

SECTION 26 35 13
GAS ENGINE DRIVE GENERATOR ASSEMBLY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Packaged engine generator system
- B. Exhaust silencer and fittings
- C. Fuel lines
- D. Remote control panel
- E. Battery and charger
- F. Weatherproof enclosure

1.2 REFERENCES

- A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)
- B. NEMA MG 1 - Motors and Generators
- C. NFPA 70 - National Electrical Code
- D. UL 489 - Molded Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
- E. NFPA 110 – Standard for Emergency And Stand By Power Systems

1.3 SYSTEM DESCRIPTION

- A. Engine generator system to provide source of emergency and standby power
- B. Operation: In accordance with NFPA
- C. Generator shall be installed and shall operate as LEVEL 1 system as defined by NFPA 110

1.4 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 0133 00.
- B. Submit shop drawings showing plan and elevation views with overall and interconnection point dimensions, fuel consumption rate-curves at various loads, ventilation and combustion air requirements, and electrical diagrams including schematic and interconnection diagrams.
- C. 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, vibration isolators, automatic changeover, and remote annunciator.
- D. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit record documents under provisions of Section 01 77 00.
- B. Accurately record the location of engine generator and mechanical and electrical connections.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Section 01 77 00.
- B. Include instructions for normal operation, routine maintenance requirements, service manuals engine, and emergency maintenance procedures, and complete manufacturer's diagnostic software package.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in packaged engine generator system with minimum three years documented experience.
- B. Supplier: Shall be an authorized franchised distributor of the engine generator manufacturer with service facilities within 50 miles of project site.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Section 01 60 00.
- B. Store and protect products under provisions of Section 01 60 00.
- C. Accept packaged engine generator set and accessories on site in crates and verify damage.

- D. Protect equipment from dirt and moisture by securely wrapping in heavy plastic.

1.9 WARRANTY

- A. Provide manufacturer's 5-year warranty under provisions of Section 01 77 00.

1.10 MAINTENANCE SERVICE

- A. Furnish service and maintenance of packaged engine generator system for 1-year from Date of Substantial Completion.

1.11 COMMISSIONING

- A. Commissioning of a system or systems specified in this section is part of the construction process.
- B. Documentation and testing of these systems, as well as training of the Owner's operation and maintenance personnel, is required in cooperation with the Owner's Representative and the Commissioning Authority.
- C. Project Closeout is dependent on successful completion of all commissioning procedures, documentation, and issue closure.
- D. Refer to Section 01 77 00 - Contract Closeout, for substantial completion details.
- E. Refer to Section 01 91 00 - Commissioning, for detailed commissioning requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Kohler Generators
- B. Caterpillar Inc.
- C. Cummins Power Generators
- D. AKSA Power Generation
- E. Blue Star Power Systems
- F. Approved equal

2.2 ENGINE

- A. Type: Water-cooled inline or V-type, four-stroke cycle, compression ignition or electric ignition internal combustion engine.
- B. Rating: Sufficient to operate at 10% overload for 1-hour at specified elevation and ambient limits.
- C. Fuel System: Shall be a dual system of Natural gas and Propane gas (LP gas).
- D. Engine Speed: 1800 rpm
- E. Governor: Isochronous type to maintain engine speed within 0.5%, steady state, and 5%, no load to full load, with recovery to steady state within 2-seconds following sudden load changes.
 - 1. Equip governor with means for manual operation and adjustment.
- F. Safety Devices
 - 1. That automatically shuts down the Engine on high water temperature, low oil pressure, over speed, and engine over crank.
 - 2. The limits as selected by manufacturer.
- G. Engine Starting
 - 1. DC starting system with positive engagement, number, and voltage of starter motors in accordance with manufacturer's instructions.
 - 2. Include remote starting control circuit, with MANUAL-OFF-REMOTE selector switch on engine-generator control panel.
- H. Engine Jacket Heater: A thermal circulation type water heater with integral thermostatic control sized to maintain engine jacket water at 90°F and suitable for operation on 120 volts AC.
- I. Radiator: Radiator using glycol coolant, with blower type fan, sized to maintain safe engine temperature in ambient temperature of 110°F.

