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**MORMUGAO PORT AUTHORITY**  
**ENGINEERING MECHANICAL DEPARTMENT**  
**ELECTRICAL HEADLAND SECTION**

**NOTICE INVITING BUDGETORY OFFERS**

Name of Work	<b>NAME OF WORK "Replacement of 320KVA DG set with 400KVA DG set at Port Hospital"</b>
Date of submission of budgetary quotation	On or Before <b>10/03/2022 at 11.00 Hrs.</b>
Address for communication:	Executive Engineer (E-HL), Mechanical Engineering Department, Mormugao Port Authority, Electrical Section, 1st Floor, Admin. Building, Headland sada Vasco-de-Gama Goa - 403804
Contact Details	Phone : (0832) 2594241, 2594244 Email : <a href="mailto:xene.mgpt@gmail.com">xene.mgpt@gmail.com</a>
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**EXECUTIVE ENGINEER (E-HL)**  
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आईएसओ 9001-2015 पल्लन  
AN ISO 9001-2015 PORT

**MORMUGAO PORT AUTHORITY**  
**ENGINEERING MECHANICAL DEPARTMENT**  
**ELECTRICAL HEADLAND SECTION**

CME/XEN(E-HL)/ELC/T-38/2022/

17.02.2022

**Sub: Replacement of 320KVA DG set with 400KVA DG set at Port Hospital**

**Ref: Budgetary Quotation No. CME/XEN(E)/ELC/T-38/2022/B1**

Mormugao Port Authority intends to carry out replacement of 320KVA DG set with 400KVA DG set at Port hospital. As such, kindly furnish the budgetary quotation for the same (Scope of work enclosed as Schedule - 'A' and Price Schedule enclosed as Schedule - 'A1').

Your budgetary quotation should reach to this office on 10.03.2022.

Thanking you,

Yours sincerely,

**EXECUTIVE ENGINEER (E-HL)**

## **SCHEDULE - 'A'**

### **TECHNICAL SPECIFICATION**

#### **1.0 GENERAL**

Mormugao Port Authority proposes to procure 1 No. outdoor type, 400 KVA, 415 Volts, Diesel Generator Set including CAMC for 5 years after completion of two years guarantee period at Hospital Building, Mormugao Port Hospital, Headland, sada including providing Exhaust piping with all required accessories from the Hospital grade silencer of DG set upto the statutory required height. Providing earthings for the DG set as per the IE Rules i.e. 02 Nos. for body and 02 Nos. for neutral. This also includes Supplying & laying of LT UG Cable for connection to the existing LT panel and end termination of both sides. Suitable foundation for the DG set as per the OEM recommendations. The statutory approvals of CPCB/electrical inspectorate etc. as required shall be the responsibility of the Contractor.

#### **2.0 SCOPE OF WORK**

Supply of factory assembled, factory tested Engine-Alternator set with CPCB approved acoustic enclosure capable of delivering not less than 400 KVA at 0.8 pf at site conditions including all accessories like base frame, Hospital grade silencer, exhaust piping, fuel tank, fuel piping (C class) with bends, stop cock and other fittings/accessories as felt necessary for supply and return lines, suitable capacity of battery for starting on MS frame, battery charging dynamo/alternator as necessary, Anti vibration mounting arrangements, with AMF control panel, Engine instrument panel, armoured copper conductor control cable with suitable glands from Genset to AMF panel, 3½C X 300 sq.mm. LT Aluminium XLPE cable as per IS: 7098 Part-2 of, etc., complete conforming to the attached specifications as required.

- 2.1 Dismantling of existing 320 KVA DG set along with acoustic enclosure and complete accessories which is presently installed and working condition at Hospital and shifting the same to MM division, baina for Disposal.
- 2.2 Dismantling of shed of 320 DG set which is made of GI pipe and covered with asbestos in order to remove the existing DG set and also installing new DG set. Assembling the shed after the commissioning of new DG Set is completed in all respects.
- 2.3 Supply, erection, testing & commissioning of one number of silent type Generator Set of 400 KVA Capacity along with accessories and other items required for proper completion of the work as mentioned in the BOQ.
- 2.4 Providing Exhaust piping with all required accessories from the Hospital grade silencer of DG set upto the statutory required height.



आईएसओ 9001-2015 पल्लन  
AN ISO 9001-2015 PORT

**MORMUGAO PORT AUTHORITY**  
**ENGINEERING MECHANICAL DEPARTMENT**  
**ELECTRICAL HEADLAND SECTION**

- 2.5 Supply and laying of LT 1.1 KV, 3.5c x 300 sq.mm underground armored Aluminum cable from DG Set to AMF panel and making end terminations with heat shrinkable end joints for LT cables.
- 2.6 Supply, laying and termination of armored copper control wiring cable as per OEM standard and required quantity cable to connect DG set to AMF panel.
- 2.7 Earthing to be carried out as per latest IS:3043 and IER amended upto date, for the Generator Set.
- 2.8 Providing standby generator of Min. 320 KVA rating, to maintain the power supply the affected areas during the period of execution of work and up to commissioning of work.
- 2.9 All labours, materials, tools plants, machinery, equipments and any other things required for execution for work shall be arranged by the contractor at his own cost.
- 2.10 After successful completion of DG Set, the bidder shall carry out Comprehensive AMC for five years after expiry of two years guarantee period.

