

SECTION 266100 - GENERATOR SYSTEM

PART 1 – GENERAL

1.1 DESCRIPTION

- A. All work specified in this Section shall comply with the provisions of Section 260100.
- B. Provide all labor and material necessary to install a natural gas engine-generator set in a complete and operating condition.
- C. The engine-generator set shall be suitable for outdoor use and complete with a weather-protective enclosure..
- D. The generator unit shall be capable of 10% overload for two hours of any twenty-four consecutive hours.

1.2 SUBMITTALS

- A. Furnish information showing manufacturers' model numbers and standard published ratings, dimensions and weights for the engine, generator and major auxiliary equipment.
- B. Submit copies of pertinent drawings and schematic diagrams for approval and include the following:
 - 1. Engine generator set including plans and elevations clearly indicating entrance points for each of the interconnections required.
 - 2. Engine generator/exciter control cubicle.
 - 3. Fuel consumption rate at various loads, ventilation and combustion CFM requirements.
 - 4. Exhaust muffler and vibration isolators.
 - 5. Battery charger, battery and battery racks.
 - 6. Actual electrical diagrams including schematic diagrams and inter-connection wiring diagrams for all equipment to be provided.
 - 7. Legends for all devices on all diagrams.
 - 8. Automatic load transfer control switch.
 - 9. Weather protective housing.
- C. The specified prime power kW shall be for continuous electrical service while paralleling to the utility company during peak shaving mode and shall be certified by the manufacturer for the actual unit supplied.

PART 2 - MATERIALS

2.1 MANUFACTURER

- A. The equipment shall be as manufactured by Cummins, Detroit Diesel, Caterpillar/Olympian or Kohler of the size and ratings indicated for natural gas fuel of 900 btu LHV.
- B. Equipment shall include weather protective housing for outdoor use.

2.2 ENGINE

- A. The engine shall be a maximum of twelve cylinders liquid cooled, four-stroke cycle spark ignited. The engine shall be equipped with lube oil and intake air filters, lube oil cooler, engine driven water pump and unit mounted instruments, water temperature gauge, lubrication oil pressure gauge and battery charging ammeter. The gas train shall be AGA certified.
- B. An electronic governor shall maintain frequency regulation not to exceed $\pm 25\%$ from no load to full rated load. Generator sets above 150KW shall have a woodward 2301 electronic type governor.
- C. The unit shall be mounted on a structural steel base and shall be provided with suitable steel spring vibration isolators.
- D. Safety shut-off for high water temperature, low oil pressure overspeed, engine overcrank and low water temperature shall be provided.
- E. Intercooler inlet water temperature shall be 130 degrees F. maximum.
- F. Guards shall be provided over all exposed moving parts as required by OSHA.
- G. Separate junction boxes for AC and DC engine wiring shall be provided for all external connections.

2.3 GENERATOR

- A. The generator shall be rated for continuous peak shaving service at ratings indicated with 0.8 power factor, 277/480 volts, three-phase, four wire, 60 hertz, 1200 RPM. Engine BMEP shall not exceed 140 PSI.
- B. The generator shall be a three phase, 60 hertz, single bearing, rotating field, synchronous type built to NEMA standards. A voltage regulator shall be provided to match the characteristics of the generator and engine. Voltage regulation shall be $\pm 1\%$ from no load to full rated load. Readily accessible voltage drop, voltage level and voltage gain controls shall be provided. Voltage level adjustment shall be a minimum of $\pm 5\%$. Generator and exciter shall be inherently capable of parallel operation with other power sources of equivalent electrical characteristics. Voltage dip shall not exceed 20% of rated voltage when a full load at rated power factor is applied to the generator regulator system shall include under frequency protection. Temperature rise by resistance of generator not to exceed 105 degrees C. over 40 degrees C. at rated load.

2.4 COOLING SYSTEM

- A. A horizontal remote radiator roof mounted with blower type fan shall be provided to maintain safe operation at 110 degrees F. ambient temperature. Airflow restriction from the radiator shall not exceed 0.5" H₂O. Provide an engine coolant heater with thermostat to maintain coolant temperature at not lower than 60 degrees F. Heater shall operate on 120 VAC. Heater shall have an oil pressure disconnect to turn heater off when engine is operating. The single roof mounted radiator shall be sized for service to all specified generator units.
- B. The engine cooling system shall be pretreated by the system supplier for the inhibition of internal corrosion and freezing. The radiator shall be sized for 50/50 glycol. A separate coolant pump shall be provided between engine and remote radiator.

2.5 FUEL SYSTEM

- A. Natural gas piping to generators will be under the plumbing subcontract.

