RFP NO: NLSIU/RFP/2026-27/001
RFP Name: Supply and Installation of 500KVA Diesel Generator (DG) at NLSIU

Annexure-1

TECHNICALLSPECIFICATIONS FOR 415V

DIESEL GENERATOR WORKS

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17.0 GUARANTEED TECHNICAL PARTICULARS FOR DIESEL ENGINE & ALTERNATOR

1.0 GENERAL SITE CONDITIONS

Engine and Alternator shall be designed for above site conditions for all practical purposes. Bidders to furnish the deration calculation at site conditions mentioned above in view of the support for the capacity/suitability of the equipment's offered. Please note that offers of the bidders not submitting the aforesaid calculations shall not be considered.

2.0 CODES AND STANDARDS

Quality of materials and works shall form to the following Acts, Rules and codes,

- Chief Electrical Inspector to Government rules (CEIG)
- Bureau of Indian Standards (BIS)
- State Electricity Board Regulations
- British Standards (BSI)
- State pollution control board
- Central pollution control board
- Indian Electricity Rules 1956
- International Electro technical Commission (IEC)
- IEEE Standards

3.0 SCOPE OF WORK

The scope of work shall be Design, fabrication, manufacture, supply, Installation, testing and commissioning of below mentioned items

The scope of work covers complete electrical installation system including but not limited to,

- Design, fabrication, supply, installation, testing & commissioning of 415V Diesel generator sets
- Design, fabrication, supply, installation, testing & commissioning of DG Acoustic.
- Design, manufacturing, supply, installation, testing & commissioning of Batteries with leads
- Design, fabrication, supply, installation, testing & commissioning of Residential silencer
- Design, fabrication, supply, installation, testing & commissioning of Day tanks, intermediate tank & Over Flow tank.
- Design, fabrication, supply, installation, testing & commissioning of Fuel piping between day tank and generator.
- Design, manufacturing, supply, installation, testing & commissioning of First fill lube oil
- Design, manufacturing, supply, installation, testing & commissioning of AVM Pads
- Design, manufacturing, supply, installation, testing & commissioning of Adaptor box
- Design, manufacturing, supply, installation, testing & commissioning of First fill of coolant
- Design, manufacturing, supply, installation, testing & commissioning of Syn panel
- Design, fabrication, supply, installation, testing & commissioning of Exhaust systems
- Design, fabrication, supply, installation, testing & commissioning of Stack pipes
- Design, fabrication, supply, installation, testing & commissioning of Stack pipes supporting structure
- Design, fabrication, supply, installation, testing & commissioning of Free-standing chimney
- Design, fabrication, supply, installation, testing & commissioning of Aviation lamps
- Design, fabrication, supply, installation, testing & commissioning of Lightning arrester
- Supply, laying & end termination of control cables and end terminations
- Supply, laying, testing & commissioning of Bus Ducts
- Supply, laying, testing & commissioning of Perforated Cable trays
- Supply, earth excavation, back filling, chamber and fixing of Tripolar earth stations with Maintenance free electrodes
- Supply, installation, testing & commissioning of earth strips
- Excavation, back filling & Construction of DG sets foundation. (Under Civil scope)

Design, manufacturing, testing, supply, erection & commissioning of Prime Duty continuous rating DG Set for power output capacity as mentioned below

- **Design, manufacturing, testing, supply, erection & commissioning of Continuous Rating DG Set for power output capacity at 1 nos of 500kVA 50 Hz, 415kV±0.5%, 3 Phase,0.8 PF (Lag) with complete accessories.**

- **The DG set continuous output shall be as indicated in the BOM/Q at specified site conditions mentioned as above. Deration shall not be accepted**

- **The DG sets shall suitable to power highly non-linier loads such as servers & computers and hence the THD level shall <1.5%. However OEM / supplier shall declare the THD levels in the data sheet.**

- **Scope shall include FAT & SAT (Factory acceptance test & Site acceptance test)**

- **The unit shall install the approved retrofit emission control device/equipment with at least 70% Particulate matter reduction efficiency on all DG sets with capacity of 125 KVA and above or otherwise the unit shall be shift to gas based generators within the time frame prescribed in the notification No. TNPCB/Labs/DD(L)02151/2019 dated 10.06.2020 issued by TNPCB**

The Generator output shall be suitable for connecting to Synchronization panel with tinned copper flexible and suitable cable terminations or bus bars as per site conditions.

