

SECTION 16310
PACKAGED ENGINE GENERATOR SYSTEMS

PART 1 GENERAL

1.1 SCOPE

- A. Furnish and install complete and operable systems including but not limited to; generator, enclosure, silencer, batteries, and charger to automatically provide emergency power when the normal power is interrupted.

1.2 REFERENCES

- A. Georgia Environmental Facilities Authority (GEFA) Design Guidelines for Generator Fuel Systems (Current Edition)
- B. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum) (Current Edition)
- C. NEMA MG 1 – Motors and Generators(Current Edition)
- D. NFPA 30 –Flammable and Combustible Liquids Code (Current Edition)
- E. NFPA 30A –Motor Fuel Dispensing Facilities and Repair Garages (Current Edition)
- F. NFPA 37 –Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines (Current Edition)
- G. NFPA 70 - National Electrical Code (Current Edition)
- H. NFPA 110 – Standard for Emergency and Standby Power Systems
- I. UL 142 – Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids (Current Edition)
- J. Underwriters Laboratories, Inc. Publications

1.3 SUBMITTALS

- A. Provide one complete set of Engineering Submittal for approval, prior to production release, showing all components. In addition to the engine and generator, submittals shall include complete system interconnection wiring diagrams, specifications and manufacturer's warranty form indicating compliance with these specifications.
- B. 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, etc.
- C. Submit Diesel Fuel Tank wiring diagrams and shop drawings showing materials of construction, dimensions, openings, connections, alarm, signaling, sensing, and indicating devices, vent devices, signage, etc.

1.4 DESCRIPTION OF THE SYSTEM

- A. Provide standby power systems as shown on the drawings for supply of 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 operation via dry contact from the automatic transfer switch described elsewhere in these specifications. The system shall come online fully automatically, and on restoration of utility automatically retransfer load to normal power, shut down the generator and return to readiness for another operating cycle.
- C. Provide diesel fuel tank for diesel powered generators, plus installation meeting this specification.
- D. Provide natural gas connection, including regulator for natural gas-powered generators. Natural gas utility provider is the City of Dublin.

1.5 GENERATOR SCHEDULE

- A. Generator manufacturer shall verify the generator supplied shall operate the loads as detailed in the chart below.

Map ID	Site	Fuel	Installation Type	Voltage	New Generator Min. Capacity (kW)	Motor Load/ Starting Method
1	Academy Avenue Pump Station	NG	Fixed	480 3φ	200	(2) 88hp/RVSS (Staggered Start)
2	Airport Pump Station	NG	Fixed	480 3φ	80	(2) 23hp/FVNR (Staggered Start)
3/11	Alabama Street & Raw Water Pump Stations	NG	Fixed	480 3φ	350	<u>Alabama Street:</u> (4) 20hp/FVNR (Staggered Start) <u>Raw Water Pump Station:</u> 15 kVA Building Load (2) 75hp/RVSS (Staggered Start) (1) 10hp/FVNR (1) 5hp/FVNR (2) 1hp/FVNR (1) 0.5hp/FVNR
4	Emergency Replacement Water Well*	n/a	n/a	n/a	n/a	n/a
5	Existing Water Well	NG	Fixed	480 3φ	45	(1) 30hp/RVSS
6	Hwy 19 Pump Station	NG	Fixed	480 3φ	60	(2) 20hp/RVSS (Staggered Start)
7	Holiday Inn Pump Station**	Diesel	Portable	480 3φ 208 3φ 240 3φ 240 1φ	100	(2) 10hp/FVNR (Staggered Start)