2.6 AUTOMATIC STARTING SYSTEM

- A. A DC electric starting system with positive engagement shall be provided. The motor voltage shall be as recommended by the engine manufacturer. The ignition system shall be a micro-processor based electronic module with individual coils for each cylinder.
- B. Fully automatic generator set start-stop controls in the generator control panel shall be provided. Controls shall provide shutdown for low oil pressure, high water temperature, overspeed and overcrank. Controls shall include a 10 second three cranking cycle limit with lockout.
- C. A lead-acid storage battery set of the heavy duty starting type shall be provided. Battery voltage shall be compatible with the starting system. The battery set shall be rated no less than 225 amp hours. Necessary cables and clamps shall be provided.
- D. Battery racks shall be provided for each battery and shall conform to NEC 480-7,a,1. They shall be constructed of metal and so treated as to be resistant to deteriorating action by battery electrolyte. Further, construction shall be such that non-conducting insulation material directly supports the cells.
- E. A current limiting battery charger shall be provided to automatically recharge batteries. It shall include overload protection, silicon diode full wave rectifiers, voltage surge suppressor, DC ammeter, DC voltmeter, equalize timer and fused AC input. AC input voltage shall be 120 volts, single phase. Amperage output shall be no less than 10 amperes.

2.7 ENGINE INSTRUMENT PANEL

- A. Provide a free standing, NEMA 1 Engine Instrument Panel with metering, annunciation, and generator power circuit disconnect. Panel shall contain, but not be limited to the following equipment:
 - 1. Frequency Meter, 3 1/2" dial type.
 - 2. Voltmeter, 3 1/2", 2% accuracy dial type.
 - 3. Ammeter, 3 1/2", 2% accuracy dial type.
 - 4. Ammeter/Voltmeter phase selector switch.
 - 5. Remote Engine Control switch with off/auto/manual positions.
 - 6. Running time meter.
 - 7. Engine gauges for oil pressure, oil temperature, and water temperature.
 - 8. Annunciation panel with lamp test pushbutton, horn silence pushbutton, annunciation reset pushbutton and a fast-pulse son alert horn rated 80db to 95db at a distance of two feet. Include the following annunciation points:
 - Gen. ECS Not in Auto
 - Gen. Pre-Low Oil Pressure
 - Gen. Pre-High Water Temp.
 - Gen. Low Water Temp.
 - Battery Charger Malfunction
 - Overcrank
 - Overspeed
 - Low Oil Pressure
 - High Water Temp

- Low Oil Level
 - Peaking Mode
 - Utility Reverse Power
9. One generator power circuit disconnect consisting of an automatic molded case switch rated 65,000 AIC at 480/277 volt and a solid neutral. Automatic molded case switch to be sized per the drawings. The circuit breaker shall meet standards as established by U.L., NEMA and the N.E.C.

PART 3 - EXECUTION

3.1 MANUFACTURING

- A. The unit shall be shipped to the job by the manufacturer's authorized dealer having a parts and service facility within a 120 mile radius of the job. In addition, and in order not to penalize the Owner for unnecessary or prolonged periods of time for service or repairs to the emergency system, the bidding generator set supplier must have replacement parts in stock at all times. Certified proof of this requirement shall be available from the dealer and a personal inspection of the dealer's facilities may be made by the Architect or his appointed representative to substantiate claims made by the generator set supplier.

3.2 TESTING

- A. Prior to acceptance of the installation, equipment shall be tested to show it is free of any defects and will start automatically and be subjected to full load test through the use of portable, dry-type load banks supplied for this purpose at the job by the generator set supplier.
- B. The load bank shall be capable of definite and precise incremental loading and shall not be dependent on the generator control instrumentation to read amperage and voltage of each phase. Rather, the test instrumentation will serve as a check of the generator set meters.
- C. Saltwater brine tanks or those load banks requiring water as a source for cooling are not acceptable for this purpose and are disallowed and shall not be utilized for this test.
- D. Load bank testing shall be done in the presence of the Owner or his appointed representative only after the unit is permanently installed in accordance with the Contract Documents. Testing shall be for a period of four (4) hours under full load.

3.3 START UP AND INSTRUCTIONS

- A. On completion of the installation, start up shall be performed by the engine manufacturers' trained dealer service representative. The distributor's representative shall provide up to 8 hours of on site training to the owner by a qualified technician. Training shall include maintenance, safety, operation, trouble shooting and a review of the operation and maintenance manuals.
- B. Operating and maintenance instruction manual shall be furnished and procedures explained to operating personnel.

3.4 SYSTEM SERVICE CONTRACT

- A. The supplier of the standby power system must furnish a copy of, and make available to the

Owner, his standard service contract which, at the Owner's option, may be accepted or refused. This contract will accompany any documents, drawings, catalog cuts, specification sheets, wiring or outline drawings, etc. submitted for approval. This contract shall be for the complete power system.

3.5 GUARANTEE

- A. Equipment provided under this Section shall be guaranteed against defective parts and workmanship under terms of the manufacturers and dealers standard warranty. But in no event shall it be for a period of less than five (5) years from date of initial start up of the system and shall include labor and travel time for necessary repairs at the job.

END OF SECTION 266100