

SECTION 26 32 13

ENGINE GENERATORS

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data:

1. Component and accessories list for control panel, battery, battery charger, exhaust silencer, vibration isolators, day tank (if included), remote radiator, remote annunciator, main alternator and circuit breaker enclosure, and governor.
2. Ratings and nameplate information, including weights. Ratings shall include deration for local elevation and fuel source.
3. Fuel consumption rates, ventilation and combustion air requirements.
4. Wiring diagrams including schematics and interconnection diagram.

B. Quality Assurance Data:

1. Certified production test reports or mill test reports.
2. Test reports for previous design, and documentation showing previous design ratings and configurations.

C. Project Record Documents:

1. Shop Drawings:

- a) Certified elevation and outline drawings with dimensions.
- b) Certified plan view drawings with dimensions.
- c) Wiring and termination drawings.

D. Operation and Maintenance Data:

1. Product Data.
2. Operating and maintenance procedures.
3. Complete set of manufacturer's drawings.
4. Complete documentation of inspections and tests performed, including any logs, curves, and certificates. Documentation shall note any replacement of equipment or components that failed during testing.
5. Spare parts lists.
6. Data sheets updated to reflect field installation conditions.

1.02 QUALIFICATIONS

A. Manufacturer:

1. Require company specializing in package standby engine generator systems with minimum five (5) years' experience.

B. Service Facility:

1. Require that standby generator supplier have a local service facility within 75 miles of project with factory-authorized service technicians.

1.03 COMMISSIONING

- A. Standby generator shall be commissioned and fully tested to ensure proper function and operation for all scenarios of power loss and/or faults at the site.
- B. If a standby generator is not provided on the project, commissioning shall include fully testing the plug-in system with a portable generator.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Packaged Generator Systems:
1. Cummins Power Generation
 2. Caterpillar
 3. Generac

2.02 EQUIPMENT

- A. Engine:
1. Engine sized to operate at site elevation (5,200 ft.) and ambient conditions.
 2. Fuel: #2 Diesel fuel or natural gas.
 3. Electronic Speed Governor: isochronous type with provisions for manual operation and adjustment to maintain required frequency parameters and limits over no-load to full-load conditions. Speed sensor and decoupling system for start-up motor shall prevent coupling of the flywheel while in motion.
 4. Safety devices: engine shutdown on high temperature cooling liquid, low coolant, low oil level, low oil pressure, overspeed, engine overcrank, and a means of emergency shutdown.
 5. Engine starting:
 - a) DC starting system with positive engagement.
 - b) Include a heavy-duty storage battery, 24-volt solenoid activated starter motor, and engine jacket heater designed for quick engine starting.
 - c) Provide pre-charged, maintenance free battery with necessary cables, cell interconnection ties, rack and battery heater blanket.
 - d) Battery ratings, cables, and clamps shall be sized to start up system. Provide corrosion resistant tray.
 - e) Battery charger shall include overload protection, full wave rectifier, DC voltmeter, ammeter and 120 VAC fused input. Charger shall include an analog DC voltmeter and ammeter and 12 hour equalize charge timer.
 - f) In the event of a false start, the start-up system shall be designed to restart starter only after the restart motor has stopped.
 - g) Protection for prolonged start-ups shall include a circuit interrupter to stop cranking after 75 seconds.
 6. Engine jacket heater: thermal circulation-type heater with integral thermostatic control. Maintain engine jacket coolant temperature at 80°F. Provide a 120 VAC heater.
 7. Radiator: glycol coolant-type, off-skid or engine-mounted. Sized to maintain safe engine temperature in ambient temperature of 105°F. Pressurized, closed recovery system. Factory installed. The cooling system controls shall be factory set to allow for operation of generator assembly without load after transfer to normal load. Provisions shall be made for filling and draining the radiator. Location shall be easily accessible. An expansion tank shall be provided with a pressure cap, level indicator and low level alarm switch. Provide lockable cap.
 8. Diesel Engine accessories: fuel filter, intake air filter, fuel transfer pump, fuel priming pump, gear-driven coolant pump. The lubrication oil system shall include lube oil pumps, lube oil filter, automatic feed and cooler for normal operation. Oil filters shall be conveniently located and designed for easy maintenance, removal and replacement.
 9. Natural Gas Engine accessories: fuel filter, intake air filter, gear-driven coolant pump. The lubrication oil system shall include lube oil pumps, lube oil filter, automatic feed and cooler for normal operation. Oil filters shall be conveniently located and designed for easy maintenance, removal and replacement.
 10. Mounting: mount on structural steel base on minimum 4" high concrete housekeeping pad. Steel base shall incorporate vibration isolation system mounting for engine generator set. Vibration isolators shall be

