# Kashmir Power Distribution Corporation Ltd.

**Office of the Chief Engineer Planning & Procurement,**
**PDD Complex Bemina Srinagar,**
**Tel: 0194-2493280, 0194-2493281, Email: ceppkpdcl@gmail.com**


# TECHNICAL SPECIFICATIONS

# FOR

## DIESEL GENERATOR SETS (D.G. SETS) WITH AMF PANEL

| Prepared by | Checked by | Checked by | Checked by | Approved by |
|---|---|---|---|---|
| Er. Gh. Qadir Mir (AEE Procurement)<br>Er.Fayaz Iqbal Wani(JE)<br>Er. Maleeha Bashir Shah (JE)<br>Er. Rafia Bashir (JE) | Er. Manzoor Ahmad Dar (Executive Engineer) Purchase Officer, Procurement Division. | Er. Muzaffar Mukhtar Shah, Superintending Engineer, Procurement Circle. | Er. Bashir Ahmad Dar, Chief Engineer, Planning & Procurement, KPDCL, Srinagar. | Techno Economic Committee vide No. MD/KPDCL/TS-1920-26/ Dated:12/08/2022 |
| **Specification No.** CE/P&P/SPEC/2022/DG SETS/009 | | **Date of Issue:** 12/08/2022 | | **Revision: 0** |

**This is a Tender Specification for procurement of Diesel Generator Sets (D.G SETS) subject to the modification by the Purchaser as per actual field requirement. Supplier to submit the Guaranteed Technical Particulars (GTP) and Drawings, after the award of the Contract, for approval of the Purchaser.**

# CIMATIC AND ISOCERAUNIC CONDITIONS (CIC)

| | | |
|---|---|---|
| **1.** | The climatic and Isoceraunic conditions at the site of work are approximately given as under: | |
| | **Description** | Kashmir |
| i) | Max. temp of air in shade | $30.6^0$C |
| ii) | Min. temp of air in shade | $-20^0$C |
| iii) | Max. temp of air in sun | $45^0$C |
| **iv)** | Height above sea level (App.) | 1600 Mtrs. |
| v) | Max. relative humidity | 90% |
| vi) | Min. relative humidity | 15% |
| vii) | Average no. of thunder storm days per year | 54 |
| viii) | Average rainfall | 80 cm |
| ix) | Wind Zone | WZ – 3 |
| x) | Average number of rainy days per year | 106 |
| xi) | Seismic Zone | SZ – 5 |
| xii) | Area of installation | Heavy Snow Zone |

**2.** **Communication and Transport:**

The nearest railway station is Jammu on the broad gauge line and is connected to the Divisional Stores by a metal road. The equipment is required to pass en-route through various tunnels on NH-44 (Nandni, Nashri and Jawahar Tunnel). The weights and maximum dimension of the packages suitable for transportation through tunnel route are as follows:-

| | | | |
|---|---|---|---|
| **1.** | Length | = | 7.0 m |
| **2.** | Width | = | 3.0 m |
| **3.** | Height | = | 4.55 m |
| 4. | Weight | = | 40 metric Ton |

The supplier shall get the permissible weight and dimensions confirmed from the Highway Authorities before proceeding with the manufacture of the equipment. It will be the responsibility of the supplier to ensure timely and proper delivery of the equipment on door delivery basis, at Srinagar, through road transport. The supplier shall also ensure that the weights and dimension of the packages which are suitable to be carried by road transport up to Srinagar.

| | | |
|---|---|---|
| **3.** | **Additional conditions** | |
| i | Permitted Noise Level | 45dB |
| ii | Induced Electromagnetic disturbance | 1.6kV |
| iii | Pollution class/ creepage distance | III/25mm/kV |
| iv | Isoceraunic Level (days/year) | 50 |
| v | Condensation | Occasional |

# SECTION: DIESEL GENERATOR SET

## 1.0 SCOPE OF SUPPLY

The scope covers Design, testing and supply of Diesel Generator sets of stationary type with cold starting kit. The D.G. Set shall have a net electrical output as specified in the BPS, under the site conditions of $50^{o}$ C ambient temperature & 1600 meters altitude. This net electrical output shall be measured after reducing all power consumptions for D.G. Set auxiliaries.

The equipment shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation, in a manner acceptable to the purchaser, who will interpret the meanings of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith.

The offered equipment shall be complete with all components necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of bidder's supply irrespective of whether those are specifically brought out in this specification and / or the commercial order or not.

The scope of supply for DG set shall include the following:

(a) Diesel engine complete with all accessories such as Engine Cooling and lubrication system, Engine air filtering system, Exhaust silencer package, Fuel Intake System etc.

(b) An alternator directly coupled to the engine through coupling, complete with all accessories including Automatic voltage regulator etc.

(c) Complete starting arrangement, including two sets of batteries (above 125 KVA) & SMPS based battery chargers

(d) Base frame, mounting pads, foundation bolts, etc (as required)

(e) Fuel Tank (as per OEM recommendations)

(f) Electrically driven fuel pump with necessary arrangement for filling of oil.

(g) All lubricants, consumable, touch up paints etc. for first filing, testing & commissioning at site. The fuel oil for first commissioning will also be provided by the contractor

(h) AMF panel & Microprocessor based controller (As per Annexure-B) for control, metering and alarm

(i) Enclosure for silent type D.G. Set enclosing Engine & the Alternator to make it work silently (with in permissible noise level as per CPCB norms) and suitable for outdoor installation.

## 2.0 SCOPE OF SERVICE

The bidder shall provide following services:

(a) Design, manufacture, shop testing including assembly testing of engine & alternator

(b) Dispatch & transportation FOR ECSD Pampore

## 3.0 D.G. SET TECHNICAL PARAMETERS

Major technical parameters for various rating of DG Set(s) are specified at Annexure-A to this technical specification.

## 4.0 FUEL TANK & FUEL PUMP

(a) The Fuel tank shall be provided of adequate capacity as per OEM recommendation and of minimum thickness as mentioned in technical parameters.

(b) For transferring fuel from bulk storage to fuel tank, transfer pump is envisaged. The capacity of transfer pump shall be adequate to fill the fuel tank in about 30 minutes. Fuel pump shall be electrically driven.

## 5.0 DIESEL ENGINE AND ACCESSORIES

The Diesel Engines Shall be of approved make, direct injection, water cooled, radiator type, turbo charged operating at a normal speed of 1500 rpm and capable of developing requisite BHP. The engine and the governing system shall be suitable for battery assisted manual/auto starting. The governing system of the engine shall be electronic type and suitable to control frequency variation with +/- 3% whenever load is switched in or thrown off. The Engine fitments shall include but not limited to the following.

1. Flexible coupling and flywheel with Guard.
2. Dry type air filter
3. Cooling radiator
4. Fuel pump
5. Electronic governor
6. Dual fuel filter with on line filter changing provision.
7. Turbo Charger
8. 24V DC starter and battery charging alternator for 200 KVA/250 KVA/320KVA/380 KVA and 400 KVA
9. 12V DC starter and battery charging alternator for 62.5 KVA,100 KVA &125 KVA

Engine mounted microprocessor based control panel to display the following engine and electrical parameters.

1. Lube Oil pressure indicator and temperature gauge.
2. Tacho meter for speed indication with hour meter.
3. Battery charging Ammeter.
4. Starting switch with key
5. Over speed stop switch with contacts.
6. Low lube oil pressure switch.
7. Stainless steel flexible for engine exhaust
8. Stop solenoid.