**Note:** The bidder shall carry out the above complete work as per IER and other relevant standard. The scope of work is not restricted, If, any additional material or accessories is felt necessary, the contractor full fills the complete system as per IER and relevant standard on the offered rate.

### 3.0 **DETAILED TECHNICAL DESCRIPTION**

#### 3.1 **DIESEL ENGINE**

Diesel Engine shall be Water cooled of any of the approved make capable of developing required BHP at 1500 rpm confirming to BS 5514/ISO 3046. To deliver specified continuous alternator output at 0.8 lagging power factor at NTP condition.

The exhaust pipe line shall be of suitable dia for fixing the Hospital grade silencer with suitable supports at suitable intervals with all its accessories such as bends, flanges, couplings etc.(including rain cap at the end to prevent the water entering inside) providing sleeves at the wall crossing complete as required.

The exhaust pipe line shall be with thermal insulation with glass wool, covered with wire mesh and gladded with 24 gauge aluminium sheet.

Engine shall be of four strokes and shall be of reciprocating compression ignition (Diesel) type, Multi cylinder with electronic fuel governor suitable for the above generating set.

#### 1) **ENGINE INSTRUMENT PANEL AND SAFETY CONTROLS**

##### i) **INSTRUMENT PANEL**

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**MORMUGAO PORT AUTHORITY**  
**ENGINEERING MECHANICAL DEPARTMENT**  
**ELECTRICAL HEADLAND SECTION**

It shall comprise of the following:

- a) Starting switch with key
  - b) Lube oil pressure gauge
  - c) Lube oil temperature gauge
  - d) Battery charging ammeter
  - e) Stop push button or lever.
  - f) Water temperature indicator
  - g) Radiator water level indicator.
- ii) Safety control auto cut off for low lube oil pressure, High water temperature and over speed with audio and visual lamp indication on control panel.
  - iii) Hour meter cum RPM indicator.

**II) ENGINE ASSOCIATED ITEMS**

- i) Hospital grade silencer
- ii) Fuel tank

**III) SPEED & GOVERNING**

The engine speed shall be regulated through Electronic Governing system which shall also provide the over speed protection.

**IV) ENGINE START**

Engine shall be cold and self-starting type. The starter battery shall conform to IS 7372 amended up to date and of sufficient capacity to meet the Engine starting and control gear requirements.

**V) QUIETNESS OF OPERATION**

The set shall have Vibration Limits as per IS 8528-9. Anti-Vibration Mounts (AVMs) are to be provided to reduce generator set vibration and noise transmission to the surrounding structure. The set shall be properly dynamically balanced.

**VI) SILENCER**

Efficient heavy duty Hospital grade silencer for the exhaust shall be supplied. The Hospital grade silencer shall be capable to provide about 20-30 db suppression in noise. A test certificate to this effect shall be furnished.



आईएसओ 9001-2015 पल्लन  
AN ISO 9001-2015 PORT

**MORMUGAO PORT AUTHORITY**  
**ENGINEERING MECHANICAL DEPARTMENT**  
**ELECTRICAL HEADLAND SECTION**

### 3.2. **ALTERNATOR**

Alternator shall be capable of generating 400 KVA at 0.8 pf, 415V, 3 Ph, 50 Hz, AC system while operating at 1500 RPM and suitable for direct coupling with the above diesel engine.

The alternator shall be copper wound of totally enclosed type screen protected type with class F insulation, designed and constructed to withstand tropical conditions, self-regulating type conforming to BS 5000/IS 4722 amended up to date as applicable. Alternator shall be brushless type, screen protected, revolving field and self-regulated through and AVR. It shall have class F insulation with IP 23 protection enclosure and space heater.

### 3.3. **ACOUSTIC ENCLOSURE**

The acoustic enclosure shall be made of 1.6 mm thick CRCA sheets in suitable approved shade and a structural/sheet metal base frame painted in black. The walls of the enclosure are insulated with fire retardant foam so as to comply with the 75 dBA at 1 mtr sound levels specified by Ministry of environment & Forest. The enclosure has the following features: Specially designed to meet stringent MOEF/CPCB norms of 75 dBA@ 1 mtr at 75% load under free field conditions, two point lifting for easy handling at site, designed to have optimum serviceability, Air inlet louvers specially designed to operate at rated load made on special purpose CNC machines for consistency in quality and workmanship, powder coated for long lasting service life and superior finish, with UV resistant powder coating, can withstand extreme environment, Use of special hardware for longer life, insulation material meets exacting IS 8183 specifications for better sound attenuation, Flush styling – no projections, Fluid drains for lube oil and fuel, Fuel filling point inside the enclosure.

### 3.4. **BACK UP GENERATOR**

The contractor shall arrange to maintain the Power supply to the affected areas during the period of execution of work and up to completion of work by providing standby generator of minimum 320KVA rating with fuel as necessary, temporary cable of adequate size, changeover switch of adequate rating, etc should be arranged by the Bidder. The standby generator's temporary connection/disconnection to the existing distribution system to be carried out by the contractor.

The Contractor shall supply Fuel, oil, lubricants and any other consumable for the day to day operation and maintenance of DG Set.