The set shall be acoustically treated to achieve sound levels of 75 dB @ 1 Meter distance and 72 dB @ 3 meter distance from the Generator set or as per CPCB norms.

For the exhaust connectivity independent pipes shall be carried (single pipe arrangement beyond silencer) to terrace level to meet pollution control board norms. The pipes shall be adequately sized for easy exhaust flow and avoid any return pressure. The pipes shall be insulated and aluminum cladded.

4.0 SCOPE OF WORK INCLUDED IN THE CONTRACT

The scope of work in this tender shall include (but not limited to) Design, Manufacture, supply, inspection before dispatch, delivery at site, installation, testing, commissioning & handing over the following

The Generator supplier shall co-ordinate and provides complete assistance for commissioning of Relay Control Panel. The Generator supplier shall take care that the inputs provided from the Generator shall be **Digital.** A tentative IO list for hooking up the system to PLC is provided along with this document. The Generator supplier shall take note of the same for extension of inputs to the relay control panel and BMS system, through communication / control cables.

- Supply, installation, testing and commissioning of 415V LT Generators capacities as mentioned above.
- Silencers, Exhaust piping, insulation up to chimney
- Acoustically treated enclosure with fresh air intakes, sound attenuators, exhaust fans for removing hot air from the hot hair chamber.
- Batteries, battery chargers, 180/200 AH, automotive heavy duty as required & recommended by DG set OEM
- Brush less exciter(s) and voltage regulators
- Governors (Isochronous) / Parallel / Load Share
- Generator lubrication systems including pumps, piping, oil coolers, oil filters, and reservoir
- Space heaters in alternator (Anti-condensation type)
- Exhaust silencers (Residential type) with insulation.
- Flexible exhaust connectors
- Structural steel for mounting
- Mounting of control and switching equipment to the concrete foundation, separate from the generator frame.
- Vibration isolators

- Safety shutdown controls
- Shop drawings
- Operation, maintenance and installation manuals
- Certifications
- Technical data
- Wiring diagrams
- Fuel day tanks and accessories with fuel piping up to day tank. Refer to detailed drawing for understanding the battery limits of fuel piping within the Generator room.
- Co – ordination with other agencies for synchronization of Generators and temporary Grid synchronization for bump less transfer.
- Preparation of shop drawing and obtaining approvals from Electrical Inspectorate, and pollution Control Board and other statutory bodies.
- Generator Body Grounding. (Carried out by Main Electrical Contractor)
- Grounding of Ground Resistor. (Carried out by Main Electrical Contractor)
- Co-ordination for 415 V Cable lying and end terminations. (Carried out by Main Electrical Contractor)
- Co-ordination for connectivity of Digital Inputs to Generator Relay and Control Panel and BMS station.
- Relay testing and setting – wherever applicable.
- Load testing of DG sets before dispatch.

5.0 MANUFACTURER'S QUALIFICATIONS

The Supplier that the Contractor proposes to use must be approved by the Consultant / Employer and shall have regularly engaged in manufacture of engine- driven generator units and ancillary equipment, of types, ratings and characteristics required, whose products have been in satisfactory use in similar service for a period of not less than 10 years.

6.0 CODES AND STANDARDS

All equipment supplied shall meet all applicable IS, ANSI and IEEE standards. The design, material, construction, manufacture, inspection, testing and performance of the engine/generator sets shall comply with all currently applicable standards, regulations and safety codes in the locality where the equipment shall be installed. The equipment shall also conform to the latest applicable standards and codes of practice. In the case of conflict between the applicable standards and this specification, this specification shall govern.

7.0 DELIVERY AND HANDLING

The engine/generator sets shall be delivered to site properly packaged and mounted on pallets or skids tofacilitate handling of heavy items. Factory- fabricated type containers or wrappings shall be utilized for engine/generator and components, which shall protect equipment from damage. Engine-driven generator equipment shall be handled carefully to prevent physical damage to equipment and components. Any damaged equipment shall be removed from site and replaced with new equipment.

8.0 WARRANTY AND SERVICE

The supplier shall warrant the equipment to be free from defects in material and workmanship for 12 months from the date of start up and for 18 months from the date of supply of equipments and materials.

Manufacturers shall have established network of service centers capable of servicing the specified equipments. The personnel shall be factory trained and shall be available for servicing of equipments with short notice.