9. The engine speed shall be regulated through an electronic governing system which shall also provide the over speed protection. The governor shall ensure that the speed of the set is regulated within 1% of the normal speed under normal operating condition.

10.The DG set shall be capable of handling step load up to 70% of the capacity without dropping other loads due to voltage dip. Further the engine shall be capable of taking full load within10 seconds of the starting. All moving parts of the engine and other associated equipment's shall be provided with guards to prevent accidental contacts. The guard shall be designed to facilitate easy removal and re-installation.

The engine supplied with first filling of oil of required quantity as recommended by the manufacturers.

## 5.1 ACCESSORIES

The following accessories shall be supplied with the DG set

1. Common base frame for the engine and alternator
2. Anti-vibration mounts of suitable capacity
3. Residential silencer
4. Protective guards for all rotating parts
5. Electric driven lube oil priming pump complete with house-pipes.

## 6.0 ALTERNATOR

1500 RPM, 415V, 3 phase, 62.5 KVA/100 KVA/125 KVA/200KVA/250 KVA/320 KVA/380KVA and 400 KVA, star connected, 50HZ, 0.85 power factor, horizontal foot mounted, double bearing, self excited, self regulated, screen protected drip proof, continuous duty alternator with class "H" insulation in IP-23 enclosure incorporating the following.

1. Voltage regulation +/- 1% of rated voltage from no load to full load
2. Self excited and self regulated
3. Permissible overload of 10% for one hour in 12 hours of duration.
4. Separately mounted adapter box suitable for cable termination of required size armored aluminum FRLS XLPE cable between alternator terminals and adapter box (2 runs of 300 sq. mm per phase.) for 250KVA and 320KVA.

## 6.0 BATTERY & BATTERY CHARGER

(a) Lead-acid batteries (capacity & quantity as per Annexure-A) complete with all leads, terminals and stand shall be provided. Arrangement shall be made inside the acoustic enclosure for housing the Battery set in a tray.

(b) The battery charger (230V, 1-Ph, 50 Hz) shall be SMPS based (rating as per Annexure-A) with provision for trickle/boost charge and complete with D.C. current & voltage display, battery charge status & loading indications, charger failures annunciation. Float charge mode shall have built-in current limiting features.

(c) One set of Battery & Battery Charger shall form an independent system.

## 7.0 CONTROL AND INSTRUMENTATION INCLUDING AMF PANEL

(a) Each D.G. Set shall be provided with suitable instruments, interlock and protection arrangement, suitable annunciation and indications etc. for proper start up, control,

monitoring and safe operation of the unit. One local AMF control panel ,with remote monitoring facility along with each D.G. set shall be provided by the Supplier to accommodate these instruments, protective relays, indication lamps, annunciations, battery chargers etc. The AMF Panel shall have IP-52 degree of Protection as per IS:12063.

(b) The D.G. sets shall be provided with automatic start facility to make it possible to take full load within 30 seconds of Power Supply failure.

(c) Testing facility for automatic operation of D.G. Set shall be provided in AMF panel.

(d) Microprocessor based controller shall be supplied for DG Set monitoring, metering and control system. A summary of all basic functions to be available in the DG Set Microcontroller are specified at Annexure-B.

(e) DG set shall be capable of being started/stopped manually from remote as well as local. For remote operation START/STOP push button is being provided in 415V ACDB. Interlocking of DG breaker shall be provided to prevent parallel operation of DG set with normal station supply.

(f) In addition to the shutdown conditions specified at Annexure-B, DG Set shall shutdown whenever any of the following conditions appear in the system:

1) Short circuit protection operated
2) Overcurrent and Earth Faults.
3) Over Heating Protection for 62.5 KVA/100 KVA/125 KVA/200KVA/250 KVA/320 KVA/380KVAand 400 KVA DG Sets

(g) Following indication lamps shall be provided in AMF panel :

1) DG Mains /Alternator ON (R,Y,B phases separately)
2) Charger ON (For Both Chargers separately)
3) DG Set Breaker ON/OFF
4) Auxiliary LT Supply ON (For Source-1 & Source-2 separately)

(h) Thermostatically controlled space heaters and cubicle illumination operated by Door Switch shall be provided in AMF panel. Necessary isolating switches and fuses shall also be provided.

(i) Following shall also be provided in AMF panel:

1) 3 Nos. single phase CT's for metering (Class-1, Output Burden=15VA)

2) 3 Nos. single phase CT's (Provided by LT switchgear manufacturer) with $K_{PV}$ = 300V & $R_{CT}$ = 0.25 ohm for overcurrent and earth fault protection of DG Set on neutral side.

3) One (1) Auto/Manual Selector Switch

4) Local/Remote Selector Switch for DG Set

5) One(1) set of Battery .

6) One(1) Set of Battery chargers

7) Necessary MCBs for LT Auxiliary Supply Distribution

8) Any other item required for completion of Control scheme shall be deemed to be included.

**8.1 D.G. SETACOUSTIC ENCLOSURE**

**8.2 General requirements**

(a) Diesel engine, alternator, AMF panel, Batteries and Chargers shall be installed in a suitable weather-proof acoustic enclosure. This enclosure shall be provided for protection from rain, sun, dust etc. Further, in addition to the weather proofing, Acoustic enclosures shall be designed such that the noise level of acoustic enclosure DG set shall meet the requirement of MOEF. The diesel generator sets should also conform to Environment (Protection) Rules, 1986 as amended. The enclosure shall be suitably designed for temperature control inside the enclosure. The enclosure shall allow sufficient ventilation to the D.G. Set, so that temperature inside the enclosure is limited to 50°C. The enclosure shall have suitable viewing glass to view the local parameters of the DG Set through display unit of Microprocessor based controller.

(b) Fresh air intake for the Engine should be available abundantly; without making the Engine to gasp for air intake. A chicken mesh shall be provided for air inlet at suitable location in enclosure.

(c) The Enclosure and the layout of the equipment inside shall be designed in such a way that there is easy access to all the serviceable parts.

(d) Engine and Alternator used inside the Enclosure shall carry their respective manufacturer's Warranty and this shall not degrade their performance.

(e) Exhaust from the Engine shall be let off through Silencer arrangement to keep the noise level within desired limits. Interconnection between silencer and engine should be through stainless steel flexible hose/ pipe. Stack Height shall be governed as per CPCB guidelines.

(f) All the Controls for Operation of the D.G. Set provided in AMF Panel & Microprocessor based controller shall be easily accessible. There should be provision for emergency shutdown from outside the enclosure.

**8.3 Construction Features:**

(a) The enclosure shall be fabricated from at least 14 Gauge CRCA sheet steel and of modular construction for easy assembling and dismantling. The sheet metal components shall be pre-treated by Seven Tank Process and Powder coated (PURO Polyester based) both-inside and outside – for long life. The hardware and accessories shall be high tensile grade. Enclosure shall be given a lasting anti-rust treatment and finished with pleasant

environment friendly paint. All the hardware and fixtures shall be rust proof and able to withstand the weather conditions.

(b) Doors shall be large sized for easy access and provided with long lasting gasket to make the enclosure sound proof. All the door handles shall be lockable type.

(c) The Enclosure shall be provided with anti-vibration pads (suitable for the loads and vibration they are required to carry) with minimum vibration transmitted to the surface the set is resting on.

(d) High quality rock wool of required density and thickness (as per Annexure-A) shall be used with fire retardant thermo – setting resin to make the Enclosure sound proof.