Transportation of DG Set along with accessories to Mormugao Port Hospital and back; transit insurance, and payment of all other taxes and duties; loading and unloading



आईएसओ 9001-2015 पलन  
AN ISO 9001-2015 PORT

**MORMUGAO PORT AUTHORITY**  
**ENGINEERING MECHANICAL DEPARTMENT**  
**ELECTRICAL HEADLAND SECTION**

of the DG Set and accessories; and installation etc. shall be under the scope of the Contractor at their cost.

### **3.5. DISMANTLING OF SHED**

The existing DG set has a rain protection shed with asbestos sheet for roof and G.I. pipe supports, M.S. tubes as cross/ support members, and covered all four sides with asbestos sheet, etc. shall be dismantled to remove 320 KVA DG set.

While dismantling the shed any asbestos sheet is broken or dislocated by the Contractor, the same shall be replaced or made good by the contractor at no extra cost.

The Contractor shall erect and commission the new 400 KVA DG set at the existing shed. All connections from DG set viz. control wiring, LT cables to existing AMF panel, existing fuel pipe to tank, exhaust pipe to chimney shall be completed, checked and adjusted to ensure safety and satisfactory operation of the equipment as per IER and relevant IS standards.

The contractor shall assemble the shed soon after the commissioning of new DG Set by providing suitable bolts & nuts & other accessories as necessary and if joints are required shall be welded, the same shall be carried out by the Contractor. The work shall be carried out as per standard and directed by E.I.C.

### **3.6. RCC FOUNDATION FOR 400 KVA DG SET**

The existing foundation of 320 KVA DG set shall be used for proposed new 400KVA dg set. The details of the existing foundation is approx. 700cm x 400cm X 120cm

### **3.7. AUTO MAINS FAILURE PANEL**

The existing AMF panel of 320 KVA DG set shall be used for proposed new 400KVA dg set. The details of the existing AMF panel is mentioned below:

<b>Sr no.</b>	<b>Item Description</b>	<b>Quantity</b>
1	Air Circuit Breaker for Mains & DG Make: ABB SACE, LT, 4P, 800A	02nos
2	AMF Controller, Make: Deep Sea Electronics, Model: DSE 4520 MKII	01no.
3	Current Transformer 600/5A(03nos) for DG i/c & Busbar	02set

**MORMUGAO PORT AUTHORITY**  
**ENGINEERING MECHANICAL DEPARTMENT**  
**ELECTRICAL HEADLAND SECTION**

4	Multi-Function Meter (Digital) for DG i/c & Busbar	02nos
5	Busbar Al, 800A	04nos
6	3.5c x 300 sq.mm Armoured cable (mains i/c, DG i/c & outgoing feeders)	06nos

### 3.8 **GUARANTEE**

The installation shall be guaranteed for two years from the date of acceptance and free maintenance shall be done during the guarantee period.

### 3.9. **EXHAUST PIPING:-**

3.9.1 All M.S. Pipes for exhaust lines shall be conforming to relevant IS. The runs forming part of factory assembly on the engine flexible connections upto exhaust silencer shall be exclusive of exhaust piping item. The work includes necessary cladding of exhaust pipe work using 50 mm thick loosely bound resin (LBR) mattress/Mineral wool/Rockwool, density not less than 120 kg/meter cube and aluminium cladding (24 gauge) for the complete portion. The exhaust pipe work includes necessary supports, foundation etc. to avoid any load and stress on turbo charger/exhaust piping. The exhaust pipe shall be run /supported on independent structure for which, the design and drawing for such structure shall be got approved from the engineer-in-charge. The exhaust stack height shall be as per the latest CPCB Norms.

3.9.2 The following points may be followed for the exhaust system piping work:

- Exhaust system should create minimum back pressure.
- Number of bends should be kept minimum and smooth bends should be used to minimize back pressure.
- Schedule B MS Pipes and long bend/elbows should be used.
- The exhaust outlet should be in the direction of prevailing winds and should not allow exhaust gases to enter air inlet/windows etc.
- If tail end is horizontal, 45 degree downward cut should be given at the end of the pipe to avoid rain water entry into exhaust piping. If tail end is vertical, there should be a rain trap to avoid rain water entry. If rain cap is used, the distance between exhaust pipe and rain cap should be higher than diameter of pipe. Horizontal run of exhaust piping should slope downwards away from engine to the condensate trap.

3.9.3. D.G. Exhaust pipe line by using ASTM A-106 GR. B SCH. 40 STD. 219.1 MM SEAMLESS CS Pipe, BS-10 Table-F CS flanges and heavy class long radius bends of matching diameter along with necessary nut, bolt, washers and U-clamps etc thereon as required, welding to be done as per best engineering practise by following high standard welding procedure, complete in all respect





आईएसओ 9001-2015 परलन  
AN ISO 9001-2015 PORT

**MORMUGAO PORT AUTHORITY**  
**ENGINEERING MECHANICAL DEPARTMENT**  
**ELECTRICAL HEADLAND SECTION**

finished with one primary followed by two secondary coats of heat resistant synthetic medium based two packs Aluminum paint suitable up to 400°C dry temp., by first allowing previous coat to get fully dry to a thickness of minimum 25 microns per coat, reducing the diameter not allowed, the upper most end to be bend and chamfered at 45 degree and to be closed by welding a wire mesh of mi. 10 gauge MS wire having 1-inch x 1-inch openings to stop entry of any bird into the pipeline.

