

SECTION 26 32 13

750 KW ENGINE GENERATOR

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes engine generator set, radiator, heat exchanger, exhaust silencer and fittings, fuel fittings and day tank, remote control panel, load bank, battery, charger and sound attenuated weatherproof enclosure.
- B. Related Sections:
 - 1. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
 - 2. Section 26 05 53 - Identification for Electrical Systems.
 - 3. Section 26 28 26 - Enclosed Transfer Switches.

1.02 REFERENCES

- A. National Electrical Manufacturers Association:
 - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 2. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
 - 3. NEMA ICS 10 - Industrial Control and Systems: AC Transfer Switch Equipment.
 - 4. NEMA MG 1 - Motors and Generators.
- B. International Electrical Testing Association:
 - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- C. National Fire Protection Association:
 - 1. NFPA 30 - Flammable and Combustible Liquids Code.
 - 2. NFPA 99 - Standard for Health Care Facilities.
 - 3. NFPA 110 - Standard for Emergency and Standby Power Systems.

1.03 SYSTEM DESCRIPTION

- A. Provide an emergency power system to supply electrical power in event of failure of normal supply, consisting of a liquid cooled engine, an AC alternator and system controls with all necessary accessories for a complete operating system, including but not limited to the items as specified hereinafter.
- B. Provide automatic transfer switch that will initiate a signal on primary power failure and automatically detect a secondary power source, transferring the load to this secondary source. On restoration of primary power, the switch must automatically retransfer the load back to primary power and signal the secondary source to shut down. The switch must be a self contained device with all features described herein

1.04 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal procedures.
- B. Provide three complete sets of the Submittal for approval, prior to production release, showing all components, in addition to the engine and generator. Submittals shall include compliance with these specifications.

- C. Shop Drawings: Indicate electrical characteristics and connection requirements. Include plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, electrical diagrams including schematic and interconnection diagrams.
- D. Product Data: Submit 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, sub-base fuel tank, radiator data and emission data.
- E. The Developer Design/Builder's electrical contractor shall submit 1/4" = 1'0" scale sketches of all electrical rooms and areas including actual dimensions of all equipment in electrical rooms and indicate clearances per CEC as well as door swings or other obstacles. Sketches shall be submitted along with or prior to shop drawing submittals. Shop drawings submitted without sketches shall be returned and not reviewed.
- F. Test Reports: Indicate results of performance testing.
- G. Manufacturer's Field Reports: Indicate inspections, findings, and recommendations.
- H. Manufacturer shall provide special seismic certification with submittal.

1.05 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit instructions and service manuals for normal operation, routine maintenance, oil sampling and analysis for engine wear, and emergency maintenance procedures.

1.06 FACTORY PROTOTYPE TESTING

- A. The system manufacturer must certify that engine, generator and controls have been tested as a complete system of representative engineering models (not on equipment sold). The manufacturer shall supply equipment that is a current factory standard production model.
- B. Prototype testing shall include:
 1. Fuel consumption at 1/4, 1/2, 3/4 and full load.
 2. Exhaust emissions.
 3. Mechanical and exhaust noise.
 4. Governor speed regulation at 1/4, 1/2, 3/4 and full load; and during transients.
 5. Motor starting kVA.
 6. Generator temperature rise in accordance with NEMA MG1-22.40 and 16.40
 7. Harmonic analysis, voltage waveform deviation and telephone influence factor.
 8. Generator short circuit capability.
 9. Cooling system performance.
 10. 3 phase short circuit tests.
 11. Maximum power (kW)
 12. Generator revolving field assembly for 2 hours at 2700 rpm (150% overspeed) and 70 degrees C and each production unit tested at 2250 rpm (125% overspeed) at room temperature.

1.07 WARRANTY

- A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

- B. Five Year Manufacturer Warranty: The manufacturer's standard warranty shall in no event be for a period of less than five years from date of initial start-up of the system and shall include repair parts, labor, reasonable travel expense necessary for repairs at the job site, and expendables (lubricating oil, filters, antifreeze, and other service items made unusable by the defect) used during the course of repair. Running hours shall not be a limiting factor for the system warranty by either the manufacturer or servicing distributor. An extended warranty for an additional five years shall be offered as an option. Submittals received without written warranties as specified will be rejected in their entirety.