(e) Provision for Neutral/Body earthing shall be available. Points shall be available at two side of the enclosure with the help of flexible copper wires from alternator neutral, and Electrical panel body respectively. The earthing point shall be isolated through insulator mounted on enclosure.

## 9.0 DOCUMENTS

(a) Following drawings and data sheet shall be submitted for approval/information:

1) Data sheet for Engine, Alternator, Battery, DG Set Controller, AMF panel and Enclosure
2) GA drawing of DG set
3) Layout of DG set in the enclosure along with sections
4) GA and schematic of AMF panel and DG Set Controller.
5) Rating Plate (in English)
6) Drawings, datasheets, design calculations and erection, operation & maintenance manual in hard & soft copies (Auto CAD &PDF Versions).
7) Certification and compliance for meeting noise level & emission parameters and other requirements in accordance with latest Notification of MOEF/CPCB.
8) Foundation Drawings

(b) The DG Set shall be supplied with

1) DG Set test certificate
2) Engine Operation & maintenance Manual.
3) Engine Parts Catalogue.
4) Alternator Operation, maintenance & Spare parts Manual.
***5)*** Alternator test certificate.

## 10.0 TESTS

### 10.1 Routine & Acceptance Tests

The Diesel generator set shall be tested for routine and acceptance tests under Third Party Inspection agency in presence of Departmental Representative

**10.2 Type Tests**

The D G Sets of each rating shall be fully type tested by the bidder before supply as per IS: the valid type test reports/certificates shall be submitted along with the technical bid/offer. The type tests must have been conducted at any of the NABL accredited laboratory of National repute/CPRI/DGS&D/RITES/ERDA/EIL/ERTL/Quality Austria Pvt.Ltd or any other third party inspection agency in presence of Departmental representative to be nominated by Chief Engineer P&P Wing KPDCL. The suppliers shall confirm that they will supply the material exactly for the design for which valid type tests have been conducted. The offers which are submitted without the valid type test certificates shall invariably be rejected.

**10.3** The following Type Test reports as per IS-10000-1980 of D.G Sets of ratings 62.5KVA/100 KVA/125 KVA/200KVA/250 KVA/320 KVA/380KVAand 400 KVA shall be provided by the bidder:

a) Preliminary Run (part-V)
b) Governing Test (part-VII)
c) Endurance Test (part-IX)
d) Initial performance test(part-VIII)
e) Final performance test (part- VIII)
f) Fuel consumption test, determination of power and mechanical efficiency (part –IV)

**10.4 Commissioning Checks at Manufactures Site.**

In addition to the checks and test recommended by the manufacturer, the bidder shall carryout the following commissioning tests .

**(a) Load Test**

The engine shall be given test run for a period of at least 6 hours. The set shall be subjected to the maximum achievable load as decided by Purchaser without exceeding the specified DG Set rating:

During the load test, half hourly records of the following shall be taken:

1) Ambient temperature
2) Exhaust temperature through thermometer fitted on Exhaust Line.
3) Cooling water temperature at a convenient point adjacent to the water output from the engine jacket
4) Lubricating oil temperature where oil cooler fitted
5) Lubricating oil pressure
6) Colour of exhaust gas
7) Speed
8) Voltage, wattage and current output
9) Oil tank level

The necessary load to carry out the test shall be provided by the purchaser.

**(b) Insulation Resistance Test for Alternator**

Insulation resistance in mega-ohms between the coils and the frame of the alternator when tested with a 500V megger shall not be less than IR=2x(rated voltage in KV)+1

**(c) Check of Fuel Consumption**

A check of the fuel consumption shall be made during the load run for the purpose of proper tuning of the engine.

**(d) Insulation Resistance of Wiring**

Insulation resistance of control panel wiring shall be checked by 500V Megger. The IR shall not be less than one mega ohm.

**(e) Functional Tests**

1) Functional tests on control panel AMF Panel & Controller
2) Functional test on starting provision on the engine
3) Functional tests on all Field devices (like Fuel Transfer Pump)
4) Functional tests of AVR and speed governor

**(f) Measurement of Vibration**

The vibration shall be measured at load as close to maximum achievable load and shall not exceed 250 microns.

**(g) Noise Level check as per relevant standard**

The Vibration & Noise Level tests shall be carried out with the DG set operating at rated speed and at maximum achievable load. Necessary correction for Test environment condition & background noise will be applied as per IS:12065.

**10.4 Rating & Terminal Marking Plate**

The DG Sets shall be provided with a non-detachable rating and terminal marking plate(s) of anodized Aluminium/Stainless Steel material securely fixed on the outer body in visible position.

Besides other details in the rating plate, the Customer Name shall be clearly mentioned as ***CE-P&P-KASHMIR POWER DISTRIBUTION CORPORATION LIMITED*** and Order Details under the space ***Order Number***.

## 10.5 INSPECTION

The Manufacturer shall furnish a complete and detailed quality plan for the manufacturing process of the D G Sets All raw materials shall conform to relevant applicable standards and tested for compliance to quality and requirement. The Manufacturer shall arrange, for inspection by the purchaser with one month advance notice for verifying the quality of the D G Sets as specified in the quality assurance plan already submitted by the Bidder at the time of Bid submission.

## 10.6 PACKING AND FORWARDING:

The packing shall be done as per the manufacturer's/ standard practice. However, it should be ensured that the packing is such that, the material would not get damaged during transit by Rail / Road.

The marking on each package shall be as per the relevant IS.

## 10.7 GUARANTEE

The manufacturers/authorized distributors of the DG Sets shall provide a guarantee of 18 months from the date of receipt at the stores of the Utility or 12 months from the date of commissioning, whichever is earlier. In case the D G Set fails within the guarantee period the purchaser will immediately inform the supplier who shall take back the failed DG Set within 15 days from the date of the intimation at his own cost and replace/repair the D.G Sets within forty five days of date of intimation with a roll over guarantee.

The outage period i.e. period from the date of failure till unit is repaired/ replaced shall not be counted for arriving at the guarantee period.

In the event of the supplier's inability to adhere to the aforesaid provisions, suitable penal action will be taken against the supplier which may inter alia include blacklisting of the firm for future business with the purchaser for a certain period.

## 10.8 SCHEDULES:

The bidder shall fill in the following schedules which will be part of the offer. If the schedule are not submitted duly filled in with the offer, the offer shall be liable for rejection at the discretion of Purchaser keeping in view the interest of the department.
Schedule-1A ,1B,1C,1D,1E,1F,1G & 1H: Guaranteed Technical Particulars/Additional Details

## 10.9 CHALLENGE CLAUSE:

The Purchaser reserves the right to have the material, received after inspection by the authorized inspecting officer, again tested for any parameter(s) from approved/NABL accredited testing house/in house technique of the purchaser. The results if found deviating/unacceptable or in non-compliance with the approved GTP'S, the lot shall be rejected and bidder shall arrange to replace the rejected lot within thirty (30) days of such detection at his cost including to & fro transportation.

**10.10 DEVIATIONS:**

The bidders are not allowed to deviate from the principal requirements of the Specifications. However, the bidder is required to submit with his bid in the relevant schedule a detailed list of all deviations without any ambiguity. In the absence of a deviation list in the deviation schedules, it is understood that such bid conforms to the bid specifications and no post-bid negotiations shall take place in this regard.

The discrepancies, if any, between the specification and the catalogues and / or literatures submitted as part of the offer by the bidders, shall not be considered and representations in this regard shall not be entertained.

