NATIONAL CENTRE FOR BIOLOGICAL SCIENCES

Supply, Installation, Testing and Commissioning of 750kVA/600kW silent Diesel Generating set at NCBS Campus, GKVK Bangalore

TENDER DOCUMENTS

'TECHNICAL BID'

SCIENTIFIC ENGINEERING &MAINTENANCE DIVISION

2017

Tender Notice No: NCBS/Electrical/E-in-C/TR-140/2017

NATIONAL CENTRE FOR BIOLOGICAL SCIENCES
Tata Institute of Fundamental Research
GKVK Campus, Bellary Road, Bangalore - 560 065.
Phone: 23666001/02 Fax: 23636662

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Tender Notice Number: NCBS/Electrical/E-in-C/Tr- 140/2017

1. NAME OF THE WORK	:Supply, Installation, Testing and Commissioning of 750kVA/600kW Silent Diesel Generating set.
2. ESTIMATE VALUE PUT TO TENDER	: Rs.76.83 Lakhs
3. EARNEST MONEY DEPOSIT	: Rs. 1,53,660.00
4. COST OF TENDER DOCUMENT	: Rs. 1000/-
5. SALE PERIOD	: 26/12/2017 to 05/01/2018
6. TIME & DUE DATE OF RECEIPT	: Up to 14:00 Hrs On: 12/01/2018
7. TIME & DATE OF OPENING	: After 15:00 Hrs On: 12/01/2018

SOLD TO : _____RECEIPT NO:_____DATE:_____

FOR A SUM OF Rs. _____ TOWARDS THE COST OF TENDER DOCUMENT.

SIGNATURE OF ISSUING OFFICER:

DESIGNATION:

Important Note: All bidders are requested to attend the Pre bid meeting on 10/01/2018 at 11:30 Hrs. in the office of the Head-SE& M, NCBS.

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Name of the work : Supply, Installation, Testing and Commissioning of 750kVA/600kW Silent Diesel Generating set.

INDEX

Annexure 'A' – Notice Inviting Tender
(NIT No: NCBS/ Electrical/E-in-C/TR-140/2017

NATIONAL CENTRE FOR BIOLOGICAL SCIENCES
Tata Institute of Fundamental Research
GKVK Campus, Bellary Road, Bangalore - 560 065.
Phone: 23666001/02 Fax: 23636662

1. Sealed tenders are invited (in 2 Part system) by the Head (Scientific Engineering Services & Maintenance) at the above office from similar experienced Contractors for Supply, Installation, Testing and Commissioning of 750kVA/600kW Silent Diesel generating set.

Eligibility Criteria:

i) Experience of having successfully completed similar type of work of Supply and Installation of Diesel Generating sets nature works during the last 7 years ending last day of the month previous to the one in which applications are invited. The works completed up to previous day of last date of submission of tenders shall also be considered.

a) **Three similar completed works,** costing not less than the amount equal to Rs.30.73 Lakhs (40% of Estimated cost),

or

b) **Two similar completed works,** costing not less than the amount equal to Rs.46.09 Lakhs (60% of Estimated Cost),

or

c) **One similar completed work** of aggregate cost not less than the amount equal to Rs.61.46 Lakhs (80% of Estimated cost) of the estimated cost.

and

(ii) One Completed work of any nature (either part of (i) or a separate one) costing not less than the amount equal to Rs.30.73 Lakhs of the estimated cost put to tender with some Central/State Government Organization/Central Autonomous Body/Central Public Sector undertaking/State public sector undertaking/City development authority/Municipal corporation of city formed under any Act by Central/State government and published in central/state gazette..

(iii) Bidders/contractor must furnish documentary proof for the above along with the following mandatory information while making request for tender documents.

a. Company's profile, Local Office status, Bankers, Manpower and Experience.

b. Valid registration certificate

c. Goods Service tax registration certificates

d. **Current financial solvency certificate:** Solvency certificate should be of the amount equal to 40% of the estimated cost (i.e Rs. 30.73 lakhs)

e. **Annual turnover:** Average annual financial turn over should be at least 100% of the estimated cost (i.e Rs. 76.83 Lakhs) during the immediate last 3 consecutive financial year.

f. **Work completion Certificates:** Work completion certificates as per sr.nos. i (a or b or c) & ii should be submitted.

g. **Performance certificates:** Minimum two performance certificate from existing clients should be attached. Performance certificate should be of as per minimum eligibility criteria. Evaluation of the performance of contractors shall be done based on available documents along with technical bids. If required, the works executed by the bidders may be got inspected by the NIT approving authority.

i. Latest income tax clearance certificate

2. Evaluation Criteria: - As per enclosed Appendix – II

If any tenderer withdraws his tender after the price bid is opened within the validity - period or makes any modifications in the terms and conditions of the tender which are not acceptable to the Department, then the NCBS shall without prejudice to any / or other rights or remedy be at liberty to forfeit 50% (Fifty Percent) of the earnest money absolutely.

3. Completion period: The time allowed for carrying out the work shall be 3 Months from the date of work order.

4. Earnest Money Deposit (E.M.D.) of Rs. 1,53,660.00 in the form of Department's receipt / Demand Draft / Pay Order / Banker's cheque / Deposit at call receipt / Fixed Deposit Receipt (FDR), issued by a Scheduled Bank, drawn in favour of "National Centre for Biological Sciences" Bangalore.

NOTE: EMD in the form of Cheques will not be accepted.

4.1 Security Deposit & Performance Guarantee:

4.2.1: Performance Guarantee:

The successful tenderer shall deposit an amount equal to 5% of the tendered and accepted value of the work (without limit) as Performance Guarantee within 15 days from the date of award of contract in one of the following forms;

a) Government securities
b) Fixed Deposit Receipt (FDR) of a Scheduled Bank.
c) An irrevocable bank guarantee bond of any scheduled bank or the State Bank of India in the prescribed form given in Annexure.

4.2.2: Security Deposit:

A sum @ 2.5% of the gross amount of the bill shall be deducted from each running bill as well as final bill of the contractor. Such deductions shall be made unless the contractor has deposited the amount of security at the rate mentioned in cash or Government securities or Fixed Deposit Receipts.

This is addition to the performance guarantee that the contractor is required to deposit as para 4.2.1.

Security Deposit can be released against bank guarantee issued by a scheduled bank on its accumulation to a minimum amount of Rs. 5 Lakhs subject to the condition that amount of any bank guarantee except last one, shall not be less than Rs. 5 lakhs.

The Bank Guarantee submitted against Security Deposit shall initially be valid up to the stipulated date of completion of the work plus maintenance period as defined under clause 17 of GCC which shall be extended further time to time depending upon extension of contract granted under provisions of clause 2 and clause 5.

Security Deposit will be released only after the completion of the defects liability period of 24 months after the date of completion of the work.

5. Acceptance of Tender: The acceptance of the tender will rest with the Centre Director, NCBS who does not bind himself to accept the lowest or any other tender. No reasons will be furnished for the acceptance or rejection of any tender.

6. Condition for tender submission:

The tenderer shall give a list of officials both Gazetted and non-gazetted employees in NCBS, who are related to him. The contractor shall not be permitted to tender for works in the Department (responsible for award and execution of contracts) in which his near relative is posted as equivalent to Accounts Officer or as an officer in the capacity of grades Scientific Officer / "C" and above. He shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relative to any gazetted officer in the Department of Atomic Energy. Any breach of this condition by the contractor would render him liable to be barred from tendering in this Department.

