tight or better.
9. Major system components
10. Pumps - Positive displacement pumps with cast iron housings shall be provided, bronze or brass housed pumps are not allowed. The pump shall be coupled to a TEFC (or TEPE Premium Efficiency on 1PH and above) motor with a flexible coupling. The flexible coupling shall be provided with a full OSHA approved coupling guard. The motor and pump assembly shall be permanently aligned with a precision permanent alignment bracket to the OEMs published standards. Pumps and motors shall be mounted with bolts threaded in to the steel channel for ease of maintenance, mounting bolts shall not penetrate the secondary containment basin. The pumps shall be provided with self-adjusting mechanical seals, packing type shaft seals are not allowed. Pumps that have aluminum, brass or bronze housing or rotors are not acceptable.
11. Pump Isolation and Check Valves: Provide and mount four (4) pump isolation valves. Locate one (1) valve on the suction and discharge side of each pump. Isolation valves will allow off-line pump maintenance without system loss of availability. Isolation valves shall be ball type, rated 600WOG, include stainless steel ball and Teflon seat. Valves to provide full flow while open and positive shutoff when closed. Additionally, two (2) class 125# spring check valves shall be provided and mounted, one (1) located on the discharge of each pump.
12. Relief Valves: Provide for each pump a relief valve sized to relieve the full outlet flow of the pump at rated pressure without causing the pump motor to overload or any of the pump set component’s pressure rating to be exceeded if the discharge is inadvertently closed off or restricted. Relief valves are to be mounted remotely from the pumps and piped to the return lines as shown on the drawings. Pump internal relief valves are not accepted except if shown on the drawings.
13. Compound and Pressure Gauges: Provide and mount a compound gauge on the common suction header feeding the pumps. The gauge shall read 30” vacuum and 30 psi pressure (30” Hg-0-30psi). Provide and mount a pressure gauge on the discharge side of each pump with the normal pump pressure shown at mid-scale. All gauges shall be provided with an isolation ball valve with 4 or 2½ inch dials.
14. Strainers: A Model STR-D cast iron duplex strainer with a 1/16 perforated basket shall be provided. The strainer shall be rated for oil service at a minimum 150psi working pressure. This strainer shall be of the dual ball diverter design; single plug type diverters are unacceptable. The diverter configuration shall be stainless steel balls operating on a common shaft in Teflon seats. The operating handle shall clearly indicate which basket is in service. No special tools shall be required for operation or maintenance. The strainer shall be selected by the pump set manufacture to meet the capacity of the pump set with a maximum, clean basket, pressure drop of 1” Hg.

Optional: 80 mesh and 100 mesh

1. Strainer shall be equipped with a factory mounted and wired differential pressure switch to indicate that the basket needs to be checked and cleaned. Indicating scale plate shall be three-position color-coded for easy indication of strainer basket status.
2. Pump Base - The pump base shall be designed and constructed to act as a containment basin with a minimum 3” continuously welded reservoir wall providing containment. Electrical motors and components shall be mounted above maximum liquid level of containment basin. To minimize trip hazards and equipment damage all pump set components shall be located within the perimeter of the containment basin walls, no extrusions are allowed. The pump set base shall use no less than 3/8” plate, using less than this thickness will be grounds for rejection. Provide ½” plugged containment basin drainage connection.
3. Leak Switch - A Model PLS float switch shall be provided to detect a flooded containment basin. The switch shall be normally closed, opening on a rise in liquid level of the containment basin. The float switch shall be compatible with fuel oil and be located within the perimeter of the containment basin.
4. Pump Automatic Sequencing Flow Switch: Provide a time delayed flow sensing switch (Model FS) on the discharge of the pump set to bring on the lag pump should the lead pump fail to maintain flow. Flow switch shall be vane operated to actuate a single double throw snap switch. Switch shall be rated for 1450 psig. Provide a flow switch outlet isolation valve for maintaining the flow switch without draining the fuel system.
5. Motor Controller Module – A fully functioning, UL 508 listed motor control panel shall be provided and permanently mounted on fuel oil pump skid. This panel shall contain the following components;
6. NEMA 4 rated metal enclosure.
7. Service disconnect for each fuel pump motor.
8. Hand-Off-Auto pump selector switch for each fuel oil pump.
9. Pump status and alarm lamps.
10. Terminal block for all skid and field wiring connections.
11. Control power transformers as required.
12. Pump running hour totalizers.
13. Alarm bell.
14. The motor control module shall provide field wiring terminal and pilot devices for remote operation of the fuel pump set and monitoring of system safeties and components.
15. Provide for local-manual operation of individual fuel pump or select auto for operation by control system.
16. Alarm upon input from logic control system.
17. Provide flooded basin and strainer D/P alarm discreet signals to control system, alarm shall be energized upon switch opening.
18. Provide individual positive pump flow discrete signal to control system.
19. Major functions.
20. Logic Control Module - A fully functioning, 24 VDC, UL 508 listed motor control panel shall be provided and permanently mounted on fuel oil pump skid and integrated with the Motor Control Module.
21. NEMA 4 rated metal enclosure.
22. Preprogrammed and configured nonproprietary PLC hardware
23. 10” Touchscreen HMI
24. The Logic Control Module shall provide all logic to operate the pump set, monitor and control levels for the day tanks, and
25. Start, stop and rotate fuel pumps
26. Monitor day tank level switches
27. Monitor day tank temperature switch
28. Monitor day tank leak detector
29. Monitor day tank flooded vent switch
30. Control and monitor up to 3 tank fill manifolds.
31. Provide alarm output to fill manifold junction box or local control box.
32. Monitor tank gauging system alarm output.