If it is observed that there are deviations in the offer in guaranteed technical particulars other than those specified in the deviation schedules then such deviations shall be treated as deviations.

All the schedules shall be prepared by bidder and are to be enclosed with the bid.

## D.G. SET MAJOR TECHNICAL PARAMETERS

**ANNEXURE-A**

| S.No. | PARTICULARS | | | | |
|---|---|---|---|---|---|
| **A** | **ALTERNATOR** | | | | |
| 1 | **Net Rated Output at 50°C temperature & 2000m of altitude after reducing DG** | **62.5 KVA** | **100/125 KVA** | **200/250 kVA** | **320/380/400 KVA** |
| 2 | Rated Terminal | 415V AC | 415V AC | 415V AC | 415V AC |
| 3 | No. of Phases | 3 | 3 | 3 | 3 |
| 4 | Rated Power Factor | 0.85 lag | 0.85 lag lag | 0.85 lag | 0.85 lag |
| 5 | Rated Speed | 1500 RPM | 1500 RPM | 1500 | 1500 RPM |
| 6 | Rated Frequency | 50 Hz | 50 Hz | 50 Hz | 50 Hz |
| 7 | Standard | BS 2613/IS 4722/IEC 60034; latest | | | |
| 8 | Type of Exciter Used | Brushless, Self-Excited | | | |
| 9 | Class of Winding | Class H | Class H | Class H | Class H |
| 10 | Permissible | Class F | Class F | Class F | Class F |
| 11 | Degree of Protection | IP-23 | IP-23 | IP-23 | IP-23 |
| 12 | Overload Capacity | 10% Overload for 1 hour in every 12 hours of continuous running | | | |
| 13 | Terminal Box | Four (4) output terminals (R, Y, B, R', Y', B' & N),with MCCB of adequate capacity with terminal thread type clamps for holding cable terminal and indicating lamps for each phase | Four (4) output terminals (R, Y, B, R', Y', B' & N),with MCCB of adequate capacity with terminal thread type clamps for holding cable terminal and indicating lamps for each phase | Seven (7) output terminals (R, Y, B, R', Y', B' & N),with MCCB of adequate capacity with terminal thread type clamps for holding cable terminal and indicating lamps for each phase | Seven (7) output terminals (R, Y, B, R', Y', B' & N),with MCCB of adequate capacity with terminal thread type clamps for holding cable terminal and indicating lamps for each phase |
| | | | | | |
| **B** | **ENGINE** | | | | |
| 1 | Standard | IS 10002/BS 5514/ISO 3046/ IS 13018; latest edition | | | |
| 2 | RATING | As per Manufacturer Datasheet | | | |
| 3 | Rated Speed | 1500 RPM | 1500 RPM | 1500 | 1500 RPM |
| 4 | No. of Strokes | 4 | 4 | 4 | 4 |
| | | | | | Multi-Cylinder |

| | | | | | |
|---|---|---|---|---|---|
| 5 | Cylinder Design | Multi- | Multi- | Multi- | Multi-Cylinder |
| 6 | Type of Cylinder | V-Type or Inline Type | | | |
| 7 | Method of Aspiration | Turbo-Charged | | | |
| 8 | Method of Engine | Water-Cooled (Through Radiator) | | | |
| 9 | Method of Starting | Battery Operated Auto Start | | | |
| 10 | Ignition Voltage | 12V DC | 12V DC | 24V DC | 24V DC |
| 11 | Type of Governor | Electronic as per ISO 8528 or latest IS/BS standards | | | |
| 12 | Balancing | Dynamically balanced flywheel | | | |
| 13 | Air-Suction & Exhaust | Suction of air shall be from indoor for ventilation and exhaust flue gasses will be let out to outside atmosphere. & Condensate traps shall be provided on the exhaust pipe. | | | |
| 14. | Air Filter | Dry Type replaceable | | | |
| 15. | Lubricating System | Forced (Closed Loop) | | | |
| 16. | Fuel Type | High Speed diesel Oil(HSD) as per IS 1460 | | | |
| 17. | Fuel Injection | Electronic type | | | |
| 18.0 | Emission Levels | In accordance with latest Notification of MOEF/CPCB (certificate to be furnished) | | | |
| 19 | Performance class of generator set | G2 or higher | | | |
| | | | | | |
| | | | | | |
| **C** | **Engine Alternator set** | | | | |
| | | | | | |
| .1 | Maximum Starting Time | 30 sec | 30sec | 30 sec | 30sec |
| 2 | Maximum Voltage Variation | +/-1% | | | |
| 3 | Maximum Frequency Variation | +/- 3% | +/- 3% | +/- 3% | +/- 3% |
| 4 | Voltage Adjustment Range | 90% to 10% of Nominal Voltage | 90% to 10% of Nominal Voltage | 90% to 10% of Nominal Voltage | 90% to 10% of Nominal Voltage |
| 5 | Balancing | Dynamic balanced rotor to minimize vibration | | | |
| 6 | Maximum Vibration Level | 250 microns | 250 microns | 250 microns | 250 microns |
| 7 | Coupling of Engine & Alternator | Directly coupled by means of self-aligning flexible flange coupling and with a protecting guard to avoid accidental contact | | | |
| | | | | | |
| **D** | **BATTERY** | | | | |
| | | | | | |
| 1. | Type | Lead Acid | Lead Acid | Lead Acid | Lead Acid |
| 2. | Capacity in AH | 180 AH | 180 AH | 180 AH | 180 AH 180 AH |
| 3. | Voltage of each Battery | 12 V | 12 V | 2*12 V | 2*12 V |
| 4. | No. of Battery Set | 1 No | 1 No | 1 No | 1No |
| | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **E** | **BATTERY** | | | | |
| | | | | | |
| 1. | Type of Charger | SMPS Based | SMPS Based | SMPS Based | SMPS Based |
| 2. | Input | 230V,AC Single phase | 230V,AC Single phase | 230V,AC Single phase | 230V,AC Single phase |
| 3. | Output Current | 10 Amps | 10 Amps | 10 Amps | 10 Amps |
| 4. | Output Voltage | As per 12V battery system | As per 12V battery system | As per 24V battery system | As per 24V battery system |
| 5. | Qty. of Battery Charger | 1set | 1set | 1set | 1set |
| 6. | SMPS based automatic battery charger with DC voltmeter, DC ammeter, selector switch for trickle/off/boost, auto manual switch for boost to float changeover copper bus bar | Yes | Yes | Yes | Yes |
| 7. | Ripple | Not more than 1% (RMS) | | | |

| | | | | | |
|---|---|---|---|---|---|
| **F** | **FUEL TANK & FUEL PUMP** | | | | |
| | | | | | |
| 1. | Capacity | As per OEM Recommendation | As per OEM Recommendation | As per OEM Recommendation | As per OEM Recommendation |
| 2 | Material of | MS Sheet | MS Sheet | MS Sheet | MS Sheet |
| 3 | Sheet Thickness | 2 mm | 2 mm | 2 mm | |
| 4 | Accessories | Level Indicator, Filling Inlet with removable screen, outlet, drain plug, an air vent, air-breather and necessary piping | | | |
| 5 | Painting | Oil Resistant Paint | | | |
| 6 | Fuel Pump Type | Electrically Driven | | | |
| 7 | Fuel Pump Rating | Adequate to fill the fuel tank in 30 minutes | | | |
| | | | | | |
| **G** | **ACOUSTIC ENCLOSURE** | | | | |
| | | | | | |
| 1 | Minimum Sheet | 2 mm | 2 mm | 2 mm | 2 mm |
| 2 | Details of Acoustic Material and make | As per CPCB Norms | | | |
| 3 | Max. Noise Level | As per CPCB Norms | | | |
| | | | | | |