The School District of Palm Beach County

Project Name:

SDPBC Project No.:

1. Radiator Air Flow Restriction: 0.5" of water maximum
- J. Engine Accessories
 1. Lube oil filter, intake air filter, lube oil cooler, auxiliary fuel pump.
 2. Include fuel pressure gage, water temperature gage, and lube oil pressure gage on engine-generator control panel.
- 2.3 GENERATOR
 - A. Generator: Provide NEMA MG 1 re-connectible brushless synchronous generator with brushless exciter.
 - B. Insulation: NEMA MG 1 Class F
 - C. Temperature Rise: 105°C continuous
 - D. Enclosure: NEMA MG 1 open drip proof
 - E. Voltage Regulation: Include generator-mounted volts per Hertz exciter-regulator to match engine and generator characteristics, with voltage regulation +/- 1% from no load to full load.
 1. Include manual controls to adjust voltage drop +/- 5% voltage level, and voltage gain.
- 2.4 ACCESSORIES
 - A. Unit shall have standard and optional accessory equipment packages including but not limited to the following equipment.
 - B. Exhaust Silencer: Residential type silencer, with muffler companion flanges and flexible stainless steel exhaust fitting, suitable for horizontal orientation, sized in accordance with engine manufacturer's instructions, exhaust system insulated for heat reduction.
 - C. Batteries
 1. Heavy-duty type, match the battery voltage to starting system.
 2. Include necessary cables and clamps.
 - D. Battery Tray
 1. Plastic coated metal or wooden tray treated for electrolyte resistance.
 2. Construct to contain spillage of electrolyte.
 - E. Battery Charger: Current limiting type designed to float at 2.17 volts per cell and equalize at 2.33 volts per cell.
 1. Include overload protection with full wave rectifier, DC voltmeter, and ammeter, and 120 volts AC fused input.
 2. Provide wall-mounted enclosure to meet NEMA 250, Type 1 requirements.
 - F. Line Circuit Breaker
 1. UL 489 molded case circuit breaker on generator output with integral thermal and instantaneous magnetic trip in each pole; sized in accordance with NFPA 70.
 2. Include battery-voltage operated shunt trip, connection to open circuit breaker on engine failure.
 3. Mount unit in enclosure to meet NEMA 250, Type 1 requirements.
 - G. Engine-Generator Control Panel: 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:
 1. Frequency Meter: 45-65 Hz range, 3½" dial.
 2. AC Output Voltmeter: 3½" dial, 2% accuracy, with phase selector switch.
 3. AC Output Ammeter: 3½" dial, 2% accuracy, with phase selector switch.
 4. Output voltage adjustment
 5. Push-to-test indicator lamps, one each for low oil pressure, high water temperature, over speed, and over crank.
 6. Engine start/stop selector switch

The School District of Palm Beach County

Project Name:

SDPBC Project No.:

7. Engine running time meter
 8. Oil pressure gage
 9. Water temperature gage
 10. Auxiliary Relay 3PDT operates when engine runs, contact terminals pre-wired to terminal strip.
 11. Remote Alarm Contacts: Pre-wire SPCT contacts to terminal strip for remote alarm functions required by ANSI/NFPA.
- H. Weather-Protective Housing for units located on the exterior:
1. Provide with reinforced steel or aluminum housing allowing access to control panel and service points, with lockable doors and panels.
 2. Weather-Protective Housing shall be hurricane rated and soundproof
 3. Include fixed louvers, tail pipe, rain cap kit, battery rack, and silencer.
- I. Remote Engine Annunciator Panel:
1. NFPA; to meet NFPA 110 requirements for level-I generator.
 2. Shall have color painted finish.
- J. Provide for automatic changeover from natural gas to LP gas (for dual rated units).
- K. Emergency manual stop break glass station: location to be field determined by School District Representative.
- L. Provide BACKNET interface capabilities for the generator to allow remote monitoring of the unit School District Energy Management System and Data NetWork System.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Coordinate pre-construction meeting with owner general contractor and others as needed prior to start of installation.
- B. Verify that surfaces are ready to receive work and field dimensions are as shown on Drawings.
- C. Verify that required utilities are available in proper location and ready for use.
- D. Beginning of installation means installer accepts existing conditions.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NFPA 110.
- C. Furnish and install an 18" x 18" x 12" metal cabinet with hinged door in the generator room.
 1. Locate in this cabinet a copy of the generator and automatic transfer switches, approved shop drawings, load bank test results.
 2. A copy of the power riser diagram-showing generator supplied panels; a copy of the generator warranty information, generator manufacturer supplied wiring diagrams, and initial maintenance logs.
 3. Label the cabinet as "Generator Documents".

