

LIFT STATION EMERGENCY GENERATOR

Revision 1.0 – 7/27/04

PART 1.0 GENERAL

- 1.0 THIS IS A PERFORMANCE SPECIFICATION FOR THE STANDARD LIFT STATION EMERGENCY GENERATOR POWER SYSTEM. SINCE CONDITIONS VARY FOR EACH SITE, THE ENGINEER OF RECORD IS REQUIRED TO PROVIDE THE FINAL DESIGN THAT INCORPORATES THESE PREFERENCES. SSRUS SHOULD BE NOTIFIED WHERE THIS PERFORMANCE SPECIFICATION CONFLICTS WITH FEDERAL STATE OR LOCAL BUILDING CODES OR GENERALLY ACCEPTED DESIGN PRACTICES.
- 1.1 This section includes the performance specification for providing the back-up power generation for a lift station, and includes, but is not limited to, a packaged engine generator system, weather proof housing, exhaust silencer and fittings, fuel system, control panel, battery and charger, automatic transfer switch, and appurtenances, connections and supplies required to provide a fully functioning system.
- 1.2 The following references shall be followed for the design of the emergency power generation system.
- A. ANSI/NEMA 250 - Enclosures for electrical equipment (1000 volts maximum)
 - B. ANSI/NEMA MG 1 - Motors and generators
 - C. ANSI/NFPA - National electrical code
 - D. NFPA 110 Level 1
 - E. ANSI/NFPA 99 - Health care facilities
 - F. ANSI/NEMA AB 1 - Molded case circuit breakers
 - G. NEMA ICS 1 - General Standards for Industrial Control and Systems.
 - H. NEMA ICS 2 - Standards for Industrial Control Devices, Controllers, and Assemblies.
 - I. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.
- 1.3 The following documents are required before the Utility will accept the system for ownership and maintenance.
- A. Submit shop drawings showing plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion requirements, and electrical diagrams including schematic and interconnection diagrams.
 - B. Submit product data showing dimensions, weights ratings, interconnection points, and internal wiring diagrams for engine, generator, control panel, battery, battery rack, battery charger, exhaust silencer, vibrator isolators, fuel system, radiator, and remote annunciator.
 - C. Submit record of system load test.
 - D. Accurately record location of engine generator and mechanical and electrical connections.
 - E. Submit operation and maintenance data upon delivery of the emergency generator.
 - F. Include instructions for normal operation, routine maintenance requirements, service manuals for engine and fuel system, oil sampling and analysis for engine wear, and emergency maintenance procedures.
 - G. Provide five-year warranty.
 - H. Furnish service and maintenance of portable emergency generator system for two years from date of delivery completion.
 - I. Provide two additional sets of each fluid (except fuel), oil, and air filter element required for the engine generator system.
 - J. Furnish one set of tools for preventive maintenance of the engine generator system.

Package tools in an adequately sized metal box that is fitted for pad lock and secured to the site.

- K. List of special tools, maintenance materials, and replacement parts.

1.4 Miscellaneous

- A. Developer/Contractor are responsible for providing a complete system, including all connections of the generator set to the lift station control panel. Developer/Contractor are also responsible for making all arrangements with other utilities including natural gas or electricity.

PART 2 PRODUCTS

- 2.0 The generator shall be Caterpillar or Kohler power system. All control panels, breakers, transfer switches and other appurtenances shall be provided by the same manufacturer or authorized distributor and will be guaranteed to operate with the system. All parts of the system shall be covered under the warranty.

2.1 ENGINE

- A. Type: Water-cooled inline or V-type, natural gas internal combustion engine, operating at no more than 1800 rpm. Where natural gas is not available as fuel source, a diesel generator shall be provided with above ground fuel storage tank.
- B. The engine shall have a rating sufficient to operate at 10 percent overload for one hour at specified elevation and ambient temperature limits. For duplex or triplex lift stations, the generator shall be sized to start two pumps simultaneously. The load shall be defined as all lift station appurtenances. Engineer should define start order to limit in-rush currents.
- C. The engine shall have an electronic governor.
- D. The generator shall be capable of delivering full load amps with up to 5% total harmonic distortion.
- E. Safety devices: engine shutdown on high water temperature, low oil pressure, overspeed, and engine overcrank. Limits as selected by manufacturer.
- F. Engine Accessories: fuel filter, lube oil filter, intake air filter, lube oil cooler, fuel transfer pump, fuel priming pump, gear-drive water pump. Include fuel pressure gage, water temperature gage, and lube oil pressure gage on engine-generator control panel.
- G. Mounting: provide unit with suitable spring-type vibration isolators.

2.2 GENERATOR

- A. Generator: ANSI/NEMA MG 1; three phase, four pole, reconnectible brushless synchronous generator with brushless exciter.
- B. Insulation: ANSI/NEMA MG 1, Class F.
- C. Temperature Rise: 130 degrees C standby.
- D. Enclosure: ANSI/NEMA MG 1; open drip proof

2.3 AUTOMATIC TRANSFER SWITCH (ATS)

- A. Provide an automatic transfer switch that is recommended by the manufacturer of the generator set. The ATS shall be rated as UL 1008
- B. Indicating lights: mount in cover of enclosure to indicate NORMAL SOURCE AVAILABLE, ALTERNATE SOURCE AVAILABLE, SWITCH POSITION.
- C. Test switch: Required.