| | | |
|---|---|---|
| **H** | **Bus Bar** | The Bus bar shall be air Insulated and made of high conductivity, electrolyte grade tinned, copper conductor. High Tensile bolts and spring washers shall be provided at at all bus bar joints. The main Bus bar shall have continuous rating throughout the length of each power control panel, and the neutral bus bar shall have a continuous rating of at least 50%of the phase bus bar . Bus bar shall have colour coded for easy identification of individual phase and neutral and protective earth |
| **I** | **Current Transformer** | The current transformer shall comply with the requirement of IS 2705. They shall have ratio outputs and accuracies as specified |
| **J** | **Control wiring** | All control wiring shall be carried out with 1100v grade single core pvc cable conforming to IS 694/IS 8130 having standard copper conductor of min 2.5 sq mm section for potential circuits and 1.5 mm sq section for current transformer circuits. Wiring shall bear neatly bunched, adequately supported and properly routed to follow for easy access and maintenance. Wire shall be identified by number ferrule at each end. The ferrule shall be of the ring of non-deteriorating material |

**Annexure-B**

## DG SET CONTROLLER FUNCTIONAL REQUIREMENT

| Measurement | Shutdown | Warning | Indication (LED) |
|---|---|---|---|
| Voltage : 3 Ph AC | Over Speed | On operation of any Protection Trip | DG Set Running |
| Current: 3 Ph AC | Over Load | Fail to Crank | Local/Remote Mode |
| Frequency | Under Voltage | Low Battery Voltage | Manual/Auto |
| Power Output (KVA) | Over Voltage | High Battery Voltage | Warning |
| Power Output (KW) | Low lube Oil Pressure | DG Set Failed to Start in 30 sec. | Shutdown |
| Power Factor | High Coolant Temperature | Low Level in Fuel Tank | |
| Engine Speed | High Temperature inside enclosure | | |
| Running Hours | Alternator Fault | | |
| Battery Voltage | | | |
| Lube Oil Pressure | | | |
| Coolant Temperature | | | |

Notes:

1. Controller shall have configurable Time Delay for START/STOP of DG Set.
2. Controller shall have configurable cranking function to configure the number of cranking cycles (at least 3 cranks) and time duration between successive cranks.
3. Controller shall also have the facility for adjustment of speed and voltage including fine adjustments in remote as well as in local mode.
4. Controller shall be IEC 61850 compliant (either directly or through a converter) for purpose of remote monitoring of the DG Set.

**SCHEDULE 1A**

**GUARANTEED TECHNICAL PARAMETERS OF D.G SET OF 62.5 KVA**

**(To Be Filled By The Bidder)**

| S.No | Characteristics | Parameters (To be filled by Bidder) |
|---|---|---|
| **Generator set specifications** | | |
| 1 | Model | |
| | Manufacturer | |
| 2 | Duty | |
| 3 | Power Rating KVA/KW | |
| 4 | No of phases | |
| 5 | Output voltage and frequency (V&Hz) | |
| 6 | Power factor | |
| 7 | Current (Amps) | |
| 8 | R.P.M | |
| **Engine specifications** | | |
| 1. | Manufacturer | |
| 2. | Model | |
| 3 | MoEF Certified power (H.P) | |
| | Type of engine | |
| 4 | Required power for rated KVA (H.P) | |
| 5 | Cooling | |
| | Operating Speed | |
| | Over speed trip | |
| | Design life (Hours) | |
| 6 | Aspiration | |
| 7 | No of cylinders and arrangement | |
| 8 | Bore (mm)x stroke(mm) | |
| 9 | Compression ratio | |
| 10 | Displacement (Ltr) | |
| 11 | Rating of lube oil pump | |
| 14 | Performance class of generator set | |
| 15 | Governor(Mechanical/Electronic) | |
| 16 | Starting system | |
| 17 | Time required for starting | |
| 18 | Lube oil specification | |
| 19 | Lube oil sump capacity ,high –low level(Ltr) | |
| 20 | Total lubrication system capacity (Ltr) | |
| 21 | Lube oil consumption @ full load (Ltr/ HR) | |
| 22 | Total coolant capacity (Ltr) | |
| 23 | No. of Exhaust pipes required | |
| 24 | Exhaust pipe size (Inch) | |
| 25 | Whether meets CPCB norms | |
| 26 | Total wet weight (engine + radiator) (Kg) | |
| 27 | Length x width x height (engine )(mm) | |
| 28 | Mean piston speed ( m/s) | |
| 29 | Combustion air intake @ 100% load (±5%) (cfm) | |
| 30 | Exhaust temperature (degree Celsius ) | |

| ALTERNATOR SPECIFICATION | | |
|---|---|---|
| 1 | Manufacturer | |
| 2 | Protection Class | |
| 3 | Rated apparent power | |
| 4 | Rated Power factor | |
| 5 | Rated active Power | |
| 6 | Rated Voltage | |
| 7 | Rated frequency | |
| 8 | Number of phases | |
| 9 | Rated speed | |
| 10 | Voltage variation range | |
| 11 | Frequency variation range | |
| **ACOUSTIC ENCLOSURE** | | |
| 1 | Make | |
| 2 | Size | |
| 3 | Details of Acoustic lining material and make | |
| **Radiators** | | |
| 01 | Make and Model No | |
| 02 | MOC for Tubes | |
| 03 | MOC for casting | |
| 04 | Pressure rating of tubes (Kg/sq.cm) | |
| **Fuel consumption** | | |
| 01 | Fuel grade | |
| 02 | Fuel consumption at NTP | |
| | 100% loading (litres/Hour) | |
| | 75% loading ( Litres/Hour) | |
| | 50% loading ( Litres/Hour) | |

Schedule: 1B

**GUARANTEED TECHNICAL PARAMETERS OF D.G SET OF 100 KVA**

**(To Be Filled By The Bidder)**

| S.No | Characteristics | Parameters (To be filled by Bidder) |
|---|---|---|
| **Generator set specifications** | | |
| 1 | Model | |
| | Manufacturer | |
| 2 | Duty | |
| 3 | Power Rating KVA/KW | |
| 4 | No of phases | |
| 5 | Output voltage and frequency (V & Hz) | |
| 6 | Power factor | |
| 7 | Current (Amps) | |
| 8 | R.P.M | |
| **Engine specifications** | | |
| 1. | Manufacturer | |
| 2. | Model | |
| 3 | MoEF Certified power (H.P) | |
| | Type of engine | |
| 4 | Required power for rated KVA (H.P) | |
| 5 | Cooling | |
| | Operating Speed | |
| | Over speed trip | |
| | Design life (Hours) | |
| 6 | Aspiration | |
| 7 | No of cylinders and arrangement | |
| 8 | Bore (mm)x stroke(mm) | |
| 9 | Compression ratio | |
| 10 | Displacement (Ltr) | |
| 11 | Fuel | |
| 12 | Fuel consumption @ 75% load with radiator and fan(Ltr/Hr) | |
| 13 | Fuel consumption @ 100% load with radiator and fan(Ltr/Hr) | |
| 14 | Performance class of generator set | |
| 15 | Governor(Mechanical/Electronic) | |
| 16 | Starting system | |
| 17 | Time required for starting | |
| 18 | Lube oil specification | |
| 19 | Lube oil sump capacity ,high –low level(Ltr) | |
| 20 | Total lubrication system capacity (Ltr) | |
| 21 | Lube oil consumption @ full load (Ltr/ HR) | |
| 22 | Total coolant capacity (Ltr) | |
| 23 | No. of Exhaust pipes required | |
| 24 | Exhaust pipe size (Inch) | |
| 25 | Whether meets CPCB norms | |