- 3.9.4. Providing and fixing structural steel supporting structure all around the chimney, comprising of ISMC 100, ISA 75x8 and ISA 65x8 and other angle iron sections higher than ISA 50x6 size welded to form a tower of size 1.2M X 1.2M; the structure to have landing platforms of 8mm thickness chequered plate at each 3 meter height, access ladder up to top starting from 3 meter height complete with fall protection cage a required for safety of the personnel who may be working on it. Main vertical supports of structure shall have base plates of 20 mm thickness duly welded at bottom with necessary ribs of 8 mm thickness thereon with each support; entire structure shall be made safe against lightening by providing a continuous 50x6 GI strip affixed thereon with SS bolts and nuts for better conductivity for earthing from top to bottom of the structure. The supporting tower should be erected on the bolts anchored on the foundation. The pipe has to be supported on the tower by U-clamps at every 1.5 metre of pipe length. The horizontal part of exhaust pipe has to be supported with ISMC 100 which is erected in suitable PCC foundation. Entire structure to be provided two coats of zinc chromate metal primer followed by two coats of weatherproof epoxy paint of appropriate shade in such manner that successive coat shall be applied only after fully drying of previous coat to a minimum thickness of 25 microns.
- 3.9.5. Civil work with all construction material for making foundation suitable for erection of above pipeline with its supporting structure – including cost of necessary excavation in hard/soft soil up to a depth of 2 meter from existing ground level, compacting, ramming, making soil bed hard, providing stone soling bed, followed by providing and laying of ready mix in PCC and RCC of appropriate mixing proportion for making platform of PCC 2m x 2m x 0.1m at bottom and RCC 1.5m x 1.5m x 2.3m at top with embedded bolts anchored at bottom as suitable for withstanding dead load of tower as well as dynamic load due to winds. The foundation shall include the cost of suitable reinforcement by steel bars as required, curing, plastering and finishing floor level in good manner as desired by client, including cost of carting away of surplus excavated material/debris etc. The foundation shall be made as per relevant IS.
- 3.9.6. Providing and fixing lighting arrestor as per relevant IS standard above the exhaust pipe which is connected to the earthing pit with GI strips.
- 3.9.7. Providing and making Electrical Earthing of tower and pipe by using Copper plate of 600 mm x 600 m x 3.18mm thick and perforated pipe of min. 63mm

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आईएसओ 9001-2015 पल्लन  
AN ISO 9001-2015 PORT

**MORMUGAO PORT AUTHORITY**  
**ENGINEERING MECHANICAL DEPARTMENT**  
**ELECTRICAL HEADLAND SECTION**

bore inserted in wet soil up to a minimum of 3 metre depth or as required as per site conditions, complete in all respect tested ok as per clause no. 3.14(V).

- 3.9.8. Providing and fixing Thermal insulation of exhaust pipeline by LRB (light resin bonded) mattresses of thickness 100 mm x density 150 kg/m<sup>3</sup> make Rockwool/Minwool/Lloyds with embedded chicken wire mesh, cladding by 24 SWG aluminium sheets make – Balco/ Hindalco, Including the bends/ flanges therein, by fixing appropriate size steel screws and washers; cladding to be done in such a manner and workmanship that it shall protect direct entry of rain water into the insulation done; workmanship of work should be good to ensure proper finishing having regular diameter all over.

3.10. **GENERAL REQUIREMENTS**

The engine and alternator shall be assembled on a common base frame. Alternator shall be directly coupled to the engine by means of flexible couplings. The alternator shall be provided with its own exciter. When separate units are provided for this purpose, they shall be driven by the alternator shaft itself.

3.11. **LUBRICATION**

Lubrication shall be positive pressure type lubricating for all moving parts. No moving parts shall be required lubrication by hand either prior to the starting of the engine or while it is in operation. Lubrication oil shall conform to relevant IS amended up to date. Necessary lubricating oil filter shall be provided for operation at normal conditions for a period of 250 hours, without any necessity of replacement and cleaning. Temperature and pressure gauges shall be fitted to the lubricating system.

3.12. **FUEL SYSTEMS /FUEL TANK**

The fuel tank shall have minimum capacity of 450 litres & compatible for the engine of the DG set. The tank shall have level indicator marked in liters, filling inlet with removable filter. Existing overhead fuel tank is available in the diesel room. The same is to be connected to the proposed generator set diesel tank using GI/UPVC pipes with bends and stop cock as found necessary.

3.13. **OPERATING CONDITIONS**

The Engine Alternator shall be capable of delivering the specified output under the site conditions. The fuel consumption of DG set at 100% load shall not be more than 90 litres/hr.

3.14. **OTHER GENERAL REQUIREMENTS**

(i) **THE PERIOD OF OPERTATION**

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आईएसओ 9001-2015 पल्लन  
AN ISO 9001-2015 PORT

**MORMUGAO PORT AUTHORITY**  
**ENGINEERING MECHANICAL DEPARTMENT**  
**ELECTRICAL HEADLAND SECTION**

The Engine Alternator set offered shall be continuous duty type conforming to BS 5514.

(ii) **OVER LOAD**

The set shall be capable of taking 10% overload for a period of one hour during any 12 hours period while operating continuously at full rated load.

