

TECHNICAL SPECIFICATIONS FOR 250 KVA D.G. SET – Qty 01 Set:

SCOPE

I. D.G. SET SUPPLY (250 KVA) The scope of D.G. set supply shall include.

- 1 Diesel engine suitable to operate on HSD, Radiator cooled with necessary fan, electronic governor, control module (AMF) & Power module, electric start.
- 2 Permanent Magnet, Brushless alternator coupled to diesel engine pre aligned in shop.
- 3 Common base frame.
- 4 Residential Silencer.
- 5 990 Liters fuel tank.
- 6 Battery & Battery leads.
- 7 Protection relays. Necessary CT's shall also be included.
- 8 Adaptor box suitable for connecting cables as required.
- 9 AMF Panel suitable for 250 KVA DG set.

Note :

- 1 Presently there is imbalance in the load distribution among three phases of source supply. Therefore, the load is to be equalized before the installation of Generator Set by the successful bidder.
- 2 All the required certificates for smooth operation and functioning from various Govt. authorities viz. Rajasthan Pollution Control Board (**RPCB**) / Central Pollution Control Board (**CPCB**) etc. may be obtained by the successful bidder.

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STANDARD SPECIFICATIONS FOR LT DIESEL GENERATOR SET.

1. **SCOPE:** This specification covers the requirements of design assembly, testing, supply and commissioning of LT Diesel Generator Set with associated Switchgears and Control Panels.

ELECTRICAL SYSTEM DETAILS

1. D. G. Set shall be water/ coolant cooled with radiator and shall be continuous duty.
2. **STANDARDS** The Diesel Generator sets, accessories and control panel shall comply with relevant BS/IS or other internationally accepted standards including the following:

BS 649: Diesel Engines for general purpose.

BS 2613: Rotating Electrical Machinery.

IS 4722: Electric al performance of rotating electrical machines.

IS 4728: Terminal marking for rotating electrical machines.

IS 4729: Measurement of vibrations of rotating electrical machines.

3. **GENERAL REQUIREMENTS** Diesel Generator set shall comprise of main equipment's specified in this Para. Vendor shall also include any other accessories; equipment's required for the satisfactory operation of the DG set.

3.1

DIESEL-ENGINE

The water cooled diesel engine shall suitably rated such that Alternator shall give defined KVA output after applicable de-rating considering site conditions. It shall be possible to draw rated output continuously 24 hours each day. The engine shall be suitable for starting from cold at min. ambient temperature and necessary accessories like preheated etc. shall be supplied, if required. Engine shall be multi-cylinder turbocharged heavy-duty industrial type. The Diesel Engine shall be suitable for operation on HSD.

- 3.2. **GOVERNOR:** The Governor shall be Electronic type with synchronous to 0 to 5% droop externally adjustable both manually and with motor for speed control.

3.3. **FLYWHEEL**

Shall be solid disc type accurately balanced. Suitable guard shall be provided for flywheel.

3.4. **STARTING**

The engine shall be suitable for 24V DC motor starting. Necessary batteries and battery charger shall be provided and charger shall have a constant potential characteristic which maintains the battery in peak condition at all times without causing excessive gassing. The input voltage for the battery charge shall be 240v, 50 HZ. One set of the batteries with necessary cables and jumpers shall be located near the engine or housed in the panel as specified. Battery shall be either sealed maintenance free & dry type or tubular lead acid long life (Low maintenance).

If pneumatic starting is offered it shall be complete with Compressor, Air Bottle, and Electronics Solenoid Valve etc.

3.5 **FUEL SYSTEM**

Engine shall be suitable for HSD fuel operation. The fuel system shall be equipped with fuel filters. The fuel oil day tank shall be sized to house fuel for eight hours. But the size of tank shall not exceed 990 liters. The day tank shall be equipped with fuel return connection, vent sight glass, fuel level indicator switch for transfer pump control, overflow line, and drain valve. All necessary fuel line pipes valves and other misc., piping materials from day tank to engine is in vendors scope. Alarm shall be provided for fuel low level and fuel high level in Day Tank.

3.6. **LUBRICATION**

Pressure feed lubrication system by means of engine driven gear type lubricating oil pump shall be included for lubrication of main and piston bearings, camshaft bushing, valves trains, etc. For cleaning and filtration both by-pass and fuel flow lubricating oil filters shall be included. A hand priming pump shall also be included for priming of lube oil in case of Engines rated more than 750 KVA.