1.08 MAINTENANCE SERVICE

- A. Division 01 - Execution and Closeout Requirements: Maintenance service.
- B. Furnish service and maintenance of engine generator for five years from Date of Substantial Completion.

1.09 MAINTENANCE MATERIALS

- A. Division 01 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish one set of tools required for preventative maintenance of engine generator system. Package tools in adequately sized metal tool box.
- C. Furnish two of each fuel, oil and air filter element.

PART 2 PRODUCTS

2.01 BASE BID MANUFACTURERS

- A. Diesel Engines:
 - 1. Caterpillar
 - 2. Cummins
 - 3. Kohler
 - 4. Substitutions: Not Permitted.
- B. Generators:
 - 1. Century
 - 2. Kato
 - 3. Lima
 - 4. Marathon
 - 5. Newage Stamford
 - 6. Substitutions: Not Permitted.
- C. Governor
 - 1. Woodward
 - 2. Substitutions: Not Permitted.
- D. Voltage Regulators:
 - 1. Basler
 - 2. Substitutions: Not Permitted.

2.02 GENERAL REQUIREMENTS

A. Diesel Engine Generator Standby Plant:

1. General

- a. Each generating unit shall consist of a diesel engine direct connected to an AC generator with brushless excitation system and all necessary accessories and auxiliary equipment resulting in complete self contained unit capable of operating independently.
- b. The total generator assembly shall include engine generator, radiator and muffler exhaust.

2. Equipment Rating and Capability:

- a. Provide diesel-electric generating unit with the net continuous emergency rating capacity of 750 kW at 0.8 power factor.
- b. Both the engine and generator of the generating unit shall satisfactorily carry a load 300 percent in excess of the net continuous rated generating capacity at 0.8 power factor for a period of 10 seconds and sustaining 130% of continuous load for 2 minutes.
- c. The generator assembly shall be capable of delivering the specified ratings at 115 degrees F ambient temperature for 24 hours minimum.
- d. The overall efficiency of the generator shall allow for power required to operate the exciter, including power consumed in losses and in windage and friction for generator and rotating exciter.
- e. Rated net capacity of generating unit is defined as gross electrical power output of the generator minus total electrical power requirements of electric motor driven engine accessories normally constituting part of "engine assembly" as defined in NEMA publication "Standard Practice for Stationary Diesel and Gas Engines".
- f. Provide auxiliary equipment designed for continuous duty at 110 percent of rated net capacity of the generating unit.
- g. The generator shall exhibit less than 5% waveform deviation at no load

3. Critical Speeds:

- a. Provide complete diesel-electrical generating unit free of critical speeds of either a major or minor order that will endanger satisfactory operation of the unit, or cause undue vibration in any part of plant equipment or structure.
- b. Satisfactory operation will be considered endangered if torsional vibration stresses exceed 5,000 psi within 10 percent above or below rated engine speed.
- c. Submit copies of a summary of computations on critical speeds.

4. Mounting Base:

- a. Factory mount diesel generating unit complete with exhaust silencer, installed by Developer Design/Builder.
- b. The structural base shall be of the skid type and shall have adequate strength and rigidity to maintain alignment of the equipment mounted thereon without dependence on a concrete foundation.
- c. Field erect exhaust silencer as indicated. Provide all necessary piping, to make a complete installation.
- d. Steel used in fabrication of the mounting base shall be free from sharp bends and corners.
- e. Provide base with suitable lifting attachments. Locate attachment so that when moving the generator set with slings and exterior parts of the equipment shall be clear of slings to avoid damage.
- f. A diagram showing the lifting attachments shall be inscribed in a copper or zinc base allow plate securely fastened to the outside of the unit with the lifting capacity of each attachment marked thereon

B. Material and Parts: All materials and parts comprising the unit shall be new and unused.

2.03 DIESEL ENGINE

A. Engine Requirements: The engine shall be water-cooled inline or vee-type, four-cycle compression ignition diesel. It shall meet specifications when operating on number 2 domestic burner oil. The engine shall be equipped with fuel, lube oil, and intake air filters, lube oil cooler, fuel transfer pump, fuel priming pump, service meter, gear-driven water pump. The engine shall have 150% minimum set brake horsepower of the generator kW rating at continuous operation at 1800 rpm.

