



**26 3213.13 –
Diesel Engine Driven Generators**

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A. Description of System

1. Provide a diesel engine driven electric generating unit, factory assembled, tested and certified to operate at stated nameplate values
2. Output voltage shall match building voltage , 3 phase, 4 wire, 60 Hertz, grounded neutral
3. Fully rated for continuous operation at elevations up to 1000 feet above sea level and ambient temperatures of 95 degF
4. System Components
 - a. Diesel engine
 - b. Direct connected generator
 - c. Exciter
 - d. Exhaust system with noise abatement
 - e. Automatic starting equipment
 - f. Control and instrument panels and devices
 - g. Common steel base
 - h. Batteries and charging system
 - i. Power disconnect switch(es) and automatic transfer switch(es)
 - j. Vibration pads (steel spring isolators for inside installations)
 - k. EPA Emissions compliant for Emergency Stationary Internal Combustion Engines
 - l. EPA spill containment compliant 24 hour fuel tank

B. Quality Assurance

1. Equipment shall meet all applicable requirements of SAE, IEEE, NEMA, NEC and ANSI/NFPA 110 Standards
2. The engine, generator and all major items shall be by U.S. manufacturers
3. The manufacturer shall assemble and factory test the unit
4. Normal factory tests shall include maximum and continuous net brake horsepower over the operating speed range of the engine
5. The authorized dealer with a service and parts facility within 60 miles of the project site shall take delivery from the factory and complete assembly of all dealer supplied options

C. Submittals

1. Drawings and operating characteristics of proposed engine generator set
 - a. Overall dimensions, weight and foundation requirements
 - b. Engine and generator specifications and operating characteristics
 - c. Muffler and sound attenuation specifications including dB levels at 1, 7 and 15 meter distances



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- d. Batteries, charger and lockable battery disconnect switch
 - e. Engine instruments
 - f. Control Panel
 - g. Radiator coolant system
 - h. Electrical control wiring and mechanical piping schematics
 - i. Vibration isolation system
- D. Warranty
- 1. Standard two year parts and service for all components
 - 2. Extended five year parts and service on engine and accessories, generator, exciter and system controls
- E. Engineering Field Service
- 1. Provide service technical support to the installing contractor during installation
 - 2. Check out of all equipment installation, wiring, field connections by a certified field service technician
 - 3. Set up and test all controls, verify operation and adjustment of mechanical systems
 - 4. Provide a four step running load test with a resistive load bank
 - 5. Each step should be at least one hour in duration, with the final step at 100 percent load
 - 6. Written inspection startup report
- F. Diesel Generator
- 1. Engine Requirements
 - a. Industrial, multi-cylinder, 4 stroke, 1800 RPM for operation on No. 2 domestic fuel
 - b. Fuel system complete with fuel filter and priming pump
 - c. Lubrication full pressure engine driven positive displacement sump pump, full flow filter
 - d. Cooling system pressure type with radiator, pusher type fan, coolant shutoff valves and drain on oil cooler to facilitate service. Provide coolant to minus 35 degF
 - e. Air intake with dry type filter
 - f. Immersion heater system to maintain engine coolant and lube oil temperature in readiness for fast starting. Pipe remotely with shutoff service and drain valves .
 - g. Engine block heaters shall have shut-off valves on both sides to facilitate maintenance.
 - 2. Electrical Starting System
 - a. Not less than 24 VDC
 - b. Heavy duty cranking motor with drive mechanism
 - c. Heavy duty storage batteries with metal frame or box
 - d. Master disconnect switch with lock out lever kit, suitable for multiple padlocks or lockout hasp



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- e. Cranking motor capable of cranking engine five times in rapid succession without overheating and sufficient speed for minus 10 degF starting
 - f. Storage batteries with capacity to start the engine generator five times consecutively as specified
3. Governor
- a. Electronic, adjustable isochronous suitable for providing accurate speed control and droop stabilization
 - b. Maximum observed speed band, plus minus 0.25% deviation from rated at constant load
 - c. Speed droop adjustable from 0% to 7 % for load application from no load to full load
4. Safety Devices
- a. Safety controls which will shut down the engine and open the generator main circuit breaker
 01. Over speed stop between 115% and 125% of rated speed
 02. High coolant temperature cutout
 03. Low oil pressure cutout with adjustment set to operate when oil pressure drops below manufacturers recommendation
 04. Engine over crank cutout adjustable from 015 to 60 seconds
 - b. Safety controls should be programmed to record and store alarms as well as safety actuation. Alarms should be adjustable by the Owner. Cutouts should only be adjustable by manufacturers field service technician
5. Generator
- a. Alternating current, single bearing, direct connected, separately excited, externally regulated, synchronous type, Class F insulated with an amortisseur winding, drip proof self ventilated enclosure
 - b. Continuous rating as specified on nameplate, conforming to referenced standards including wave form, telephone influence factors.
 - c. Total harmonic distortion less than 5%with control conforming to IEEE 519
 - d. Extend all leads to a main termination terminal box, adequate in size to make all terminations including neutral and ground
 - e. Neutral shall be isolated from ground and shall maintain lugs for connection from normal and engine generator source and load wires
 - f. Provide a suitable generator field discharge resistor automatically connected and disconnected as required for proper operation
6. Output Circuit Breaker(s)
- a. The output circuit breaker with shunt trip shall be mounted on the unit frame assembly.
 - b. Circuit breaker shall be 100% rated and equipped with auxiliary contacts to monitor position
 - c. Circuit breaker shall be insulated case, heavy duty with RMS digital sensing trip unit
 - d. A ground fault sensing system shall be provided to sound/indicate an alarm locally