3.7. **COOLING**

Engine shall be water / coolant / cooled with radiator unless otherwise specifically asked for water shall be circulated by engine driven centrifugal pump around cylinder liners, Cylinders heads and injector sleeves. Engine coolant shall be cooled by engine mounted fan assisted radiator of tropical capacity, driven directly from the engine. Fresh water quantity required for topping up shall be indicated. In case of heat exchanger cooled option, the heat exchanger shall be mounted on Engine. The other accessories like FRP cooling Tower with fan, RW pump and associated piping shall be in DG vendor's scope. Also Ancillary panel shall be provided. Pump in cooling circuit shall be electric driven and heaters shall be provided, if required.

3.8. **VENTILATION**

Vendor shall plan well ventilated layout such that clean cool and dry air flows over the engine and generator and that temperature rise of the room / canopy with DG in Operation is within permissible limits of 70 C above ambient temperature. Radiator Exhaust ducting is being planned separately.

3.9. **EXHAUST**

Exhaust system shall consist of Expansion Bellows, insulated exhaust manifold, silencers and other misc. piping materials as required, supply of total exhaust system From engine exhaust outlet flange is in vendor's scope.

The exhaust system shall be so designed to maintain backpressure within permissible Limits. The exhaust outlet shall be outside the building and at a height stipulated by Pollution control board. Necessary information for pollution control board for exhaust Outlet height shall be obtained by vendor. The exhaust piping approachable and seen lengths shall be provided with proper insulation and aluminum cladding.

3.10. **ENGINE CONTROL MONITORING & PROTECTION**

Engine shall be equipped with following control monitoring and protection system.

- a) Over speed device for automatic shutdown of engine independent of governor at speed of 10% above rated speed. The shutdown shall be enunciated in control panel.
- b) Tachometer shall be provided on engine panel for engine speed indication.
- c) Pressure gauge for lubrication oil shall be provided on engine panel.
- d) Temperature gauge for jacket water shall be provided on engine panel.
- e) For following condition an alarm and trip indication shall be given on control panel.
 - Lube oil pressure low.
 - Water temperature high.
 - Over speed stop.The engine shall be equipped with electric shut down valves.

3.11. **COUPLING**

The engine and the alternator shall be coupled with a fully flexible power coupling with Suitable coupling guard. Arrangements shall ensure constant alignment and ease of Maintenance.

3.12. **MISC. EQUIPMENTS**

All necessary misc. material/ equipment comprising of bearing (base) Plates and shims for setting up the DG set foundation, foundation bolts, nuts, washers, brackets, piping supports and any other necessary materials shall be provided. The base frame shall be provided with lifting facility and predrilled foundation holes. Anti-vibrating pads shall be provided on the base plates.

3.13. **ALTERNATOR**

- a) The alternator design shall meet the Rated output KVA, at 415v rated voltage, 0.8 P.F. 3 Phase, 4 wire, 50HZ AC.
- b) The alternator shall be mounted on a common base frame together with the engine.
- c) The insulation shall be class-F, The windings and overhangs shall be suitably braced to Withstand the short circuit forces.
- d) Alternators should be preferably permanent magnet generators with 2/3-pitch winding (PMG for better starting & 2/3 pitch winding to eliminate third Harmonics.)
- e) The line and neutral ends of the windings shall be connected to six terminals mounted on insulated base of non-hygroscopic and fire proof materials. Suitable clamping and terminating arrangements for cables shall be provided. Alternator shall be star connected and star point (Neutral) shall be brought out into a terminal box on alternator for connection to earth. All parts and accessories shall be suitable to withstand stresses due to over speed /over load/short circuit conditions specified. The alternator shall be complete with following: Suitable terminal boxes for connecting cable with necessary extension of box & busbar arrangement. -Space heaters if required only due to atmospheric conditions-These shall be wired up to separate terminal box. -Lifting hooks. -Earthings terminals -2 Nos. -Rating plate. Necessary terminal box suitable for cable connection shall be provided with Alternator.

3.14. **EXCITATION SYSTEM**

The alternator shall have brush less self-exciter-mounted on the same shaft.

3.15. **VOLTAGE REGULATOR**

- a) Automatic solid-state voltage regulator shall be provided. The voltage regulator shall be complete with cross current compensation, voltage setting device and all accessories required for successful operation.