3.3 FIELD QUALITY CONTROL

- A. Perform all field inspection and testing under the provisions of Section 01400.
- B. Simulate power failure including operation of transfer switch, automatic starting cycle, and automatic shutdown, and return to normal.
- C. Provide full load test utilizing portable test bank.
 1. Notify Owner at least 24 hours prior to the test.
 2. A minimum of 4- continues hours at full load, warm up and cool down times are not included in the four hours minimum.
 3. Generators with dual fuel system shall be load bank tested for 4-hours on the primary fuel at full load and 1-hour on the backup fuel at full load.

The School District of Palm Beach County

Project Name:

SDPBC Project No.:

4. A facility with more than one generator fed from the same fuel source shall be full load tested at the same time.
 - D. During test, record the following at 20-minute intervals
 1. Kilowatts
 2. Amperes
 3. Voltage
 4. Coolant temperature
 5. Room temperature
 6. Frequency
 7. Oil pressure
 - E. Test alarm and shutdown circuits by simulating conditions.
 - F. On existing generators where the new and existing loads exceed 60% of the generators rating, provide a full load test as described in 26 35 13-3.3.
- 3.4 MANUFACTURER'S FIELD SERVICES
- A. Prepare, start, test, and adjust systems under provisions of Section 01 60 00.
 - B. Contractors' tests shall be scheduled and documented in accordance with the commissioning requirements.
 1. Refer to Section 01 91 00, Commissioning, for further details.
 - C. Contractor shall provide all labor, tools, and equipment, including resistive load banks, to facilitate testing in accordance with NFPA 110.
 1. This testing shall include the 4-hour load bank test.
- 3.5 ADJUSTING
- A. Adjust work under provisions of Section 01 75 00.
 - B. Adjust generator output voltage and engine speed.
- 3.6 CLEANING
- A. Clean work under provisions of Section 01 77 00.
 - B. Clean engine and generator surfaces.
- 3.7 DEMONSTRATION
- A. Provide systems demonstration under provisions of Section 01 60 00.
 - B. Describe loads connected to emergency and standby system and restrictions for future load additions.
 - C. Simulate power outage by interrupting normal source, and demonstrate that system operates to provide emergency power.
 - D. Provide a full tank of fuel at the time of final acceptance.
 1. If LP gas is back up to natural gas, provide LP gas fuel for minimum of 4-hours of full load operation.
 2. If natural gas is not available on the site, provide LP fuel for minimum of 4-hours of full load operation.
 3. Facilities with Enhanced Hurricane Protection Areas (EHPAs) shall have LP fuel for minimum of 24 hours of full load operation.
 - E. Provide manufacturer's diagnostic literature and software, and demonstrate their use.
- 3.8 FUNCTIONAL PERFORMANCE TESTING
- A. System Functional Performance Testing is part of the Commissioning Process.
 1. The Contractor shall perform the Functional Performance Testing and the Commissioning Authority shall witness and document the test.
 2. Refer to Section 01 91 00 - Commissioning, for functional performance tests and commissioning requirements.

The School District of Palm Beach County

Project Name:

SDPBC Project No.:

- B. Systems Readiness Checklists shall be completed and submitted for each piece of equipment included in this section.
- C. Functional performance testing of the generator systems will include testing of other emergency systems and sub-systems.
- D. The Functional Performance Tests will include a "Loss of Power" test to simulate loss of utility power.
- E. The Functional Performance Tests will include testing of all "Hurricane Shelter" systems and sub-systems, including using the emergency generator to provide power to all "Hurricane Shelter" systems for up to 4-hours.

3.9 DEMONSTRATION AND TRAINING

- A. Training of the Owner's operation and maintenance personnel is required in cooperation with the Owner's Representative.
 - 1. Provide competent, factory authorized personnel to instruct the operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems.
 - 2. Schedule the instruction in coordination with the Owner's Representative after submission and approval of formal training plans.
 - 3. Refer to Section 01 91 00, Commissioning, for further contractor training requirements.
- B. Provide demonstration and training for all types of generator systems installed in this project.

END OF SECTION