

## **TECHNICAL SPECIFICATIONS**

### **1.00 GENERAL SCOPE OF WORK**

The scope of work shall cover Diesel Generator set with AMF panel, Cabling etc. for LRSI Hospital New Delhi. The scope covers supply, installation, testing and commissioning of electrical works of the project including the following main systems:

#### **1.00 DIESEL GENERATOR SET**

##### **1.01 SCOPE**

Under this head, the bidders scope covers the design, supply, transportation, assembly, supply and erection at site of diesel generator sets including making the requisite foundations, supply and erection of all accessories and controls including control panels, day tanks, starting device, batteries, protection gear, instruments etc. and as contained in detailed specifications. The scope also covers spares, training and operation for initial period as specified herein.

##### **1.02 DIESEL ENGINE:**

Water Cooled Electric starting four stroke multi cylinder diesel engine having a minimum BHP as per schedule 1500 RPM conforming to BS:649/1958 with 10% overloading for one hour duration having following:

###### **COOLING SYSTEM**

- Water Cooled Heat Exchanger Type with cooling towers
- Cooling water centrifugal pump
- Corrosion resistor
- Bypass thermostat

###### **EXHAUST SYSTEM**

- Exhaust gas turbocharger with after cooler
- Exhaust manifold
- 2 Nos. Residential Silencers
- Flexible pipe for silencer

###### **FUEL SYSTEM**

- Fuel pump PTR type
- Fuel injectors
- Fuel filter - paper element type
- Fuel hoses

###### **LUB OIL SYSTEM**

- Lub oil pump

- Lub oil priming pump
- Lub oil filter
- By pass filter

#### AIR SYSTEM

- Air intake manifold
- Air cleaner-dry type mounted (filter efficiency 99.9%)

#### GOVERNOR

- Electronic governor

#### STARTING SYSTEM

- Electric starter - 24 volts DC
- Battery charging alternator

#### COUPLING ARRANGEMENT

- Flexible coupling
- Flywheel to suit flexible coupling
- Flywheel housing

#### SAFETY CONTROLS ON ENGINE

- High water temperature
- Low lub oil pressure
- Engine overspeed

#### ENGINE INSTRUMENT PANEL ENGINE MOUNTED

- Starting switch with key
- Water temperature gauge (outgoing)
- Lub oil pressure gauge
- Lub oil temperature gauge
- Tachometer with hour meter

### **1.03 ALTERNATOR**

1.03.1 Synchronous alternator rated as per schedules at 1500 RPM, at 415 volts suitable for 50 Hz 3 phase system. The alternator shall be in SPDP enclosure, brushless, continuous duty type self excited, self regulated, foot mounted with ball and roller bearings on end shields. The alternator shall conform to IS:4722/BS: 2613 and will be suitable for tropical conditions. Class of insulation will be "B/F". The other technical particulars are as given below:-

#### 1.03.2 TECHNICAL PARTICULARS OF ALTERNATOR

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S.No.	Description	125/60 kVA
1.	CURRENT AMPS FOR 125KVA CURRENT AMPS FOR 60KVA	174 84
2.	EFFICIENCY AT F.L. 0.8 PF	Not less than 94%
3.	TEMPERATURE RISE	Within Class 'F/B' Limits
4.	TOTAL DISTORTION FACTOR	LESS THAN 3%
5.	a) 10% OVERLOAD b) 50% OVERLOAD	ONE HOUR 30 SECONDS
6.	REGULATOR	
	a) VOLTAGE REGULATION b) VOLTAGE ADJUSTABILITY	+/- 1% +/- 2.5%
7.	METHOD OF LUBRICATION	GREASE
8.	DAMPER WINDINGS ON POLES	REQUIRED
9.	REF.CONDITIONS AS PER NTP IS:4722-TEMP. : 40°C	
10.	The generator shall be suitable for 10% overload for one hour duration at NTP as per BS:649/IS:10000.	
11.	50% overload shall be possible for "Momentary overload" as per IS: 4722/BS 2613.	

#### 1.04 BASE FRAME

Suitable base Frame of sturdy design made of MS channel with necessary reinforcement and redrilled holes made out of TISCO/ISSCO steel shall be provided with each DG set.

#### 1.05 FUEL TANK

Daily service fuel tank of sheet metal of 990 liters capacity (two number) complete with drain valve, air vent, inlet and outlet connection shall be provided for DG set. All pumps, pipe connections, motor control panel, LT/control cables, earthing etc. shall be covered in the scope of supplied and installation. 10KL Outdoor tank complete in all respects along with piping work, pumps, valves, connections to DG Set etc.

#### 1.06 BATTERIES

Maintenance free batteries of suitable AH, 12 volts each in dry and uncharged condition with leads shall be supplied with DG set.

## BATTERY CHARGER:

Battery charger static type with complete with following items:-

- Transformer of adequate rating
- Rectifier
- DC Ammeter
- DC Voltmeter
- Charge rate selector switch
- Indication lamps

### 1.07 TESTING

The following test shall be conducted on alternator and DG set.