| | | |
|---|---|---|
| 26 | Total wet weight (engine + radiator) (Kg) | |
| 27 | Length x width x height<br>(engine )(mm) | |
| 28 | Mean piston speed ( m/s) | |
| 29 | Combustion air intake @ 100% load (±5%) (cfm) | |
| 30 | Exhaust temperature (degree Celsius ) | |
| **ALTERNATOR SPECIFICATION** | | |
| 1 | Manufacturer | |
| 2 | Protection Class | |
| 3 | Rated apparent power | |
| 4 | Rated Power factor | |
| 5 | Rated active Power | |
| 6 | Rated Voltage | |
| 7 | Rated frequency | |
| 8 | Number of phases | |
| 9 | Rated speed | |
| 10 | Voltage variation range | |
| 11 | Frequency variation range | |
| **ACOUSTIC ENCLOSURE** | | |
| 1 | Make | |
| 2 | Size | |
| 3 | Details of Acoustic lining material and make | |
| **Radiators** | | |
| 01 | Make and Model No | |
| 02 | MOC for Tubes | |
| 03 | MOC for casting | |
| 04 | Pressure rating of tubes (Kg/sq.cm) | |
| **Fuel consumption** | | |
| 01 | Fuel grade | |
| 02 | Fuel consumption at NTP | |
| | 100% loading (litres/Hour) | |
| | 75% loading ( Litres/Hour) | |
| | 50% loading ( Litres/Hour) | |

Schedule: 1C

**GUARANTEED TECHNICAL PARAMETERS OF D.G SET OF 125 KVA**

**(To Be Filled By The Bidder)**

| S.No | Characteristics | Parameters (To be filled by Bidder) |
|---|---|---|
| **Generator set specifications** | | |
| 1 | Model | |
| | Manufacturer | |
| 2 | Duty | |
| 3 | Power Rating KVA/KW | |
| 4 | No of phases | |
| 5 | Output voltage and frequency (V & Hz) | |
| 6 | Power factor | |
| 7 | Current (Amps) | |
| 8 | R.P.M | |
| **Engine specifications** | | |
| 1. | Manufacturer | |
| 2. | Model | |
| 3 | MoEF Certified power (H.P) | |
| | Type of engine | |
| 4 | Required power for rated KVA (H.P) | |
| 5 | Cooling | |
| | Operating Speed | |
| | Over speed trip | |
| | Design life (Hours) | |
| 6 | Aspiration | |
| 7 | No of cylinders and arrangement | |
| 8 | Bore (mm)x stroke(mm) | |
| 9 | Compression ratio | |
| 10 | Displacement (Ltr) | |
| 11 | Fuel | |
| 12 | Fuel consumption @ 75% load with radiator and fan(Ltr/Hr) | |
| 13 | Fuel consumption @ 100% load with radiator and fan(Ltr/Hr) | |
| 14 | Performance class of generator set | |
| 15 | Governor(Mechanical/Electronic) | |
| 16 | Starting system | |
| 17 | Time required for starting | |
| 18 | Lube oil specification | |
| 19 | Lube oil sump capacity ,high –low level(Ltr) | |
| 20 | Total lubrication system capacity (Ltr) | |
| 21 | Lube oil consumption @ full load (Ltr/ HR) | |
| 22 | Total coolant capacity (Ltr) | |
| 23 | No. of Exhaust pipes required | |

| | | |
|---|---|---|
| 24 | Exhaust pipe size (Inch) | |
| 25 | Whether meets CPCB norms | |
| 26 | Total wet weight (engine + radiator) (Kg) | |
| 27 | Length x width x height (engine )(mm) | |
| 28 | Mean piston speed ( m/s) | |
| 29 | Combustion air intake @ 100% load (±5%) (cfm) | |
| 30 | Exhaust temperature (degree Celsius ) | |
| **ALTERNATOR SPECIFICATION** | | |
| 1 | Manufacturer | |
| 2 | Protection Class | |
| 3 | Rated apparent power | |
| 4 | Rated Power factor | |
| 5 | Rated active Power | |
| 6 | Rated Voltage | |
| 7 | Rated frequency | |
| 8 | Number of phases | |
| 9 | Rated speed | |
| 10 | Voltage variation range | |
| 11 | Frequency variation range | |
| **ACOUSTIC ENCLOSURE** | | |
| 1 | Make | |
| 2 | Size | |
| 3 | Details of Acoustic lining material and make | |
| **Radiators** | | |
| 01 | Make and Model No | |
| 02 | MOC for Tubes | |
| 03 | MOC for casting | |
| 04 | Pressure rating of tubes (Kg/sq.cm) | |
| **Fuel consumption** | | |
| 01 | Fuel grade | |
| 02 | Fuel consumption at NTP | |
| | 100% loading (litres/Hour) | |
| | 75% loading ( Litres/Hour) | |
| | 50% loading ( Litres/Hour) | |

Schedule: 1D

**GUARANTEED TECHNICAL PARAMETERS OF D.G SET OF 200 KVA**

**(To Be Filled By The Bidder)**

| S.No | Characteristics | Parameters (To be filled by Bidder) |
|---|---|---|
| **Generator set specifications** | | |
| 1 | Model | |
| | Manufacturer | |
| 2 | Duty | |
| 3 | Power Rating KVA/KW | |
| 4 | No of phases | |
| 5 | Output voltage and frequency (V & Hz) | |
| 6 | Power factor | |
| 7 | Current (Amps) | |
| 8 | R.P.M | |
| **Engine specifications** | | |
| 1. | Manufacturer | |
| 2. | Model | |
| 3 | MoEF Certified power (H.P) | |
| | Type of engine | |
| 4 | Required power for rated KVA (H.P) | |
| 5 | Cooling | |
| | Operating Speed | |
| | Over speed trip | |
| | Design life (Hours) | |
| 6 | Aspiration | |
| 7 | No of cylinders and arrangement | |
| 8 | Bore (mm)x stroke(mm) | |
| 9 | Compression ratio | |
| 10 | Displacement (Ltr) | |
| 11 | Fuel | |
| 12 | Fuel consumption @ 75% load with radiator and fan(Ltr/Hr) | |
| 13 | Fuel consumption @ 100% load with radiator and fan(Ltr/Hr) | |
| 14 | Performance class of generator set | |
| 15 | Governor(Mechanical/Electronic) | |
| 16 | Starting system | |
| 17 | Time required for starting | |
| 18 | Lube oil specification | |
| 19 | Lube oil sump capacity ,high –low level(Ltr) | |
| 20 | Total lubrication system capacity (Ltr) | |
| 21 | Lube oil consumption @ full load (Ltr/ HR) | |
| 22 | Total coolant capacity (Ltr) | |
| 23 | No. of Exhaust pipes required | |
| 24 | Exhaust pipe size (Inch) | |
| 25 | Whether meets CPCB norms | |

