DETAILED SPECIFICATION FOR DIESEL ENGINE AND GENERATOR SET

Specifications for 250kVA DG Set

1  Diesel Engine (Suitable capacity to drive 250KVA alternator)

The diesel engine should be vertical cylinder type having 6 cylinders totally enclosed, compression ignition, water cooled (radiator cooled), turbo charged cooled suitable for Power generation application having minimum of 306 BHP capacity to drive the 250 kVA alternator at 1500 rpm under NTP condition confirming to BS 649, complete with all interconnecting piping and the following standard accessories.
- a) Suitable fly wheel.
- b) Flexible coupling
- c) Air cleaner
- d) Radiator – heavy duty type
- e) Cooling fan
- f) Water circulating pump
- g) Corrosion resistor
- h) PT fuel pump
- i) Electronic governing control (EGC)
- j) Fuel filter
- k) Fuel shut down solenoid (24Vdc, stop solenoid)
- l) Lubricating oil filter
- m) Oil cooler
- n) By pass filter
- o) Silencer (Residential type)
- p) Starter
- q) Engine instrument panel with following
  - Lubricating oil temperature
  - Lubricating oil pressure gauge
  - Water temperature gauge
  - Hour meter and speedometer
- r) The engine should have following
  - Safety control trip for low lube oil pressure
  - Safety control trip for high lube oil temp.
  - Safety control trip for high water temp.
  - Safety control trip for engine over speed

2  Requirement for the diesel engine

The diesel engine shall be vertical cylinder, single acting, mechanical injection type and furnished with all the required equipments as per standard practice. The engine should develop rated horse power to drive 250kVA alternator.

The required auxiliaries, guarantee of fuel consumption for rated output, provision for parallel operation, governor performance and torsional vibration shall be in accordance with BS : 649.
The engine shall be provided with an exhaust gas turbo charger and a charged air cooler, integral air intake filter and silencer.

The engine should have throttle control, the engine water cooling should have radiator. For charged air cooler, the cooling water inlet flow shall be thermostatically controlled.

3 Fuel system

Fuel (Diesel) system to the engine shall be supplied from a fuel tank. The supplier should provide a fuel tank of 900 liter capacity, including 200 liter reserve capacity to be installed in a weather proof enclosure. The supplier should provide mechanical fuel level indicator with ‘Low’ and ‘High’ markings.

The fuel tank shall be free standing, floor mounting type with mounting brackets, fuel inlet and outlet, air vent, drain plug, opening with cover for direct filling from the top of the tank. Provide suitable fuel pipe lines for suction and return with bends, collars etc.

An engine driven booster pump shall be provided to deliver fuel from the supply line to the fuel injector through two numbers of fuel filters.

4 Lube oil system

The automatic pressure lubrication shall be provided by an engine driven pump. This system should be complete with an oil cooler and 2Nos. of 100% capacity mesh filters. The oil cooler should be water cooled and equipped with necessary bypass arrangement, to bypass cooler during starting until oil temperature reaches the minimum (or the threshold) temperature.

5 Engine starting system

Starting of the diesel engine shall be of electric starting. The electric starting system should have starter motor, Lead acid starter Batteries, battery charger and necessary instrument and accessories to indicate the condition of the batteries.

6 Batteries

The batteries shall be sized taking in to account the starting load requirement of the D-G set. 2Nos. of 12V, Lead acid batteries, of suitable capacity to start the engine by 24V DC electrical starting Motor without struggling, and with suitable capacity of battery cable. The batteries must be capable to try 3 unsuccessful starts continuously. The batteries
have to
be placed on a suitable well painted steel stand.

7  **Air intake system:**
Air intake system should have requisite air filters and complete interconnecting piping, supports etc..

8  **Exhaust system**

Engine exhaust system shall consist of exhaust gas driven turbo charger with lagged piping, interconnecting cylinder head outlet let with the turbo charger inlet. Exhaust gas from the turbo charger shall be let out through exhaust gas silencer. The exhaust gas silencer, necessary pipes etc., shall be provided by the contractor. Exhaust piping shall be suitably cladded with aluminum sheets, mineral wool etc. The silencer should be of residential type.

Flexible connection (expansion joints) shall be provided in the exhaust piping to avoid transmission of vibration from engine to the structure (acoustic and weather proof enclosure etc.). Also the exhaust line with suitable bends, collars, flanges, angle supports and other accessories should be provided. Provide necessary arrangements to avoid entry of rain water, falling dust etc. at the top of the exhaust pipe. The exhaust piping system should be designed and laid up to a height of 5 Meters above the acoustic enclosure or as directed by the SPMU authorities to suit the site and environmental condition as per the controller pollution board, standards.

