Last date of submission of tender: 12.03.2013 upto 2.30 p.m.

Name of Work: SITC of 62.5 KVA Silent Type D.G. Set for CBSE HQ, bldg. Preet Vihar, Delhi-110092

(SH: SITC of 1 No. 62.5 KVA Silent Type DG Set with AMF Panel).

"Acceptable make"

SI. No.	Items		Approved Makes
1.	Diesel Engine	-	Cummins / Mitsubishi/ Caterpillar / MTU Germany/ KOEL/Greaves.
2.	Alternator	-	Kirloskar Electric/ NGEF/Stamford / Kirloskar Green/Crompton
3.	Mineral Wool	-	As per manufacturer practice.
4.	Metering	-	Automatic electric/Conzerb/Rishab/IMP
5.	Batteries	-	Exide/ Amaron/ Pulse Lite.
6.	Acoustic Enclosure	-	As per manufacturer practice.
7.	Antivibration mountings	-	Dunlop/Resistoflex/ As per OEM Supply
8.	Control/ protection relays and Contactors	-	G.E. Power/L & T/Siemens/BCH/PIC/ As per OEM Supply
9.	Audio/video Annunications	-	L & T / Minilec/ Conzerb/PIC.
10.	Energy management analyzer	-	Ducati / AE / Conzerb / L & T/Minilac.
11.	Change over switch	-	HPL/ L&T/ GE.
12.	CT's	-	AE/ Kappa/ Matrix.
13.	MCB	-	Legrand/ Hager/ Siemens/C&S.
14.	Push Button/ Indicating Light	-	Vaishno/ GE/ L&T/ BCH/
15.	Under Ground Cable/Control Cable	-	Gloaster/ Nicco/ Finolex/ CCI/Unversal/Polycab.
16.	AMF Panel.	-	Adelec / Tricolite / Milestone / Advance panel & switch gears Pvt. Ltd./ Sudhir Genset/Control & switch gears Pvt.Ltd.
17.	MS Pipe	-	Jindal (Hissar), Tata.

NAME OF WORK: **SITC of 62.5 KVA Silent Type D.G.Set for CBSE HQ, bldg. Preet Vihar, Delhi-110092**
(SH: SITC of 1 No. 62.5 KVA Silent Type DG Set with AMF Panel).

COMMERCIAL AND ADDITIONAL CONDITIONS

1.0 **GENERAL:-**

1.1 This specification covers manufacture, testing as may be necessary before dispatch, delivery at site, all preparatory work, assembly and installation, commissioning putting into operation and final testing of standby supply at New Delhi.

1.2 **LOCATION:-** The generating sets will be installed at CBSE HQ Bldg., Preet Vihar, Delhi-110092.

1.3 The work shall be executed as per CPWD General Specifications for Electrical Works Part – I (Internal-2005), Part-II (External-1995), Part-VII (DG Sets- 2006), as per relevant IS specifications as amended upto date and as per directions of Engineer-in-charge. These additional specifications are to be read in conjunction of with above and in case of variations, specifications given in this Additional conditions shall apply. However, nothing extra shall be paid on account of these additional specifications & conditions as the same are to be read along-with schedule of quantities for the work.

1.4 The tenderer should in his own interest visit the site and familiarizes himself with the site conditions before tendering.

1.5 No T & P shall be issued by the Department and nothing extra shall be paid on account of this.

2.0 **COMMERCIAL CONDITIONS:-**

2.1 Type of contracts:- The work awarded by this specification shall be treated as an indivisible works contract.

2.2 **MODE OF SUBMISSION OF TENDER:-**

2.2.1. Being Two-Bid tender, all eligibility documents & EMD of Rs. 30,000/- in the form of DD/BD payable in f/o the Secretary CBSE, Delhi must be placed in the Technical-Bid envelope. Tech-Bid & Price-Bid envelopes should be sealed & then placed in a bigger envelope superscribed as Tender for SITC of 62.5 KVA DG Set.

2.2.2 The tender is in two parts:

(a) Part I – Technical Bid.

(b) Part II – Price Bid.

2.2.3. Price Bids of only those firms who are pre-qualified by the competent authority shall be opened.

2.2.4 The date of opening of the sealed Price-Bids will be notified to all pre-qualified tenderers in advance. The technical part will have to be submitted by the tenderers complete with the following:

(i) Complete tender documents be downloaded from the CBSE Website www.cbse.nic.in & submitted duly signed in token of acceptance of all terms and conditions along with Price Bid. Prices should be indicated/filled only in "price bid" part and should be placed in separate sealed envelope clearly super-scribed "Price Bid". The tenderers will have to fill up their rates only in the price bid notified by the CBSE. Tenders in which the price bids are given in any other format are liable to be rejected.

(ii) Complete technical particulars of all equipment & materials as per list attached.

2.2.5 The tenderers are advised not to deviate from the technical specifications/ items, commercial terms and conditions of NIT like terms of payment, guarantee, arbitration clause, escalation etc.

2.2.6 The technical bid only, shall be opened on the due date and time, in the presence of tenderers or their authorized representatives.

2.2.7 Scrutiny /evaluation of the technical bid shall be done by the department in consultation with any agency as deemed necessary. In case it is found that the technical bid of a tenderer is not in line with NIT specifications, requirements and/or contains many deviations, the department reserves the right to reject the technical bid of such firm (S) without making any reference to the tenderer (S).

2.2.8 Necessary clarifications required by the department shall have to be furnished by the tenderer within the time given by the department for the same. The tenderer will have to depute his representative to discuss with the officer (S) of the department as and when so desired. In case, in the opinion of the department a tenderer is taking undue long time in furnishing the desired clarification, his bid will be rejected without making any reference.

2.2.9 After obtaining clarifications from all the tenderers, the department may modify the technical conditions/specifications, if required, and will intimate the same to the tenderers, whose technical bids are acceptable. At the same time, date and time of opening of price-bid will also be intimated. A tenderer will also not be allowed to withdraw or modify any condition at a time after the technical bids have been accepted and the decision to open the price bid has been taken by the department unless revised bid is allowed due to minor changes made during negotiations on technical- bid.

2.2.10. The price bid will be opened by a Committee in the presence of the interested representatives of the tenderers who wish to be present.

2.2.11. The department reserves the right to reject any or all the price bids and call for fresh prices/tenders as the case may be without assigning any reason.

3. **VALIDITY:-** Tenders shall be valid for acceptance for a period of 90 days from the date of opening price bid.

4. **TERMS OF PAYMENT:-**

4.1. 80% after inspection by department officers and dispatch of the stores and receipt of materials in good condition at site.