9.0 EXCLUSIONS

- Foundation of common chimney if any
- Earthing of DG Sets & Panels.

Note: However, relevant drawing showing complete foundation details for DG sets and common chimney foundation details shall be furnished by you as per the recommendations of OEM.

10.0 DIESEL GENERATOR SETS

10.1 GENERAL

Scope covered by this contract shall include design, manufacture, testing at factory, supply, transportation, delivery, installation, testing and commissioning of Diesel Generator Sets and auxiliaries required for prime power generation.

The package shall consist of a diesel engine directly coupled to an electric generator, together with the necessary control panel, battery, diesel tank etcand accessories to provideprime electric power.

Except as otherwise indicated, manufacturer's standard diesel engine- generator sets and auxiliary equipment as indicated by published product information, and as required for a complete installation shall be provided. Engine/generator sets shall be suitable for parallel operation in conjunction with paralleling switchgear provided by others.

The engine power (kW) shall be sufficient to deliver full rated generator set kVA, when operated at rated rpm, equipped with all engine-mounted parasitic and external loads and operated at specified site conditions. Refer data sheet. The Engine shall suitable to drive alternator of base load application 24/7 operation.

Engine/generator sets shall meet IEEE emergency power requirement to start and be on line within 10 seconds of onset of failure.

The engine/generator manufacturer shall assemble the engine/generator sets on a robust base. In addition the supplier shall provide dimensions of a concrete foundation block to match the generator set base, sized to dampen effects of disturbing vibrating forces. The foundation shall be isolated from the building structure. The generator set base shall be designed and built by the engine/generator manufacturer to resist deflection, maintain alignment, and minimize resonant linear vibration.

Vibration isolators shall be of resilient rubber design and installed between the engine/generator set base and the mounting surface. The isolators shall bolt to the engine/generator set base and foundation block. The pads shall be resistant to heat and aging, and impervious to oil, water, antifreeze, diesel fuel, and cleaning compounds.

The engine/generator sets transient response shall conform to IEEE requirements.

10.2 STANDARDS

The equipment offered shall conform to the latest revision of relevant Indian or British Standard (BSS) as indicated below and Codes together with the requirements of the Local Supply Authority.

- Engine shall conform to BS 5514/IS: 10000 and the
- Alternator shall be in accordance with IS: 4722/BS: 2613/IEC-34(Part-1).

- Specification for AC Generators driven by Reciprocating Engine: IS 13364(1-2)/1992

10.3 ENGINE AND ACCESSORIES

Diesel Engine: Diesel Engine of required bhp, stationary typeand fourstroke with V cylinder arrangement shall be complete with integral air intake through suitable air filters and exhaust system, speed regulation system, fuel injection system, lube oil system, cooling water system, silencers, self contained piping, instruments, mounted on anti vibration mounts.

The engine shall have the following characteristics:

- Type : Suitable for generating set application, turbo charged, multi- cylinder, 4-stroke,cold starting.
- Cycle : Four strokes
- Speed : 1,500 r.p.m.
- Method of Starting : Battery
- Net site output : This shall be the continuous power output (exclusive of the power requirements of Auxiliaries deriving power with engines) at 1500 r.p.m. under site conditions.
- Overload feature : The engine shall have 10% overload capacity for one hour in every 12 hoursof operation.

Engine rating shall be stated in the tender in accordance with the standards above. The engine should comply to CPCB emission guidelines and should be of emission optimized type. Theengine shall be installed in area where in it need be operated for long durations. Bidder need to declare the max load factor for prime power continuous duty application.

10.4 ACCESSORIES

- Exhaust system : Turbocharger
- Silencers : Residential type with stainless Steel Flexible Bellows.

10.5 ENGINE INSTRUMENT PANEL

The engine instrument panel forms part of Generator supply.
Engine mounted meter instrument panels shall be provided for each engine for starting and emergency stop operations, Generator hours run meters.

The Generator relay control panel is provided by other agency. The Generator supplier shall provide digital inputs to the panel board to remote monitoring. The IO list is provided elsewhere in this document.

10.6 COOLING SYSTEM

Engine coupled Radiator Cooled.