No Engineer of Gazetted rank or other Gazetted Officer employed in Engineering or Administrative duties in an Engineering Department of the Government of India is allowed to work as a contractor for a period of two years after his retirement from Government Services, without the previous permission of the Government of India in writing. This contract is liable to be cancelled if either the contractor or any of his employees is found at any time to be such a person who had not obtained the permission of the Government of India as aforesaid before submission of the tender or engagement in the contractor's service.

7. Site visit by the tenderer before tendering: Tenderers are advised to inspect and examine the site and its surroundings and satisfy themselves before submitting their tenders as to the location of DG set to be installed. Nature of the site, the means of access to the site, and in general shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their tender. A tenderer shall be deemed to have full knowledge of the site whether he inspects it or not and no extra charges consequent on any misunderstanding or otherwise shall be allowed.

8. **Tenderer's responsibilities:** The tenderer shall be responsible for arranging and maintaining at his own cost all materials, tools & plants and all other services required for executing the work unless otherwise specifically provided for in the contract documents. Submission of a tender by a tenderer implies that he has read this notice & all other contract documents, and has made himself aware of the scope & specifications of the work to be done and local conditions and factors having a bearing on the execution of the work.

9. **Tender documents & signing of contract:** The Notice Inviting Tender shall form a part of the contract document. The successful tenderer / contractor, on acceptance of his tender by the Accepting Authority, shall, within 15 days from the stipulated date of start of the work, sign the contract consisting of : The Notice Inviting Tender, all the documents including all conditions, specifications and drawings, if any, forms the tender as issued at the time of invitation of tender and acceptance thereof together with any correspondence leading thereto.

10. **Canvassing, either** directly or indirectly, in connection with the tenders is strictly prohibited and the tenders submitted by the contractors who resort to canvassing will be liable to rejection.

11. Any tender which does not fulfill any of the prescribed conditions will be liable for rejection.

12. NCBS reserve the right to alter the scope/ or reduce quantum of work before issue of work order and the **Tenderer** shall not have any claim what so ever on this account.

13. Rates quoted by the Contractor in Item rate Tender in figures and words shall be accurately filled in so that there is no discrepancy in the rates written in figures and words. However, if any discrepancy is found, the rates which correspond with the amount worked out by the Contractor shall be taken as correct.

14. If the amount of an item is not worked out be the Contractor or if it does not correspond with the rate written either in figures or words, then the rate quoted by the Contractor in words shall be taken as correct.

15. Where the rates quoted by the Contractor in figures and in words tally but the amount is not worked out correctly the rate quoted by the Contractor will be taken as correct and not the amount.

16. In case rates are quoted only in words or only in figures, then the rate quoted will be considered and amount will be worked out accordingly.

17. In the event no rate has been quoted for any item / items, leaving space both in figure(s), word(s) and amount blank, it will be presumed that the contractor has included the cost of this / these item(s) in other items and rate for such item(s) will be considered as zero and will be required to be executed accordingly.

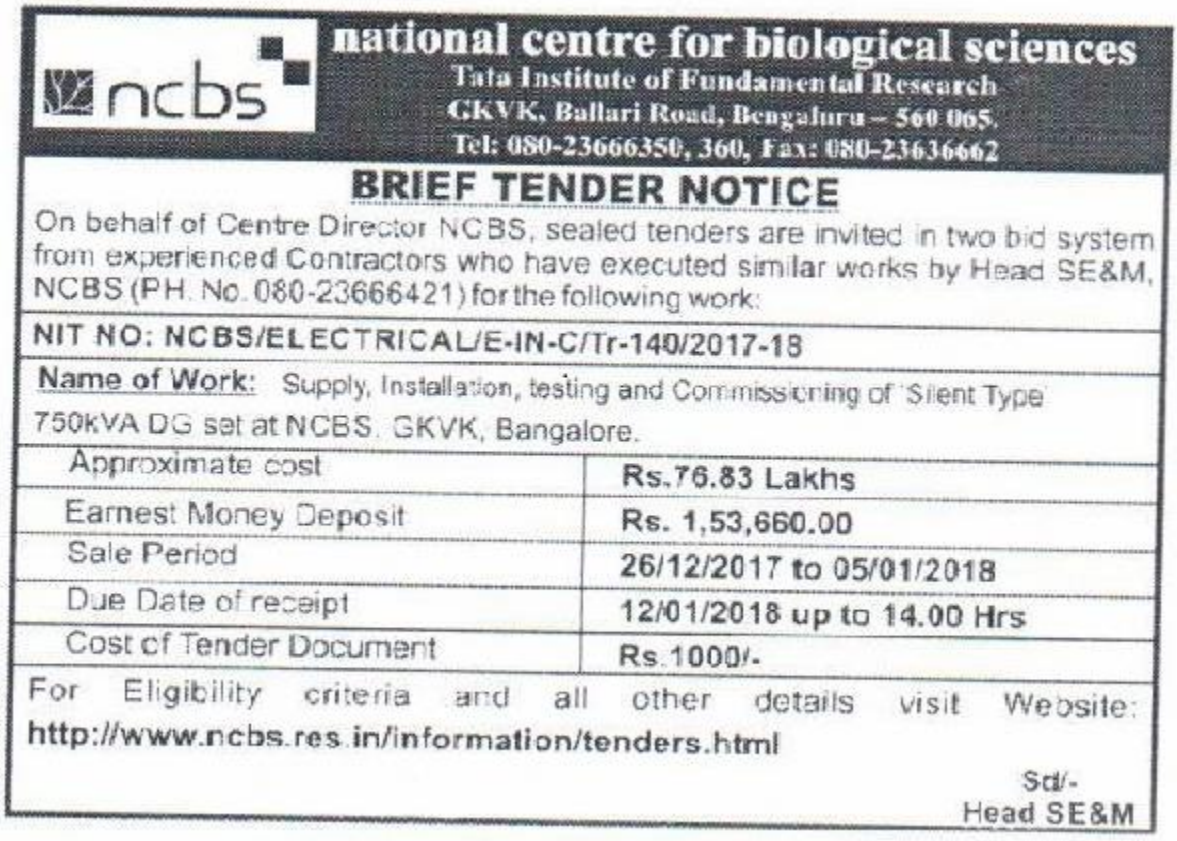
Note:

Issue of tender documents on the basis of the documentary eligibility alone will not make a tenderer eligible for participating in the bidding. The documents furnished by the tenderers will be subjected to verification subsequently by department. If found not meeting the requirement, such offers will be rejected.

NIT NO: NCBS/Electrical/E-in-C/ TR-140/2017

TECHNICAL BID

PRESS NOTIFICATION



national centre for biological sciences
Tata Institute of Fundamental Research
GKVK, Ballari Road, Bengaluru – 560 065.
Tel: 080-23666350, 360, Fax: 080-23636662

BRIEF TENDER NOTICE

On behalf of Centre Director NCBS, sealed tenders are invited in two bid system from experienced Contractors who have executed similar works by Head SE&M, NCBS (PH. No. 080-23666421) for the following work:

NIT NO: NCBS/ELECTRICAL/E-IN-C/Tr-140/2017-18

Name of Work: Supply, Installation, testing and Commissioning of 'Silent Type' 750kVA DG set at NCBS, GKVK, Bangalore.

Approximate cost	**Rs.76.83 Lakhs**
Earnest Money Deposit	**Rs. 1,53,660.00**
Sale Period	**26/12/2017 to 05/01/2018**
Due Date of receipt	**12/01/2018 up to 14.00 Hrs**
Cost of Tender Document	**Rs.1000/-**

For Eligibility criteria and all other details visit Website: **http://www.ncbs.res.in/information/tenders.html**

Sd/-
Head SE&M

Annexure 'B'

COMMERICIAL 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 in to operation of DG sets.