4.2. 10% on erection.

4.3. Balance 10% will be paid after testing commissioning & will be released after taking over by the department.

5. **DRAWING FOR APPROVAL ON AWARD OF THE WORK:-**

5.1 The contractor shall prepare & submit three sets of following drawings and get them approved from the Engineer-in-charge before the start of the work. The approval of drawings, however, does not absolve the contractor not to supply the equipments /materials as per agreement, if there is any contradiction between the approved drawings and agreement.

(a) Lay out drawings of the equipments to be installed including control cables, fuel/lube oil pipes and supports/structure for exhaust piping, chimney and bus ducts/cable trays.

(b) Drawings including section, showing the details of erection of entire equipments.

(c) Electrical wiring diagrams from engine-alternator set to electrical control panel, electrical control panel to essential LT board including the sizes and capacities of the various electrical/ control cables and equipments.

(d) Drawings of acoustic enclosure/Engine—Alternator set and electrical control panel.

(e) Drawings showing details of supports for pipes, chimney cable trays, ducts etc.

(f) Any other drawings relevant to the work.

6 **DRAWINGS/DOCUMENTS TO BE FURNISHED ON COMPLETION OF INSTALLATION:-**

Three sets of the following drawings shall be submitted by the contractor while handing over the installation to the department. Out of these three, one set shall be laminated on

a hard base for display in the DG set room/room where AMF panel is installed. One set shall be displayed in Junior Engineer's room. In addition, drawings will be given on Compact Disc (CD):-

(a) DG set installation drawings giving complete details of all the equipment, including their foundations.
(b) Line diagram and layout of all electrical control /AMF panels giving switchgear ratings and their disposition, cable feeder sizes and their layout.

(c) Control wiring drawings with all control components and sequence of operations to explain the operation of control circuits in AMF panel /PCC.

(b) Manufacturer's technical catalogues of all equipments and accessories.

(c) Operation and maintenance manual of all major equipments, detailing all adjustments, operation and maintenance procedure.

7.1. **SAFETY CODES AND LABOUR REGULATIONS:-**

(i) In respect of all labour employed directly or indirectly on the work for the performance of the contractor's part of work, the contractor at his own expense, will arrange for the safety provisions as per the statutory provisions, B.I.S. recommendations, factory act, workman's compensation act, & other relevant rules applicable at that time. Failure to provide such safety requirements would make the tenderer liable for penalty for 200/- for each violation. In addition the Engineer-in-charge, shall be at liberty to make arrangements and provide facilities as aforesaid and recover the cost from the contractor.

(ii) The contractor shall provide necessary barriers, warning signals and other safety measures while executing the work of DG Set installation, cables etc. or wherever necessary so as to avoid accident.

7.2. **WORKS TO BE ARRANGED BY THE DEPARTMENT:-**

Unless otherwise specified in the tender documents, the following works shall be arranged by the Department:

(i) Space for accommodating all the equipments and components involved in the work. However, watch and ward shall be responsibility of the contractor.

(ii) Power supply (single / three phase).

7.3 **WORKS TO BE DONE BY THE CONTRACTOR:-**

Unless otherwise mentioned in the tender documents, the following works shall be done by the contractor and therefore, their cost shall be deemed to be included in their tendered cost- whether specifically indicated in the schedule of work or not:-

(i) Foundations for equipments including vibration isolation spring/pads.

(ii) Making good all damages caused to the structure during installation and restoring the same to their original finish.

(iii) Minor building works necessary for installation of equipments, foundation trench for fuel line & cable, making of opening in walls or in floors and restoring them to their original condition /finish and necessary grouting etc., as required.

(iv) All supports for exhaust & water pipes, chimney, bus trunking (if included in scope of contract), cables, anti-vibration pads etc. as are necessary.

(v) All electrical work and neutral earthing, body earthing, required for engine & alternator, main board/ control panels, and control wiring including loop earthing, if specified in schedule of work.

(vi) All pipes, bus trunking and / or cable connections.

(vii) POL i.e. HSD oil and lub oil for diesel engine for testing & commissioning and for trial run as per conditions of the contract.

(viii) Painting of all exposed metal surfaces of equipments and components with appropriate colour.

8. **RATES:-**

8.1. The rates quoted by the tenderer, shall be firm and inclusive of all taxes (including works contract tax), duties and levies and all charges for packing, forwarding, insurance, freight and delivery, installation, testing, commissioning etc. at site including temporary constructional storage, risks, overhead charges, general liabilities/obligations etc.

8.2. The department is not liable to reimburse the octroi duty.

8.3 The contractor has to carry out routine and preventive maintenance as per manufacturer's standards for a **period of 12 months** from the date of handing over. However, all consumables (fuel/lube oil etc.) and spare parts including filters will be supplied by the department.

9.0. **POWER SUPPLY AND WATER SUPPLY:-**

9.1. **POWER SUPPLY:-**

(i) Unless otherwise specified, 3 phase, 415 volts, 50 Hz power supply shall be provided by the department to the contractor at one point for installation at site free of cost. Termination switchgear, however, shall be provided by the contractor. Further extension, if required, shall be done by the contractor.

(ii) The contractor shall not use the power supply for any other purpose than that for which it is intended for. No major fabrication work shall be done at site. Power shall be used only for welding/cutting works. The power supply shall be disconnected in case of such default and the contractor shall than have to arrange the required power supply at his own.

9.2. **WATER SUPPLY:-**

Water supply shall be made available to the contractor by the Department free of charge at one point.

10.0. **MACHINERY FOR ERECTION:-**

All tools and tackles required for unloading/handling of equipments and materials at site, their assembly, erection, testing and commissioning shall be the responsibility of the contractor.

11.0 **COMPLETENESS OF THE TENDER, SUBMISSION OF PROGRAMME, APPROVAL OF DRAWING AND COMMENCEMENT OF WORK:-**

(i) Completeness of the tender-

All sundry equipments, fittings, assemblies, accessories, hardware items, foundation bolts, supports and all other sundry items for proper assembly and installation of the various equipments and components of the work shall be deemed to have been included in the tender, irrespective of the fact that whether such items are specifically mentioned in tender documents or not.

(ii) Submission of programme -

Within Seven days from the date of receipt of the letter of acceptance, the successful ternderer shall submit his programme for submission of drawings, supply of equipment,

installation, testing, commissioning and handing over of the installation to the Engineer-in-charge. This programme shall be framed keeping in view the building progress.

(iii) Submission of Drawings-

The contractor shall submit the drawings to the Engineer-in-charge for approval before start of work.

(iv) Commencement of Work-

The contractor shall commence work as soon as the drawings submitted by him are approved.