- installed between base and concrete foundation. Supplier shall provide required hardware and shims to permanently mount unit to concrete pad.
11. Emissions: System shall be tested and listed as compliant with current local and EPA emissions controls requirements.
- B. Generator: three-phase, six-pole reconnectible brushless synchronous generator with brushless exciter.
1. Rating: specify required kW, kVA at 0.8 power factor, voltage, phase, 60 Hz at rpm of motor.
 2. Insulation: Class F.
 3. Temperature rise: 125°C (standby).
 4. Enclosure: open drip-proof.
 5. Voltage regulation: generator-mounted volts per Hz exciter-regulator to match engine and generator characteristics, with voltage regulation ± 1 percent from no load to full load. Include manual controls to adjust voltage drop ± 5 percent of voltage level, and voltage gain.
- C. Accessories:
1. Fuel supply: diesel fuel or natural gas.
 2. Fuel Supply System:
 - a) Complete with fuel pump (if necessary), tubing, hoses, valves, fittings, and vents in accordance with applicable standards and codes.
 - b) Supplier shall include a diesel fuel tank with engine generator skid (as required). Tank shall be sub-base mounted or in-skid day tank and have twenty-four (24) hours continuous operation fuel capacity.
 - c) Provide pipe, valves, and fittings associated with fuel storage and connections in accordance with requirements of appropriate NFPA standards.
 - d) Fuel tank shall be in accordance with API 650, "Welded Steel Tanks for Oil Storage," and Colorado regulations for above ground fuel storage tanks. Provide at a minimum:
 - i) Level gauge
 - ii) High level and low level switches with alarm and control options.
 3. Provide for remote shutdown of engine and remote shutdown of fuel supply as required by NFPA 37.
 4. Engine shall be provided with a properly sized air intake system including air cleaner and inlet silencer.
 5. Exhaust silencer: critical-type silencer with muffler connection flanges and flexible stainless steel exhaust fittings. Provide rain cap at end of exhaust pipe, exhaust pipe to be horizontal with grade. Provide for installation of a drain line from the muffler to a floor drain to drain off condensation from the exhaust.
 6. Line circuit breaker: molded case circuit breaker on generator output with adjustable electronic trip for long term, short term and instantaneous trips. Quantity of breakers may be more than one under certain conditions. Breakers shall be compliant with Overcurrent Coordination requirements.
 7. Engine-generator control panel: control panel enclosure with engine and generator controls and indicators. Control panel shall be electronic and have standard controls for shutdowns, instrumentation and regulation. Emergency stop button shall be located on panel front. Include the following features.
 - a) Frequency readout.
 - b) AC output voltage all phases.
 - c) AC output amperage all phases.
 - d) Output voltage adjustment.
 - e) Alarms for low oil pressure, high coolant temperature, over speed and over crank.
 - f) Engine start/stop selector.
 - g) Engine running time.
 - h) Oil pressure.

- i) Coolant temperature.
 - j) Auxiliary relay, 3-pole-double-throw, operates when engine runs; wire to terminal strip.
 - k) Remote alarm contacts for remote status panel.
 - l) Utility loss of power.
8. Remote status panel: wall-mounted in Facility Manager’s office with the following indicators and controls.
- a) LED type indicators for low oil pressure, high coolant temperature, low battery, over speed and over crank. Provide panel-mounted audible alarm.
 - b) Engine start/stop selector switch and LED type engine run indicator light.
9. Weather-protective housing: provide reinforced steel housing allowing access to control panel and service points. Include fixed louvers, day tank (if required), battery rack, silencer, engine jacket heater, and a battery heating pad. Provide all necessary screens (heavy metal) to prevent small rodent access (rodent-proof). Enclosure shall be reinforced steel housing with lockable doors and panels. The enclosure shall provide sound attenuation such that the operating decibel level shall not exceed sound regulatory requirements at site location.
- a) System shall meet sound pressure level rating requirements for local jurisdiction requirements.
 - b) Provide sound pressure level test reports for factory tested systems of same size, silencer type and enclosure type.
10. Provide label stating tank size and quantity of diesel fuel necessary to fill tank. Include fuel gauge at fill line connection and on tank.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Provide proper clearances around generator assembly per manufacturer’s recommendations.
- B. Load shall include emergency power and in some cases, power for boilers and heating hydronic circuits and fans.
- C. Provide full tank of diesel fuel after commissioning has been completed.

3.02 FIELD QUALITY CONTROL

- A. Provide for a full factory test and on-site test utilizing portable test load bank for minimum four (4) hours. Simulate power failure including operation for transfer switch, automatic starting, automatic shutdown and return to normal. This testing does not include commissioning. Commissioning shall be performed after system is connected to the building electrical system.
- B. During test record the following at twenty minute intervals:
 - 1. Kilowatts
 - 2. Amperes
 - 3. Voltage
 - 4. Coolant temperature
 - 5. Room temperature
 - 6. Frequency
 - 7. Oil pressure
- C. Test alarm and shutdown circuits by simulating conditions.
- D. Set generator output and engine speed.
- E. Turn over factory test results to DPS before shipment of generator. Test shall be as in “B” above.
- F. Turn over written site test results of generator to DPS. Test shall be as in “B” above.

END OF SECTION 26 32 13