1.2 **Location**

The DG set will be installed at National Centre for Biological Sciences (NCBS) Campus, GKVK, Bellary road, Bangalore.

1.3 The work shall be executed as per specification and CPWD General specifications for Electrical works (Part VII DG Sets -2013), as per relevant IS and General Condition of Contract and as per the directions of Engineer-in-Charge. These additional specifications are to be read in conjunction with the 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 of work.

1.4 The tenderer should in his own interest visit the site and familiarize 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 contract**

The work to be awarded by this tender shall be treated as indivisible work contract.

2.2 **Submission and Opening of Tenders**

2.2.1 The tender is in two parts:

(a) Part-I : Technical and Commercial Bid

(b) Part-II : Price Bid

2.2.2 Tender documents consisting of Part-I and Part-II (i.e Technical-cum-commercial bid and Price bid) will be issued against application accompanied with the earnest money in prescribed format to only eligible contractors and who are pre-qualified by the competent authority.

2.2.3 The sale period : 26/12/2017 to 05/01/2018

Time and due date of receipt : Up to 14:00 Hrs On: 12/01/2018

Time and date of opening technical bid : after 15.00 hrs on 12/01/2018

The Technical-cum-commercial part will have to be submitted by the tenderers complete with the following:

Complete tender documents (Part-I), as purchase from the NCBS or downloaded from CPPP website including the schedule of work (without indicating the price) duly signed in token of acceptance of all terms and conditions along with Part-II(Price Bid). Prices should be indicated /filled only in "Price Bid" part and should be placed in separate sealed envelope clearly superscribed "Price Bid". The tenderers will have to fill up their rates only in the price bid issued by the Department. Tenders in which the price bids are given in any other format are liable to be rejected. The abstract of cost will be required to fill in. Complete technical particulars of all equipment & materials as per list attached.

2.2.4 The tenderes 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,

2.2.5 The part-I of the tender documents i.e Technical-cum-commercial bid only, shall be opened on the 12/01/2018 at 15.00 hrs, in the presence of tenderers or their authorised representatives.

2.2.6 Scrutiny/ evaluation of the Technical-cum-commercial bid shall be done by the department. In case it is found that the Technical- cum-Commercial bid of a tenderer is not in line with the NIT specifications, requirements and / or contains many deviations, the department reserves right to reject the technical bid of such firm(s) without making any reference to the tenderer (s).

2.2.7 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 clarifications, his bid will be rejected without making any reference.

2.2.8 After obtaining clarifications from all the tenderers, the department may modify the technical & commercial conditions / specifications if required, and will intimate the same to the tenderers, whose technical-cum-commercial 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 bids has been taken by the department unless revised bid is allowed due to measure changes made during negotiations on technical bid.

2.2.9 The Part-II of the tender i.e price bid will be opened by the Head SE&M in the presence of the interested representative of the tenderers who wish to present.

2.2.10 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.

2.2.11 Bids Validity

Bids shall be valid for 90 days from the date of opening of price bids.

2.2.12 Completion of period

The completion period indicated in the tender documents is for the entire work of planning, designing, supplying, installation, testing, commissioning and handing over of the entire job to the satisfaction of the Engineer-in-charge.

Cover –I shall contain the following:

a. EMD as specified above in the form of Demand draft of a Scheduled Bank guaranteed by the Reserve Bank of India, in favour of National Center for Biological Sciences, TIFR, Bangalore – 65. No other mode of payment for EMD be accepted.
b. Entire tender document should be duly signed & sealed in every page by the contractor, along with technical information. Any deviations from the tender conditions, specifications, makes etc in Annexure – D.
c. Reference of similar completed & ongoing works.
d. Confirming that “Price-Bid” is completely filled and kept in price bid.
e. Technical catalogs and drawings

Cover II – Shall contain the following

"Price bid" completely filled as per given format and should be placed in separate sealed envelope clearly superscribed "Price Bid".

If clarifications are sought by the contractor during the bidding period, the same should be in writing. Both the clarifications from the tenderer and the response to the clarifications from **NCBS** should be in writing and all such correspondences should be enclosed along with **COVER-I**.

Director, NCBS does not bind himself to accept the lowest or any other tender, and reserves the authority to reject any or all the tenders or to allot parts of the works to different agencies without assigning any reason thereof.

Pre-Bid meeting:

All bidders are requested to attend the Pre-Bid meeting on 10/01/2018 at 11.30hrs, in the office of Head SE&M, NCBS. It is important for the vendor to attend the pre-bid meeting to attend the site conditions and actual requirements.

Annexure 'C'

Technical specification

Name of the work: Supply, Installation, Testing and Commissioning of 'Silent Type' Diesel Generating set alongwith having Prime Power Rating of 750kVA, 415 volts at 1500 RPM, 0.8 lagging power factor at 415 V suitable for 50 Hz, 3 phase, 4 wire system & for 0.85 Load Factor and consisting of the followings:

A. Technical Specification

1.0 Diesel Generator Set Specification:

Duty	: Prime
Power Rating kVA / kW	: 750/600
No. of Phases	: 3 phase, 4 wire
Output Voltage and Frequency	: 415 V, 50 Hz
Power Factor	: 0.8 (lagging)
Speed	:1500 rpm

2.0 Prime Mover conforming to ISO 8528 specifications;

2.1 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 after 12 hours of continuous operation. The engine will be fitted complete with all the required accessories.

The engine shall be capable for delivering specified Prime Power rating at variable loads for PF of 0.8 lag with 10% overload available in excess of specified output for one hour in every 12 hours. The average load factor of the engine over period of 24 hours shall be 0.85 (85%) for prime power output

The engine shall conform to IS:10000/ ISO 3046/ BS:649/ BS 5514 amended up to date.

2.2 Necessary certificate indicating the compliance of the above capacity requirement for the engine model so selected along with compliance of Noise and Emission norms as per latest CPCB guidelines for DG set, should be furnished from the manufacturers along with the technical bid. However manufacturers shall furnish certificate that the Engine for the DG set complies with the CPCB Emission norms

2.3 The engine shall be fitted with following accessories subject to the design of the manufacturer:

(i) Dynamically balanced Fly wheel

(ii) Necessary flexible coupling and guard for alternator and engine (applicable only for double bearing alternator)

(iii) Air cleaner (dry/ oil bath type) as per manufacturer standard

(iv) A Electronic governor to maintain engine speed at all conditions of load.

(v) Daily fuel service tank of minimum capacity of 900ltrs, fabricated from M.S. sheet with inlet, outlet connections air vent tap, drain plug and level indicator (gauge) M.S. fuel piping from tank to engine with valves, unions, reducers, flexible hose connection and floor mounting pedestals, twin fuel filters and fuel injectors. The location of the tank shall depend on standard manufacturers design& site condition.

(vi) Dry exhaust manifold with suitable exhaust residential grade silencer to reduce the noise level.

(vii) Suitable self-starter for 12 V/ 24 V DC.

(viii) Battery charging alternator unit and voltage regulator, suitable for starting batteries, battery racks with interconnecting leads and terminals.

(ix) Necessary gear driven oil pump for lubricating oil, priming of engine bearing as well as fuel systems as per manufacturer recommendations.