12.0. **DISPATCH OF METERIALS TO SITE AND THEIR SAFE CUSTODY:-**

The contractor shall dispatch materials to site in consultation with the Engineer-in-charge. Suitable lockable storage accommodation shall be made available free of charge temporarily. Watch & ward, however, shall be the responsibility of contractor. Programme of dispatch of material shall be framed keeping in view the building progress. Safe custody of all equipment / items supplied by the contractor shall be the responsibility of the contractor till final taking over by the department.

13.0 **CO-ORDINATION WITH OTHER AGENCIES:-**

The contractor shall co-ordinate with all other agencies involved in the work so that the work of other agencies is not hampered due to delay in his work.

14.0 **INDEMNITY:-**

The successful tenderer shall at all times indemnify the department, consequent upon this works contract. The successful tenderer shall be liable, in accordance with the Indian Law and Regulations for any accident occurring due to any cause and the contractor shall be responsible for any accident of damage incurred or claims arising there from on the department during the period of erection, construction and putting into operation the equipments and ancillary equipment under the supervision of the successful tenderer in so far as the latter is responsible. The successful tenderer shall also provide all insurance including third party insurance as may be necessary to cover the risk. No extra payment would be made to the successful tenderer on account of the above.

15.0 **QUALITY OF MATERIALS AND WORKMANSHIP:-**

(i) The components of the installation shall be of such design so as to satisfactorily function under all conditions of operation.

(ii) The entire work of manufacture/ fabrication, assembly and installation shall confirm to sound engineering practice. The entire installation shall be such as to cause minimum transmission of noise and vibration to the building structure.

(iii) All equipments and materials to be used in work shall be manufactured in factories of good repute having excellent track record of quality manufacturing, performance and proper after sales service.

16.0. **CARE OF THE BUILDING:-**

Care shall be taken by the contractor during execution of the work to avoid damage to the building. He shall be responsible for repairing all such damages and restoring the same to the original finish at his cost. He shall also remove all unwanted and waste materials arising out of the installation from the site of work from time to time.

17.0. INSPECTION AND TESTING:-

17.1. The successful tenderer will arrange staff/fuel/POL for test run at his cost.

17.2.. **Inspection and testing of DG Sets**

(i) For testing, following procedure will be followed-
All major items/equipments i.e. engine & alternator in assembled condition, associated electrical control panel etc. shall be offered for inspection and testing at factory/ manufacturers works. The successful tenderer shall give a notice of minimum 7 days for carrying out such tests. The Engineer-in-charge/or his authorized representative may witness such inspection & testing at mutually agreed date. The cost of the representative's visit to the factory will be borne by the Department.

(ii) The department also reserves the right to inspect the fabrication job at factory and the successful tenderer has to make arrangements for the same.

(iii) DG set will be tested on load of unity power factor for the rated KW rating. During testing, each of the D G set's covered under scope of work, shall be operated for a period of 12 hours on the rated KW at DG set's KW rating including one hour on 10% overload after continuous run of the 12 hou` During testing all controls/ operations safeties will be checked and proper record will be maintained. Any defect/ abnormality noticed during testing shall be rectified. The testing will be declared successful only when no abnormality/ failure is noticed during the testing. The DG set will be cleared for dispatch to site only when the testing is declared successful by authorized representative/ Engineer-in-charge.

(iv) The requirement of testing of DG set at manufacturer's premises, in presence of representative of the department, can be dispensed with/waived off, keeping in view the exigency of works, with the prior approval of the Jt. Secy.(A&L). However, test certificates

of the particular DG set on full load shall be submitted at the time of delivery of DG set at site.

17.3. **TRIAL RUN / RUNNING-IN-PERIOD:-**

After successful testing of the DG set, a trial run at available load will be carried out for 120 hours or 15 days whichever is earlier. The DG set will be operated and a log book of all relevant parameters will be maintained during this period. The arrangement of staff for trial run/ running in period will be made by the successful tenderer. However, diesel shall be provided by department. The contractor will be free to carry out necessary adjustments. The DG set will be said to have successfully completed the trial run, if no break down or abnormal/unsatisfactory operation of any component of the entire installation included in the scope of work of the contract, occurs during this period. After this the DG set will be made available for beneficial use. After the DG set has operated without any major break down/ trouble, it shall be taken over by the department subject to guarantee clause of this contract. This date of taking over of the DG set, after trouble free operation during the trial run/running-in- period, shall be the date of acceptance/ taking over.

18.0. **SAFETY MEASURES:-**

All equipments shall incorporate suitable safety provisions to ensure safety of the operating personnel as per manufacturers' standard practice.

19.0 **STATUTORY CLEARANCE (S):-**

Approval/clearance of the complete installation shall be obtained by the contractor from CPCB/State Pollution Control Board/Local Bodies/Central Electricity Authority (CEA)/ other licensing authorities, wherever required. However, application shall be made by department and any statutory fee, as applicable, shall be paid by department directly to the Govt. authorities concerned.

20.0. **GUARANTEE:-**

All equipments shall be guaranteed, against unsatisfactory performance and/or break down due to defective design, workmanship or material, for a period of 12 months from the date of taking over the installation by the department. The equipments or components, or any part thereof, so found defective during guarantee period shall be forthwith repaired or replaced free of cost, to the satisfaction of the Engineer-in-charge. In case it is felt by the department that delay is being caused by the contractor in attending the defect/fault removed, the same will be got done by the department at the risk and cost of the contractor. The decision of the Engineer-in-charge in this regard shall be final taking over by the department.

Special Terms & Conditions

1. The Work has to be completed within 30 days from the seventh day of the work order.
2. In case of delay beyond the control of the contractor due to unforeseen circumstances or force majeure reasons, EOT shall be considered.
3. In case of delay without any valid reason penalty @ ½ % or 0.5 % per week shall be levied upto a maximum of 5%.
4. In case it is noticed that the firm is intentionally delaying the work for one reason or the other, the firm could be debarred for future works i/c forfeiture of the EMD.
5. In case of any extra item, the contractor shall seek prior permission in writing from the Engineer-incharge and submit analysis of rates.
6. The quantities are tentative and could be increased or decreased.
7. The material shall be got approved from the Engineer-incharge before utilization. Inferior/substandard material shall have to be removed from the site immediately. In case the contractor fails to remove the inferior/substandard material the Board reserves the right to dispose it off.
8. In case of slow progress/intentional delay by the contractor the work can be withdrawn/rescind in whole or part thereof and executed at the risk & cost of the defaulting contractor.
9. In case of any dispute, the arbitrator shall be appointed by the Chairman, CBSE and his decision shall be final as well as binding on both the parties.
10. Hindrance register shall be maintained by JE at site.
11. Instructions given in site order book would be followed immediately.