10.7 FUEL SYSTEM

- Fuel pump
- Fuel injectors
- Fuel filter
- Fuel hoses
- Lube oil pump
- Lube oil-priming pump.
- Lube oil filter
- Bypass filter

10.8 FUEL TANK SYSTEM

Total content 990 L, vessel installed acc. to regulations, with the following equipment:

- The tank shall be with double containment. The outer bund shall be 110% if the primary tank.
- Low level alarm sensor
- Leak sensors – supplied, installed and hooked on to the liquid leak detection system (by other vendors)
- Tray for Mechanical overfill protection
- Vendor shall refer to the fuel system drawing attached along with this bid document to understand the scope of

10.9 WORK AND BATTERY LIMITS

- Fuel tank pipe from diesel engine to day tank and return,
- Refueling and drainage plugs
- Various gaskets, welding sleeves and fixing material

10.10 INTAKE AIR SYSTEM

- Air intake manifold
- Air cleaner
- Vacuum indicator

10.11 GOVERNOR

- Microprocessor based Fuel Controller with display
- Starting System
- 24 V DC Electric starters
- Battery Charging Alternator

10.12 LUBE OIL SYSTEM: COUPLING ARRANGEMENT

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

10.13 PROTECTION / WARNING

- Engine over Speed Shutdown

- Low Lube Oil Pressure Warning /Shutdown
- High Coolant Temperature Warning / Shutdown
- Low Coolant Level Warning / Shutdown
- Low Coolant Temperature Warning
- Low And High Battery Voltage Warning
- Weak Battery Warning
- Dead Battery Shutdown
- Over Crank Shutdown
- Fail To Crank Shutdown

10.14 FUEL CONSUMPTION

The engine shall be suitable for satisfactory operation on H.S.D. as locally available.

10.15 GOVERNING SYSTEM

The governor shall be Electronic type confirming to Class A1 complete with Display unit and shall be a self-contained unit capable of monitoring speed. The engine/generator sets shall be provided with electronic governors suitable for unattended automatic paralleling and load sharing. The steady state frequency regulation shall be + 0.25 percent. They shall be capable of sharing load within 5 percent when paralleled with similarly equipped engines. Speed shall be sensed by a magnetic pickup off the engine flywheel ring gear. A provision for remote speed adjustment shall be included. The governors shall operate over an ambient temperature range of 15 Deg; C to 55 Deg; C.

10.16 FREQUENCY VARIATION

The engine speed shall be so maintained that frequency variation at constant load including no load shall remain within band of 1% of rated frequency.

10.17 MOUNTING AND FOUNDATIONS

The engine and direct coupled alternators shall be rigidly secured to common rigid base frames fabricated from MS sections. The DG set shall be placed on concrete block with anti vibration mountings.

10.18 EXHAUST SYSTEM & PIPING

Each engine shall be provided with residential type silencerswith stainless Steel Flexible Bellows so as to limit the sound level from theDG set.

The exhaust silencer piping system shall be MS pipes confirming to Class“B”asper the recommendations of the manufacturer.

Exhaust pipe along with silencer inside the building shall be provided with mineral wool insulation with chicken mesh wrapping and 26 SWG aluminum cladding.

All terminal connections and pipes joint shall be of welded construction. The terminals ofsizes 2" and above shall be butt welded, and of sizes 1.5" and below shall be socket welded, complete with flanges, jointing and fasteners.This welding shall be done as per relevant ASME/ASA codes. Exhaust piping shall be connected to the engine by means of flexible section or an expansion joint.

The Contractor will have to indicate in advance the welding procedure he proposes to use. After confirmation by the Engineer-in-Charge the procedure which is finalized shall be strictly adhered to.

10.19 TURBOCHARGER

Turbocharger mounted at the side of the engine for better conversion of energy of exhaust gases resulting in more power, improved fuel economy, altitude compensation, lower exhaust temperature, lower smoke and noise level.

10.20 AIR FILTER

The engine air intake shall be fitted with dry type air cleaner with vacuum indicator facilitating change of air filter.

10.21 FUEL AND LUBRICATING OIL FILTERS

Filter for fuel and lubricating oil systems shall be of replaceable paper element type.

10.22 LUBRICATING OIL SYSTEM

The engine shall be of the totally enclosed type and fitted with a positive pressure system of lubrication to all working parts. Lubricating oil shall be circulated in the engine by an engine driven pump. There shall be no moving part requiring lubrication by hand prior to the starting of the engine or while in operation. It shall be so designed that when the engine starts after a long shut down lubrication failure does not occur. Necessary priming pump for the lub oil circuit shall be installed to keep bearings primed.