(x) Naturally aspirated/ turbo charger (as per manufacturer standard)

(xi) Lubrication oil cooler

(xii) Lubrication oil filters with replaceable elements

(xiii) Crank case heater as per manufacturer recommendations

(xiv) Fuel injection: Engine should have suitable fuel injection system in order to achieve low fuel consumption

(xv) Fuel control solenoid

(xvi) Fuel pump with engine speed adjustment

(xvii) Engine Control Panel: fitted and having digital display for following:

(a) Start/stop key switch. (f) Battery charging indication

(b) Lube oil pressure indication
(c) Water temp. indication
(d) RPM indication
(e) Engine Hours indications
(g) Low lub. Oil trip indication
(h) High water temp. indication
(i) Over speed indication.
(j) Oil temperature indication.

(xviii) All moving parts of the engine shall be mechanically guarded in such a manner that a human finger cannot touch any moving part.

(xix) Radiator/ Heat Exchanger System/ Remote Radiator(delete whichever is not applicable)

(xx) Any other item not included/ specified but is a standard design of the manufacturer

2.4 Governor:

The engine shall be having Electronic governor as per ISO 3046/BS 5514 and suitable for AMF operating with Auto synchronizing, load sharing, load bearing, load dependent starting etc. using with digital controllers, relays & control modules.

2.5 Frequency Variation:

The engine speed shall be so maintained that frequency variation at constant load including no load shall remain within a band of 1% of rated frequency. i.e from no load to full load is 1%.

2.6 Fuel System:

It shall be fed through engine driven fuel pump. A replaceable element of fuel filter shall be suitably located to permit easy servicing. The daily service tank shall be complete with necessary supports, gauges, connecting pipe work etc. In case of Top Mounted tanks, non return valves are must in fuel supply and return line of specified value. Pipe sealant should be used for sealing for all connections. No Teflon tape to be used. If piping length is more than 10 meters, detail engineering is required in consultation with OEM/ Manufacturers.

2.7 Lubricating Oil System:

It shall be so designed that when the engine starts after a long shut down lubrication failure does not occur. Necessary priming pump for the lub. oil circuit as per

recommendation of manufacturer shall be installed, to keep bearings primed. This pump shall be normally automatically operative on AC/ DC supply available with the set.

2.8 Starting System:

This shall comprise of necessary set of heavy duty batteries 12V/ 24V DC (as per manufacturer standard), and suitable starter motors, axial type gear to match with the toothed ring on the
Fly wheel. A timer in the control panel to protect the starter motor from excessively long cranking runs shall be suitably integrated with the engine protection system and shall be included within the scope of the work. Battery capacity shall be suitable for meeting the needs of starting system (as three attempt starting), as well as the requirements of control panel, indications and auxiliaries such as priming pump as applicable etc. The scope shall cover all cabling, terminals, including initial charging etc. The system shall be capable of starting the DG set within 20-30 sec., even in winter condition with an ambient temperature down to 0°C.

2.9 Battery Charger:

The battery charger shall be suitable to charge required numbers of batteries at 12V/ 24 volts complete with, transformer, rectifier, charge rate selector switch, indicating ammeter & voltmeter etc. Connections between the battery charger & batteries shall be provided with suitable copper leads with lugs etc.

2.10 Piping Work:

All pipe lines and fittings and accessories requirement inside the room/ enclosure and outside for exhaust piping shall be provided by the contractor. This shall include necessary flexible pieces in the exhaust, fuel, lub. oil and water lines as are necessary in view of the vibration isolation requirement in the installation. Piping of adequate size shall be used for lub. oil of the material as per manufacturer standard. However, only M.S. pipes for the exhaust shall be used. For fuel lines within the acoustic enclosure, PVC braided pipe as per manufacturer recommendations can be used. However, for fuel lines outside the acoustics enclosure only MS pipe be used.The pipe work shall be inclusive of all fittings and accessories required such as bends, reducers, elbows, flanges, flexible connections, necessary hardware etc. The installation shall cover clamps, supports, hangers etc. as are necessary for completing the work. However, the work shall be sectionalized with flanged connections as are necessary for easy isolation for purposes for maintenance of unit as approved by Engineer-in-charge.

2.11 Common Bed Plate:

Engine and alternator shall be directly coupled or coupled by means of flexoplate/ flexible coupling as per manufacturer standard design and both units shall be

mounted on a common bed plate together with all auxiliaries to ensure perfect alignment of engine and alternator with minimum vibrations. The base channel frame shall be suitable for installation on suitable anti-vibration mounting system.

2.12 Exhaust System:

2.12.1 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 connectionsup to exhaust silencer shall be exclusive of exhaust piping item. The work include necessary cladding of exhaust pipe work using 50 mm thick Loosely bound resin (LBR) mattress/ mineral wool/ Rockwool, density not less than 120 kg/$m^3$and aluminium cladding (0.6 mm thick) for the complete portion. The exhaust pipe work includes necessary supports, foundation etc. to avoid any load & stress on turbo charger / exhaust piping. The exhaust pipe shall be run on freely supported frame work duly clamped/supported on independent structure for which, the design and Drawing for such structure shall be got approved from the Engineer-in-charge.

(a) Exhaust system should create minimum back pressure.

(b) Number of bends should be kept minimum and smooth bends should be used to minimize back pressure.

(c) Pipe sleeve of larger dia. should be used while passing the pipe through concrete wall & gap should be filled with felt lining.

(d) Exhaust piping inside the Acoustic Enclosure/ Genset room should be lagged with asbestos rope along with aluminum sheet cladding / insulated to avoid heat input to the room.

(e) Exhaust flexible shall have it's free length when it is installed.

(f) The exhaust outlet should be in the direction of prevailing winds and should not allow exhaust gases to enter air inlet/ windows etc.

(g) When 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.

(h) When tail end is vertical, there should be rain trap to avoid rain water entry. If rain cap is used, the distance between exhaust pipe and rain cap should behigher than diameter of pipe. Horizontal run of exhaust piping should slope downwards away

from engine to the condensate trap. Silencer should be installed with drain plug at bottom.

(i) Care should be taken to ensure that no carbon particles emitted due to exhaust leakage enters and deposits on alternator windings and on open connections.

(j) Lightning arrester shall be fixed above the exhaust top and it shall be connected to earth pit.

(k) Aviation lamp should be installed at above the exhaust top with view of 360 degree and control shall be provided in the plant room as required by Engr-in-charge.

2.12.2: **Optimum Silencer Location:**

Location of the silencer in exhaust system has very definite influence on both reduction of noise and back pressure imposed on the system. The preferred silencer locations are given in the table below, where L is length of the total exhaust system measured from exhaust manifold in meters. Please note that locating the silencer as per optimum silencer location is not mandatory. For high rise buildings, suitable arrangements may have to be provided in consultation with acoustics engineer.

Optimum Location of Silencer (In meters)		
	In-Line Engine	'V' Engine
Best	2L/5	(4L-1.5)/5
Second best	4L/5	(2L-4.5)/5
Worst location of silencer	L/5 or 3L/5 or at tail end or exhaust piping	(3L-10)/5 or at the tail end of exhaust piping

2.12.2: **Exhaust Stack Height :**

In order to dispose exhaust above building height, minimum exhaust stack height should be as follow:-

a) For Dg set up to 1000 kVA:-

$H = h + 0.2 \times \sqrt{kVA}$

Where H = height of exhaust stack, h= height of building

Care should be taken to ensure that no carbon particles emitted due to exhaust leakage enters and deposits on alternator windings and on open connections.