Map ID	Site	Fuel	Installation Type	Voltage	New Generator Min. Capacity (kW)	Motor Load/ Starting Method
8	Carver Street Pump Station**	n/a	n/a	n/a	n/a	(2) 2.4hp/FVNR (Staggered Start)
9	I-16 Westbound Pump Station	Diesel	Fixed	480 3 ϕ	80	(2) 20hp/FVNR (Staggered Start)
10	Loves Pump Station	NG	Fixed	480 3 ϕ	70	(2) 20hp/FVNR (Staggered Start)
12	Surface Water Treatment Plant	NG	Fixed	480 3 ϕ	500	75 kVA Building Load (2) 150hp/RVSS (Staggered Start) (1) 125hp/RVSS
13	Wastewater Treatment Plant	NG	Fixed	480 3 ϕ	500	100 kVA Building Load (2) 75hp/RVSS (Staggered Start) (1) 40hp/RVSS (3) 15hp/FVNR (Staggered Start) (4) 7.5hp/FVNR (Staggered Start) (3) 5hp/FVNR (2) 1hp/FVNR (2) 0.75hp/FVNR (12) 0.5hp/FVNR
14	West Laurens Pump Station	NG	Fixed	480 3 ϕ	125	(2) 45hp/RVSS (Staggered Start)
15	Washington Street Pump Station	Diesel	Portable	480 3 ϕ 208 3 ϕ 240 3 ϕ 240 1 ϕ	275	(2) 115hp/RVSS (Staggered Start)

* Emergency Replacement Water Well will be served by an existing fixed generator.

** Holiday Inn and Carver Street Pump Stations will be served individually and exclusively by one common portable generator.

1.6 REQUIREMENTS OF REGULATORY AGENCIES

- A. The electric generating system consists of an engine, generator, governor, coupling and all controls that must have been tested as a complete unit on a representative engineering model as required by NFPA 110. The tests, being potentially damaging to the equipment tested, must not be performed on the equipment to be sold, but on a separate prototype model.
- B. Conform to N.E.C. and applicable inspection authorities.

1.7 MANUFACTURER QUALIFICATIONS

- A. This system shall be supplied by a manufacturer who has been regularly engaged in the production of engine-alternator sets, automatic transfer switches, and associated controls for a minimum of ten years, so there is one source of supply and responsibility.
- B. To be classified as a manufacturer, the builder of the generator set must manufacture at least the engine or alternator.
- C. The manufacturer shall have printed literature and brochures describing the standard series specified, not a one-of-a-kind fabrication.
- D. Acceptable Manufacturers: Cummins-Onan, Caterpillar, and Kohler.

PART 2 PRODUCTS

2.1 ENGINE

- A. The engine shall be a liquid cooled, 4-cycle design, diesel or natural gas fueled engine, as specified. It shall provide the kW rating at an operating speed of 1800 RPM.
- B. The engine is to be cooled with a unit mounted radiator, fan, water pump, and closed coolant recovery system providing visual diagnostic means to determine if the system is operating with a normal engine coolant level. The radiator shall be designed for operation in 122 Degrees Fahrenheit (50 Degrees Celsius) ambient temperature.
- C. The intake air filter with replaceable element must be mounted on the unit. A positive displacement lube oil pump shall supply full pressure lubrication. The engine shall have a replaceable oil filter with internal bypass. Engine coolant and oil drain extension must be provided to outside the mounting base for cleaner and more convenient engine servicing. A fan guard must be installed for personnel safety.
- D. The engine shall have a battery charging DC alternator with an electronic voltage regulator.
- E. An electronic governor to maintain alternator frequency within 0.5% from no load to full load alternator output shall govern engine speed. Steady state regulation is to be +/- 0.33%.
- F. The engine fuel system for diesel engines shall be designed for operation on No. 2 diesel fuel. A secondary fuel filter, water separator, manual fuel priming pump and fuel shut-off solenoid and all piping must be installed at the point of manufacture.
- G. Sensing elements to be located on the engine for low oil pressure shutdown, high coolant temperature shutdown, low coolant level shutdown, over-speed shutdown, and over-crank shutdown. These sensors are to be connected to the control panel using a wiring harness with the following features: wire number labeling on each end of the wire run for easy identification, a molded rubber boot to cover the electrical connection on each sensor to prevent corrosion and all wiring to be run in flexible conduit for protection from the environment and any moving objects.
- H. The engine shall have an engine mounted, thermostatically controlled block heater to aid in quick starting. It will be of adequate wattage as recommended by the engine

manufacturer. The contractor shall provide proper branch circuit as shown on the drawings.