| | | |
|---|---|---|
| 26 | Total wet weight (engine + radiator) (Kg) | |
| 27 | Length x width x height<br>(engine )(mm) | |
| 28 | Mean piston speed ( m/s) | |
| 29 | Combustion air intake @ 100% load (±5%) (cfm) | |
| 30 | Exhaust temperature (degree Celsius ) | |
| **ALTERNATOR SPECIFICATION** | | |
| 1 | Manufacturer | |
| 2 | Protection Class | |
| 3 | Rated apparent power | |
| 4 | Rated Power factor | |
| 5 | Rated active Power | |
| 6 | Rated Voltage | |
| 7 | Rated frequency | |
| 8 | Number of phases | |
| 9 | Rated speed | |
| 10 | Voltage variation range | |
| 11 | Frequency variation range | |
| **ACOUSTIC ENCLOSURE** | | |
| 1 | Make | |
| 2 | Size | |
| 3 | Details of Acoustic lining material and make | |
| **Radiators** | | |
| 01 | Make and Model No | |
| 02 | MOC for Tubes | |
| 03 | MOC for casting | |
| 04 | Pressure rating of tubes (Kg/sq.cm) | |
| **Fuel consumption** | | |
| 01 | Fuel grade | |
| 02 | Fuel consumption at NTP | |
| | 100% loading (litres/Hour) | |
| | 75% loading ( Litres/Hour) | |
| | 50% loading ( Litres/Hour) | |

**SCHEDULE 1 E**

**GUARANTEED TECHNICAL PARAMETERS OF D.G SET OF 250 KVA**

**(To Be Filled By The Bidder)**

| S.No | Characteristics | Parameters (To be filled by Bidder) |
|---|---|---|
| **Generator set specifications** | | |
| 1 | Model | |
| | Manufacturer | |
| 2 | Duty | |
| 3 | Power Rating KVA/KW | |
| 4 | No of phases | |
| 5 | Output voltage and frequency (V & Hz) | |
| 6 | Power factor | |
| 7 | Current (Amps) | |
| 8 | R.P.M | |
| **Engine specifications** | | |
| 1. | Manufacturer | |
| 2. | Model | |
| 3 | MoEF Certified power (H.P) | |
| | Type of engine | |
| 4 | Required power for rated KVA (H.P) | |
| 5 | Cooling | |
| | Operating Speed | |
| | Over speed trip | |
| | Design life (Hours) | |
| 6 | Aspiration | |
| 7 | No of cylinders and arrangement | |
| 8 | Bore (mm)x stroke(mm) | |
| 9 | Compression ratio | |
| 10 | Displacement (Ltr) | |
| 11 | Fuel | |
| 12 | Fuel consumption @ 75% load with radiator and fan(Ltr/Hr) | |
| 13 | Fuel consumption @ 100% load with radiator and fan(Ltr/Hr) | |
| 14 | Performance class of generator set | |
| 15 | Governor(Mechanical/Electronic) | |
| 16 | Starting system | |
| 17 | Time required for starting | |
| 18 | Lube oil specification | |
| 19 | Lube oil sump capacity ,high –low level(Ltr) | |
| 20 | Total lubrication system capacity (Ltr) | |
| 21 | Lube oil consumption @ full load (Ltr/ HR) | |
| 22 | Total coolant capacity (Ltr) | |
| 23 | No. of Exhaust pipes required | |
| 24 | Exhaust pipe size (Inch) | |
| 25 | Whether meets CPCB norms | |

| | | |
|---|---|---|
| 26 | Total wet weight (engine + radiator) (Kg) | |
| 27 | Length x width x height<br>(engine )(mm) | |
| 28 | Mean piston speed ( m/s) | |
| 29 | Combustion air intake @ 100% load (±5%) (cfm) | |
| 30 | Exhaust temperature (degree Celsius ) | |
| **ALTERNATOR SPECIFICATION** | | |
| 1 | Manufacturer | |
| 2 | Protection Class | |
| 3 | Rated apparent power | |
| 4 | Rated Power factor | |
| 5 | Rated active Power | |
| 6 | Rated Voltage | |
| 7 | Rated frequency | |
| 8 | Number of phases | |
| 9 | Rated speed | |
| 10 | Voltage variation range | |
| 11 | Frequency variation range | |
| **ACOUSTIC ENCLOSURE** | | |
| 1 | Make | |
| 2 | Size | |
| 3 | Details of Acoustic lining material and make | |
| **Radiators** | | |
| 01 | Make and Model No | |
| 02 | MOC for Tubes | |
| 03 | MOC for casting | |
| 04 | Pressure rating of tubes (Kg/sq.cm) | |
| **Fuel consumption** | | |
| 01 | Fuel grade | |
| 02 | Fuel consumption at NTP | |
| | 100% loading (litres/Hour) | |
| | 75% loading ( Litres/Hour) | |
| | 50% loading ( Litres/Hour) | |

**SCHEDULE 1 F**

## GUARANTEED TECHNICAL PARAMETERS OF D.G SET OF 320 KVA

**(To Be Filled By The Bidder)**

| S.No | Characteristics | Parameters (To be filled by Bidder) |
|---|---|---|
| **Generator set specifications** | | |
| 1 | Model | |
| | Manufacturer | |
| 2 | Duty | |
| 3 | Power Rating KVA/KW | |
| 4 | No of phases | |
| 5 | Output voltage and frequency (V & Hz) | |
| 6 | Power factor | |
| 7 | Current (Amps) | |
| 8 | R.P.M | |
| **Engine specifications** | | |
| 1. | Manufacturer | |
| 2. | Model | |
| 3 | MoEF Certified power (H.P) | |
| | Type of engine | |
| 4 | Required power for rated KVA (H.P) | |
| 5 | Cooling | |
| | Operating Speed | |
| | Over speed trip | |
| | Design life (Hours) | |
| 6 | Aspiration | |
| 7 | No of cylinders and arrangement | |
| 8 | Bore (mm)x stroke(mm) | |
| 9 | Compression ratio | |
| 10 | Displacement (Ltr) | |
| 11 | Fuel | |
| 12 | Fuel consumption @ 75% load with radiator and fan(Ltr/Hr) | |
| 13 | Fuel consumption @ 100% load with radiator and fan(Ltr/Hr) | |
| 14 | Performance class of generator set | |
| 15 | Governor(Mechanical/Electronic) | |
| 16 | Starting system | |
| 17 | Time required for starting | |
| 18 | Lube oil specification | |
| 19 | Lube oil sump capacity ,high –low level(Ltr) | |
| 20 | Total lubrication system capacity (Ltr) | |
| 21 | Lube oil consumption @ full load (Ltr/ HR) | |
| 22 | Total coolant capacity (Ltr) | |
| 23 | No. of Exhaust pipes required | |
| 24 | Exhaust pipe size (Inch) | |

| | | |
|---|---|---|
| 25 | Whether meets CPCB norms | |
| 26 | Total wet weight (engine + radiator) (Kg) | |
| 27 | Length x width x height<br>(engine )(mm) | |
| 28 | Mean piston speed ( m/s) | |
| 29 | Combustion air intake @ 100% load (±5%) (cfm) | |
| 30 | Exhaust temperature (degree Celsius ) | |
| **ALTERNATOR SPECIFICATION** | | |
| 1 | Manufacturer | |
| 2 | Protection Class | |
| 3 | Rated apparent power | |
| 4 | Rated Power factor | |
| 5 | Rated active Power | |
| 6 | Rated Voltage | |
| 7 | Rated frequency | |
| 8 | Number of phases | |
| 9 | Rated speed | |
| 10 | Voltage variation range | |
| 11 | Frequency variation range | |
| **ACOUSTIC ENCLOSURE** | | |
| 1 | Make | |
| 2 | Size | |
| 3 | Details of Acoustic lining material and make | |
| **Radiators** | | |
| 01 | Make and Model No | |
| 02 | MOC for Tubes | |
| 03 | MOC for casting | |
| 04 | Pressure rating of tubes (Kg/sq.cm) | |
| **Fuel consumption** | | |
| 01 | Fuel grade | |
| 02 | Fuel consumption at NTP | |
| | 100% loading (litres/Hour) | |
| | 75% loading ( Litres/Hour) | |
| | 50% loading ( Litres/Hour) | |