Support to Exhaust Piping:

Exhaust piping should be supported in such manner that load of exhaust piping is not exerted to turbocharger.

3.0 Alternator Specification

3.1 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
Rated voltage	: 415 volts
Rated frequency	: 50 Hz
No. of Phases	: 3 phase, 4 wire
Enclosure	: SPDP
Degree of protection	: IP-23
Ventilation	: Self ventilated air cooled
Ambient Temperature	: 40° C Maximum
Insulation Class	: F/H
Temperature Rise	: Within class F/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 excitation
Type of AVR	: Electronic
Type of Bearing and	: Anti-friction bearings with Grease lubrication Lubrication arrangement
Standard	: IS 4722 & IEC:34 as amended upto date.

3.2 Alternator should be able to deliver output rating at actual site conditions.

3.3 The alternator shall be fitted with suitable Nos. Resistance Temperature Device (RTD) & Bearing Temperature Device (BTD) alongwith space heaters. The terminal of space heaters will be wired to terminal box and the temperature scanner shall be provided in control panel for scanning the winding and bearing temperature.

3.4 Excitation:

The alternator shall be brushless type and shall be self excited, self-regulated having static excitation facility. The exciter unit be mounted on the control panel or on the alternator assembly. The rectifier shall be suitable for operation at high ambient temperature at site.

3.5 Automatic Voltage Regulators (AVR)

In order to maintain output terminal voltage constant within the regulation limits i.e. +/- 1%, Automatic voltage regulator unit shall be provided as per standard practice of manufacturer. Also it shall be compatible for auto synchronization, hence electronic AVR is required.

3.6 Fault tripping

In the event of any fault e.g. over voltage/ high bearing temperature/ high winding temperature or an external fault, the AVR shall remove the excitation voltage to the alternator. An emergency trip shall also be provided.

3.7 Standards

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

i) IS 4722/BS 2613 : 1970. The performance of rotating electrical machine
ii) IS 4889/ BS 269 rules for method of declaring efficiency of electrical machine

3.8 Performance:

Voltage dip shall not exceed 20% of the rated voltage for any step load or transient load as per ISO 8528 (Part-1). The winding shall not develop hot spots exceeding safe limits due to imbalance of 20% between any two phases from no load to full load.

The generator shall preferably be capable of withstanding a current equal to 1.5 times the rated current for a period of not more than 15 seconds as required vide clause 14.1.1 of IS 4722:1992

The performance characteristics of the alternator shall be as below:

(a) Efficiency at full load 0.8 P.F : not less than 93.5%
(b) Total distortion factor : Less than 3 %
(c) (i) 10% overload : One hour in every 12 hrs of continuous use.
(ii) 50% overload : 15 seconds

3.9 Terminal Boxes:

Terminal boxes shall be suitable for U.G. cables/ Bus Trunking. The terminal box shall be suitable to withstand the mechanical and thermal stresses developed due to any short circuit at the terminals.

3.10 Earthing Terminals:

Two Nos. of earth terminals on opposite side with vibration proof connections, non-ferrous hardware etc. with galvanized plate and passivated washer of minimum size 12 mm dia. hole shall be provided.

3.11 Space Heaters:

Alternator shall be provided with suitable space heaters with thermostats to maintain the winding temperature automatically such that it does not absorb moisture during long idle periods. The heater terminals shall be brought to a separate terminal box suitable for 230 V AC supply and a permanent caution notice shall be displayed.

4.0 AMF PANEL:

Scope:This section covers technical and functional requirements of AMF Panel.

4.1 Location of Panel: Associated AMF panel of the DG Set can be located outside the acoustic enclosure as per manufacturer's standard. However, necessary location shall be shown by Engr-in-charge.

4.2 AMF Control Panel

General Features: The control panel shall be fabricated out of 2 mm thick sheet steel, totally enclosed, dust, damp and vermin proof free standing floor mounted type & front operated. It shall be made into sections such that as far as feasible, there is no mixing of control, power, DC & AC functions in the same section and they are

sufficiently segregated except where their bunching is necessary. Hinged doors shall be provided preferably double leaf for access for routine inspection from the rear. There is no objection to have single leaf hinged door in the front, all indication lamps, instruments meter etc. shall be flushed in the front. The degree of protection required will be IP-42 conforming to IS 2147.

4.3 Terminal Blocks and Wiring : Terminal blocks of robust type and generally not less than 15 Amps capacity, 250/500 V grade for DC upto 100 V and 660/ 1100 volts grade for AC and rest of the junction 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 sqmm copper conductor PVC insulated and 660/ 1100 volts grade. Suitable colour coding can be adopted. Wiring system 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.

4.4 Labeling: All internal components shall be provided with suitable identification labels suitably engraved. Labels shall be fixed on buttons, indication lamps etc.

4.5 Painting: The entire panel shall be given primer coat after proper treatment and powder coating with 7 tanks process before assembly of various items.

4.6 Equipment requirements: The control cubical shall incorporate into assembly general equipment and systems as under:

(a) Control system equipments and components such as relays, contactors, timers, etc. both for automatic operation on main failure and as well as for manual operation.
(b) Equipment and components necessary for testing generating set's healthiness with test mode and with load on mains.
(c) Necessary instruments and accessories such as voltmeter, power factor meter, KW meter, KWH meter, Ammeter, Frequency meter etc. in one multifunction meter unit with selector switch to obtain the reading of desired parameters.
(d) Necessary indication lamps, fuses, terminal blocks, push buttons, control switches etc. as required.
(e) Necessary engine/ generating set shut down devices due to faults /abnormalities.
(f) Necessary visual audio alarm indication and annunciation facility as specified.
(g) Necessary battery charger.
(h) Necessary excitation control and voltage regulating equipment. (Alternatively provided on the Alternator itself).
(i) Necessary trenches, cable terminations all internal wiring, connections etc. as required.
(j) Breakers as specified in the schedule of work.

4.7 System Operation:

The above mentioned facilities provided shall afford the following operational requirements.

4.7.1 Auto Mode:

(a) A line voltage monitor shall monitor supply voltage on each phase. When the mains supply voltage fails completely or falls below set value (variable between 80 to 85% of the normal value) on any phase, the monitor module shall initiate start-up of diesel engine. To avoid initiation due to momentary disturbance, a time delay adjustment between 0 to 5 second shall be incorporated in start-up initiation.

(b) A three attempt starting facility shall be provided 6 seconds ON, 5 seconds OFF, 6 seconds ON, 5 seconds OFF, 6 seconds ON, if at the end of the third attempt, the engine does not start, it shall be locked out of start, a master timer shall be provided for this function. Suitable adjustment timers 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 circuit breaker shall close connecting the load to the alternator. The load is now supplied by the alternator.

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

4.7.2 Manual Mode:

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

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

(c) Alternator circuit breakers close and trip operations shall also be 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.

4.7.3 Test Mode:

(a) When under 'test' mode pressing of 'test' button shall complete the start up sequence simulation and start the engine. The simulation will be that of mains failure.

(b) Engine shall build up voltage but the set shall not take load by closing of alternator circuit breaker. When the load is on the mains, monitoring of performance for voltage/ frequency etc. shall be feasible without supply to load.
(c) If during test mode, the power supply has failed, the load shall automatically get transferred to alternator.

4.7.4 Engine shut down and alternator protection equipment: Following shut down and protection system shall be integrated in the control panel.

(a) Engine:

(i) Low lubricating oil pressure shut down. This shall be inoperative during start up and acceleration period.
(ii) High coolant (water) temp. shut down.
(iii) Engine over speed shut down.

