Design Guide ESS.DG.912. Spec 02

Complete your MasterSpec for An Integrated Fuel System Solution

earthsafe
Fuel Systems for Critical Power

.

Introduction

The Fuel System MasterSpec can be long on tanks, pipes, and valves but lacking in the fuel transfer and control assemblies that make it all work

It's not that complicated to specify a complete fuel system solution. In addition to the tanks, pipes, and valves you will need to add elements for:

- Tank Fill Stations
- Duplex Transfer Pumps
- Fuel Filtration – Polishers
- Day Tanks for Generators

With Earthsafe you are specifying these as a suite of products with a common controller unit for each and the ability to simply network the individual elements for integration and monitoring:

Include a Tank Fill Station:

2.1 TANK FILL SYSTEM

A. Manufacturers: Subject to compliance with requirements provide products by:

1. Earthsafe Systems, Inc. Model M400
2. Approved equal.

B. Description:

1. Controller: The fill station shall include a C80 electronic controller with touch screen to indicate tank level and alarm status during the fill operation. The controller shall include an Ethernet connection for networking with other fuel system controllers.
2. Fill Station Enclosure: Stainless steel wall mounted enclosure with minimum 7 gallon containment capacity, lockable door, flush mounted or surface mounted.
3. Fuel Connection: Tight fill adapter for fuel delivery hose and cap.
4. Manual Valve and Check Valve: Provide manual valve and check valve.
5. Hand Pump: Provide hand pump or drain for containment area.
6. Actuated Ball Valve: Provide actuated ball valve for fill line connection at tank.
7. High Level Tank Sensor: Provide tank sensor for 85%, 90%, and 95% tank levels.
8. Level Transmitter: Provide tank level transmitter or integration to tank level gauging system for tank volume readout.

Include a Fuel Transfer Pump Set

2.2 FUEL OIL TRANFER PUMP SET

A. Manufacturers: Subject to compliance with requirements provide products by

1. Earthsafe Systems, Inc. Model M200
2. Approved equal.

B. Description:

1. Controller: The duplex pump set shall include a C80 electronic controller with touch screen to indicate tank level and alarm status during the fill operation. The controller shall include an Ethernet connection for networking with other fuel system controllers.
2. Pumps: Iron body steel gear pumps shall be close coupled or mounted on steel base with coupling and guard.
3. Motors: Motors shall be TEFC motors with voltage and power ratings indicated on the drawings or to provide the required fuel transfer.
4. Containment Base: Welded steel base with liquid containment
5. Check Valves: provide at pump outlets
6. Strainers: provide at pump inlets
7. Ball Valves: provide at each pump inlet and outlet
8. Pressure Gauge: Liquid filled, 2-1/2" pressure gauges at pump outlet.
9. Vacuum Gauge: Liquid filled, 2-1/2" pressure gauges at pump inlet.
10. Motor Starters and Controls: Provide motor starters with disconnect switches, rated contactors, overload relays, current sensors, HOA switches, and control transformers. Motor starters shall operate in manual mode on line power alone independent of external control power.
11. Piping: Piping shall be minimum schedule 40 steel with threaded, flanged, or socket weld connections.
12. Finish: provide prime and finish coats of fuel resistant industrial enamel.
13. Factory assemble and test: Assembly shall be fully factory fabricated and tested.

Include a Fuel Filter - Polisher

2.3 FUEL MAINTENANCE SYSTEM

A. Manufacturers: Subject to compliance with requirements provide products by

1. Earthsafe Systems, Inc. Model M300
2. Approved equal.

B. Description:

1. Control Module: The fuel maintenance system shall include a C80 control module. The unit shall be programmed to activate the pump on a time cycle to provide one complete filtration cycles each week. The unit shall monitor a differential pressure switch across the filter and shall provide an alarm at a 15 PSI differential pressure. The unit shall monitor a high water level switch and indicate a high water alarm. Indicator lights shall be provided for power on, pump on, and pressure / water alarms. The controller shall include an Ethernet connection for networking with other fuel system controllers.
2. Provide a packaged pump and filter set to provide filtration of stored fuel on a timed cycle. The pump and filter set shall be integrated with a control panel to provide motor control, system status, and alarm indication.
3. Transfer Pumps: The transfer pump shall be rated at a minimum of 10 GPM or the design flow as indicated on the drawings. Pump motors shall be as required to provide the design flow. Motors shall be TEFC.
4. Filter Housing: The filter housing shall be welded carbon steel construction rated at a minimum 150 PSI. The unit shall have minimum 1 inch inlets and outlets, and minimum ¼ inch openings for top air vent, pressure gauge connections, bottom water drain and water sensing. The interior of the housing shall be epoxy coated and the exterior shall have a prime and finish cost of industrial enamel.
5. Filters: The filters shall provide two stage separation and coalescing of water and dirt from the diesel fuel. The stage 1 filter shall be rated at 10 microns, and the stage 2 coalescing filter shall be rated at 2 micron. The filters shall have viton gaskets and corrosion protection metal components. The filters shall be rated at up to 75 PSI differential pressure.
6. Containment Base and Frame: Pumps shall be mounted on a welded steel liquid tight containment basin. The base shall include a welded steel support for piping and accessories.
7. Pump Motor Starters: Each pump shall be equipped with an individual motor starter disconnect panel. The panel shall include an HOA switch for operator use. The panel shall include output relays for pump overload trip and Not-In-Auto signals. In auto mode the pump shall be controlled by the filter control module.
8. Mechanical Accessories: The assembly shall include ball valves, check valves, and pressure relief valves as required for proper operation.
9. Sensors: The assembly shall include flow or pressure sensors, filter water sensors, and leak sensors integrated to the controller for system monitoring
10. Enclosure: The filtration unit shall be located within a welded steel enclosure. The enclosure shall provide a minimum 7 gallons fluid containment. The enclosure shall have a fan and vent to prevent condensation within the cabinet. Where located outside buildings the enclosure shall have a unit heater and thermostat to provide freeze protection.
11. Optional Multi-Tank Selection: Where indicated provide multi-tank selection using actuated ball valves at the filter inlet and outlet controlled by the integral control panel.