Signature of the Agency with
Complete address and seal

Telephone_____
Mobile No._____

NAME OF WORK: **SITC of 62.5 KVA Silent Type D.G.Set for CBSE HQ, bldg. Preet Vihar, Delhi-110092**
(SH: SITC of 1 No. 62.5 KVA Silent Type DG Set with AMF Panel).

TECHNICAL SPECIFICATION

1. **CLIMATIC AND SITE CONDITIONS:-**

Generating set is to be installed at Delhi and will be required to operated under the following climate conditions:-

(i)	Height above mean sea level	--	216 mt.
(ii)	Max. Temp.	--	48 degree C.
(iii)	Max. Humidity	--	90% RH
(iv)	Minimum Temp.	--	2 degree C.

2. **SCOPE OF WORKS:-** The detailed scope of supply, installation, testing and commissioning includes the following.

(i) AMF controlled silent type Diesel Generating set of 62.5 KVA capacity at 0.8 power factor developing 415 volts +/- 5%, 3 phase 4 wire system, required

(ii) Necessary set of piping required for lub. oil system, fuel system, circulating water system for radiator and exhaust piping.

(iii) Necessary flexible connections to be inserted in water circulation, lub, oil, fuel and exhaust piping system.

(iv) Necessary lead acid battery for starting including cable work.

(v) Necessary winterization system scheme.

(vi) Necessary set of foundation bolts and suitable vibration isolation mountings.

(vii) Necessary cable work between control panel and the alternator both power and control as per detailed specification.

(viii) Minor building work including cutting and making good, all clamps, supports grouting etc.

(ix) Necessary earthing, comprising of electrode system neutral earthing, earth bar and loop earthing etc. as per schedule.

3. **DIESEL ENGINES:-**

3.1. **ENGINE RATING:-**

The engine shall be multi cylinder, vertical, 4 stroke, water cooled, turbocharged diesel engine developing suitable BHP for giving a continuous output of 62.5 KVA at 0.8 P.F. at the load terminate of alternator exclusive of power requirements of auxiliaries at 1500 rpm under site conditions. The engine shall have 10% overload capacity for one hour after continuous run of 12 hours without exceeding temp. Rise limit with following accessories and as per BS 5514, BS 649, IS 10000 amended upto date.

(i) Fly wheel, dynamically balanced to suit flexible coupling with guards.

(ii) Necessary flexible coupling and guard for alternator and engine.

(iii) Air cleaner dry type.

(vi) corrosion inhibitor.

(v) Fuel service tank suitable for 12 hours continuous-operation of engine on full load with inlet, outlet connections, air vent folding tap, drain plug and floor mounting pedestals with hoses.

(vi) Radiator complete with hoses, fan, fan drive and guard.

(vii) Fuel pump.

(viii) Electronic governor.

(ix) Starter 24 V.D.C.

(x) Battery charging generator with voltage regulator 24 V.D.C.

(xi) Set of heavy duty starting batteries consisting of suitable nos. 12 V, 180 AH, 25 plate lead acid batteries connected in series with leads and terminals & battery stand.

(xii) Fuel Oil filter.

(xiii) Lub. Oil filter.

(xiv) Necessary pumps for cooling water, lub, oil, and winterization, engine shall be self primed type.

(xv) Necessary turbo chargers (exhaust gas driven.)

(xvi) Instrument, panel comprising of starting switch with key, lub, oil pressure gauge, water temperature gauges, hour meter with RPM indicator.

(xvii) Necessary control push pull etc. for emergency shut off and speed adjustment etc.

(xviii) Safety control against low lub. Oil pressure, high cooling water temperature, and over speed.

(xix) Exhaust silencer with necessary pipe work of reqd. size.

(xx) Necessary semi rotary pump for filling the daily service fuel tank.

3.1.1. **CYCLE VARIATION:-**

Cycle variation of set shall be within the time limit specified in B.S. 649.

3.1.2. **GOVERNOR:**

It shall be electronic and shall be a self contained unit capable of monitoring speed for load variation within limits specified in BS 649/1958 for class A.2 Governing.

3.1.3. **FREQUENCY VARIATION:-**

Frequency variation at constant load including no load shall remain within a band of 1% of rated frequency.

3.1.4. **FUEL SYSTEM:-**

It shall be gravity fed to engine driven fuel pump. A replaceable element of fuel filter shall be suitable located to permit easy servicing. The daily service tank shall be completed with necessary supports, gauges, connecting, tubing etc. both to the engine as well as for filling pump.

3.1.5. **LUB. OIL SYSTEM:-**

It shall be so designed that when the engine starts after a long shut down lub. Failure does not occur. Manual provision for filling and emptying the sump shall also be supplied.

3.1.6. **COOLING SYSTEM:-**

A closed circuit, self contained cooling system shall be provided comprising of radiator fan belt driven through engine.

NOTE:- The net output at the generator load terminals shall be not less than the 200 KVA at 0.8 capacity specified. The capacity of engine or engine and alternator as the case may be/ should be suitably increased.

3.1.7. **STARTING SYSTEM:-**

This shall comprise of necessary set of heavy duty batteries 24 V.D.C. or as suitable, starter motor axial type gear to match with the toothed ring on the fly wheel. A bimetallic relay protection to protect the starter motor from excessively long cranking runs suitable integrated with the engine protection system shall be included within the scope of work. Battery capacity shall be suitable for meeting the needs of the starting system as well as the

requirements of control panel, indications and auxiliaries etc. The scope shall cover all cabling, terminals including initial charging etc.

3.1.8. **BATTERY CHARGER:-**

The battery charger shall be suitable to charge required numbers of batteries of 12 volts-25 plates 180 AH capacity each at 24 volts complete with, transformer, rectifier, charge rate selector switch, indicating ammeter & voltmeter etc.

3.1.9. **SILENCERS**:-Residential silencer suitable for indoor mounting shall be provided.

3.1.10. **INSTRUMENTATION:-**

Engine instrumentation shall be centralized on an instrumentation panel. The instrument panel shall be resilient, mounted on the engine and shall have the following mounting:

(i) Cooling water temperature indicator.

(ii) Lub. Oil pressure indicator.

3.1.11. **ENGINE PROTECTION AND SWITCHING DEVICES:-**

Following protection and equipment shall be provided.

(i) Low lubricating oil pressure.

(ii) High cooling water temperature.

(iii) Over speed shut down.

(iv) Switching and protection equipment for engine auxiliaries such as motor, Jacket water heater, etc. as applicable shall be included.