(b) Alternator Protection: Following protection arrangement shall be made:
(i) Over load
(ii) Short circuit
(iii) Earth fault
(iv) Over voltage
(v) Under voltage
(vii) Reverse power

4.7.5 Monitoring and Metering Facilities:

(a) Necessary energy analyzer unit for visual monitoring of mains, alternator and load voltage, current, frequency, KWH, power factor, etc.
(b) A set of visual monitoring lamp indication for:
(i) Load on set
(ii) Load on mains
(iii) Set on test (Alternator on operation duty, Alternator on standby duty).
(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 fault trip of alternator, engine lock out and failure to start etc. All these indications shall have an audio and visual alarm. When operator accepts the alarm, the hooter will be silenced and the fault indication will become steady until reset by operating a reset button.

4.7.6 Operating 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 DC control to the 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, DC volt meter / 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) Energy analyzer unit for display of various electrical parameters like voltage, current, frequency, KW, power factor, etc.

(d) A set of push button as specified.
(e) Relays, contactors, timers, circuit breakers as required.
(f) Necessary battery charger with boost/ trickle selector, DC voltmeter and DC ammeter.

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

5.0 Cabling:

Control and Power cabling between alternator and control panel and change over switch to mains should be done with recommended cable sizes. The suitable power cable(approx. distance would be 75mtr)should be laid between DG set to existing LT panel and it includes supply, laying and termination on the existing 2500A, 4P EDO type ACB. However tenderer shall visit the site to know about the location before submitting the bids.

6.0 Foundation:

Scope: This section covers details of foundations for DG set with acoustic enclosures.

(A) For DG Sets installed outside in open area - A RCC (1:2:4, M-20 grade) foundation of weight 2.5 times the operating weight of the Genset with enclosure or as recommended by the Genset manufacturer OEM/OEA, whichever is higher, is required to be provided and is included in scope of work. 300 mm of this foundation height should be above the ground level. The length and breadth of foundation should be at least 250 mm more on all sides than the size of enclosure. Genset should be mounted on AVM's inside the enclosure. Design of the foundation as recommended by

the OEM shall be submitted by the contractor before execution of work along with the drawings.

7.0 Acoustic Enclosure:

Scope: This section covers technical requirements of the acoustic enclosures.

As per CPCB norms, restriction has been imposed for new DG sets upto 1000 KVA for noise level. Therefore, in terms of these norms, acoustic enclosure should have been type tested at the climatic conditions through one of the authorized laboratory and type tested report shall be submitted along the technical bid.

7.1 Installation:

a. Acoustic enclosures are supplied with built in Anti Vibration Mountings (AVMs). as Such Genset can be installed directly on the leveled surface.
b. Exhaust piping outlet should not be turned towards window / ventilator of home or occupied building. Provision of rain cap should be ensured.
c. The acoustic enclosure placement should be such that there is no restriction in front of air inlet and outlet from canopy.

7.2 Service Accessibility:

a. Genset / Engine control panel should be visible from outside the enclosure.
b. Routine / periodical check on engine / alternator (filter replacement and tappet setting etc.) should be possible without dismantling acoustic enclosure.
c. For major repairs / overhaul, it may be required to dismantle the acoustic enclosure.
d. Sufficient space should be available around the Genset for inspection and service as per standard.

7.3 General Design Guidelines:

a. To avoid re-circulation of hot air, durable sealing between radiator and canopy is must.
b. Ventilation fans are must for the Gensets cooled by heat-exchanger/cooling tower system.
c. Exhaust piping inside the enclosure must be lagged (except bellow).
d. Temperature rise inside the enclosure should not be more than 5°C for maximum ambient above 40°C and it should be below 10°C for ambient below 40°C.
e. There should be provision for oil, coolant drain and fill. Fuel tank should have provision for cleaning.
f. The enclosure should be designed to meet the total air requirement for the D.G.

Set at full load at site conditions as recommended by the engine manufacturer.

7.4 Specifications for Acoustic Enclosure:

The acoustic enclosure shall be designed and manufactured confirming to relevant standards suitable for outdoor installation exposed to weather conditions, and to limit overall noise level to 75 dB (A) at a distance of 1 mtr. from the enclosure as per CPCB norms under free field conditions.

The construction should be such that it prevents entry of rain water splashing into the enclosure and allows free & quick flow of rain water to the ground in the event of heavy rain. The detailed construction shall conform to the details as under:

a. The enclosure shall be fabricated out the CRCA sheet of thickness not less than 1.6 mm on the outside cover with inside cover having not less than 0.6 mm thick perforated powder coated CRCA sheet.

b. The hinged doors shall be made from not less than 16 SWG (1.6 mm) thick CRCA sheet and will be made air tight with neoprene rubber gasket and heavy duty locks.

c. All sheet metal parts should be processed through 7-tank process.

d. The enclosure should be powder coated.

e. The enclosure should accommodate the daily service fuel tank of the D.G. Set to make the system compact. There should be provision of fuel gauge, which should show the level of the fuel even when the DG Set is not running. The gauge should be calibrated. The fuel tank should be filled from the outside as in automobiles and should be with a lockable cap.

f. The batteries should be accommodated in the enclosure in battery rack.

g. The canopy should be provided with high enclosure temperature safety device.

h. The acoustic lining should be made up of high quality insulation material i.e. rockwool/ glass/ mineral wool/ PU foam of appropriate thickness & density for sound absorption as per standard design of manufacturer's to reduce the sound level as per CPCB norms. The insulation material shall be covered with fine glassfiber cloth and would be supported by perforated M. S. Sheet duly powder coated / GI sheet/aluminium sheet.

i. The enclosure shall be provided with suitable size & No. of hinged type doors along the length of the enclosure on each side for easy access inside the acoustic enclosure for inspection, operation and maintenance purpose. Sufficient space will

be provided inside the enclosure on all sides of the D.G. set for inspection, easy maintenance & repairs.

j. The canopy should be as compact as possible with good aesthetic look.

k. The complete enclosure shall be of modular construction.

l. The forced ventilation shall be as per manufacturer design using either engine radiator fan or additional blower fan(s). If the acoustic enclosure is to be provided with forced ventilation then suitable size of axial flow fan (with motor and auto-start arrangement) and suitable size axial flow exhaust fan to take the hot air from the enclosure complete with necessary motors and auto start arrangement should be provided. The forced ventilation arrangement should be provided with auto stop arrangement to stop after 5 minutes of the stopping of D.G sets.

m. The acoustic enclosure should be suitable for cable connection through UG cable. Such arrangements on acoustic enclosure should be water proof & dust-proof conforming to IP-65 protection.

n. The inside of enclosure should be provided with at least two nos. 28 W-T5 fluorescent tube light luminaire controlled by a 5A switch for adequate lighting during servicing etc. of the DG Set. The power supply to this luminaire should be from the load side of the AMF Panel so that it can remain energized under all conditions.