- I. Muffler: Critically damped, internal to the enclosure.

2.2 ALTERNATOR

- A. The alternator shall be a 4-pole revolving field type, with a brushless exciter. Photosensitive components will not be permitted in the rotating exciter. The generator shall meet temperature rise standards for class "H" insulation and conform to NEMA MG1-1.66. All leads must be extended into the AC connection panel. The alternator shall be protected by internal thermal overload protection and an automatic reset field circuit breaker.
- B. One-step load acceptance shall be 100% of nameplate kW rating and meet the requirements of NFPA 110 paragraph 5-13.2.6. The engine-generator set shall be so designed that voltage dip upon application of nameplate kW/kVA shall not exceed 12.5% with recovery to stable operation within 2 seconds. The generator set and regulator must sustain at least 90% of no-load voltage for 30 seconds with 250% of rated load at near zero power factor connected to its terminals.
- C. A solid-state voltage regulator designed and built by the engine-generator set manufacturer must be used to control output voltage by varying the exciter magnetic field to provide + or - 1% regulation during stable load conditions. Should an extremely heavy load drop the output frequency, the regulator shall have a voltage droop of 4 volts/hertz to maximize motor starting capability. The frequency at which this droop operation begins must be adjustable, allowing the generator set to be properly matched to the load characteristics ensuring optimum system performance.
- D. The voltage regulator must contain a limiting circuit to prevent output voltage surges. On a loss of the sensing signal, the voltage regulator must shut down to prevent an over-voltage condition from occurring. A voltage regulator that can go into a full field condition is unacceptable. LED indication will be provided on the regulator to monitor the sensing (yellow), excitation (green), and output circuit (red). A rheostat shall provide a minimum of + or - 10% voltage adjustment from the rated value.
- E. A panel that is an integral part of the generator set must be provided to allow the installer a convenient location in which to make electrical output connections. An isolated neutral lug must be included by the generator set manufacturer, ensure proper sizing.
- F. The engine-generator set shall be mounted with vibration isolators on a welded steel base that shall permit suitable mounting to any level surface.
- G. The generator shall be provided with a properly sized main output circuit breaker capable of providing the full rated output of the generator indefinitely. Thermal magnetic circuit breakers meeting the full load output current of the generator do NOT meet this requirement.

2.3 CONTROLS

- A. All engine alternator controls and instrumentation shall be designed, built, wired, and tested by the manufacturer. The controller shall be mounted to the engine-generator set via vibration isolation system. All control circuits shall be 24-volt DC.