B. Governor:

1. Provide isochronous type governor with speed sensing.
2. Governor shall include an external load limit, speed and voltage drop adjustment mounted in control panel, adjustable while unit is in operation.
3. Provide governor capable of maintaining specified stability without halting, cycling, or other irregularities, as required to insure generator voltage, frequency and performance.
4. Governor characteristics shall conform to the following:
 - a. Minimum range of speed changer (expressed as a percent of rated speed): plus 15 to minus 5.
 - b. Observed speed band shall not exceed (expressed as a percent deviation of rated speed): plus or minus 0.25.
 - c. Transient speed deviating shall not exceed (expressed as a percent deviation for sudden addition or removal of 25 percent load): plus or minus 3.0.
 - d. Time to return to limits of observed speed band above shall not exceed (after sudden load change of transient speed above): 3 seconds.
 - e. Minimum manual speed regulation range adjustment (expressed as percent of rated speed): 0 to 5.
5. Provide with backup protection or safety devices to prevent engine runaway.
6. Provide electronic governor with automatic load sharing to insure generator voltage, frequency and performance, installed in the paralleling switchboard. Provide with external speed and droop adjustments mounted in control panel.
7. Provide governor with reversible synchronizing direct current motor or speed changer connected to the speed adjusting mechanism by a slip coupling. Arrange synchronizing motor for remote manual operation. Provide motor suitable for operation at rated control battery voltage.

C. Engine Cooling System: The engine shall be air cooled as follows:

1. Provide integrally mounted radiator and fan sized for operation based on standby rating at 115 degrees F ambient air and 1.0 inch, wg external static pressure and sized for removal of total engine generator set heat rejection.
2. The radiator shall be unit mounted horizontal air discharge design. The core shall be manufactured from brass tubes with bonded copper plate fins. Tubes to headers shall be mechanically bonded without the use of solder. The core shall be tested to 50 psig with a standards working pressure of 35 psig. Manifold tanks shall be removable for tube end inspection and cleaning. The fan shall be a high efficient, aluminum, adjustable pitch air foil section type. Fan tip speed shall not exceed 10,000 fpm. The radiator assembly shall have an operating noise level of 80 dBA or less, measured at 23 feet. All rotating parts shall be protected from accidental contact with OSHA approved removable safety guards. The radiator shall reject 100% of the heat load in an ambient of 115 degrees, with a 30% aqueous ethylene glycol coolant solution. The radiator shall be a Young Touchstone or approved equal. A fuel oil cooler shall be provided and factory installed.
3. Provide a thermostatic valve to maintain the jacket water temperature as recommended by the engine manufacturer under all load conditions.
4. Provide an engine driven, centrifugal type water circulating pump for circulating water through the engine jacket, cylinder heads, and radiator.

5. Fill the system with a 50% solution of ethyl-glycol/water antifreeze for engine freeze-up protection to minus 20 degrees F ambient.
- D. Block Design: The complete engine block shall be machined from one casting. Designs incorporating multiple blocks bolted together are not acceptable.
- E. Lubrication System: The engine shall utilize a gear-type, positive displacement, full pressure lubricating oil pump and water-cooled lube oil cooler. Pistons shall be spray-cooled. Provide oil filters, oil pressure gauge, dipstick and oil drain.
- F. Fuel System: Fuel filter and serviceable fuel system components shall be located to prevent fuel from spilling onto gen set batteries.