8.0 Earthing:

Scope: This section covers the earthing requirement of DG Set installations. Copper plate earthing as per standard dimension shall be provided for Neutral Grounding, The GI strip earthing shall provided for body earthing.

a. The generating set and all associated equipments control and switch gear and switch gear panels must be earthed before the set is put into operation.

b. Four numbers of earth sets are required as under:
   - 2 earthing sets for Genset/ control panel body.
   - 2 plate earthing sets for neutral.

b. Earthing job should be carried out as per CPWD General specifications for Electrical works, (part 1-internal), 2013.

c. Copper strips of suitable size shall be used for earthing for interconnection.

d. For Gensets with AVM's between engine/alternator and base rail, the body earthing must be done at the engine/ alternator and not at base-rail.

e. Genset should be earthed at two distinct point through a conductor strip having cross-section suitable to carry the short circuit (three phase dead short circuit with ground) current without burning out in conformity to CPWD General specifications for Electrical works (part 1-internal), 2013 in vogue.

f. Earth bus : For body earthing, an earth-bus shall be provided.

g. In case, DG set is being installed inside the substation building or near to the substation, for body-earthing of DG set, AMF panel and Essential panel, earth bus provided for sub-station shall be used.

h. Test joints should be provided for testing the earthing as and when required.

i. For further details of Earthing work, like size of plate / earth strip, depth of earthing method etc., please refer "CPWD General Specifications for Electrical works (part-1-internal), 2013 in vogue.

9.0 Site Information:

The tenderer should, in his own interest, visit the site and familiarize himself with the site conditions before tendering. For any clarification, tenderer may discuss with the Engineer-in-Charge.

10.0 Works to be done by 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 springs/ 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 (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, cable trench and/ or cable connections.
vii) POL i.e. HSD oil and lub. oil for testing & commissioning for 12 hours full load and 1hr of 10% overloading at OEA/ OEM works shall be arranged by the

contractor. POL i.e. HSD oil and lub. oil for trial run of 4 Hrs. at site at available load shall be arranged by the department.

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

ix) Clearance/ Approval of the complete installation from CPCB/ State Pollution Control Board, Central Electricity Authority (CEA)/ Local Bodies and other licensing authorities, wherever required are the responsibility of contractor.

11.0 INSPECTION AND TESTING

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

b. **Inspection and Testing of DG sets:** Testing shall necessarily be carried out at factory/ manufacturer premises in presence of representative of the Department.

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

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

d. DG set will be tested on load of unity power factor for the rated KW rating. During testing, the D.G. set covered under scope of work, shall be operated for a period of 12 hours on the rated KW at DG set KW rating including one hour on 10% overload after continuous run of the 12 Hours. 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.

12. Safety measures

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

13. STATUTORY CLEARANCE(S)

Approval/ clearance of the complete installation shall be obtained by the contractor from CPCB/ State Pollution Control Boards/ 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.

14. GUARANTEE

All equipments shall be guaranteed, against unsatisfactory performance and/ or break down due to defective design, workmanship or material, for a period of 24 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 undue 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.

15. DRAWINGS FOR APPROVAL & COMPLETION DRAWINGS

a. Drawings for Approval on Award of the work:

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.

i. 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.

ii. Drawings including section, showing the details of erection of entire equipments.

iii. 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 equipment.

iv. Dimensioned drawings of Acoustic enclosure/ Engine-Alternator set and Electrical control panel.

v. Drawings showing details of supports for pipes, chimney cable trays, ducts etc.
vi. Any other drawings relevant to the work.

b. Drawings/Documents to be furnished on completion of Installation:

Two sets of the following laminated drawings shall be submitted by the contractor while handing over the installation to the Department. One set shall be laminated

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

i. DG set installation drawings giving complete details of all the equipments, including their foundations.

ii. Line diagram and layout of all electrical control/AMF panels giving switchgear ratings and their disposition, cable feeder sizes and their layout.

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

iv. Manufacturer's technical catalogues of all equipments and accessories.

v. Operation and maintenance manual of all major equipments, detailing all adjustments, operation and maintenance procedure.

16. AFTER SALES SERVICES

The contractor shall ensure adequate and prompt after sales service free of cost during guarantee period, and against payment after the guarantee period is over, in the form of maintenance, spares and personnel as and when required during normal life span of the equipments and shall minimize the breakdown period. In case of equipment supplied by other manufacturers the firm shall furnish a guarantee from the manufacturer for the same before the DG Set installation is taken over.

17. Non Comprehensive Annual Maintenance Contract:

Tenderers shall submit the proposal for three years non comprehensive AMC from post guarantee period, the AMC work involves 12 preventive maintenance and unlimited break down calls per year. This also includes free of 'B' check service (2 times per year), however, payment shall be made for the spare parts used for 'B' check service.

18. Replacement Parts Stocking

Parts shall be available through an extensive network to ensure around-the-clock parts availability throughout the country. Recommended spare parts shall be fully stocked by local field service personnel (in Bangalore office) with back-up available from national parts center and the manufacturing location. The national parts center Customer Support Parts Coordinators shall be on-call 24 hours/day, 7 days/week, and 365 days/year for immediate parts availability. Tenderers may also produce Bangalore authorized service center address along with strength support in the form of escalation chart. The DG set is going to feed the power to very critical

equipments, and it is the responsibility of local service team to attend any emergency situation immediately during warranty period as well as post warranty period. Hence, authorized service center at Bangalore is very much essential.

19. Climatic conditions:

The output of DG set specified in tender documents under actual site conditions. The tenderer has to certify that the engine & alternator meets the capacity requirement after de-ration as per IS/BIS.

The DG set should be type tested for Noise and Emission norms/standards as per CPCB as per Appendix 'II' and Appendix 'III'. Necessary type tested reports shall be submitted along with the technical bids.

20. Client details

Tenderers may also produce the client contact details, PO copies, performance certificates & completion certificates of similar rating DG set installed at Bangalore/any other city from past 5 years period.

Annexure 'D'

SCHEDULE OF DEVIATIONS

Sr.No	Requirement of the Center	Sr.No. as per Schedule	Deviation proposed

Name and Address of the Tenderer **Signature of the Tenderer**

SCHEDULE OF WORK ABSTRACT **(for Technical Bid)**

Name of the work: Supply, Installation, Testing and Commissioning of 750kVA/600kW Silent Diesel Generating set.

Sub Head A	Equipments	Rs.
Sub Head B	Cabling	Rs.
Sub Head C	Earthing	Rs.
Sub Head D	Annual Maintenance Contract	Rs.

Note: Amount not to be filled in

Annexure 'E'
Part-I (for Technical Bid)

Schedule of Quantity

Name of the work: Supply, Installation, Testing and Commissioning of 750kVA/600kW Silent Diesel Generating set.

Sl.No	Description of Work	Unit	Qty	Rate	Amount
1	**SUB HEAD 'A' (Equipments)**				
i	The offer price shall be an all inclusive price that shall include all costs for delivery, supply & Installation, testing and commissioning of 'Silent type' Diesel Generating set having Prime power rating of 750 KVA, 415 Volts at 1500 RPM, 0.8 Lagging power factor at 415 V suitable for 50 Hz, 3 Phase system and for 0.85 load factor and consisting of the followings:	**Sets**	1	Not to be filled	Not to be filled
(a)	**Diesel Engine offered shall be as per specification and with following accessories:**				
	Diesel Engine 4 stroke Radiator based water cooled, electric start, of suitable BHP at 1500 RPM suitable for above output with 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 after 12 hours of continuous 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)	The engine shall be having Electronic governor and suitable for AMF operating with Auto synchronising, Load sharing, Load bearing, Load dependant starting etc. using with digital controllers, relays & control modules.				
(d)	**Alternator:**				
	Synchrounous alternator rated at 750 KVA, 415 Volts at 1500 RPM, 3 Phase, 4 wire, 50 Hz, AC supply with 0.8 lagging power factor at 40 Degree C, 50% RH & at 1000 meter MSL. The alternator shall have SPDP enclosure, brushless, continuous duty, self excited and self- regulated through elctronic AVR conforming to IS: 4722 / BS 2613 suitable for tropical conditions and with class F/H insulation. AVR should be compatiable for auto synchronisation.				
(e)	**Base Frame and Foundation**				
	Both the engine and alternator shall be mounted on suitable base frame made of MS channel with necessary reinforcement which shall be installed on suitable cement concrete foundation and vibration isolation arrangement as per recommendations of manufacturer. Necessarry civil work is in the contractor scope.				
(f)	**Fuel Tank:**				
	Daily service fuel tank of 990 litres capacity fabricated out of 5 mm thick MS sheet complete with all standard accessories and fuel piping between fuel tank and diesel engine with MS class 'C' pipes of suitable dia. Complete with valves, level indications & accessories as required as per specifications.				
(g)	**Starting system:**				
	12V / 24V DC starting system comprising of starter motors: voltage regulator and arrangements for initial excitation complete with suitable nos of batteries as required as per specifications.				