3.1.12. **PIPING WORK:-**

All pipe lines and fittings and accessories required inside the engine room shall be provided. Thus supply shall include necessary flexible pipes in the exhaust, fuel, lub. Oil and water line as are necessary in view of the vibration isolation mountings that are to be used in the installation. Copper piping of adequate size shall be used for lub oil and M.S. pipes will permitted for the exhaust and water lines and fuel oil. The pipe work shall be inclusive of all fittings and accessories required in such as valves, bends, reducers, elbows flanges, flexible connections necessary hardware etc. The installation shall cover clamps, supports hangers necessary asbestos rope round the exhaust pipe etc. as are necessary for completing the work. Welding or brazing will be permitted in the installation. However, the work shall be sectionalized with flanged connections as are necessary for easy installation for purposes of maintenance of units as approved by the Engineer-in-charge. All M.S. pipe work shall be medium class seamless type for water lines and exhaust lines nothing extra shall be paid on this account.

3.1.13. **COMMON BED PLATE:-**

Engine and alternator shall be mounted on a common bed plate together with all ancillaries but excluding radiator assembly where it is an independent driven unit.

3.1.14. **EXHAUST PIPING:-**

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 hospital exhaust silencer shall be exclusive of exhaust piping item. The work includes necessary cladding of exhaust pipe work using 50 mm thick glass wool/ mineral wool/ rockwool, density not less than 46 kg/m^2 and aluminium cladding (0.80mm thick) for the complete portion.

3.1.15. **ANTI VIBRATION MOUNTING:-**

Suitable anti-vibration mounting duly approved by engineer-in-charge shall be employed for mounting the unit so as to prevent to the maximum extent feasible transmission of vibration to the structure. Isolation efficiency by the tenderer in terms of percentage assumed to be achieved by the system proposed by him may be indicated in the tender.

4. **ALTERNATOR:-**

Scope:- This section covers technical requirement of the alternator.

Synchronous Alternator:- Self excited, screen protected, self regulated, brush less alternator, Horizontal foot mounted in single/double bearing construction (specify one only) suitable for the following—

Rated Power Factor,	:	0.8 (lag)
Rated voltage	:	415 volts
Rated frequency	:	50 Hz
No. of phases	:	3
Enclosure	:	SPDP
Degree of protection	:	IP-23
Ventilation	:	Self ventilated air cooled
Ambient Temperature	:	48^0 C Maximum
Insulation Class	:	H
Temperature Rise	:	Within class H limits at rated load
Voltage Regulation	:	+/- 1%
Voltage Variation	:	+/- 5%
Overload duration/capacity	:	10% for one hour in every 12 hours of continuous use.
Frequency variation	:	As defined by the Engine Governor (+/-1%)
Excitation	:	Self
Type of AVR	:	Electronic

Type of Bearing and Lubrication Arrangement	:	Anti-friction bearings with Grease lubrication
Standard	:	IS- 4722/ BS 2613 as amended upto date.

4.1.0. **RATING:-**

The alternator shall be raised for a continuous output of 62.5 KVA at 0.8 P.F. lug. At 415 volts, 3 phase 50 cycles suitable for the 4 wire system exclusive of power requirement of auxiliaries. Winding are in be star connected and neutral shall be brought out through a separate terminal and will be solidly grounded. Speed of the alternator shall match the engine for a direct drive.

4.1.1 **EXCITATION:-**

Self excited, self regulated and static excitation facility. The exciter unit shall be mounted on the alternator assembly. The regulator shall be suitable for operation at high ambient temperature at site.

4.1.2. **STANDARDS:-**

The alternator shall be in accordance with the following standards as are applicable.

(i) IS: 4722/BS-2613/1970, the electrical performance of rotating electrical machine.

(ii) IS: 4889/BS-269, rules for method of declaring efficiency of electrical machine.

4.1.3. **PERFORMANCES:-**

Voltage regulation from no load to rated load shall be within a band of 5% of rated voltage. The frequency regulation from no load to full load shall be as defined by the engine governor. Voltage dip for any addition of load upto and including 90% load shall not exceed 20% of rated voltage and shall recover to and remain within the steady band in not more than 1.5 sec. Similarly the frequency shall recover to the state frequency band within 5 seconds. The windings shall not develop hot spots exceeding safe limits due to an imbalance of 25% between any two phases from no load to full load.

4.1.4. **ENCLOSURE:-**

Alternator enclosure of screen protected drip proof (SPDP) conforming to IP-23.

4.1.5. **TERMINAL BOXES:-**

Terminal box shall be suitable for PVC insulated PVC sheeted 1.1 KV grade cable confirming to IS: 1554. Suitable segregation shall be available for other cables such as excitation, control etc. The terminal box shall be suitable for withstanding the mechanical and thermal stresses developed due to any short circuit at the terminals.

4.1.6. **EARTH TERMINALS:-**

Two nos. each terminals on opposite side with vibration proof connections, nonferrous hardware etc. with galvanized plate and passivated washers of minimum size 12mm dia shall be provided.

4.1.7. **VOLTAGE REGULATION:-**

An automatic voltage regulator system compitable with excitation system described above shall be provided so as to furnish a performance as defined herein under all condition of load. A manual recostatic control or an equivalent alternator to vary to set point from 400V to 433 volts may be incorporated on the regulator panel or control panel.

4.1.8. **WINDING:-**

Class H insulation shall be used for stators/rotor windings.

5.0. **CONTROL PANEL:-**

5.1. **CONSTRUCTION:-**

5.1.1. **GENERAL FEATURES:-**

The control panel shall be fabricated out of sheet steel, totally enclosed, dust, damp and vermin proof free standing floor mounted type and front operated. It shall preferably be made into sections such that as far as feasible, there is no mixing of control power D.C. and A.C. functions in the same section and they are sufficiently segregated except where their bunching is necessary. Sheet steel used for fabrication shall not be less that 2mm thick. Hinged doors shall be provided at the rear, preferably double leaf, for each section for access to routine inspection from the rear etc. There is no objection to have single leaf hinged door in the front, all indication, lamps instruments meters etc. shall be flushed in the front. The degree of protection required will be IP 42 confirming to IS: 2147 .

5.1.2 **EARTHING ARRANGEMENT:-**

A frame earth bus made of 25mm × 5mm copper strip of suitable length & all sections shall be suitably bonded to the earth bus. The number of earth terminals shall be provided at the ends for connections to earth system. Earth terminals shall be vibration proof with all hardware of nonferrous or galvanized/plated and pasivated in case of ferrous hardware.