2.04 GENERATOR

A. General

1. The generator shall be a single ball bearing close coupled heavy duty, salient pole revolving field alternator of drip proof construction. The stator frame shall be bolted to the engine flywheel housing the rotor and shall be connected by a flexible plate type coupling to the engine flywheel.
 2. The rotor shall consist of an integral pole laminated steel assembly keyed directly to the shaft. The pole faces shall contain complete amortisseur windings.
 3. The generator shall be brushless permanent magnetic exciter.
 4. Generator winding shall be 2/3 pitch, with stator winding WYC connected.
 5. The generator temperature rise shall not exceed 80 degrees C as measured by resistance and based on a 40 degree C ambient temperature.
 6. The generator shall have class H insulation in the rotor and stator windings.
 7. Motor starting capability shall be a minimum of 2670 KVA.
 8. Generator output characteristics shall be as follows:
 - a. 200 kW at 80 percent power factor.
 - b. 1875 KVA
 - c. 480 V, 3 phase, 4 wire, 60 hertz
 9. Cooling: The generator shall be self-ventilated with air entry through louvers and discharge through screened openings at the engine end, air directed by two axial flow shaft mounted fans. The centrifugal ventilating fan shall be mounted to the flywheel to serve as a pressure ring for the coupling plates.
 10. Terminal Box: The terminal box shall be solidly mounted with vibration isolation and flexible connections to avoid transfer of normal engine vibration. The terminal box shall be of suitable capacity to receive and connect all required wires and conduit.
 11. Telephone Influence Factor (TIF): Telephone influence factor shall be below 50.
 12. Generator Heater: Provide generator heater controlled by thermostat set at 50 degrees F.
 13. Generator Grounding: Ground generator to ground grid.
 14. Total Harmonic Distortion (THD): Generator total harmonic voltage distortion shall not exceed 3 percent.
- B. Insulation: The insulation material shall meet NEMA standards for Class H insulation and be vacuum impregnated with epoxy varnish to be fungus resistant. Temperature rise of the rotor and stator shall not exceed NEMA class F. The excitation system shall be of brushless construction.
- C. Exciter (Self-Excited): The self-excited, brushless exciter shall consist of a three-phase armature and a three-phase full wave bridge rectifier mounted on the rotor shaft. Surge suppressors shall be included to protect the diodes from voltage spikes.
- D. Automatic Voltage Regulator: The digital automatic voltage regulator (DVR) shall maintain generator output voltage within +/- 0.5% for any constant load between no load and full load. The regulator shall be a totally solid state design, which includes electronic voltage buildup, volts per Hertz regulation, three phase sensing, over excitation protection, loss of sensing protection, temperature compensation, shall limit voltage overshoot on startup, and shall be environmentally sealed.

- E. Jacket Water Heater: Provide a jacket water heater, 120/240 VAC, at 100 degrees F in a 40 degree ambient. The heater shall be thermostatically controlled.

2.05 CIRCUIT BREAKER

- A. Circuit Breaker Specifications: Provide a generator mounted circuit breaker, molded case or insulated case construction, 100% rated, 2500 amp trip, 3 pole, NEMA 1P22. Breaker shall utilize a thermal magnetic trip unit and 24 VDC shunt trip. The breaker shall be UL listed with shunt trip device connected to engine/generator safety shutdowns. Breaker shall be housed in an extension terminal box mounted on the side of the generator. Mechanical type lugs, sized for the circuit breaker feeders, shall be supplied on the load side of breaker.

2.06 CONTROL PANEL

- A. Generator Mounted Control Panel: Provide a generator mounted control panel for complete control and monitoring of the engine and generator set functions. Panel shall include automatic start/stop operation; adjustable cycle cranking, digital AC metering (0.5% true rms accuracy) with phase selector switch, digital engine monitoring, shutdown sensors and alarms with horn and reset, adjustable cool down timer and emergency stop push-button. Panel shall incorporate self-diagnostics capabilities and fault logging. Critical components shall be environmentally sealed to protect against failure from moisture and dirt. Components shall be housed in a NEMA 1/IP22 enclosure with hinged lid.

- B. Digital Readouts: Provide the following digital readouts:

1. Engine oil pressure
2. Coolant temperature
3. Engine RPM
4. System DC Volts
5. Engine running hours
6. Generator AC volts
7. Generator AC amps
8. Generator frequency
9. KW meter
10. Percentage of rated Power
11. KVA meter
12. KVAr meter
13. Power Factor meter
14. KWHR meter

- C. Alarm NFPA 110: Provide the following indications for protection and diagnostics according to NFPA 110 level 1:

1. Low oil pressure
2. High water temperature
3. Low coolant level
4. Overspeed
5. Over crank
6. Emergency stop depressed
7. Approaching high coolant temperature
8. Approaching low oil pressure
9. Low coolant temperature
10. Low voltage in battery
11. Control switch not in auto. position
12. Low fuel main tank
13. Battery charger ac failure
14. High battery voltage
15. EPS supplying load
16. Day tank low fuel level
17. Day tank high fuel level