- B. The engine-generator set shall contain a complete engine start-stop control, which shall start the engine on closing contacts and stops the engine on opening contacts. An automatic preheat circuit that can also be operated in a manual mode must be provided. A cyclic cranking limiter shall be provided to open the starting circuit after eight attempts if the engine has not started within that time. Engine control modules must be solid-state plug-in type for high reliability and easy service. The engine controls shall also include a 3-position selector switch with the following positions: RUN/OFF/AUTO.
- C. Safety shutdown monitoring system shall include solid state engine monitor with individual lights and one common external alarm contact indicating the following conditions: Over-crank shutdown, Over-speed shutdown, High Coolant Temperature Shutdown, Low Coolant Level Shutdown, Low Oil Pressure Shutdown. Monitoring system shall include lamp test switch for manual reset of tripped conditions. Engine RPM is to be monitored by an independent permanent magnet sensor. If there is a failure in this circuit, the engines must shut down immediately and illuminate a Loss of RPM Sensor shutdown.
- D. Engine instrumentation shall consist of an oil pressure gauge, coolant temperature gauge, DC ammeter, and an engine run hour meter located on the unit control panel. Alternator instrumentation must include analog meters to indicate output voltage, amperage, and frequency.
- E. Provide the following items installed at the factory:
 - 1. Pre-alarms indicators for auxiliary/multifunction must be provided to anticipate potential problems before the system becomes inoperative. A red light labeled on the control panel will illuminate should the associated parameters be exceeded.
 - 2. Engine battery voltage is to be monitored by a special printed circuit board to detect abnormal voltage levels. Red lights labeled on the control panel will illuminate should a high or low voltage condition be experienced.
 - 3. Provide an automatic dual rate battery charger manufactured by the engine-generator set supplier. The automatic equalizer system shall monitor and limit the charge current as required. The output voltage is to be determined by the charge current rate. The charger must have a maximum open circuit voltage of 35 volts DC and be protected against a reverse polarity connection. The battery charger is to be factory installed on the generator set.
- F. For diesel generators, also provide the following at the factory.
 - 1. Provide control circuit for a fuel level alarm light and alarm horn that alarms when either a low level (10%) or high level (90% full fuel level) is sensed in the base mounted fuel tank See Miscellaneous Equipment.

2.4 MISCELLANEOUS EQUIPMENT

- A. The following equipment is to be installed at the engine-generator set manufacturer's facility or at their approved fabricator:
 - 1. Weather protective enclosure: The engine-generator set shall be factory enclosed in a heavy gauge (minimum 14 gauge) steel enclosure constructed with corner posts, coated with electrostatically applied zinc, and finished with baked enamel paint. The enclosure is to have large, easily opened doors to allow access to the

engine, alternator, and control panel. Each door is to be fitted with stainless steel, lockable hardware with identical keys. Padlocks do not meet this specification.

2. Fuel level alarm enclosure: For diesel generators, provide red fuel level alarm light and alarm horn in a NEMA 3R enclosure that sounds when either a low level (10%) or high level (90% full fuel level) is sensed in the base mounted fuel tank. Alarm horn output shall be minimum 85dBA (min.) at 3 feet. An independent alarm silence switch shall be provided, with labeling for its use, inside the enclosure. The alarm enclosure shall be mounted so as to be readily viewed from the refueling location. All control circuits for the fuel level alarm system shall be 24 volt. Control wiring shall be installed in liquid tight flex. See Controls above.
3. For diesel powered generators, provide an 85dBA (min.) @ 10 ft. rated horn and amber alarm strobe light mounted to the exterior of the enclosure. Strobe shall be visible from the ground on the same side (end) as the generator control panel. Horn shall be mounted facing the facility. Alarm to sound and strobe shall flash for either primary fuel containment failure or activation of the fuel / oil reservoir alarm switch activation. An independent alarm silence switch shall be provided, with labeling for its use, inside the enclosure. Alarm strobe tube shall be field replaceable, Class II type and visible for 360 degrees around generator enclosure. Strobe shall be ECCO Model 6750 or equivalent. All control circuits for the alarm system shall be 24 volt. Control wiring shall be installed in liquid tight flex.

B. Diesel Fuel Tank (For Natural Gas powered generators, continue to next section)
Coordinated and provided by the generator manufacturer.