(iii) **OUTPUT VOLTAGE FREQUENCY AND WAVE FORM**

Normal output voltage shall be 415 volts with  $\pm 2.5\%$  manual adjustment at all conditions of load with coarse and fine controls. Frequency shall be 50 cycles per second  $\pm 4\%$ . Output wave form shall be sinusoidal at all load conditions. Alternator shall be of brushless type provided with AVR suitable for voltage regulation of  $\pm 2.5\%$  or better at all load conditions and with prime mover speed drop up to 4% of nominal speed. Alternator shall be provided with radio frequency suppressor and in built frequency rollover protection.

(iv) **SAFETY PROVISION**

All Exposed moving parts like fan blades, belts etc. shall be provided with suitable Guards / covering to avoid the possibility of accidents.

(v) **EARTHING**

The Copper plate earthing system shall be designed and installed so as to meet the requirement of CEA.

All non current carrying parts with conducting surface such as power transformer, frame works of circuit breakers and medium / low voltage switch gears, instrument transformer cases, cable glands, cable supports, any steel works of the substation buildings should be efficiently grounded for the protection of equipments and operating personnel by connecting to the earth ring bus with two distinct and separate earth leads.

The earth connection shall be made of copper of adequate size and section of the conductor conforming to IS 3043 to safely carry the maximum fault current for a short period without burning the conductor and pass on the fault current in excess of this, additional earth connections under fault condition and at no time the potential shall exceed 10 volts between the equipment and earth. The earthing system shall be mechanically robust and joints shall be capable of retaining low resistance even after many passages of fault current. The G.I. flats of size 50x 6mm shall be interconnected at all earth pits.

Interconnections and joints for earth conductors shall be riveted and soldered for retaining low resistance. Each earth bar should be connected to the main earth



आईएसओ 9001-2015 पल्लन  
AN ISO 9001-2015 PORT

**MORMUGAO PORT AUTHORITY**  
**ENGINEERING MECHANICAL DEPARTMENT**  
**ELECTRICAL HEADLAND SECTION**

through a bolted removable link. All ground connections shall be compounded and braided. The earth electrodes shall be driven to a depth of not less than 2.7 meters below the ground level and at least 3 meters away from the building and any other earthing electrodes, treating the soil surrounding the electrodes with the salt, coke and charcoal in accordance with IS 3043. The size of the copper plate shall be 600x600x3.18mm.

A suitable brick cemented enclosure for neutral and body earth will be as per IE Rule (i.e) 450mm x 450mm with 125mm wall thickness. The depth of the masonry work will be not less than 600mm below the ground level and with suitable cover provided by the contractor enclosing the earth electrodes and shall be able to take up the load of lorries, etc., operating in that area. The top surface of the earth pit shall be in level with the finished surface level of the surrounding area. After installation, earthing stations has to be tested with earth tester and earthing resistance should be below 5 ohms. Also copy of valid calibration certificate of the above earth tester and earth testing certificate has to be provided to the Port. The details of earth station such as neutral/body earthing, date of testing etc has to be marked on the earth pits with yellow paint with black background paint.

(vi) **FINISH**

All fabricated items should be painted after proper surface finish & treatment. Two coat of zinc metal primer to be applied. Standard colour as specified in IS should only be used wherever applicable. High quality brand of paints should be used to prohibit corrosion under climatic conditions prevailing at site.

(vii) Manufacturer's test certificate for the DG set to be provided to the Port.

**3.15. FIRE EXTINGUISHER:**

Adequate number of portable CO<sub>2</sub> dry chemical fire extinguishers for electrical installation conforming to IS shall be supplied and installed at the proposed DG set location.

**3.16. SUPPLY AND LAYING OF 3.5 CORE X 300 SQ.MM AND CONTROL CABLES**

a) **Supply of LT, 3.5 C x 300 Sq.mm ,XLPE Cable**

The cable measurements are tentative and may vary as per site condition. Supply and laying of Aluminium XLPE L.T. underground cable of 1.1KV voltage grade, extruded PVC inner sheathed, single layer of galvanized steel wire / strip armoured, over all PVC sheathed conforming to IS 7098 Part I 1985 with latest amendments with ISI mark of approved make. The cable quantity shown in BOQ is tentative. The Contractor shall measure the actual quantity as per the site requirement and confirm the same from E.I.C before taking for procurement action.

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Note: i) Test certificates from the manufacturers for the cable shall be submitted along with the supply of cable.

**b) Laying of LT, 3.5 C x 300 sq.mm, XLPE Cable**

The laying of cable in the existing RCC cable trench / excavating trench / road crossing / Hume Pipe / concrete cutting, etc. from New DG set to existing AMF panel at Hospital Substation. However, the cable shall be laid as per the relevant IS standard.

The cables are to be laid as per IS:1255 and as detailed under: The cable quantity shown in the price schedule is tentative. The Contractor shall measure the quantity and supply the same. However, the payment will be made by actual length.