- 18. Spare
 - 19. Required shutdown per 2005 NFPA 110, 5.6.5.2 and Table 5.6.5.2.
- D. Remote Annunciator NFPA 110: Provide two remote annunciators to meet the requirements of NFPA 110, Level 1. The annunciators will be installed by Developer Design/Builder at basement main electrical room. The annunciator shall provide remote annunciation of all points stated above and shall incorporate ring-back capability so that after silencing the initial alarm, any subsequent alarms will sound the horn. Provide alarm indication for "generator ground fault" on solidly grounded wye systems of more than 150 volts to ground and circuit breakers rated 1000 amp or more, to meet NEC.
- E. Programmable Control Panel: Provide programmable protective relay functions inside the control panel to include the following:
- 1. Undervoltage
 - 2. Overvoltage
 - 3. Over frequency
 - 4. Under frequency
 - 5. Reverse power
 - 6. Overcurrent (phase and total)
 - 7. KW level (overload)
 - 8. Three spare LED's
 - 9. Four spare inputs

2.07 FUEL SYSTEM

- A. Fuel Filter: Filter/Separator - In addition to the standard fuel filters provided by the engine manufacturer, there shall also be installed a primary fuel filter/water separator in the fuel inlet line to the engine.
- B. Fuel Piping: All fuel piping shall be black iron or flexible fuel hose rated for this service. No galvanized piping will be permitted.
- C. Fuel Line Rating: Flexible fuel lines rated 300 degrees F and 100 PSI.
- D. Fuel Day Tank: .Provide the following items installed at the factory:
 - 1. The manufacturer shall supply its recommended stainless steel, flexible connector to couple the engine exhaust manifold to the exhaust system.
 - 2. The fuel system for the 16.0L engine shall include a 313 gallon (usable), double wall base mounted fuel tank. It shall have a stub-up area convenient for electrical conduit entry. It shall have the structural integrity to support the engine-generator set and carry the UL 142 mark. Minimum features shall include all welded construction, a fuel filler cap, electronic and manual fuel gauge, electric fuel level sensor, fuel line check valve, vent and fittings for fuel supply, return, fill and emergency vent. This tank must be supplied by the engine-generator set manufacturer and be installed before shipment.
- E. Supply the base tank with emergency venting per NFPA 37

2.08 EXHAUST SYSTEM

- A. Silencer: A critical type silencer, companion flanges, and flexible stainless steel exhaust fitting properly sized shall be furnished and installed according to the manufacturer's recommendation. Mounting shall be provided by the Developer Design/Builder as required per Code. The silencer shall be mounted so that its weight is not supported by the engine nor will exhaust system growth due to thermal expansion be imposed on the engine. Exhaust pipe size shall be sufficient to ensure that exhaust backpressure does not exceed the maximum limitations specified by the engine manufacturer.
- B. Exhaust System: The muffler and all indoor exhaust piping shall be "lagged" by the Developer Design/Builder to maintain a surface temperature not to exceed 150 degrees F. The insulation shall be installed so that it does not interfere with the functioning of the flexible exhaust fitting.

2.09 STARTING SYSTEM

- A. Starting Motor: The engine shall be started by two 24 V DC electric starting motors. Crank termination switch and 24 V DC fuel solenoid valve shall be provided for remote automatic start/stop capability.
- B. Jacket Water Heater: A unit mounted forced circulation type water heater. The heater Watt rating shall be sized by the manufacturer to maintain jacket water temperature at 90 degrees F, and shall be a (120/208/240/480) volt, three phase, 60 hertz.
- C. Batteries: Lead acid batteries of sufficient capacity for four 15 second crank periods with 10 second rest intervals shall be furnished. Battery voltage of 24 V DC shall be derived from four 12 V DC, 205 amp-hour high performance batteries, dry charged. Two battery interconnection cables and four battery-to-starter cables.
- D. Battery Trays: A battery tray shall be provided for the batteries and shall conform to NEC 480-7(b). It shall be treated to be resistant to deterioration by battery electrolyte. Further, construction shall be such that any spillage or boil-over battery electrolyte shall be contained within the tray to prevent a direct path to ground.
- E. Battery Charger: A current limiting battery charger shall be furnished to automatically recharge batteries. Charger shall float at 2.17 volts per cell and equalize at 2.33 volts per cell. It shall include overload protection, silicon diode full wave rectifiers, voltage surge suppressor, DC ammeter, DC voltmeter, and fused AC input. Ac input voltage shall be 120 volts, single phase. Charger shall have LED annunciation for low DC volts, rectifier failure, loss of AC power, high DC volts. Amperage output shall be no less than ten (10) amperes. Charger shall be wall-mounting type in NEMA 1 enclosure