#### 1. Factory Test

The factory tests shall incorporate the following:

- i) Routine tests
- ii) High voltage test
- iii) Short circuit current test
- iv) Instantaneous short-circuit withstand test
- v) Insulation resistance test.
- vi) Full Load Test for 8 continuous Hours

These tests shall be conducted as per the requirements of BS 2613 or IS 4222 and the original test certificates shall be furnished.

#### 2. Site tests

After the erection and wiring and earthing of DG set, the following tests shall be conducted.

- i) Insulation resistance of the generator.
- ii) Speed, No. load voltage and full load voltage regulation.
- iii) Frequency at no load, half load and full load.
- iv) Full load test for 8 Hrs. at rated voltage, speed and frequency.

The readings shall be observed with calibrated meters. Only one meter shall be used for the test, the readings shall be properly tabulated and submitted in triplicate.

### 3. Testing of controls

All the safety controls and protective devices of the DG set shall be tested for correct calibration and operation. The results of the tests shall be tabulated and submitted in triplicate in the presence of Engineer-in-Charge.

## 1.08 **AUTOMATIC MAINS FAILURE PANEL(AMF)**

### **General**

The AMF panel shall be made of sheet metal totally enclosed dead front pattern, free floor standing type to transfer the load from normal source to diesel generator emergency source. The transfer breaker shall be rated for continuous duty. The breaker shall be interlocked to ensure non-paralleling SEB power supply and DG supply. Panel shall consist of breakers for emergency, normal source and load circuits. All main contacts shall be protected by arcing contacts. All replaceable contacts coils, springs control elements shall be conveniently removable from the front of the panel without major disassembly or disconnection of power conductor. Sensing and control relays shall be of continuous duty, industrial control grade type and with a minimum contact rating of ten amperes. Automatic transfer switch shall conform to the safety requirements of NEMA standard ICSL 2447. The panel shall be provided with bus bars of the specified capacity.

### **Operation**

- a) The normal source shall be constantly monitored by a mains voltage monitor.
- b) When mains voltage fails or drops below 70-80% of the rated voltage, the automatic control system shall give a starting signal to the diesel generator set.
- c) As soon as the diesel generator set reaches its operating speed and alternator its operating voltage, the load shall be transferred to the generator set and the breaker closing terminal shall be activated to operate the relay and close the breaker and operate all interlocks to ensure that normal supply input is activated and the main breaker trips.
- d) Upon the return of the normal source voltage of 90% of rated voltage for one minute the switch shall retransfer the load to the normal source and the interlock system described above reverses its operation
- e) The automatic control system shall then reset itself and be in readiness to start the engine generator set upon the failure of the normal source.
- f) In the event of failure of the diesel generator set due to faulty starting, the normal source breaker shall get energized without any time delay on the restoration of the normal source.
- g) If the diesel set fails to start or reach its operating speed in 40/50 seconds, in three attempts, the set shall automatically be disconnected and locked in

isolated position. In such an event there shall be both a loud alarm and a visual indication.

- h) A test switch to simulate a normal source failure shall be provided for routine testing of the transfer switch panel and DG set.
- i) Time delay of minimum 3 seconds shall be provided for change over of supply in both directions.

**Construction :**

- a) AMF Panel shall be of sheet metal of minimum 2 mm thickness with adequate working space inside.
- b) Indication lamps shall be provided on the panel separately for grid supply and generator supply.
- c) Control wiring diagram shall be affixed inside the AMF panel
- d) Standard colour codes and numbered ferrules shall be used for wiring the AMF panel
- j) There shall be facility for remote control of generator voltage and engine speed.
- k) Reverse power relay shall be provided for generators.
- l) Neutral switching facility shall be provided

**Safety Equipments :**

Two 24 Kgs foam type fire extinguisher and 2 Nos. Fire buckets filled with dry sand shall be provided. The cost of the these items is deemed to be included in the rate of DG Set

## 2.00 LIST OF APPROVED MANUFACTURERS

1. L.T. Switchgear Panels
  - L&T.
  - Siemens
  - Schneider (Crompton Greaves)
  - GE
2. Diesel Engine
  - Caterpillar
  - Kirloskar
  - Greave Cotton
  - Ashok Leyland
  - Cummins
3. Alternator.
  - Kirloskar
  - Cater Pillar
  - Crompton Greaves
  - LEROY SOMER & Controls (I) Ltd.
  - Stamford
4. Battery Charger
  - Expo-Fyn
  - Amar Raja
  - BCH
  - Chabhi Electricals
5. Batteries
  - Exide
  - Amar Raja
  - Standard Farrukawa
6. Relay
  - Crompton Greaves
  - GEC (Alstom)
7. LT Cables
  - Universal
  - ICC
  - National
  - Nicco
  - Rallison Cables (Rollex)
  - Cable Corporation of India Limited
  - Incab Industrial Ltd.
  - Ford Gloster