1. Diesel Fuel Tank: The fuel system for diesel-powered generators shall include a base mounted, GEFA approved fuel tank with capacity to operate the generator at full load for 24 continuous hours. It shall have the structural integrity to support the engine-generator set. Tank construction shall be welded steel, 10 gauge minimum on primary tank, secondary tank, containment area, and bottom. Minimum features shall include double wall all welded construction in compliance with UL 142, fuel gauge, fuel line check valve and fittings for fuel supply, return, fill and vent. A 1-1/2" minimum air gap shall be provided below the bottom of the tank and the concrete support pad.
2. A one (1) inch high minimum, welded collar shall be supplied under the engine area of the generator and within the generator enclosure. This collar shall create a sealed fuel/oil containment reservoir in the event of a fuel/oil line rupture. Reservoir shall be supplied with a visible open/close valve with hose connection for draining. Fuel supply fitting shall NOT be installed within the reservoir area. This tank must be supplied and warranted by the engine-generator set manufacturer and be installed by factory technicians.
3. At a minimum, provide top-mounted tank openings as follows:
 - a. Fuel supply and return openings shall be 1" NPT min. EA.
 - b. Normal (primary) tank vent opening, 2" NPT min.
 - c. Emergency pressure relief (secondary) vent on opening sized for NFPA 30. Note: Vent shall be OPW 202.

- d. Openings for Low Level and High Level fuel alarm switches, 2" NPT min.
 - e. Mechanical fuel gauge opening, 1-1/2" NPT min.
 - f. Stick port opening, 1-1/2" NPT min.
 - g. Tank fuel fill bung, 2" NPT min. See location note above.
 - h. Note: Dielectric couplings and/or flanged kits shall be provided at all copper to steel connections to isolate the piping from the tank.
4. Diesel Fuel Tank Fill Assembly: The tank fill connection shall be a cam-lock style tight-fill type used in conjunction with an overflow prevention valve set to stop the flow of fuel when the tank reaches 95% of tank capacity. The fill shall be located such that the delivery operator has direct access to the tank gauge. The overflow prevention valve shall be Clay & Bailey Mino #1228, EBW "Auto Limiter II" or approved alternate. Where tank fill assemblies are located outside the generator enclosure, provide assembly with gasketed, weatherproof, hinged cover to preclude rain accumulation in assembly.
5. Diesel Fuel Tank Gauges: A mechanical, direct reading type fuel level gauge indicator shall be provided in addition to any electronic monitoring system. The fuel level indicator shall be one of the following: A Kruger mechanical tank gauge, a "Scully" gauge, a Hersey Direct Reading mechanical, or magnetic gauge, or equivalent. In addition, provide Owner with a manufacturer tank chart with inches to gallon conversions. Mount a laminated copy of the chart inside the generator module for use by the fuel delivery operator.
6. Diesel Fuel Tank Signage: Tanks shall be labeled with fuel type and capacity. Labels shall be 2 inch high white letters on black background and permanently attached to the tank with adhesive near the fuel filler area.
7. Diesel Fuel Tank Leak Alarms: A 24V liquid sensor shall be mounted inside the rupture basin (secondary tank) and wired to the major engine alarm. Sensor shall be INCON TSP-ULS or equal. Sensor shall be wired in series with the reservoir sensor.
8. Diesel Fuel Tank Venting: Provide weighted type vents. Spring loaded type vents are unacceptable. Primary vent extensions shall be installed extending 12 feet above grade. Emergency vent stacks shall be extended above the height of the top of the fill bucket where generators are installed in a fenced or protected enclosure. If the generator is installed in an area accessible to the public, emergency vent stacks shall extend to a minimum of 6 feet above the tank. Vents stacks shall either be located and braced internal to the generator enclosure or externally from a C2 x 1 x 3/8" channel, minimum 8 feet long, bolted to the pad. Venting installed internal to the generator enclosure shall be vented through the roof with a weatherproof seal. The addition of venting through the generator enclosure shall NOT void factory warranty of the enclosure. External bracing shall be installed as not to interfere with access to the generator or the components within the enclosure. Vent and brace shall be primed and powdercoat painted black.