5.1.3. **GLAND PLATES:-**

Removable gland plates, sectionalized for receiving various cables that are to enter on the section and undrilled or with suitable knockout shall be provided at the bottom of the panel sections. Where heavy cables are to be brought and terminated suitable clamps shall also be incorporated to relieve the stress on the gland. Due to the weight and boards of the cable cover.

5.1.4. **TERMINAL BLOCK AND WIRINGS:-**

Terminal blocks of robust type and generally not less than 30 amps for DC and 15amp for AC capacity, 250 V/500V grade for DC upto 100V and 660V/1100V grade for AC and rest of the junctions shall be employed in such a manner so that they are freely accessible for maintenance. All control and small wiring from unit to unit inside the panel shall also be done with not less than 2.5 sq.mm copper conductor PVC insulated and 660 V grade. Suitable colour coding can be adopted. Wiring harness shall be neatly formed and run, preferably, function wise and as far as feasible segregated voltage wise. All ends shall be identified with ferrules at the ends.

5.1.5. **SPACE HEATERS:-**

Necessary space heather shall be provided inside the control panel to function on 230 V. A.C. supply to prevent condensation. The heaters shall be controlled by a separate control switch, thermostat and protective MCB.

5.1.6. **LABLES:-**

All internal components shall be provided with suitable identification labels suitable engraved. Labels shall be fixed on bottoms of indication lamps etc.

5.1.7. **PAINTING:-**

The entire panel shall be given proper treatment before the final powder coating of approved shade before assembly of various items.

5.1.8. **EQUIPMENT REQUIREMENTS:-**

Control panel would incorporate the following:-

5.1.8.1. For manual operation.

(i) One suitable scaled flush mounted AC ammeter CT operated with ammeter selector.

(ii) One suitable scaled flush mounted AC Voltmeter.

(iii) One AC voltmeter selector switch.

(iv) One set of indicating lamps-set "ON" load on mains failures due to load on after--

(v) Low lub. Oil pressure

(vi) High water temp.

(vii) Over speed.

(viii) One set of instrument fuses.

(ix) One Audible alarm with visual indication for low. Lub. oil pressure, high water temperature and over speed.

(x) One frequency meter.

(xi) One input/output terminal.

(xii) One set of cable gland on the incoming side.

(xiii) One engine start/stop push buttons.

(xiv) One emergency stop.

5.1.8.2. **For AMF Panel.**

(a) Control system equipments and components such as relays, contactors, circuit breakers etc. both for automatic operation on main failure and for manual operation.

(b) Equipment and components necessary for testing generating set of healthiness with test mode and with load on mains.

(c) Necessary instruments and accessories such as volt meters, ammeter, running hour No. of starts meter and energy management analyzer etc. push button control switches etc. as are required.

(d) Necessary engine/generating set shut down device due to the fault/abnormalities.

(e) Necessary visual audio alarm indication and annunciation facility as specified.

(f) Necessary battery charger.

(g) Necessary cable glands, terminations, lugs all internal wiring connections etc.

6.1.0. **AUTO MODE:-**

(a) A line voltage monitor shall monitor supply voltage on each phase. When the mains supply fails, completely or falls below set value (variable between 80% to 95% of normal value) on any phase, the monitor module shall initiate start up of diesel engine. To avoid Initiation due to momentary dips/system disturbance, a time delay adjustable between 0 to 5 seconds shall be incorporated in the start up initiation.

(b) A three attempt starting facility shall be provided 6 seconds ON, 5 seconds OFF, 6 seconds ON, 5 seconds OFF and 6 seconds ON if at the end of the third attempt the engine does not start, it shall be locked out of start and a master timer shall be provide for this function. Suitable adjustment timers are to be incorporated which will make it feasible to vary independently ON-OFF setting periods from 1-10 seconds. If alternator does not build up voltage after the first or second start as may be, further starting attempt will not be made until the starting facility is reset.

(c) Once the alternator has built up voltage, the alternator contactor or circuit breaker shall close connection load to the alternator. The load is now supplied by the alternator.

(d) When the main supply is restored and healthy as sensed by the line voltage monitor setting both for under voltage and unbalance, the system shall be mentioned by a

suitable timer which can be set between 1 minute to 10 minutes for the load to be transferred automatically to main supply.

(e) The diesel alternator set reverts to standby for next operation as per (a), (b) and (c) above.

(f) Alternator and mains ACB are invariably electrically interlocked so that unless one is off the other cannot be made on.

6.2.0. **MANUAL MODE:-**

(a) In a manual mode it shall be feasible to start up the generator set only by the operator pressing the start push button.

(b) Three attempt starting facility shall be operative for the start-up to function.

(c) Alternator circuit breaker closing and trip operations shall be also through operator only by pressing the appropriate button on the panel and closure shall be feasible only after alternator has built up full voltage. If the load is already on 'mains' pressure on "close" button shall be ineffective.

(d) Engine shut down, otherwise due to faults, shall be manual, by pressing a "stop" button.

6.3.0. **TEST MODE:-**

(a) When under "test" mode pressure of "test" button shall complete the start up sequence simulation and start the engine. The simulation will be that of main failure. Sequence 6.1.0 (a) and (b) shall be complete.

(b) ENGINE:-

(i) Low lub. Oil pressure shut down. This shall be in operative during start up and acceleration period.

(ii) High coolant (water) temp. shut down.

(iii) Engine overspeed shut down while this could be on the basis of a tacho generator of a centrifugal switch off a drive to governor, an independent shut down triping air for engine aspiration shall also be incorporated on the engine. Tenderer shall particularly make it clear in the tender if the later is being provided.

(c) ALTERNATOR:-

It shall have overload and earth leakage trip to the ACB in the event of overloads, short circuit and also earth leakage trip in the event of winding earth faults. An alternator over/voltage trip also shall be incorporated. Over load trip adjustable between 80% to 150%, E/L trip adjustable between 20% to 80%.

(d) All shut downs and trip shall have visual and audible alarms.

6.4. **MONITORING AND METERING FACILITIES:-**

(a) Necessary visual monitoring of mains, alternator and load voltage.

(b) Necessary visual monitoring of mains, load and alternator current through a set of current transformer.

(c) Necessary visual monitoring of mains, load and alternator supply frequency.

(d) A set of visual monitoring lamp indicator for:-

(i) Load on set.

(ii) Load on mains.

(iii) Set on test.

(iv) Set of lamp for engine, shut down for over speed, low lub. Oil pressure, and high coolant water temperature overload trip of alternator, earth leakage trip of alternator, engine lock out and failure to start etc. All these indicator shall have audio alarm and when energized shall be blinking and trigger audio alarm through a hooter until annunciated and accepted by the operator. When operator accepts the alarm, the hooter will be silenced and fault indicator will become steady until reset by operating a reset button.