10.23 LUBRICATING OIL CONSUMPTION

The bidder shall state the lubricating oil consumption in gm/bhp-hr (ltr/hr) at rated load.
Minimum acceptablelube oil temperature at start up - minus 4 Deg C.

10.24 SAFETY CONTROLS

Low Lubricating Oil Pressure sensors shall be fitted such that in the event of a fall in the lub oil pressure and indication shall be actuated. In addition, the engine shall be automatically shut down in the event of lub oil pressure dropping to a pre-determined low value.

10.25 HIGH WATER TEMPERATURE

An indication shall be given if the water temperature exceeds the safe limits and the shall be shut down when a pre-determined set water temperature is reached.

10.26 OVER SPEED

Speed control shall be so arranged that 12-13% increase over normal rated speed shall cut off fuel supply, thus stopping the engine.

11.0 GENERAL

The DG sets shall be complete with all equipments, indications and controls required for fully reliable and safe operation of the DG sets whether specifically stated in these specifications or not. It is essential that the operation of all protection equipments be completely reliable in all respects.

Engine Mounted Instruments Panel (Electronic): The flexibly mounted instrument panel on engine shall be complete with the following - Digital Display to indicate:

- Coolant Temperature
- Lub Oil Pressure
- Battery voltage
- Engine speed
- Engine Run hours

Engine and alternator protection: The electronic panel will display the fault codes on the screen so that the necessary action can be taken. It should also provide the engine protection features such as :

- High Coolant Temperature
- Over-speed
- Low lube oil pressure

The DG Set shall be supplied with micro-processor based generator monitoring, metering & protection feature with display viz.,:

- Analogue & Digital AC output metering
- Battery monitoring system to sense and warn against a weak battery condition.
- Digital alarm & status message display
- Overload
- Overcurrent
- Over voltage
- Under voltage
- Over frequency
- Under frequency
- Reverse Power Relay
- Restricted Earth Fault

11.1 GENERATOR

Synchronous alternator of suitable capacity to generate as stated above output at alternator terminal at 415V, 50 Hz, 3 Phase, 4 Wire, 0.8 pf (lag) 1500 RPM and in accordance with BS:2613 / IS:4722/IEC-34(Part-I) shall be of totally enclosed or screen protected dip proof and self air-cooled type driven by the Diesel Engine. Generator shall be supplied along with its excitation system, AVR and include all necessary auxiliaries.

11.2 ALTERNATOR SHALL HAVE FOLLOWING CHARACTERISTICS:

- Permissible voltage regulation (max.) in static condition + 0.5% Permissible over load of 10% for one hour in every 12 hrs. of operation
- Permissible voltage & frequency variation of + 0.5% & + 1 % respectively
- Alternator shall be provided with QDCTs, RTD & BTD.
- Alternators shall be, salient pole, brush less, synchronous, revolving field and star connected with a separately excited system using a permanent magnet generator.
- The alternators shall be capable of withstanding, without adverse effects. Over-speeds of 25 percent above the governed speed for the duration of one minute.
- Generators shall have the capability to provide minimum of 300 percent of rated three-phase current for 10 seconds by means of a Permanent Magnet Alternator (PMA) or series boost kit.
- Engine mounted fuel filter, fuel pressure gauge and engine fuel priming pumps.
- Phase segregated terminal box shall be provided which shall be suitable for terminating
- THD at full load shall be < 3%
- 3 Nos. single phases 415V / 110 V / √3 PTs shall be supplied for AVR sensing.
- All terminals for activating alarms and trip arrangements and monitoring shall be brought out to a terminal box, the same shall be extended by other agencies to hook up to PLC and Generator relay and control panel. The Generators shall have communication port – RS 485 and Ethernet with mod bus protocol.

11.3 EXCITATION SYSTEM

The Generator shall be provided with brush less excitation system capable of supplying the excitation current of the generator under all conditions of output from no load to full load.

Enclosure: Alternator enclosure shall be Screen Protected Drip Proof (SPDP) conforming to IP-23.
Winding: Class 'H' Insulation shall be used for stator/rotor winding.

Voltage Regulators

Provide each engine/generator set with solid state automatic voltage regulator as specified to maintain generator output voltage by controlling the current applied to the exciter field of the generator.

a) Regulation accuracy of less than<1% percent of overall range of regulator loading. AVR shall be provided over excitation protection. Engine load relief feature shall be incorporated. The following accessories shall be part of AVR.