- (i) The cable shall be laid in the existing trench by opening the slab covers and reclosing the same without damaging the slab corner after laying of the cable.
- (ii) The cable shall be laid across road in excavated trench, size 60 cm width x 100 cm depth to lay each run of the above cable covered with RCC Hume pipe and re-closing with excavated soil and make it original condition. Required RCC Hume Pipe shall be supplied by the Contractor. The size of pipe shall not be less than 20cms in diameter for each cable. The pipe shall be laid at an angle to avoid sharp cable bends at the point of entry and exit. A spare pipe of the same size shall simultaneously be laid for future augmentation / requirement.
- (iii) The end termination for 1100V grade underground cables shall be of crimping type lugs shall be supplied by the contractor. The crimping type lugs shall be installed by highly skilled personnel with all accessories and other material confirming to relevant IS specification the additional length of cable shall be provided for loop of sufficient length for future requirement before commencing and termination work. The work includes all labour and material as directed by E.I.C.

All the tests shall be carried out as per relevant IS specifications and IER 1956 before charging the Transformer.

- (iv) Scope of work shall also include Supply, laying, end termination and connections of armored control wiring cable as per OEM standard and required quantity cable to connect DG set to AMF panel. The cable shall be laid underground / on wall / in pipe/existing trench as per site requirement.

**3.17. INSTALLATION, TESTING AND COMMISSIONING**

Installation, testing and commissioning of the above Genset complete with its acoustic enclosure, AMF panel, Exhaust Chimney, battery Charge and all

**MORMUGAO PORT AUTHORITY**  
**ENGINEERING MECHANICAL DEPARTMENT**  
**ELECTRICAL HEADLAND SECTION**

equipments, accessories/ associated items on the existing cement concrete floor / foundation including supplying consumables like lube oil, fuel and providing artificial resistive load, cabling, switching arrangements, etc., for trial run (i.e. 2 hours on load & 1 hour at no load) and final Acceptance Testing of Genset (i.e. Trial run upto 6 days, 8 hours daily for Final Acceptance) including topping up of lube oil upto full mark and filling of fuel suitable for working etc., as per specifications as required. The tentative drawing shown for the reference. However, the work has to be carried out as per the site condition.

**3.18. SUPPLY AND LAYING OF GI FLAT:**

Supply, laying & connection of GI strip of size 50 x 6mm from new earth stations to the DG set neutral and its body. The laying of GI strip to be done above the ground and should be connected at both ends with SS bolts, nuts & washers. GI strips has to be supplied in standard lengths and joints of GI strips has to be made only with SS bolts & nuts (02nos for one joint). Sharp bends required in GI strip should be formed by the use of a bending machine. Earthing Strips which are installed below the ground should be covered adequately with insulating Sleeve to avoid corrosion. For installing GI strip on wall, GI clamps to be used for every one metre.

The GI strip quantity shown in BOQ is tentative. The Contractor shall measure the actual quantity as per the site requirement and confirm the same from E.I.C before taking for procurement action.

**4.0 ACCEPTANCE TEST**

The test shall be with artificial resistive load only and nonlinear load will not be arranged for testing purpose.

**5.0 INSULATION TEST**

Immediately after the over-load test, the insulation resistance between the stationary coil and the frame is tested with 500V Meggar.

**6.0 REGULATION TEST**

The Automatic and manual regulation of the alternator at no load, half load and full load are noted for the nominal voltage of 230 Volts between phase and neutral at power factor 0.8. All the arrangements for all the test shall be the responsibility of the tenderer.

**7.0 FUNCTIONAL TEST**



आईएसओ 9001-2015 पल्लन  
AN ISO 9001-2015 PORT

**MORMUGAO PORT AUTHORITY**  
**ENGINEERING MECHANICAL DEPARTMENT**  
**ELECTRICAL HEADLAND SECTION**

Performance of incoming switch / circuit breaker starting arrangement for the engine safety features, instruments and control panel etc., shall be verified.

**8.0 APPROVAL OF INSTALLATION AND COMPLETION CERTIFICATE**

Obtaining approval of statutory bodies i.e. CPCB/Electrical Inspectorate etc. as required shall be the responsibility of the contractor duly preparing/approval of installation drawings within the quoted price of this turnkey work. The statutory fees/charges required to be paid to these bodies shall be within the quoted price.

Any modification if required for termination of the cables from DG set to existing panel shall be in the scope of the contractor, within the quoted price of this turnkey work. No additional charges will be paid by Port later on.

**9.0 MAINTENANCE WORK DURING GUARANTEE PERIOD AND CAMC PERIOD**

- i. After successful installation by the Contractor and accepted by the Port, annual maintenance shall be carried out by the contractor for a period of 05 years after expire of 2 years guarantee period.
- ii. The annual maintenance work is comprehensive nature, therefore, all the repairing refurbishing and maintenance costs including spares shall be borne by the Contractor.
- iii. The contractor shall submit the maintenance schedule to Port for approval based on OEM recommendation to carry out the maintenance work during AMC period.
- iv. Maintaining the operation record in Log book for the entire Operation & Maintenance Work and same will be submitted along with bill during payment.
- v. During the maintenance, the contractor shall properly clean the D.G. sets, AMF panels etc and check all the parameters as per maintenance schedule and standards and also with the satisfaction of the Port's representatives.
- iv. The contractor shall arrange training for 2 days of the technical staffs of Port for operation of D.G.sets with AMF panel operation on both the mode i.e Auto/manual start of DG set immediately during failure of power supply & including important check list.