The engineer may wish to specify the future number of day tanks to be controlled so that they can be added without having to change the control hardware or logic.

1. Safety and environmental provisions
2. Storage tank leak detection shall detect leakage at a rate of 0.1gph
3. Containment basin with 4” reservoir walls to prevent the release of fuel oil through minor drips, seal failure and strainer leakage.
4. Fail safe operation of flow switches and safety devices.
5. Leak detector switch for containment basin.
6. OSHA approved coupling guard and alignment bracket.
7. NFPA 70e compliant low voltage logic control panel
8. Communication Interface to Building Automation Systems:
9. Modbus, BACnet or other IP Interface shall be provided as shown on drawings.
10. The interface shall provide monitoring on the following point:
11. Pump Run Status
12. Flow Switch Status (if supplied)
13. Leak Switch Status (if supplied)
14. High Strainer DP Status (if supplied)
15. General Alarm
16. If no interface is used the system shall provide discrete contact outputs for the following
17. Pump 1 Run
18. Pump 2 Run
19. Leak Switch Status
20. Strainer DP Status
21. Environmental Conditions may be dirty, dusty, and damp. All of the equipment shall be suitable for use in this environment.
22. The pump motor shall be TEFC/TEPE.
23. The motor control module enclosure shall be NEMA 4 rated with NEMA 4 pilot devices.
24. All wiring shall be enclosed in liquid tight conduit in accordance with NEC standards.
25. Quality Control and Factory Testing –
26. The fuel pump set shall be tested for tightness and proper operation prior to leaving factory. The pressure test for tightness shall be a “wet” test with fluorescent liquid; the system shall be brought to pressure and after 60 minutes, each joint shall be visually inspected under pressure with a fluorescent lamp. If any leaks are detected repairs must be made and the system shall be retested in its entirety. Simply testing the system with air pressure and soap bubbles is unacceptable.
27. After a successful pressure test and documentation of those results each pump shall be energized, checked for proper rotation and operation. The motor full load amps shall be read and recorded. The manufacturer shall set all pressure relief and regulating valves, the settings shall be recorded on tags affixed to each individual device and noted in the installation/operation manual shipped provided to installing contractor.
28. The testing liquid shall be purged. If fuel oil is used as the test media it must be removed sufficiently to prevent any accumulation that could result in spillage during transportation, unloading or installation.
29. The owner or the owner’s representative may witness the testing. This factory acceptance test requirement is to be noted in the submittal approval. It is the responsibility of the owner or his representative to coordinate his schedule with the manufacturer so as not to affect manufacturing or delivery schedules.
30. Wiring – The wiring between the Logic Control Module, the Motor Control Module and individual pump set components shall be installed by the manufacturer, at his facility, to provide a single location for connection of field wiring. The wiring shall be done in accordance with NEC with special attention being paid to ensure conduits are not overfilled. If the Logic Control Module is to be mounted separately from the pump set, this will require field wiring by a qualified electrician.
31. Manufacturers acceptable shall have at least 10 years of experience designing and building fuel oil pump sets and shall have, on staff, degreed engineers to provide assistance to the installing contractors, owners and operators. The equipment shall be Critical Fuel Systems Series (LZ, MZ or HZ) or approved equal.