

SCHEDULE OF WORK

Name of work : D/O land at Narela Town ship (SH: S/I of 125 KVA DG Set at Project Office complex at Narela)

| S.No. | Description of items | Qty. | Unit | Rate | Amount. |
|------------|---|------|-------|------|---------|
| 1- | Supplying, installation, testing and commissioning of diesel engine driven generating set of 125 KVA capacity complete with acoustic enclosure, developing 415 volts, 3 phase 4 wires, 50 Hz at 0.8 power factor (lagging) AC supply, comprising of alternator directly coupled with water cooled electric start diesel engine of minimum 156 BHP, at 1500 RPM, mounted on common MS channel iron base frame complete with in-built fuel tank, charged battery, battery leads, control panel, residential silencer, anti-vibration mounting pads, protections, connections, inter connections etc. as reqd. | 1 | Set | | |
| 2- | Earthing with copper earth plate 600mm x 600mm x 3mm thick i/c accessories and providing masonry enclosure with cover plate having locking arrangement and watering pipe etc. (but without charcoal or coke as reqd.) | 2 | Set | | |
| 3- | Extra for using salt & charcoal for G.I. or copper plate earth electrode as reqd. | 2 | Set | | |
| 4- | Earthing with G.I. earth pipe 4.5m long 40mm dia i/c accessories and providing masonry enclosure with cover plate having locking arrangement and watering pipe etc. (but without charcoal or coke as reqd.) | 2 | Set | | |
| 5- | Extra for using salt and charcoal for pipe earth electrode as reqd. | 2 | Set | | |
| 6- | Supply of 3.5 x 50 mm ² PVC sheathed XLPE al. cond. armoured cable of 1.1 KV grade i/c testing etc. as reqd. | 2 | Set | | |
| 7- (AN) | Laying of 1 No. PVC insulated & PVC sheathed/XLPE power cable of 1.1 KV grade of size exceeding 25 sq. mm but not exceeding 120 sq. mm, with sand cushioning, protective covering and refilling the trench etc. as reqd. | 80 | Meter | | |

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| 8- | Laying and fixing of 1 No. FVC insulated and PVC sheathed XLPE al. cond. cable of 1.1 KV grade of size exceeding 25 sq. mm but not exceeding 120 sq. mm on surface as reqd. | 10 Mtr. Meter |
| 9- | Providing and fixing 25mm x 5mm copper strip on surface in recess for connection etc. as reqd. | 15 Mtr. Meter |
| 10- | Providing and fixing 25mm x 5mm GI strip on surface or in recess for connections etc. as reqd. | 15 Mtr. Meter |

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List of acceptable makes of materials & Governing Specifications.

| S.No. | Items | Governing Specifications | Makes/Manufacturer |
|-----------------|---------------------|--------------------------|--|
| <u>D.G. SET</u> | | | |
| 1- | Diesel Engine | BS 5514/IS 10002 | Kirloskar/Greaves Cotton/Cummins. |
| 2- | Alternator | IS: 4722 | Kirloskar/Crompton Greaves/Stanford. |
| 3- | Battery | - | Standard/AMRON/S Exide/ Panasonic |
| 4- | MCCB | - | L&T/Siemens/Schneider AREVA/ Q.S. ABB |
| 5- | Acoustic Enclosure | - | Kirloskar Green/Sudhir Gen.sat/Jakson |
| 6- | G.I. Pipe. | IS : 1239 | TATA/Jindal(Hissar)/ Surya |
| 7- | XLPE armoured cable | IS:1554 | Asian/Unistar/Ecko/ Skytone/Havell's |

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ADDITIONAL CONDITIONS & SPECIFICATIONS

Conditions

1. The contractor must get acquainted with the proposed site for work and study specifications and conditions carefully before tendering. The work shall be executed as per programme approved by the Engineer-in-Charge. The work shall be executed in close co-ordination with the progress of the building work. If the site for electrical work is not available in part or in full for any reason whatsoever, the time for the execution of the electrical work shall be correspondingly extended. No claim for any idle labour or compensation (except as provided under clause 10C / 10CC, as applicable, in the printed conditions of contract) shall be entertained.
2. (a) The contractor shall submit completion certificate as per appendix 'E' of the General Specifications for Electrical Works(Part-I) Internal-2005 within one month after actual date of completion, failing which an amount @ 1% of the value of work subject to a maximum of Rs.5,000/- (Rupees Five thousand only) shall be deducted from any amount due to the contractor from DDA.

(b) The contractor shall submit completion plan of the D.G.Set installation as per details given below:-
One copy of Completion Plan duly laminated & three copies of the same in blue print showing the following details:-
 - (i) Line diagram of complete installation with equipment details.
 - (ii) Size of cables including outgoing cables from D.G.Set & LT panel
 - (iii) Details of LT panel.In case, the contractor fails to submit the completion plan as aforesaid he shall be liable to pay a sum equivalent to 2.5% of the value of the work subject to a maximum of Rs. 2500/- (Rupees two thousand and five hundred only).