(v) All instruments and meters shall be flush mounted.

6.5. **OPERATION DEVICES:-**

A set of operation devices shall be incorporated in the front of panel as under.

(a) MASTER ENGINE CONTROL SWITCH:-

This shall cut off in OFF position, D.C. control supply to entire panel thus preventing start up of engine due to any cause. however, battery charger, lamp test button for testing the healthiness of indication lamps, D.C. voltmeter / ammeter etc. shall be operative. It shall be feasible to lock the switch in off position for maintenance and shut down purposes.

(b) Operation selector switch OFF/AUTO/manual/test position.

(c) Voltmeter, frequency meter, selector switch.

(d) Ammeter with selector switch.

(e) Relays, contactors, timers, circuit breakers as required.

(f) Auto/manual statics selector.

(g) Necessary battery charger with boost/trickle selector D.C. voltmeter and D.C. Ammeter with lamp indications for healthy mains boost charge and float charges.

(h) Compatibility with 'Building Management System' *BMS): PLC compatibility and required nos. of input/output terminals points should be provided in the AMF control panel.

7.0. **TESTS ON GENERATING SETS:-**

Tests shall cover the following-

(a) Routine tests as per standards at manufactures works.

(b) Insulation resistance tests.

(c) Operation checks

(d) DG set will be tested on load of unity power factor for the rated KW rating. During testing, each of the D G set's covered under scope of work, shall be operated for a period of 12 hours on the rated KW at DG set's KW rating including one hour on 10% overload after continuous run of the 12 hour During testing all controls/ operations safeties will be checked and proper record will be maintained. Any defect/ abnormality noticed during testing shall be rectified. The testing will be declared successful only when no abnormality/ failure is noticed during the testing. The DG set will be cleared for dispatch to site only when the testing is declared successful by authorized representative/ Engineer-in-charge.

(e) Any other test that is necessary for check up of satisfactory performance of set.

8.0. **EARTHING SYSTEM:-**

The earthing shall be carried out as per CPWD specifications for electrical works 2005 (Internal as amended upto date and in accordance with the Indian Electricity Rules 1956 and Electricity ACT 1910 as amended upto date and as per the instructions of the Engineer-in-charge.

8.1. ACOUSTIC ENCLOSURE CONSTRUCTION DETAILS:-

The enclosure shall be fabricated using CRCA sheets of 14 SWG thickness and steel member The enclosure shall have suitable cross members to make it robust and sturdy. Rock wool /mineral wool of suitable thickness and density conforming to IS 8183 shall be used for acoustic insulation to reduce the sound level to 75 dBA from the original sound level of 120-130 dBA when measured at one meter distance from the D.G. set. The acoustic enclosure shall consist of following –

A. Acoustic Insulation:-

High density fireproof acoustic enclosure material i.e. resinbonded rock wool/mineral wool (100mm thick of 64 Kg 3 per Cu. M density) conforming to IS: 8183 is provided on all doors and roof to absorb noise. The insulation material used is fire retardant the insulation shall be covered with fiber glass cloth and shall be supported by perforated sheet. Sound attenuators /down stream silencers shall be provided at all openings for air inlet / outlet to facilitate free air flow but to absorb sound resulting in extremely low noise level. Detachable partitions shall be provided inside the enclosure to attain further noise attenuation of the engine.

B. Fabrication & Design :-

Fabrication and design of enclosure is to be got approved from the department, before actual fabrication. The enclosure shall be as per standard / design approved by engine manufacturer and shall also confirm to requirements of bye-laws. Emergency shut off switch is required outside the acoustic enclosure for switching off D.G. set in case of

emergency alongwith an audio signal alarm. At least three No. of twin luminare fittings with lamp & wiring are also to be installed in the acoustic enclosure.

C. Noise Suppressor:-

A suitable designed absorption type residential noise suppressor shall be provided which minimizes the exhaust noise of the engine.

D. Exhaust System:-

The exhaust gas shall be taken out through a specially designed flexible pipe, which prevents any back pressure on the engine.

E. Thermal Insulation:-

The exhaust system and noise suppressor shall be provided thermal insulation by using glass wool & covering it with aluminium sheet. This prevents it from radiating excess heat on the engine, make it safe for the operator and enhances asthetics.

F. Surface Treatment:-

The enclosure shall be surface treated and painting with high quality polyurethane epoxy paint with prior zinc oxide primer base, which make it weather proof and suitable for outdoor application. The paint shall be highly resistant to acids, alkalies, salt sprays, halogens, solvents, lubricants etc. and shall be very good dielectric properties and is resistant to abrasion and cracking.

G. Air Circulation & Ventilation System:-

A suitable forced air circulation and ventilation system designed to maintain safe operating temperatures inside the enclosure. Requisite air circulation for engine aspiration combustion and cooling shall be provided by means of exhaust fans and tube axial flow blower driven by a 3 phase squirrel cage induction motor. The temperature in side the enclosure should not increase beyond the permissible limit.

H. Vibration Insulation:-

The engine and alternator shall be mounted on anti-vibration mounting pads to eliminate engine vibration.

I. Hardware:-

Inlet and outlet for cable, draining of lub oil and diesel etc. shall be provided. Heavy duty bronze industrial pressure locking system shall be provided. The doors shall be gasketed with high quality EPDN gaskets to avoid leakage of sound.

J. The firm must furnish a copy norms as below:-

-- Exhaust norms of engine offered shall be minimum euro-II/ bharat-III

-- Acoustic Enclosure type test

The test must be carried out through a test lab., which is accredited by CPCB for this purpose.

K. The acoustic enclosure shall be as per standard design of D.G. set OEA/OEM and shall also confirm requirement of bye-laws of CPCB. Sound level when measured at a distance of 1mtr. Should not exceed 75db. Adequate illumination inside the enclosure shall be provided.

L. Payment of all taxes such as work contract tax and VAT (except service tax etc.) shall be the liability of the contractor and nothing shall be paid on this account however service tax is reimbursable on production of proof of payment and service tax for this work.