- Droop kit suitable for grid paralleling.
- Current limiting kit / booster monitor.
- Over voltage breaker
- Excitation loss module and frequency detection module.
- Automatic VAR / PF regulator.
- RF interference suppressor.
- Manual voltage regulator.

b) Regulator response of less than 17 msec.

c) Regulator drift of less than + 1 percent per 1 Deg; C change, at 40 Deg; C ambient Temperature.

d) Ambient temperature range of 15 Deg; C to 65 Deg; C.

e) Protection shall be provided for under-voltage over-voltage and over-current conditions. The over-current protection function shall automatically reset when the regulator is de-energized. The regulator shall not be damaged or result in unsafe generator operation when subjected to open or shorted input due to sensing loss, or a short to ground or adjacent conductor. Fast blow fuses shall be included in two of the sensing leads to fully protect the regulator.

f) The regulator shall include suitable reactive cross current compensation to provide constant bus voltage independent of load, within the capacity of generation.

11.4 ACCESSORIES

Anti-condensation type space heaters shall be provided and mounted in the stator frame which can easily be replaced in the field. Equip with thermostats set as required to maintain generators above dew point. Supply voltage shall be 240V, single phase.

The alternators shall have a non-corrosive stainless steel nameplate with not less than the minimum information called for in NEMA publication number MG1.

11.5 BATTERY

Battery of voltage and capacity compatible with the engine, complete with battery charging equipment shall be provided to energize electric starting equipment. Batteries shall be of lead-acid automotive heavy duty.

Batteries shall be of mounted on the DG. A corrosion resistant battery rack shall be provided for mounting. Battery shall have sufficient capacity to provide for the engine/generator safety circuits, for 24 hours without recharging. The batteries shall be suitable for 6 successive attempts each of

10 secs duration with a gap of 5 sec forward starters. The battery bank shall be provided with steel stand and a containment tray. Also a rubber mat shall be provided below the battery rack.

11.6 BATTERY CHARGER

A current limiting battery charger shall be provided to automatically recharge the batteries. The charger shall charge at 2.17 Volts per cell and float at 2.33 Volts per cell. It shall include overload protection, silicon diode full wave rectifiers, voltage surge suppressors, DC Ammeter, and fused AC input. The AC input voltages shall be 240 VAC. The amperage output shall be not less than 10A. Each Generator shall be provided with separate battery charger.

The following indications shall be required:

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a) Input supply on.
b) Battery charge/discharge current.
c) Output voltage.
d) DC earth fault.
e) Charge fail.

Voltage free changeover contacts shall be wired to the outgoing terminal block of the unit to provide external indication of the following conditions:

a) Input AC supply fail.
b) Charger fail.
c) DC earth fault

The charger must be large enough to provide for a 100 percent increase in the charging needs of the batteries for future sets.

The charger shall be housed in a cabinet suitable for wall mounting.

12.0 TECHNICAL SPECIFICATIONS OF ACOUSTIC

The Contractor shall submit calculations, engineering, supply and install the acoustic treatment for the Generator Room to ensure that the noise level is not more than 75 dBA measured at 1.0m externally away from the doors and lourves of the Generator Room. All DG sets up to 1000 kVA shall be provided with it's own outdoor type acoustic enclosure duly tested and approved for 75 dBs as per norms of central / local pollution control board.

Silent DG Set container is of modular construction with the provision to assemble and dismantle easily at site.

The enclosure is fabricated out of CRCA sheet of 14 SWG.

The sheet metal components are hot dipped seven tanks pretreated.

Enclosure is polyester based powder coated (inside as well outside).Nut, bolts & hardware's are Zinc coated.

The doors are gasketed with EPDM gaskets to avoid leakage of sound.

The door handles are lockable type.

The rock wool is further covered with fiber glass cloth and perforated powder coated M.S sheet.

Specially designed attenuators are provided to control sound at air entry to the container and exit from the container.

Adequate ventilation is provided to meet air requirement for combustion and heat removal.

Temperature of enclosure does not exceed beyond 5-7°C of ambient temp.

13.0 TESTING AND COMMISSIONING

All routine test as per IS/BS codes shall be conducted on alternator, exciter and AVR. The engine and alternator supplied shall be duly tested and supported by the test certificates of the respective manufacturer. Also to submit type test certificates for DG Set.

In addition to the above, Vendor shall submit Pump performance curves and power consumption with operating points duly indicated shall be submitted and verified at the time of testing and commissioning of the installation.