9. Spill Kit: Provide a Ramsey Group (828-684-2257) "First Responder" petroleum spill kit, Part No. FR-911-125 or equal for the use of the facility. Provide onsite for initial fueling of generator fuel tank and present to Owner's Representative.
10. Diesel Fuel Tank Certification:
 - a. The fuel tank shall be pressure tested to 5 psig for 2 hours with no readable pressure drop, in accordance with manufacturer's instructions/recommendations.
 - b. The Contractor shall provide written certification, signed by the Owner's Representative, that the tank passed the pressure test. This certification shall be included with the Contractor's final documentation provided to the Owner.
 - c. The fuel tank and associated piping systems shall meet all requirements of the most current Environmental Protection Agency Publications and local and State requirements. The fuel tank shall be installed in accordance with the manufacturer's recommendations and NFPA 30, NFPA 30A, NFPA 37, and GEFA.

C. Generator Certification: (ALL)

1. The Contractor shall provide written certification that the appropriate Authority Having Jurisdiction has witnessed the tightness tests required by the prevailing code.
2. The Contractor shall comply with the provisions of all Federal and State regulations pertaining to the removal or modification of existing systems or installation of the new systems.
3. The Contractor shall notify the State of the work to be performed (including removal and modification of existing systems and installation of new systems) within the times required.
4. The Contractor shall obtain all permits and pay all fees required by the State and local jurisdictions.

2.5 PORTABLE GENERATORS

- A. Provide two vehicle towable portable generators: one for the Washington Street Pump Station and one to serve Holiday Inn and Carver Street Pump Stations individually. Generator and enclosure shall comply with the requirements of this section.
- B. Voltage: Portable Generators' available output voltages shall be as scheduled. Voltage selection shall be made by 4-position rotary switch.
- C. Output Circuit Breaker: Provide one LSI static trip adjustable output circuit breaker with alarm only ground fault sensing sized to provide protection for the generator's full load current for all output voltages. Trip settings shall be field adjustable.
- D. Output Connections: Provide Camlock type 16 400A connections to match cables' connectors.

- E. Shore Power Connections: Provide shore power connection(s) for onboard support equipment: battery charger, battery warmer, alternator heater, oil heater, and coolant heater. Shore power connection shall be by no more than two twist lock type receptacles. Provide matching plug(s) to be installed at the pump station locations.
- F. Cables:
1. Provide 600V UL listed generator cable constructed with a 30 ga. extra flexible Class K (ASTM-B) bare, annealed electrolytic copper, equipped with an added inner jacket for safety. Separator shall be extruded in a high contrast color and applied between the conductor and outer sheath for increased insulation, added flexibility, and easily identifiable damage or wear.
 2. Construction: Rope stranded copper conductor with a colored safety separator. A braid shall separate the copper conductors from the exterior insulation. Jackets shall be reinforced by a braid.
 3. Outer jacket shall be TYPE PPE (FT5). Cable shall be Manufactured to (UL) standard 1650.
 4. Output Connections: Provide Camlock type 16 400A connections to match the generators' connectors. Phase color coding of connectors shall match that of the pump station connection receptacles.
 5. Provide one full set of cables for each portable generator. Cables shall possess sufficient NEC ampacity for the full-load amp output of the generators operating at their lowest 3-phase voltage. Cables shall be color coded to match generator output connections.
 6. Each cable shall be 50 feet in length.
 7. Temperature Rating: -40°C TO +105°C
 8. Cables shall be by Trystar or equal.
- G. Portable Generator Trailer
1. A special purpose trailer designed specifically for a generator application shall be provided with the following options: structural tubing frame, integral double wall fuel tank, generator mounting points, heavy duty trailer fenders. Trailer shall be in full compliance with the following standards established by the US Department of Transportation and National Highway Traffic Safety Administration, DOT/ICC approved and be manufactured in accordance with NATM (National Association of Trailer Manufacturers) guidelines. VIN plate labels and trailer equipped to be U.S. and Canadian Compliant. Trailer shall be supplied with DOT/ICC lighting with standard 6-pin connector plug.
 2. Tow connection shall be by pintle ring.
 3. Wheel and tire capacities must be equal to or exceed the axle capacities
 4. Provide a trailer-mounted load bank with an automatic step controller to maintain a 35% load on the generator. Provide CT's for input to load bank controller. Load bank controller shall maintain a base load of 35% minimum and step loads shall

be automatically adjusted once the facility load has reached 35%. Load bank shall be served from suitably sized circuit breaker on the generator. Load bank shall be weather resistant.

