

STANDBY NATURAL GAS GENERATOR SYSTEM

PART 1. GENERAL

1.01 RELATED DOCUMENTS

- A. Attention is directed to Division 0, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this specification.

1.02 SCOPE

- A. The scope of this section is to specify a standby generator to support the building's standby electrical loads. Review of proposal shall be based on cost, availability (i.e. delivery schedule) and Owner preference. The successful bidder will be issued purchase order from the Owner to initiate the order with the contract assigned to the Electrical Contractor winning the bid for the next phase of the construction.
- B. The generator supplier shall include an on-site full-load test of the generator as well as maximum building loads as outlined in the test section of this specification.

1.03 MANUFACTURERS

- A. Manufacturers
 - 1. Cummings
 - 2. Caterpillar
 - 3. Kohler
- B. Other manufactures must bid in the voluntary alternate section of the bid proposal.
 - 1. Alternate proposals must be based on equivalent devises and products listed in this section of the specification.
 - 2. Non-equivalent proposals must be clearly identified in the voluntary alternate section as a value engineering replacement.

1.04 SUBMITTAL

- A. Submittal shall include specification sheets showing all standard and optional accessories to be supplied, schematic wiring diagrams, dimension drawings, and interconnection diagrams identifying by terminal number each required interconnection between the generator set, the transfer switches, and remote devices if included in these specification.

1.05 PROTOTYPE TESTING

A. Generator Set Factory Prototype Tests and Evaluation: These tests and evaluations must have been performed on a prototype generator set representative of the Model specified as described herein. A summary of the generator set testing results shall be submitted for review with shop drawings: Components of the actual system, such as the engine/generator set, and accessories do not need to be subjected to prototype tests.

1. Maximum power (KW).
2. Maximum Motor Starting KVA: Based on sustained RMS recovery voltage of at least 90% of no load voltage at specified KVA at near zero power factor applied to the generator set.
3. Alternator temperature rise by embedded thermocouple and by resistance method.
4. Governor speed regulation under steady-state and transient conditions.
5. Voltage regulation and generator transient response.
6. Fuel consumption at 1/4, 1/2, 3/4, and full load.
7. Harmonic analysis, voltage waveform deviation, and telephone influence factor.
8. Three phase line-to-line short circuit test.
9. Cooling airflow.
10. Torsional analysis testing to verify that the generator set is free of harmful torsional stresses.
11. Endurance testing.

1.06 FINAL PRODUCTION TESTS

A. The standby generator set shall be factory tested under varying loads with guards and exhaust system in place. Tests shall include:

1. Single-step load pickup.
2. Transient and steady-state governing.
3. Safety shutdown device testing.
4. Voltage regulation.
5. Rated power.
6. Maximum power.

B. Test results shall be provided with operating and parts manual and as-built drawings.

PART 2. PRODUCTS

2.01 GENERATOR

- A. 50KW / 62.5KVA, 208Y120 Volt, 3 phase, 4 wire.
- B. Brushless permanent magnet exciter.
- C. Three phase sensing volt-per-hertz voltage regulator with $\pm 1/2\%$ regulation and voltage gain adjustment.
- D. 175 amp, 3 pole output breaker.
- E. Anti-condensation space heater.
- F. Class H vacuum impregnated insulation system or better.

2.02 NATURAL GAS ENGINE

- A. Self-contained radiator with fan and belt guards.
 - 1. Extended life coolant.
 - 2. Coolant drain line with valve.
- B. Critical grade exhaust muffler with stainless steel flex coupler.
- C. Engine block / coolant heater.
- D. Isochronous engine governor: ± 0.15 Hz frequency stability.
- E. 24 volt battery and battery charger.
- F. Heavy duty starting system.
- G. Oversized battery system with rack and cables.

2.03 ELECTRONIC GENERATOR CONTROL

- A. Automatic and manual start/stop engine control.
- B. Engine crank cycle, 1-60 sec. adjustable cranking/rest periods.
- C. Engine cool-down timer 0-30 minutes.
- D. Metering and gauges: Engine oil pressure, coolant temperature, engine RPM, generator AC volts, generator frequency, generator amps, engine run hours.
- E. Ammeter / voltmeter phase selector switch.
- F. Emergency stop.
- G. Voltage: Adjust potentiometer.

2.04 LOCAL AND REMOTE LED ALARM PANELS

- A. 80 DB horn.
- B. High coolant temperature.
- C. Low coolant temperature.
- D. Low oil pressure.
- E. Not in automatic.
- F. Battery charger malfunction.
- G. Generator on-load indicator.
- H. Overcrank.
- I. Overspeed.

2.05 ENCLOSURE

- A. Minimum 14 ga. steel.
- B. Lockable doors.
- C. Gasketed doors.
- D. Lift-off door hinges.
- E. Pitch roof.
- F. Radiator guard.
- G. Beige color.