ANNEXURE- 'A'

SCHEDULE OF TECHNICAL PARTICULARS

(To be filled by Tenderer)

1. Engine — Remarks

    1. Make
    2. Model/ISS reference
    3. No. of cylinders
    4. Rated R.P.M.
    5. Method of starting
    6. Aspiration method
    7. BHP
    8. Specific fuel oil consumption (gm/BHP/Hr.)
    9. Lub. Oil recommended
    10. Lub. Oil pressure
    11. Qty. of lub. Oil required
    12. Time required for starting
    13. Lub. Oil sump capacity
    14. Nos. of exhaust pipe required
    15. Dia. Of exhaust pipe
    16. Whether meets CPCB norms for emission
    17. Fuel consumption of full load
    18. Any other data

2. Alternator

    1. Make
    2. Enclosure details
    3. Full load output in KVA
    4. Full load output in KW at 0.8 PF
    5. Designed over load capacity of max. ambient temp.
    6. Efficiency at full load
    7. Class of insulation of rotor
    8. Class of insulation stator

3. General

    1. Overall length of DG set LxWxH
    2. Overhall weight of DG set

3. Noise level of DG set at one meter with acoustic enclosure

4. AMF panels
    1. Make
    2. Type (Floor/Wall mounted)
    3. Overall dimensions (LxBXH)
    4. Finish

5. Generator Control Panel
    1. Make

6. Acoustic Enclosure
    1. Make
    2. Size
    3. Details of acoustic lining material & make

ANNEXURE – 'B'

LIST OF TECHNICAL LITERATURE & CATALOGUE AND ANY OTHER INFORMATION

The tenderer should furnished the list of technical literature & catalogues of the equipments offered.

S. No.	Data/Information	Remarks
1		
2		
3		
4		
5		
6		

Date:-

Signature of tenderer

Name of Work: SITC of 62.5 KVA Silent Type D.G. Set for CBSE HQ, bldg. Preet Vihar, Delhi-110092

(SH: SITC of 1 No. 62.5 KVA Silent Type DG Set with AMF Panel).

S.No.	Description of work	Qty.	Rate	Unit	Amount	Remarks
1(i)	Providing installation, Testing and commissioning of 'Silent Type Diesel Generating set along with Prime Power Rating of 62.5 KVA, 415 volts at 1500 RPM, 0.8 lagging power factor at 415 V suitable for 50 Hz, 3 Phase system & for 0.85 Load factor and consisting of the following:					
A)	Diesel Engine: Diesel engine 4 stroke water cooled, electric start, of suitable BHP at 1500 RPM suitable FOR ABOVE OUTPUT OF ALTERNATOR AT 40 Degree C, 50% RH & at 1000 Meter MSL and conforming to BS 5514, BS. 649, IS 10000, capable of taking 10% over loading for one hour in any period of 12 hours of continous operation. The engine will be fitted complete with all the required accessories.					
B)	Engine mounted instrument panel fitted with and having digital display for following: (i) Start-stop switch with key (ii) Water temperature indication (iii) Lubrication oil pressure indication (iv) Lubrication oil temperature indication (v) Battery Charging indication (vi) RPM indication (vii) Over speed Indication (viii) Low lub. Oil trip indication (ix) Engine Hours indication					

C)	Alternator Synchronous alternator rated at 62.5 KVA, 415 volts at 1500 RPM, 3 phase 50 Hz, AC supply with 0.8 lagging power factor at 40 Degree C, 50% RH & at 1000 meter MSL. The alternator shall be having SPDP enclosure, brushless, continous duty, self-excited and self-regulated through AVR conforming to IS: 4722/BS 2613 suitable for tropical conditions and with class-F/H insulation.	optional				
D)	Base Frame and Foundation: Both the engine and alternator shall be mounted on the base frame i/c vibration isolation arrangement (AVM pads) as per recommendations of manufacturer.					
E)	Fuel Tank: Daily service fuel tank of 800 liters capacity fabricated out of 2 mm thick M.S. sheet complete with all standard accessories and fuel piping between fuel tank and diesel engine with MS pipes 'C' class of suitable dia. Complete with valves, level indications and accessories as required as per specifications.					
F)	Exhaust System: Dry exhaust manifold with residential exhaust silencer, as per maufacturer specifications.					
G)	Starting System: 12V/ 24 V DC starting system comprising of starter motors: voltage regualtor and arrangement for initial excitation complete with suitable nos of batteries as required as per specifications of OEM/OEA.					

H)	Acoustic and weather proof enclosure with arrangement for fresh air, intake for cooling of the engine and alternator, extraction, discharging hot air in to the atmosphere as per specifications of OEM/OEA & strictly as per CPCB norms with valid CPCB approval.					
1 (ii)	Fabricating, Installing, Testing and commissioning of automatic mains failure control including manual by-pass panel, suitable for 62.5 KVA silent type DG set complete with relays, timers, set of CTs for metering and protection and energy analyzer to indicate currents, phase and line voltages, frequency, power factor, KWH, KVARH and provision for overload, short circuit, restricted earth fault, under frequency, control cabling form AMF panel to diesel engine and elsewhere, if required, all complete and inter locking including the following: A) 2 Nos, 500 Amp., TP & N switch Disconnector Fuse Unit along with contactors. B) Auto/Manual/Test/Off selector switch. C) 2 Nos, Over Voltage Relay, 2 Nos. Reverse Power Relay and 2 Nos. Under Voltage Relay. D) 1 Set of 3 Nos. of current transformers. E) Energy analyzer unit to indicate current voltage frequency power factor and KWH. F) Indicating lamps for load on mains and load on set. G) Fuse for instruments. H) Battery charger, complete with transformer/ rectifier, D.C. voltmeter and ammeter, selector switch for trickle, off and boost and current adjustment. I) Main supply failure monitor. J) Supply failure timer					

	K) Restoration timer L) Control unit with three impulse automatic engine start/ stop and failure to start lockout. M) Impulse counter with locking and reset facility. N) ON/OFF/ Control circuit switch with indicator. Audio/Video annunciaton for : (i) High water temperature (ii) Low lubricating oil pressure (iii) Engine over speed (iv) Engine fails to start (v) Full load/maximum load wiring	1 Set		Set		
2)	Supplying and laying of two nos. XLPE/ PVC insulated and PVC sheathed Al. conductor armoured power cable of 1.1 KV grade of size 3-1/2 x 95 sq.mm in the existing masonary open duct as required.	65 Mtr.		Mtr.		
3)	Supplying and making end termination brass compression gland and Al lugs for 2 nos., 3-1/2 x95 sqmm XLPE Al conductor cable of 1.1 KV grade etc. as required.	6 Set		Set		
4)	Providing and fixing 25 mm X 5 mm copper strip in 40 mm dia G.I. pipe from earth electrode including connection with brass nut, bolt, spring, washer excavation and re-filling etc. as required.	24 Mtr.		Mtr.		

Total

Add 3% Contingencies
Grand Total
Say Rs.

Signature of the Agency with
Complete address and seal
Telephone_____
Mobile No._____