4. **LOCAL CONTROL PANEL**

1. **CONSTRUCTION :**

The panels shall be free standing, floor mounting compartmentalized cubicle type panels with framed structure and bottom channel frame of suitable section. The frame structure

shall be rolled/folded sheet section of 2.0 mm thick sheet. Partitions shall be 1.6mm thick. Doors and gland plates shall be 2.0 mm thick. The panel shall be dust and vermin proof with neoprene gasketing. All doors shall be provided with concealed hinges, necessary Earthing arrangement and shall be provided with bracings wherever required to avoid deformation. Easily openable door locks with common key shall be provided for all doors including alleys. Bolts should not be provided for fixing doors except for busbar chambers.

2. **CLEANING AND PAINTING:**

The fabricated sections shall be thoroughly cleaned by 7-tank process, which include alkaline degreasing, cold water rinsing, acid pickling, water rinsing, phosphating and passivation. Panels shall then be powder coated unless otherwise specified including corrosion resistance treatment. No alternative treatment or part treatment other than 7-tank process is acceptable. In case enamel painting is to be done corrosion resistance treatment shall be done under controlled conditions and then two coats of stoving enamel paint of approved shades shall be given. The paint / powder coating shade shall be RAL 7032 unless otherwise specified.

3. **MEASURING INSTRUMENTS AND INSTRUMENT TRANSFORMER:** All meters on panels unless otherwise specified shall be digital meters either individual or combined with minimum class 1 accuracy and will be calibrated. These will be flush mounting type.

Direct reading instruments shall be in confirmation with IS 1248 and of accuracy class

1.0. All analog meters wherever used shall be flush mounting type with minimum 96 x 96mm size and in dust proof enclosures. The meters shall have white dials with black scales. All meters shall have sealing arrangement and zero adjustment screw from outside. Voltmeters and ammeters shall be moving iron type with suitable selector switches and protective MCB's for potential circuits.

The current transformers shall be single pole wire wound resin cast accuracy class 1.0 for metering and 5p for protection. Separate CT's shall be provided for metering and protection. The polarities shall be prominently marked CT circuits shall be wired with 2.5 sq.mm. Multi-strands copper wires. CT's shall not be kept open and terminal-shortening arrangement shall be provided. PT's wherever specified shall be of appropriate voltage class and 100 VA Burden.

4 **MANUAL MODE**

In this mode of operator shall manually start the engine from local panel of engine after carrying out necessary initial steps, The operator shall close the outgoing circuit breaker after the voltage builds up to rated value.

5 **ENGINE PANEL**

On this panel annunciation for following unhealthy condition shall be provided.

-Lube oil pressure low.

-Water temperature high.

-Engine over speed.

In case of unhealthy condition both hooter and annunciator will get energized, Accept PB will silence the hooter and reset PB will reset the annunciator.

6 **ENGINE SPARES TOOLS & TACKLES**

Vendor shall furnish complete list of spare for two years of satisfactory operation along With unit price and suggested quantity.

Vendor shall quote for complete set of tools and tackles required for maintenance of Engine and alternator.

7 **DRAWING AND DATA**

7.1 Following documents shall be furnished along with the offer without which offer without which offer will not be considered.

a) Plan & Sectional Layout of DG Area showing various auxiliary and panels. Size of DG plinth shall be as specified.

b) GA of panels showing arrangement of various devices on panels.

- c) P & I Diagram for the following:
 - I. Lube Oil System.
 - II. Fuel Oil System.
 - III. Cooling water System.

- 7.2 Following documents shall be furnished in triplicate for purchaser comments / approval within 3 weeks after placement of LOI Vendor shall incorporate Client/consultants comments on these drawings and furnish revised / final drawing in 3 sets for inspection final 6 sets of AS BULITS" drawings.
 - a) Layout of DG Area with all accessories weight of equipment, maintenance space etc. clearly indicated.
 - b) Wiring and scheme diagrams for LT system and control system of D.G. set.
 - c) P & I Diagrams for the following system.
 - I. Lube oil system
 - II. Fuel oil system
 - III. Cooling water system.
 - d) Foundation drawing of a DG set with static and dynamic loading / center of gravity of loads and location of all loads.
 - e) Foundation requirement of all auxiliaries like compressors heat exchangers, tanks cooling tower etc.
 - f) Bill of material for DG Set, Fuel oil system cooling water system, lube oil system electrical system (including cables engine and alternator control system (including cables).

 - g) GA of panels showing arrangements of various devices on panel and foundation details.
 - h) Test Certificates
 - i) Installation. Operational & Maintenance Manual.