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3- The following work shall be deemed to be included within the scope of work to be executed by the contractor and nothing extra will be paid on this account:-

- (i) All minor building work such as cutting of holes and chases in walls/ceiling and making good the same with cement mortar 1:4 (1 cement and 4 coarse sand).
- (ii) Provision of suitable support and clamps for fixing arrangement including nuts, bolts, cable glands, lugs, terminal blocks etc. as a part of the particular item unless given separately in the schedule of work.
- (iii) Masonary support / G.I. pipe support etc. shall be provided wherever required.

4- Testing of installation:

- (i) The entire system shall be tested to the satisfaction of Engineer-in-Charge.
- (ii) Tests shall be performed in the presence of Engineer-in-Charge or his representative.
- (iii) The contractor shall provide all labour, equipments and material required for performance of the tests.

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- 5- The rates quoted by the contractor, shall be firm and should be inclusive of all Central / State Govt. Taxes, Duties and Levies etc.
- 6- Concessional Sales Tax Form C, D shall not be issued by the Department.
- 7- The installation shall be covered by the conditions that the whole installation or any part thereof found defective within the warranty period should be replaced by the contractor free of charge in a reasonable time. The warranty shall cover the followings:-
 - a. Quality, strength and performance of the material and equipment used.
 - b. Safe electrical and mechanical strength of all parts of the equipments under all specified conditions of operations / satisfactory performance.
 - c. Safe performance figure and other values as specified in the schedule of warranty / technical particulars.
 - d. Prompt service during warranty period.
 - e. Attending to consequential damages in the equipments supplied and installed by the tenderer.
 - f. Warranty period of 12 months shall be counted from the date of handing over of installations to the department.
- 8- Contractor shall provide the manufacturer's test certificate in respect of all major items.
- 9- The contractor shall be fully responsible for watch and ward of the material brought / work executed at site till the same is complete and taken over by the department.

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10. After the award of work, the contractor shall get all the materials approved from the Engineer-in-Charge before use in the work. The contractor shall also produce test certificates for conformity with relevant IS specifications, if required by the Engineer-in-Charge.

11. Clay Fly ash bricks shall be used in the work wherever required.

SPECIFICATIONS:

12. The work as indicated in the schedule of quantities attached herewith including any modifications, additions, alterations ordered subsequently shall be carried out as per specifications given below:

- i) CPWD Specifications for Electrical Works, at Delhi Part-I (Internal) 2005 and Part-II (External) 1994 with amendments upto the date of tenders.
- ii) Indian Electricity Rules 2005 as amended upto date.
- iii) A table indicating the makes, Governing Specifications and other details in respect of some of the important materials to be used in the work is attached. These specifications shall have preference over those indicated in 13(i) above.
- iv) Only material bearing ISI/BIS certification mark shall be used in the work. Where articles of different designs / makes bearing ISI/BIS certification mark are available, the decision of Engineer-in-Charge about the design / make to be used in the work shall be final and binding on the contractor.
- v) Where material bearing ISI/BIS certification mark is not available, material conforming to relevant BIS/ISI shall be used with prior approval of Engineer-in-Charge.

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vi) If the specifications of any item are not available then the decision of the Engineer-in-Charge regarding quality shall be final and binding on the contractor.

13- In case of any discrepancy in the description of any item given in the schedule of quantities and the specifications, the former shall prevail. If the specifications of any item are not available, the decision of the Engineer - in-charge shall be final.

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TECHNICAL SPECIFICATIONS FOR SILENT DG SETS

A. DIESEL ENGINE :

Diesel engine developing 156 BHP at 1500 RPM, water cooled, four stroke, electric start, engine conforming to BS: 5514/IS: 10002 with capacity of 10% over loading for one hour in twelve hours duration having following accessories covered in the scope of supply :-

AIR INTAKE SYSTEM :

Air intake manifold.
Dry type air cleaner

EXHAUST SYSTEM :

Turbocharger.
SS Flexible bellow.
Companion flanges for silencer & bellow
Exhaust silencer
The silencer pipe shall be taken out of the pump room/ DG room upto a height of 1.5 mtr. above the roof top and shall have asbestos rope wound around it.

COOLANT SYSTEM :

Engine water pump
Aluminum Radiator
Coolant additive concentrate

LUBRICATING SYSTEM :

Oil pan.
Engine mounted lube oil pump
Lube oil filter

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FUEL SYSTEM :

MICO fuel pump with Mechanical Governor.
12V DC solenoid coil

STARTING SYSTEM :

12V DC electric starter.
12V DC battery charging alternator.