The following tests shall be performed at manufacture's works prior to packing and dispatch to site, in the presence of Project Manager/Consultant. A week's notice shall begiven. Nothing extra shall be payable. If witness is waived off the supplier / contractor shall have tosubmit type test& routine Test certificate.

13.1 DG SET

- Maximum power load capacity.
- Maximum motor starting capacity
- Endurance test.
- Fuel consumption at full load, 50% load, 75% load and 25% load.

13.2 THE ALTERNATOR

- High voltage tests on stator and rotor windings.
- Insulation resistance of stator and rotor windings.
- Temperature rise test.
- Stator voltage and current tests.
- Stator phase sequence check.

13.3 THE EXCITER

- High voltage tests on stator and rotor winding.
- Insulation resistance of stator and rotor windings.
- Temperature rise test.
- Measurement of losses.

13.4 THE AUTOMATIC VOLTAGE REGULATOR

- Sensitivity test.
- Response time test.

14.0 PAINTING

The exterior and all steel (ferrous) surfaces of the tower shall be given two shop coats of anti-corrosive poly urethane basedpaint of approved finish.

If these shop coats become marred during shipment or erection, the affected areas shall be cleaned off with mineral spirits, wire brushed and spot primed, then coated with enamel paint of matching shades.

15.0 DRAWING & DOCUMENTATION TO BE SUBMITTED WITH RFP

- Filled-in Technical Particulars catalogue & literature for various equipment.
- Fuel Pump performance curve and data sheet.
- Type test certificate for DG Set (Engine& Alternator)
- GA drawings of a) Engine
  b) Alternator
  c) DG set complete with Acoustic.
- Foundation drawings of DG sets.
- Delivery Schedule & Time frame of major activities for Erection, Testing & Commissioning

16.0 IMPORTANT INFORMATION TO BE PROVIDED BY THE BIDDER:

Duration calculation for the equipment at stated site conditions Warranty of the equipment to be provided by the manufacturer and local Service dealer's address to be specified. The acoustic enclosure for the DG set shall be manufactured by the DG set supplier.

17.0 GUARANTEED TECHNICAL PARTICULARS FOR DIESEL ENGINE & ALTERNATOR

Vendor shall furnish the point wise confirmation/information against each point

DG SETS – TEST PROCEDURE

DG Set shall be duly tested at factory as per manufacturer's standards and procedures detailed as under:
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1) Before testing, following details shall be recorded on test report: -
   i) Engine S. No.
   ii) Alternator S. No.
   iii) Engine Model and Make
   iv) Alternator Model and Make
   v) Engine and Alternator Rating
   vi) Date of Testing
   vii) Cooling System Type
   viii) Rated Sped, Voltage & KW Rating

2) Check the tightness of al bolts and necessary connections before starting the DG sets.

3) Start the DG set and run at idle for few minutes. If any leakage occurs, rectify them and note down the parameters on test report.

4) Raise the load gradually and allow the performance parameters to reach steady state conditions and note down the following parameters on test report:

   i) Speed in RPM
   ii) Load in KW
   iii) Current in Amps
   iv) Voltage
   v) Frequency (Hz)
   vi) Lube Oil Pressure
   vii) Water Temperature
   viii) Lube Oil Temperature
   ix) Regulation of Voltage & Speed

   Above parameters shall be recorded at following loads and duration:

Idle Run	-	05 mins
25% Load	-	15 mins
50% Load	-	30 mins
75% Load	-	30 mins

100% Load - 60 mins
110% Load - 60 mins

The DG sets shall be tested with standard test bench facilities as per ISO – 8528 – 6.

5) Noise level measurement of DG set running in acoustic enclosure.

TEST REPORT

Description	Engine	Alternator	DG Set	Panel
Make				
Model				
Rating				
S. No.				

Rated Voltage:
Rated Speed:

Load built up test on resistive load bank (unity power factor)

Load %	Time Min.	Start Time	Stop Time	Volt (Line to Line)			Current (Amps)			Load (kW)	Frequency (Hz)	Lube Oil Pr. Bar	Lube Oil Temp (°C)	Water Temp (°C)	Speed RPM
0															
25															
50															
75															
100															
110															

Volt & RPM at no load
Volt & RPM at full load
Notes:
Date: Tested By: Witnessed By:

---------- **END OF SECTION** ----------