Include a Generator Day Tank:

2.4 DAY TANK

A. Manufacturers: Subject to compliance with requirements provide products by:

1. Earthsafe Systems, Inc. Model M500
2. Approved equal

B. Description:

1. Controller: The day tank shall include a C80 electronic controller with touch screen to indicate tank level and alarm status during the fill operation. The controller shall include an Ethernet connection for networking with other fuel system controllers.

2. UL 142 Steel Tank: Welded steel fuel tank with capacity to support 2 hours of generator run time or as indicated on the drawings.
3. Secondary Containment: Double wall construction or 160% containment / rupture basin. Where a double wall tank is provided, the top of the tank shall be constructed to provide leak containment for the inlet control valves.
4. Finishes: The tank exterior shall have an industrial enamel or epoxy finish coating.
5. Emergency Vent: provide emergency vent device for primary tank, and secondary tank for double wall construction.
6. Standard Vent Cap: provide standard vent cap for normal vent pipe termination.
7. Direct Reading Fuel Gauge: provide a direct reading fuel gauge to indicate fuel levels
8. Inspection Port: provide an inspection port with vapor tight cap.
9. Engine Fuel Oil Supply Connection: Provide a 1” minimum suction pipe for the engine fuel oil supply connection. A manual valve shall be provided at the top of the tank.
10. Engine Fuel Supply Solenoid Valve: Where required by local code provide an electric actuated solenoid valve at the day tank connection for the engine fuel oil supply. The valve shall be a minimum of 1”, normally closed, electric actuated, 24 VDC, bronze body with viton soft goods. The valve shall have an integral manual bypass. The valve shall be controlled directly by the engine generator to open upon generator start.
11. Engine Fuel Oil Return Connection: Provide a 1” minimum pipe connection for the engine return fuel flow.
12. Overflow Connection: Provide a 2” overflow connection for the day tank to allow gravity overflow back to the main storage tank.
13. Level Sensor: Provide a tank level sensor for 95% high level, 85% normal fill level, 75% refill start level, 50% low level, and 25% critical low level.
14. Leak Sensor: provide a leak sensor for the tank secondary containment.
15. Inlet Solenoid Valve Assembly: Where remote fuel transfer pumps are used, provide a normally closed solenoid valve and a normally open solenoid valve in series for normal tank filling and high stop. Provide a line strainer upstream of the solenoid valves. Provide manual valves to isolate the solenoid valves and to provide a manually operated bypass of the solenoid valves. Where indicated on the drawings a dual set of inlet control valves shall be provided. The solenoid valves shall be ½” size or as indicated on the drawings.
16. On-Board Fuel Transfer Pumps: Where remote fuel transfer pumps are not used, provide duplex on-board fuel transfer pumps.
17. Flow Limiting Valve: Where indicated on the drawings include an adjustable flow limiting valve in the inlet piping. The valve shall be set to 150% of the generator

maximum consumption, and within 75% of the day tank overflow or return flow pump capacity.

18. Flow Indicators: Where indicated on the drawings pride a rotary type fuel oil flow indicator, or flow switch.
19. Return Flow Pump: Where gravity return flow to the bulk storage tank is not possible, provide a return flow pump.. Where the return flow piping condition requires anti-siphon protection the pump outlet shall include a normally closed solenoid valve that opens when the pump is active, or a siphon break may be provided where applicable.
20. Temperature and Level Transmitters: Provide level transmitters or temperature transmitters for integration to the day tank controller.
21. Vent High Level Sensor: Where required by local code, provide a level switch at the normal vent pipe connection to serve as a redundant high level shutoff signal.
22. Fire Safety Valves: Where indicated on the drawings or required by local code, provide fire safety valves with 165 degrees F fusible links at the tank inlet and outlet connections.
23. Generator Integration: Provide dry contact output relays for day tank high level, low level, critical low level, and leak alarms.