PART 3. WARRANTY / MAINTENANCE

3.01 WARRANTY / SERVICE

- A. The manufacturer shall provide a minimum 5 year / 1500 hour comprehensive warranty to cover complete electrical power system outlined in the specification section. The warranty shall cover all costs for replacement parts, labor, travel expenses to trouble shooting, removal, reinstall and testing to return the generator to service.
- B. Warranty service work shall occur weekdays during normal business hours, excluding holidays and weekends. However, service shall be available at a premium differential cost (i.e. only the cost related to premium or holiday pay shall be charged to the Owner for warranty service work outside normal service hours). Premium cost shall be explained in the proposal.

- C. The manufacturer shall provide a proposal to extend the base bid warranty to a minimum ten year / 3000 hour major component warranty. The extended warranty beyond the five year base bid as noted above for cost of defective parts through the remaining coverage.

3.02 MAINTENANCE

- A. The manufacturer (or manufacturer's representative) shall include in the base bid a maintenance agreement for the coverage of the base bid warranty period noted in paragraph 3.01 above. The maintenance agreement shall provide for a minimum of the following:
 - 1. All recommended maintenance and adjustments to ensure validation of the warranty.
 - 2. Minimum semi-annual check to ensure proper operation of the generator under normal winter and summer building loads for a minimum of two hours. Test to be coordinated with the Owner minimum six weeks prior to commencement.
 - 3. Provide the Owner with a yearly report of maintenance, repairs and tests provided.
- B. Continuing maintenance agreements after the base bid agreement may be negotiated with the Owner after completion of the generator installation.

PART 4. TESTING

4.01 GENERAL

- A. Base bid shall be no-load and full-load testing of the generator as follows. A copy of the test results shall be submitted to the Engineer prior to turnover to the Owner. Test results shall show manufacturer's tolerances as well as actual parameters recorded.
- B. All fuel consumption for testing is the responsibility of the Generator Supplier or Representative.

4.02 NO LOAD / FULL LOAD TESTING

- A. No Load:
 - 1. Verify engine crank cycle.
 - 2. Check automatic and manual engine start features. Coordination with the automatic transfer switch controls will be necessary.
 - 3. Start the generator engine and verify the following at no-load.
 - a. Operation of all gauges and meters.

- b. Proper output voltage all three phases L-L & L-N.
 - c. Voltage adjustment range.
 - d. Proper oil pressure.
 - e. Proper coolant temperature.
 - f. Proper RPM/frequency.
 - g. Phase rotation at the transfer switch compared to the normal power source.
 - h. Emergency stop.
 - i. Engine cool / shutdown timer set for 50 minutes.
- B. Load testing using supplemental load banks at the generator.
- 1. With the generator operating at no-load, increase the load in 10% increments at 80% PF every 15 minutes until the generator reaches full load. Record the following at the start and after each load step thereafter.
 - a. Oil pressures.
 - b. Coolant temperatures.
 - c. Generator frequency / engine rpm.
 - d. AC volts each phase L-L and L-N.
 - e. AC current each phase and neutral.
 - f. Engine run hours.
 - g. Generator frame temperature (using externally attached thermocoupling).
 - 2. Operate the generator for two hours at full-load or until engine temperatures and pressure stabilize (whichever is longer). Record the same parameters as noted in paragraph 4.01.B(1) above, every 15 minutes.

4.03 BUILDING LOAD TEST

- A. The following test must be coordinated with the Owner for a minimum of six weeks prior to testing to ensure minimal disruption.
- B. With the "Automatic/Manual Re-Transfer Switch" in automatic, the building on normal power and the generator secured, simulate a normal source power failure at transfer switch. Note the following:
- 1. Verify the diesel generator start and comes up to proper voltage and frequency.
 - 2. Verify the transfer switch switches to standby power and the generator picks up the building loads.
 - 3. Verify the generator operation is stable and smooth and record the same parameters as paragraph 4.01.B for minimum one-hour, ensuring the building's new chiller operates through at least two compressor start cycles. Operate the building elevator during the same test period
- C. Automatic Re-Transfer and Shutdown:

1. Return power to the normal power sensor. Verify the transfer switch retransfers to the normal source after thirty minutes from restoring normal power. Verify the diesel generator shuts down after a minimum five minute cooldown delay.
2. Place the "Automatic / Manual Re-Transfer Switch" to "Manual Re-Transfer".

D. Manual Transfer and Shutdown:

1. With the "Automatic/Manual Re-Transfer Switch" in manual, the building on normal power and the generator secured, simulate a normal source power failure at transfer switch. Note the following:
 - a. Verify the diesel generator start and comes up to proper voltage and frequency.
 - b. Verify the transfer switch switches to standby power and the generator picks up the building loads.
 - c. Verify the generator operation is stable and smooth and record the same parameters as paragraph 4.01.B for minimum one-hour, ensuring the building's new chiller operates through at least two compressor start cycles. Operate the building elevator during the same test period.
2. Return power to the normal source power sensor and manually transfer load back to the normal supply. Verify the ATS immediately transfers to the normal source and the diesel generator shuts down after a five minute delay.

END OF SECTION