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- e. Ground fault detection shall not trip the circuit breaker
 - f. Provide extra fully rated "Load Bank" circuit breaker in addition to other breaker(s) on the genset to facilitate annual load bank testing.
7. Exciter
- a. Built in alternator type mounted on generator shaft, directly connected to the generator field windings without intervening brushes, slip rings or commutators
 - b. Not less than 6 solid state rectifiers and surge protectors
8. Voltage Regulation
- a. Static type, 3 phase voltage regulator
 - b. Adjustment of rated voltage over a range of plus minus 10 %
9. Manual and Automatic Start Operation
- a. Complete automatic engine starting and load transfer after sensing an adjustable predetermined single or multiple phase voltage sag
 - b. Upon restoration of normal power, sequence phase rotation and automatically transfer load back to normal source and shut the engine generator down
 - c. Manual-Off-Automatic selector on generator control panel
 - 01. Resetting of the automatic engine control after a failure by moving the selector switch from "Auto" to "Off" and then back to "Auto"
 - 02. Manual starting and stopping of the engine without transferring the load when placing the selector switch in the "Manual" position
 - 03. Prevent any operation of the engine generator in any mode when placing the selector switch in the "Off" position.
10. Starting Control Guidelines
- a. The controller shall start the engine generator set when the normal supply voltage in any phase drops below a predetermined value, programmable from 100% to 85%
 - b. The engine generator will operate until normal voltage is restored to a predetermined value, programmable from 85% to 100%
 - c. The engine generator will monitor the normal voltage for an adjustable time period, programmable from 0 to 30 minutes and if no interruption is experienced the unit will synchronize phasing and transfer the load back to normal source.
 - d. The engine generator will continue to run for a predetermined value, programmable from 0 to 5 minutes for a no load cool down and then shut down
 - e. Delay time in initiation of the engine starting control adjustable from 0 to 2 minutes
 - f. Provide indicating light that the load is on engine generator source
 - g. Transfer of load to the engine generator source after 90 % of rated voltage and frequency values have been achieved
 - h. Permit simulation of normal power failure without load transfer by a maintained contact switch



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- i. Permit manual retransfer of the load to normal service, during the adjustable 5 to 30 minute delayed return transfer period, by a momentary contact switch
 - j. Permit load to be continuously supplied by the engine generator set, regardless of normal power condition, through use of a maintained contact switch
11. Instrument /Control Panels
- a. Instrumentation/control panel(s). Provide one or more panels mounted on a common supporting system that is part of the steel base for the engine generator assembly. Provide fully identifying name plates permanently attached to the panels or structure. Provide a vibration isolation system to prevent premature failure of electronic components
 - b. Provide Modbus communication between RTU's and Generator Control Panel
 - c. Control functions
 - 01. Manual-Off-Auto selector switch
 - 02. Engine Start push button
 - 03. Engine Stop push button
 - 04. Main Circuit Breaker
 - a. Shunt Trip
 - b. Over current rip
 - c. Short circuit trip
 - d. Programmed Display Alarms
 - 01. Low Oil Pressure Pre Alarm
 - 02. Low Oil Pressure Alarm
 - 03. High Coolant Temperature Pre Alarm
 - 04. High Coolant Temperature Alarm
 - 05. Low coolant level
 - 06. Failure to Crank
 - 07. Failure to generate
 - 08. Overspeed Stop
 - 09. Overcrank
 - e. Programmed Display Measured Values
 - 01. Fuel pressure
 - 02. Battery Voltage
 - 03. Battery charging current
 - 04. Output voltage
 - 05. Output frequency
 - 06. Output current



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- 07. Run time hour clock, accumulated
- 08. Kilowatt Hour

- 12. Spare Parts. Provide 2 each: Air filter, oil filter, fuel filter.