- D. Return to normal switch: mount in cover of enclosure to initiate manual transfer from alternate to normal source.
- E. Transfer switch auxiliary contacts: 1 normally open: 1 normally closed.
- F. Alternate source monitor: monitor alternate source voltage and frequency; inhibit transfer when voltage is below 85 percent or frequency varies more than 3 percent from rated nominal voltage.
- G. Provide adjustable time delay on transfer and re-transfer.

2.4 ACCESSORIES

- A. Natural Gas Fuel System: (if available) Contractor is completely responsible for the connection to the natural gas system. Arrangements can be made through City of Gulf Breeze at 934-5110.
- B. Diesel Fuel System: The above ground fuel storage tank shall provide volume sufficient for 24-hour consumption at full load. Tank shall be double walled, stainless steel fuel tank used as the base of the generator with fuel gauge, overfill protection, stage II vapor recovery, per DEP and EPA requirements. Provide low-level fuel indicator. The painting shall be 100 % shop applied as follows.

Organic Zinc-rich/Urethane/Urethane Coating System

Surface Preparation: SSPC-SP6 Commercial Blasting Cleaning

Prime Coat: Series 90-97 Tnemec-Zinc at 2.5 to 3.5 mils DFT

Intermediate and Finish: Series 1075 Endura-Shield-Color at 2.0 to 3.0 mils DFT
each coat

Minimum Total DFT: 7.0 mils

- C. Batteries: Heavy duty, diesel starting type lead-acid storage batteries. Match battery voltage to starting system. Include necessary cables and clamps.
- D. Battery charger: current limiting type designed to float at 2.17 volts per cell and equalize at 2.33 volts per cell. Include overload protection. Full wave rectifier, DC voltmeter and ammeter, and 120 volts AC fused input. Provide enclosure to meet ANSI/NEMA 250, Type 1 requirements.
- E. Generator Enclosure: Manufacturers standard aluminum enclosure designed to withstanding 150 MPH wind speed, Exposure C, Importance Factor 1.15, Partially Enclosed Condition in accordance with the methodology contained in A.S.C.E. 7-98. Drawings sealed by a professional engineer shall be provided to the utility.
- F. Enclosure shall also be designed with removal louvers for servicing generator. Generator enclosure to house battery tray, batter charger, generator circuit breakers. The generator should be designed to prevent the intrusion of rain from driving rain (rain in high winds). All electrical controls shall be contained within NEMA 4X rated enclosures.
- G. Exhaust Silencer: critical type silencer, with muffler companion flanges and flexible stainless steel exhaust fitting, suitable for horizontal orientation, size in accordance with engine manufacturer's instructions. Muffler to be installed outside generator enclosure.
- H. Engine-Generator Control Panel: ANSI/NEMA 250, Type 1 generator mounted control panel enclosure with engine and generator controls and indicators. Include provision for padlock and the following equipment and features:
 - a. All indications for protection and diagnostics according to NFPA 110 Level 1, including remote and local annunciation
 - b. Frequency Meter: 45-65 Hz range, 3-1/2 inch (89 mm) dial
 - c. AC Output Voltmeter: 3-1/2 inch (89 mm) dial, 2 percent accuracy, with phase

- selector switch.
- d. AC Outlet Ammeter: 3-1/2 inch (89 mm) dial, 2 percent accuracy, with phase selector switch
- e. Output voltage adjustment
- f. Push-to-test- indicator lamps, one each for low oil pressure, high water temperature, overspeed, and overcrank
- g. Engine start/stop selector switch
- h. Engine running time meter
- i. Oil pressure and water temperature gages
- j. Auxiliary Relay: 3 PDT, operates when engine runs, with contact terminals pre-wired to terminal strip
- k. Provision for regularly scheduled starting and operation of engine generator for maintenance purposes

2.5 REMOTE COMMUNICATIONS

- A. Remote Alarm Contacts: Pre-wire SPCT contacts to terminal strip for remote alarm functions required by ANSI/NFPA 99
- B. All alarm conditions shall be made available for connection to control unit at the generator site for transmission to a central communication facility. Additionally, all level monitored by the microprocessor shall also be made available through 4-20 ma signals or other compatible method.
- C. The supplier of the generator set is responsible for labeling where these signals are available, but not for connecting them to the local monitoring system.

PART 3 EXECUTION

- 3.0 Installation of the generator shall be in compliance with Federal, State and local building codes. Install generator in accordance with generator manufactures recommendations on 6" thick concrete pad. Pad to be 3' larger than generator on all sides.

3.1 TESTING

- A. Testing will be performed.
- B. Provide full load test utilizing portable test bank, for two hours minimum.
- C. During test, record the following at 20 minute intervals:
 - 1) Kilowatts
 - 2) Amperes
 - 3) Voltage
 - 4) Coolant temperature
 - 5) Ambient temperature
 - 6) Frequency
 - 7) Oil pressure
- D. Test alarm and shutdown circuits by simulating conditions.
- E. Manufacturer's representative should be present to prepare, start, test, and adjust systems. Adjust generator output voltage and engine speed.