**MORMUGAO PORT AUTHORITY**  
**ENGINEERING MECHANICAL DEPARTMENT**  
**ELECTRICAL HEADLAND SECTION**

- v. The Bidder shall complete the preventive maintenance activity every quarterly and shall record in register with sign of appropriate authority of Port.
- vi. The contractor shall arrange local representative, whenever fault occurs during the CAMC period to attend the same within 2hrs call logging by the Port's personnel.
- vii. Payment shall be made on quarterly basis during CAMC period. However, the contractor shall submit the availability records and also maintenance report with the bills.
- viii. The contractor shall be maintained 99% availability of the DG sets on each quarter and otherwise 1% deducted from the quarterly running bills.
- ix. The bidder shall provide the contact details, mobile no. E mail, Fax No. of deputed person for this Job & escalation matrix to higher supervisor.
- x. Similarly, contractor shall maintain 99% availability of the D.G. sets and otherwise 1% cost on Performance Guarantee shall be deducted during the end of the Guarantee period.

**10.0 OPERATION INSTRUCTIONS AND DRAWINGS**

The Contractor shall provide 3 sets of operation and maintenance manual, complete layout drawings of Genset, AMF panel with wiring, earthing system and battery charger for DC source compiled in the spiral binding hard copy and soft copy and hand over to the Port's representative.

**11.0 INSPECTION AND TESTING OF GENSET**

The engine alternator sets shall be tested at factory, before dispatch to site and at site as per detailed specification of NIT in the presence of department representatives.

All the following tests to check the performance of the set to meet the requirements of specifications shall be carried out at site after installation. The engine shall be run for at least half an hour on no load and then the engine shall be run continuously for six hours at its full rated load. 'The set will be tested with an overload of 10% for one hour. The over load test may be taken at any stage during the full load period and need not be at the end of six hours of full load test. During the full rated load test half hourly readings of the stationary coil temperature are to be taken and the rise in temperature should not be more than the value stipulated as per relevant clauses of insulation given in IS - 4722 - 1958.





आईएसओ 9001-2015 पल्लन  
AN ISO 9001-2015 PORT

**MORMUGAO PORT AUTHORITY**  
**ENGINEERING MECHANICAL DEPARTMENT**  
**ELECTRICAL HEADLAND SECTION**

The fuel consumption should be within 5% of the manufacturers stipulated ratings.

**12.0 SAFETY:-**

In the course of the work, personnel working in the system at site should take utmost care for their safety and work purely at individual's/ party's risk. MCF will not be responsible for any untoward accidents for the party's working personnel.

**13.0 TRANSPORTATION**

The prices also include packing charges, transportations charges and insurance as required. All necessary clearances as per the prevailing rules shall be obtained by the supplier for transportation of the Generator to the site. The packing shall be in such way as to prevent damages or deterioration in transit and final destination as mentioned in the tender. The packing should be sufficient to withstand rough handling and atmospheric condition.

**14.0 WORK INSTRUCTIONS:-**

- All allied works as per the Bill of Quantities to be carried out by the Contractor in all respects invariably mentioned or not in the specification to complete the work in all respects.
- The materials required / intended for the work should be handled carefully and neatly installed / laid / commissioned and any damages during installation will be Contractors account and same shall be rectified immediately to its original condition.
- The Miscellaneous works to be carried out invariably whether clearly mentioned or not in the specifications and BOQ and to be completed in all respects the said project work.
- Supply & termination of Power cable from DG to Power Control Panel is in scope of supplier.
- Supply & termination of control cable / Cat 5 cable (as necessary required) is in scope of supplier.
- All the welding works should be done by the qualified welders.
- Only the qualified electricians should do the other Electrical works
- The party shall bring all the necessary tools and instruments required for erection, installation, commissioning and testing.
- For all electrical works such as crimping, terminal connections, tinning... etc right

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आईएसओ 9001-2015 पलान  
AN ISO 9001-2015 PORT

**MORMUGAO PORT AUTHORITY**  
**ENGINEERING MECHANICAL DEPARTMENT**  
**ELECTRICAL HEADLAND SECTION**

size and proper tools should be used.

- Interconnection of all copper flats should be done only after end surface tinning. Reputed brand SS hard wares only to be used.
- All the piping materials shall meet the requirements of ASTM standards.
- All the pipelines joints should be flange type. Sharp bends should be avoided. High quality gaskets should be used.
- DG exhaust Chimney should have lightning protection down conductor of 50 x 6 mm GI flat mounted on suitable out door type insulators.
- All other works should be done strictly as per standard code of practice



आईएसओ 9001-2015 पलन  
AN ISO 9001-2015 PORT

**MORMUGAO PORT AUTHORITY**  
**ENGINEERING MECHANICAL DEPARTMENT**  
**ELECTRICAL HEADLAND SECTION**

**SCHEDULE 'A1'**

**SCHEDULE OF PRICES AND QUANTITIES**

**PRICE SCHEDULE**

**Part - A**

Sl. No.	Description of work	Unit	Qty.	Rate/Unit (Rs.)		GST %	Amount (Rs.)
				In figure	In words		
1.	Dismantling, removing of existing shed to take out existing DG set and assemble the shed after the commissioning of new DG as per the detailed specification at Schedule-.A	LS	1				
2.	Dismantling, removing and shifting of existing DG Set, acoustic enclosure, cables, end connections, accessories, etc . and handing over to MM Division, Baina as per the detailed specification at Schedule-.A	LS	1				
3.	Supply, Installation, Testing & Commissioning of 'Silent Type' Diesel generator set long with having Prime Power rating of 400 Kva, 415 Volts at 1500 RPM, 0.8 lagging power factor at 415 Volts suitable for 50 Hz, 3 phase system and for 0.85 Load factor and consisting as per the detailed specification at Schedule-.A						
a)	Supply as indicated at 3 above	No.	1				
b)	Installation, Testing, Commissioning	No.	1				
4.	Providing exhaust system as per the detailed specification at Schedule-.A						
a)	Extension of DG exhaust	Mtr.	20				
b)	Providing and fixing MS supporting structure all around the chimney up to height of 16 Mtr.	Kg.	2000				
c)	Excavation of hard/soft soil & soling	Cu.m	12				