5. Fuel and DEF tanks shall be built into the trailer for the generator set and sized to allow for 75% load operation of the generator set for 24 hours. The sub-base fuel tank shall be UL142 listed and labeled. The fuel tank shall be a double-walled, steel construction and include the following features:
 - a. Emergency tank and basin vents.
 - b. Fuel gauge shall be a top mounted direct reading "Kruger" mechanical gauge.
 - c. Fuel fill shall be elevated 6" and be complete with a "Velvac" key locking/non venting cap, (suitable for mobile applications).
 - d. Tank atmospheric vent shall be elevated above fuel fill.
 - e. Tank baffles.
 - f. Fuel supply and return lines, connected to generator set with flexible fuel lines as recommended by the engine manufacturer.
 - g. Leak detection provisions, wired to the generator set control for local and remote alarm indication.
 - h. Provide a low fuel level float switch factory set at 50% of the tank's usable fuel capacity. Wire switch to generator control for local alarm.
 - i. Basin drain.

2.6 FACTORY TESTING

- A. Before shipment of the equipment, the engine-generator set shall be tested under rated load and power factor for performance and proper functioning of control and interfacing circuits. Tests shall include:
 1. Verifying all safety shutdowns are functioning properly.
 2. Single step load pick-up per NFPA 110.
 3. Transient and voltage dip responses and steady state voltage and speed (frequency) checks.

2.7 OWNER'S MANUAL

- A. Three (3) sets of owner's manuals specific to the product supplied must accompany delivery of the equipment. General operating instructions, preventative maintenance, wiring diagrams, schematics and parts exploded views specific to this model must be included.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Contractor shall install the complete electrical generating system including all fuel connections in accordance with the manufacturer's recommendations as reviewed by the Engineer.
- B. Supplier shall have permanent service facilities in this trade area. These facilities shall comprise a permanent force of factory-trained service personnel on 24-hour call, experienced in servicing this type of equipment, providing warranty and routine maintenance service to afford the owner maximum protection. Delegation of this service responsibility for any of the equipment listed herein will not be considered fulfillment of these specifications. Service contracts shall also be available.

3.2 WARRANTY

- A. The manufacturer shall warrant against defective materials and factory workmanship of the standby electric generating system components, complete engine-generator, instrumentation panel, and all appurtenances for a period of one year. Such defective parts shall be repaired or replaced at the manufacturer's option, free of charge for travel and labor. The warranty period shall commence when the standby power system is first placed into service. Multiple warranties for individual components (engine, alternator, controls, etc.) will not be acceptable. Satisfactory warranty documents must be provided. Also, in the judgment of the specifying authority, the manufacturer supplying the warranty for the complete system must have the financial strength and technical expertise with all components supplied to provide adequate warranty support.

3.3 INSPECTION AND STARTUP

- A. The supplier of the electric generating plant and associated items covered herein shall provide factory-trained technicians to inspect the completed installation and perform an initial startup inspection to include: insuring the engine starts (both hot and cold) within the specified time.
 - 1. Verification of engine parameters within specifications.
 - 2. Set no load frequency and voltage.
 - 3. Test all automatic shutdowns of the engine-generator.
 - 4. Perform a 2-hour load test, ensuring full load frequency and voltage is within specification by using a contractor furnished resistive load set and test exerciser. Test shall be performed at 100% of generator capacity (full load).
 - 5. Contractor shall provide for the diesel generators to be provided with full fuel tanks upon completion of all testing.

END OF SECTION