9  **Engine governing system**
The engine governing system shall be of class ‘A’ hydraulic governor. An over speed trip mechanism shall be provided to automatically shut off the fuel supply in case of set speed reading about 110% of rated speed.

10  **The Alternator**
The Alternator shall be screen protected, drip proof, separately excited system (with PMG) of brush less, continuously rated to give an output of 200kW/250kVA at 0.8 pf at 415V, 50Hz, 1500rpm, 3 phase, 4 wire. The alternator should be provided with automatic voltage regulator with voltage regulation of ± 0.5% (MX321) and is designed, tested for confirming to IS 4772/1992 or IEC 34.

11  **Requirement of Alternator.**

a) kVA Rating : 250
b) kW Rating : 200
c) Terminal Voltage : 415 V
d) Power Factor : 0.8 (lag)
e) No. of Phases : 3
f) No. of wires : 4
g) Type of excitation : with built in PMG.
h) Voltage Regulation : +/- 0.5 %.
i) Frequency : 50 Hz.

The insulating material of Class H and shall be non-hygrosopic and fully tropicalised. The Alternator shall be suitable for operation with its neutral solidly grounded. The neutral shall be formed at the terminal box.

The alternator terminal box is made out of 16 SWG sheet steel having louvers and removable type bottom gland plate, top inspection cover and 600A capacity tinned Copper Bus-bars for all phases and Neutral. The Bus-bar should be properly supported with porcelain / resin cast epoxy molded bus supports. Provide sufficient clearances between phases and earth as per BS / IS standards.

12 **Mounting**
Design, fabricate suitable base frame, which is a welded construction using channel iron etc. to mount D-G set

13 **Foundation**
Details to be submitted

14 **Earthing**

The Generator Neutral should be earthed with 2Nos. of Copper plate earthing as per BS 6043

15 **Tests**
Supplier shall perform all standard tests (Shop tests) on Engine and alternator and the test reports pertaining to the engine and alternator should be submitted.

16 **Commissioning**
Supplier shall perform the following tests at site to the satisfaction of SPMU
a) Testing the set in Auto / Manual / Test modes.
b) Testing for all Interlocks
c) Full load test on the set for Eight hours

17 **Acoustic and Weather proof Enclosure**
Design, fabricate, supply and install out door type acoustic and weather proof enclosure for the healthy operation of 250 kVA D-G set at site. The enclosure should be well fabricated structure using 14 SWG sheet steel on all sides. Provide sufficient working clearance around the D-G set inside the enclosure.

a) Special acoustic panels of optimum sound attenuation using special Aluminum sheets (perforated) and acoustic grade high density wool sandwiched with gypsum.

b) Self insulated ventilation louvers for proper air aspiration and temperature
control with suitable incorporation of special blower / axial fans of heavy duty depending on the on-site fresh air needs.

c) Corrugated steel frames and sturdy supporting material for housing the panels, effective sealing with the right gasket/ neoprene materials.

d) Well fabricated / nylon wheeled smooth sliding doors to be provided for easy access to the set. Suitable locking arrangement has to be provided on the doors.

e) Aesthetic finish (with intensive painting care) for perfect integration with the surroundings.

f) Noise level should be less than 65 ± 3dB at 3 meter distance from the enclosure.

g) Acoustic and weather proof enclosure system should be complete in all respect as per prevailing standards.

h) Adequate and suitable lighting arrangement inside the acoustic enclosure shall be made.

Note; Separate DP MCBS with control box to be provided for Lighting and blower fans.

18 LT distribution switchgear panel

Design, fabrication & supply of Indoor L.T. 415V distribution switchgear Panel made out of 16 SWG CRCA sheet steel Enclosure with powder coated matt grey finish. The panel shall have proper supporting and mounting structure of suitable size ‘u’ channel, provision for grouting. Provide sufficient clearance between live and non live parts as per standards. The panel should have 14 SWG gland plate. Cable alley and bus-bar chambers should be provided.

19 Requirements in panel

INCOMER : - 1No. of 630A, 415V SDF with 400A fuse FEEDERS :
- a) 2 Nos. of 200A, 415V TP&N SDF. With fuse
b) 1No. of 100A, 415V TP&N SDF. With fuse

20 Metering & Indication

- 0-500V digital voltmeter of size 96 mm square with selector switch.
- CT operated 400/5A digital Ammeter 3½ digit of size 96 mm square with selector
• switch.
• 1 Set of Measuring CT 400/5A, class-1 for all the Three Phases.
• 3 Nos. of 22.5 mm dia 230V Cluster LED type Phase indicating lamps for R, Y, B.
• Separate control Fuses 2/4A, for Voltmeter, indication circuits.
• Use 2.5 sq. mm. Copper multi strand wire for measuring and control circuit.