SAFETY CONTROLS :

Low lube oil pressure trip.
High water temperature trip

ELECTRIC INSTRUMENT PANEL :

Key switch.
Lube oil pressure indication.
Water temperature indication.
Electric Hour meter.
Battery charging indication.

OTHERS :

Vibration damper
Flywheel with housing

B. ALTERNATOR :

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Synchronous alternator of 125 KVA rating, suitable for continuous operation at 1500 RPM generating 415 volts at 0.8 p.f.(lag), 50 Hz, 3 phase, 4 wire system. The alternator shall be Brushless type, self excited & self regulated through an AVR. The alternator will be suitable for tropical climate and shall generally confirm to IS: 4722. The salient features of the alternator shall be :-

- $\pm 15\%$ voltage regulation (maximum) in static conditions.
- IP: 23 protection with class 'H' insulation.
- Permanent lubricating bearing.
- Permissible overload of 10% for one hour in 12 hours of operation.

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C. CONTROL PANEL :

The standard control Panel shall be alternator mounted & fabricated from 14 SWG sheet and Powder Coated after seven tank treatment process. The panel shall be equipped with :-

- . One No.3 pole _____ Amp. MCCB with overload & short circuit protection.
- . Combined digital meter for indication of :-
 - . Current
 - . Voltage
 - . Frequency
- . Three Nos. current transformers where ever required.
- . Aluminum bus bars of suitable capacity with incoming & outgoing termination ends.
- . Indication lamps for 'Load On' and "Set Running".
- . Instrument fuses.

D. BASE FRAME :

Engine and alternator shall be mounted, coupled and aligned on a common channel iron fabricated Base Frame with pre-drilled holes.

E. BATTERY :

~~One~~ No. battery of 12V, 180 AH capacity in charged condition with its leads.

F. ACOUSTIC ENCLOSURE :

- a) The Acoustic enclosure shall be powder coated and fabricated out of 16 SWG CRCA MS sheet.
- b) The enclosure shall be of nut bolt type construction
- c) Powder coating shall be done after seven tank surface preparation process of sheet metal.
- d) The enclosure panel and doors shall have inside lining of FIRE-RETARDANT foam as acoustic material.

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- e) The enclosure should be provided with four doors for the engine and alternator for trouble free maintenance and day to day operation and cleanliness. One door shall have glass window for visibility of control panel.
- f) There shall be provision of lifting hook for convenient lifting of complete set i.e. along with enclosure, engine and alternator.
- g) The average sound level when measured at 1 metre distance from all four sides shall be less than 75dBA average or as per CPCB norms.
- h) The average stabilized hot air temperature rise within the enclosure shall be maintained within 10°C over and above ambient temperature.
- i) The fuel tank should be accommodated inside the enclosure.
- j) The enclosure shall be designed for installation inside the pump houses.
- k) Lockable doors shall be provided.
- l) Residential silencer shall be housed in the enclosure.
- m) Externally accessible emergency stop button shall be provided.
- n) The exhaust gases shall be taken out through a suitable flexible pipe to prevent any back pressure on the engine.
- o) The exhaust system and noise suppressor shall be provided with thermal insulation by using fire retardant/non igniting foam confirming to BIS 7888/BS 4735 to prevent excess heat radiation on the engine and safe for operator.
- p) Absorption type non resistance residential silencer insulated from inside with glass wool shall be provided to suppress exhaust noise from the engine.
- q) There should be arrangement for proper illumination inside the enclosure.
- r) To make the system vibration free, engine and alternator should be mounted on specifically designed channel iron base frame and anti-vibration pads.
- s) The contractor shall submit the certificate that the acoustic enclosure meets the norms specified by Central Pollution Control Board.
- t) Sound proofing of enclosure should be done with high quality rock wool confirming to IS : 8183 & IS: 3144
- u) The rock wool should be further covered with fiberglass cloth, perforated powder coated sheet, thickness 100mm and density 48kg./m³
- v) The battery should be provided in a PVC tray inside the enclosure.



G. FUEL TANK :

Fuel tank should be suitable to hold diesel for 8 hrs. running and fabricated from 14 SWG MS sheet inbuilt inside the enclosure complete with drain valve, air vent, inlet and outlet connections.

H. DOCUMENTATION :

1 set of following documents shall be provided with each set :-

- O & M Manual of Diesel Engine
- Spare parts catalogue of diesel engine.
- Test Certificate of diesel engine.
- Test certificate of Alternator
- Test Certificate of D.G. set

I. The tenderer shall supply tool kit required for operation and maintenance as detailed below :-

- a. Pipe wrench (18") - 1 No.
- b. Insulated plier (8") - 1 No.
- c. Double end ring spanner set of eight pieces
i.e. from 8 No. to 22 No. - 1 set
- d. Screw driver (6", 8", 10") - 3 Nos.
- e. Grease Gun (Hand operated) - 1 No.

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