2.10 VIBRATION ISOLATORS

- F. For unit to base provide spring type with neoprene acoustical pads, leveling devices and vertical limit stops. Minimum static deflection shall be 1 inch.
- G. For base to concrete pad spring mountings, provide adjustable type to provide minimum clearance of 4 inches between structural base and floor, with alignment and lift off restraints.
- H. Provide for engine-generator set base, engine-generator set base and remote radiator and silencer and exhaust pipe.

2.11 ENCLOSURE

- A. Sound Attenuated Enclosure: The weatherproof enclosure shall attenuate the engine sound to meet local County requirements.

2.12 SPARE PARTS

- A. Deliver 1 set of filter elements (air, fuel and oil), complete set of fuses, for each size used and one belt for every belt drive to County's Representative at final acceptance.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install equipment in accordance with manufacturer's recommendations, specifications and all applicable codes.
- B. Install engraved plastic nameplates in accordance with Section 26 05 53.
- C. Ground and bond generator and other electrical system components in accordance with Section 26 05 26.

3.02 START-UP AND TESTING

- A. Division 01 - Quality Requirements and Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.22.
- D. Coordinate all start-up and testing activities with the County's Representative.
- E. After installation is complete and normal power is available, the manufacturer's local dealer shall perform the following:
 - 1. Verify that the equipment is installed properly.
 - 2. Check all auxiliary devices for proper operation, including battery charger, jacket water heater(s), generator space heater, remote annunciator, etc.
 - 3. Test all alarms and safety shutdown devices for proper operation and annunciation.
 - 4. Check all fluid levels.
 - 5. Start engine and check for exhaust, oil, fuel leaks, vibrations, etc.
 - 6. Verify proper voltage and phase rotation at the transfer switch before connecting to the load.
 - 7. Perform a 4-hour load bank test at .80 power factor at full nameplate load using a reactive load bank and cables supplied by the local generator dealer. Observe and record the following data at 15-minute intervals:
 - a. Service meter hours
 - b. Volts AC - All phases
 - c. Amps AC - All phases
 - d. Frequency
 - e. Power factor or Vars
 - f. Jacket water temperature
 - g. Oil Pressure
 - h. Fuel pressure
 - i. Ambient temperature
 - 8. Connect the generator to building load and verify that the generator will start and run all designated loads in the plant.

3.03 MANUFACTURER'S FIELD SERVICES

- A. Division 01 - Quality Requirements: Manufacturer's field services.
- B. Prepare and start up engine-generator assembly.

3.04 ADJUSTING

- A. Division 01 - Execution and Closeout Requirements: Testing, adjusting, and balancing.
- B. Adjust generator output voltage and engine speed to meet specified ratings.

3.05 CLEANING

- A. Division 01 - Execution and Closeout Requirements: Final cleaning.
- B. Clean engine and generator surfaces. Replace oil and fuel filters with new.

3.06 OPERATION AND MAINTENANCE MANUALS

- A. Manuals Provided: Provide four (4) sets of operation and maintenance manuals plus one copy of CD covering the generator, switchgear, and auxiliary components. Include parts manuals, final as-built wiring interconnect diagrams and recommended preventative maintenance schedules.

3.07 TRAINING

- A. On-Site Training: Provide one day of on-site training to instruct the County's personnel in the proper operation and maintenance of the equipment. Review operation and maintenance manuals, parts manuals, and emergency service procedures.
- 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 system operates to provide emergency and standby power.

END OF SECTION