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आईएसओ 9001-2015 पलन  
AN ISO 9001-2015 PORT

**MORMUGAO PORT AUTHORITY**  
**ENGINEERING MECHANICAL DEPARTMENT**  
**ELECTRICAL HEADLAND SECTION**

d)	PCC: Providing cement concrete (1:3:6) using 20mm nominal size traps stone metal including compaction, necessary shuttering, curing. All labour, material & transportation etc complete	Cu.m	15				
e)	RCC (1:11/2:3) mix using 20mm graded black trap stone metal out of quarried boulders as coarse aggregate including mixing, placing, consolidating, vibrating, levelling, curing etc. including the cost of shuttering and reinforcement. All labour & material etc. complete.	Cu.m	7				
f)	Providing and fixing lighting arrestor above the exhaust pipe which is connected to the earthing pit with GI strips	No.	1				
g)	Proving and fixing thermal insulator of exhaust pipeline by LRB	Mtr.	5				
h)	Insulation and 24 gauge aluminium cladding for silencer	No.	1				
5.	Supply of 2 runs of 3½C X 300 sq.mm. LT Aluminum XLPE cable as per IS : 7098 Part-2 of single length as per the detailed specification at Schedule-.A	Mtr.	40				
6.	Laying of two runs of 3.5Cx300 sq. mm aluminum armoured XLPE through existing trench as per the detailed specification at Schedule-.A	Mtr	12				
7.	Excavation of hard/soft for cable trench upto the depth of 1 meter and laying of two runs of 3.5Cx300sq. mm aluminum armoured XLPE insulated cable and backfilling as per the detailed specification at Schedule-.A	Mtr.	8				
8.	Termination of 3.5Cx300sq. mm aluminum armoured XLPE insulated cable with proper gland in the LT panel as per the detailed specification at Schedule-.A	No.	4				



आईएसओ 9001-2015 पलन  
AN ISO 9001-2015 PORT

**MORMUGAO PORT AUTHORITY**  
**ENGINEERING MECHANICAL DEPARTMENT**  
**ELECTRICAL HEADLAND SECTION**

9.	Earthing system for the DG set of size 600 x 600 x 3.15 mm Copper flat plate buried in ground in a depth of 2Mtr. from ground level with alternate layer of charcoal and salt including supply and fixing of 40mm dia perforated GI pipe funneling for watering purpose including construction of masonry pit with metal cover as per IS: 3043 as per the detailed specification at Schedule-.A	Set	5					
10.	Supply of hot dip galvanized earth flat of size 50mm X 6mm as per relevant standard as per the detailed specification at Schedule-.A	Mtr.	30					
a)								
b)	Laying of hot dip galvanized earth flat of size 50mm X 6mm as per relevant standard as per the detailed specification at Schedule-.A	Mtr.	30					
11.	Supply and installation of 2 nos. of fire extinguishers of suitable capacity as per OEM standards	Set	1					
12.	Provide standby generator of minimum 320KVA rating as per the detailed specification at Schedule-A.	LS	1					
13	Obtaining approval of statutory bodies i.e. CPCB/Electrical Inspectorate etc. as required	LS	1					
<b>Total Amount</b>								

(In Words Rupees \_\_\_\_\_ only  
exclusive of all taxes and duties)

**Note: The rates quoted shall be inclusive of transportation, lodging and boarding, but exclusive of GST. Applicable GST shall be paid extra as applicable.**



आईएसओ 9001-2015 पल्लन  
AN ISO 9001-2015 PORT

**MORMUGAO PORT AUTHORITY**  
**ENGINEERING MECHANICAL DEPARTMENT**  
**ELECTRICAL HEADLAND SECTION**

**PART - B**

Sr. No.	Description of work	Unit	Qty.	Rate/Unit		Amount (Rs.)
				In figure	In words	
1.	Comprehensive Annual Maintenance Contract (CAMC) with full responsibility of carrying out repair and supply of required original spare parts to keep the DG set in fully operational condition for a period of 5 years, after expiry of 2 years Guarantee period.					
a.	1 <sup>st</sup> year CAMC	LS	1			
b.	2 <sup>nd</sup> year CAMC	LS	1			
c.	3 <sup>rd</sup> year CAMC	LS	1			
d.	4 <sup>th</sup> year CAMC	LS	1			
e.	5 <sup>th</sup> year CAMC	LS	1			
<b>TOTAL AMOUNT 'PART B'</b>						

(In Words Rupees \_\_\_\_\_)

\_\_\_\_\_ only inclusive of all taxes and duties)