**SCHEDULE 1 G**

**GUARANTEED TECHNICAL PARAMETERS OF D.G SET OF 380 KVA**

**(To Be Filled By The Bidder)**

| S.No | Characteristics | Parameters (To be filled by Bidder) |
|---|---|---|
| **Generator set specifications** | | |
| 1 | Model | |
| | Manufacturer | |
| 2 | Duty | |
| 3 | Power Rating KVA/KW | |
| 4 | No of phases | |
| 5 | Output voltage and frequency (V & Hz) | |
| 6 | Power factor | |
| 7 | Current (Amps) | |
| 8 | R.P.M | |
| **Engine specifications** | | |
| 1. | Manufacturer | |
| 2. | Model | |
| 3 | MoEF Certified power (H.P) | |
| | Type of engine | |
| 4 | Required power for rated KVA (H.P) | |
| 5 | Cooling | |
| | Operating Speed | |
| | Over speed trip | |
| | Design life (Hours) | |
| 6 | Aspiration | |
| 7 | No of cylinders and arrangement | |
| 8 | Bore (mm)x stroke(mm) | |
| 9 | Compression ratio | |
| 10 | Displacement (Ltr) | |
| 11 | Fuel | |
| 12 | Fuel consumption @ 75% load with radiator and fan(Ltr/Hr) | |
| 13 | Fuel consumption @ 100% load with radiator and fan(Ltr/Hr) | |
| 14 | Performance class of generator set | |
| 15 | Governor(Mechanical/Electronic) | |
| 16 | Starting system | |
| 17 | Time required for starting | |
| 18 | Lube oil specification | |
| 19 | Lube oil sump capacity ,high –low level(Ltr) | |
| 20 | Total lubrication system capacity (Ltr) | |
| 21 | Lube oil consumption @ full load (Ltr/ HR) | |
| 22 | Total coolant capacity (Ltr) | |
| 23 | No. of Exhaust pipes required | |
| 24 | Exhaust pipe size (Inch) | |

| | | |
|---|---|---|
| 25 | Whether meets CPCB norms | |
| 26 | Total wet weight (engine + radiator) (Kg) | |
| 27 | Length x width x height<br>(engine )(mm) | |
| 28 | Mean piston speed ( m/s) | |
| 29 | Combustion air intake @ 100% load (±5%) (cfm) | |
| 30 | Exhaust temperature (degree Celsius ) | |
| **ALTERNATOR SPECIFICATION** | | |
| 1 | Manufacturer | |
| 2 | Protection Class | |
| 3 | Rated apparent power | |
| 4 | Rated Power factor | |
| 5 | Rated active Power | |
| 6 | Rated Voltage | |
| 7 | Rated frequency | |
| 8 | Number of phases | |
| 9 | Rated speed | |
| 10 | Voltage variation range | |
| 11 | Frequency variation range | |
| **ACOUSTIC ENCLOSURE** | | |
| 1 | Make | |
| 2 | Size | |
| 3 | Details of Acoustic lining material and make | |
| **Radiators** | | |
| 01 | Make and Model No | |
| 02 | MOC for Tubes | |
| 03 | MOC for casting | |
| 04 | Pressure rating of tubes (Kg/sq.cm) | |
| **Fuel consumption** | | |
| 01 | Fuel grade | |
| 02 | Fuel consumption at NTP | |
| | 100% loading (litres/Hour) | |
| | 75% loading ( Litres/Hour) | |
| | 50% loading ( Litres/Hour) | |

**SCHEDULE 1 H**

**GUARANTEED TECHNICAL PARAMETERS OF D.G SET OF 400 KVA**

**(To Be Filled By The Bidder)**

| S.No | Characteristics | Parameters (To be filled by Bidder) |
|---|---|---|
| **Generator set specifications** | | |
| 1 | Model | |
| | Manufacturer | |
| 2 | Duty | |
| 3 | Power Rating KVA/KW | |
| 4 | No of phases | |
| 5 | Output voltage and frequency (V & Hz) | |
| 6 | Power factor | |
| 7 | Current (Amps) | |
| 8 | R.P.M | |
| **Engine specifications** | | |
| 1. | Manufacturer | |
| 2. | Model | |
| 3 | MoEF Certified power (H.P) | |
| | Type of engine | |
| 4 | Required power for rated KVA (H.P) | |
| 5 | Cooling | |
| | Operating Speed | |
| | Over speed trip | |
| | Design life (Hours) | |
| 6 | Aspiration | |
| 7 | No of cylinders and arrangement | |
| 8 | Bore (mm)x stroke(mm) | |
| 9 | Compression ratio | |
| 10 | Displacement (Ltr) | |
| 11 | Fuel | |
| 12 | Fuel consumption @ 75% load with radiator and fan(Ltr/Hr) | |
| 13 | Fuel consumption @ 100% load with radiator and fan(Ltr/Hr) | |
| 14 | Performance class of generator set | |
| 15 | Governor(Mechanical/Electronic) | |
| 16 | Starting system | |
| 17 | Time required for starting | |
| 18 | Lube oil specification | |
| 19 | Lube oil sump capacity ,high –low level(Ltr) | |
| 20 | Total lubrication system capacity (Ltr) | |
| 21 | Lube oil consumption @ full load (Ltr/ HR) | |
| 22 | Total coolant capacity (Ltr) | |
| 23 | No. of Exhaust pipes required | |
| 24 | Exhaust pipe size (Inch) | |

| | | |
|---|---|---|
| 25 | Whether meets CPCB norms | |
| 26 | Total wet weight (engine + radiator) (Kg) | |
| 27 | Length x width x height<br>(engine )(mm) | |
| 28 | Mean piston speed ( m/s) | |
| 29 | Combustion air intake @ 100% load (±5%) (cfm) | |
| 30 | Exhaust temperature (degree Celsius ) | |
| **ALTERNATOR SPECIFICATION** | | |
| 1 | Manufacturer | |
| 2 | Protection Class | |
| 3 | Rated apparent power | |
| 4 | Rated Power factor | |
| 5 | Rated active Power | |
| 6 | Rated Voltage | |
| 7 | Rated frequency | |
| 8 | Number of phases | |
| 9 | Rated speed | |
| 10 | Voltage variation range | |
| 11 | Frequency variation range | |
| **ACOUSTIC ENCLOSURE** | | |
| 1 | Make | |
| 2 | Size | |
| 3 | Details of Acoustic lining material and make | |
| **Radiators** | | |
| 01 | Make and Model No | |
| 02 | MOC for Tubes | |
| 03 | MOC for casting | |
| 04 | Pressure rating of tubes (Kg/sq.cm) | |
| **Fuel consumption** | | |
| 01 | Fuel grade | |
| 02 | Fuel consumption at NTP | |
| | 100% loading (litres/Hour) | |
| | 75% loading ( Litres/Hour) | |
| | 50% loading ( Litres/Hour) | |