(h)	Accoustic and weather proof enclosure with arrangements for fresh air intake for cooling of the engine & alternator, extraction, discharging hot air in to the atmosphere as per specifications.				
(i)	Unloading, shifting & positioning of DG set.				
(j)	Site testing of DG set (The price shall include required quantity of diesel for site testing)				
	Total				
ii.	**Exhaust System:**				
a.	Residential silencer with necessary supporting arrangements with spring support, wherever applicable .			Not to be filled	Not to be filled
b.	The system shall comply with the norms of KSPCB/other statutory bodies, with a standard height from the ground with required structure. Please refer specification.				
c.	5mm thick MS pipes as per IS 3589 shall be supplied. The exhaust system including the silencer must be sized to ensure that back pressure on system does not exceed the back pressure recommended by engine manufacturer. Design calculation in support shall be submitted on award of contract.				
d.	Pipe shall be thouroughly cleaned of rust and painted with heat resistant paint after fabrication and erection.				
e.	Exhaust piping and silencer shall be thermally insulated with aluminium sheet cladding.				
f.	Silenscers and Horizontal runs shall be supported on spring supports fixed to ceiling. Vertical runs to have expansion bellows where length exceeds 25M.				
g.	Flexible expansion joint of multiple corrugated stainless steel shall be provided between engine exhaust manifold and exhaust piping.				
h.	Earthing, wether cowl at the top and aviation lights are to be provided.				

ii.a	Supplying and fixing exhaust gas piping of suitable dia. Welded black MS, B class pipe confirming to IS:3589 cut to required lengths and installed with necessary bends, supports and clamps, anti-vibration mounting, insulation of exhaust systems with mineral wool/Rockwool, 50mm thick wiremesh & aluminium cladding etc. as required as per specifications.	**Mtrs**	30	Not to be filled	Not to be filled
ii.b	Steel supports for exhaust pipe, Residential silencer Supply & installation etc using ISMC, ISA steel sections complete including painting with zinc chromate primer and black enamel paint (supply, fabrication and installation). The weight mentioned is indicative, however actual measurement will be done during execution.	**Kg**	4000	Not to be filled	Not to be filled
	Total				
iii.	**DG AMF panel & associated electrical works:**				
	Supply, Installing, Testing and Commissioning of DG AMF panel complete with all switchgear, control, protection and metering features as per specification suitable for 750 kVA silent type DG set complete with suitable ACBs, relays, timers, set of CT's for metering & protection and energy analyser to indicate currents, phase and line voltages, frequency, power factor, KWH, KVARH & provision for overload, short circuit, restricted earth fault, under frequency, control cabling from AMF panel to DG set and elsewhere if required, all complete and their interlocking including of the following:			Not to be filled	Not to be filled
	The PLC based control panel to have the following features:				
(a)	AMF operation with provision for manual operation				
(b)	2500A, Microprocesor based ACB, 4Pole EDO type				
(c)	Auto / Manual / Test / Off selector switch				
(d)	2 Nos. Over voltage relay, 2 Nos. reverse power relay and 2 nos Under voltage relay.				

(e)	3 sets of current transformers 15 P 10 accuracy for protection and 15A class-I for metering. CT make- Kappa				
(f)	Energy analyser unit to indicate current, voltage, frequency, power factor and KWH				
(g)	Indicating lamps for load on mains and load on set.				
(h)	Battery charger, complete with transformer / rectifier, DC 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.				
(o)	Audio / Video annunciation for				
	1. High water temperature.				
	2. Low lubricating oil pressure.				
	3. Engine Over speed.				
	4. Engine fails to start				
	5. Full load / max. load warning.				
iii.a	750kVA DG set AMF panel as per above specification with incomer of 2500Amps microprocessor based ACB, 4Pole EDO type.	**No**	1	Not to be filled	Not to be filled
	Total				
iv	**Statutory clearance(s)**				
	Approval/clearance of the complete installation shall be obtained by the contractor from CPCB/state pollutions control boards/local bodies/Central Electricity Authority (CEA)/other licensing authorities wherever required.	**job**	1	Not to be filled	Not to be filled
	TOTAL OF SUB HEAD 'A' (i+ii+iii+iv)				

2	**Sub Head 'B'- Cabling**				
i	Supply of 1.1kV grade, 3.5 Core, XLPE insulated, and overall sheathed, stranded aluminum conductor, flat steel strip/wire armored cables conforming to IS:7098/part I (with latest amendments) and for following size. The cable shall bear ISI certification mark.				
a	3.5 Core x 240 Sq.mm	**Mtrs**	675	Not to be filled	Not to be filled
ii	Laying of 3.5 core, 1.1kV grade XLPE cables, armored aluminum conductor cables in ground, in all kind of soil, below ground level including transportation of cable of site, excavation, refilling with sand and baked bricks on top and sides and providing cable route/joint markers complete as per specifications				
a	Laying of 5 nos. of cables, 3.5core, 240 Sq.mm (Note: 5 nos. of cable measured as a single run).	**Mtrs**	60	Not to be filled	Not to be filled
iii	Laying of 3.5 core, 1.1kV grade, XLPE cables armored aluminum conductor cable in existing trench/on cable tray, on wall/floor/ceiling/above false ceiling/below false floor/existing hume pipe/existing HDPE pipe including transportation of cable to site, removing of trench/false ceiling/false flooring covers and reclosing the covers after laying the cables in good condition with supply of all necessary materials such as brackets, clamps, MS spaces complete as required and as directed by EIC.				
a	Laying of 5 nos. of cables, 3.5core, 240 Sq.mm (Note:5 nos. of cable measured as a single run)	**Mtrs**	75	Not to be filled	Not to be filled
iv	**End terminations**				

a	Providing end terminations for 3.5 core, 1.1 kV grade XLPE insulated armoured, Aluminium conductor cables including supply of cable gland, lugs, neoprene bushes and other materials and tolls required complete with terminal connections, earthing of glands and as required and as directed by Engineer-in-charge.				
b	3.5 core x 240 Sq.mm cables with aluminium conductor	**each**	20	Not to be filled	Not to be filled
	TOTAL OF SUB-HEAD 'B' (i+ii+iii+iv)				
3	**Sub Head 'C' - Earthing**				
a	Providing standard GI pipe earth of 3.5 Mtr Long, 38mm dia GI pipe for earth stations with GI pipe, conforming to IS: 3043 with latest amendments including supply of all materials (charcoal and salt) and providing chamber and funnel complete as required Note: Pipe earth used for earthing shall be " medium " class with ISI marking	**Sets**	2	Not to be filled	Not to be filled
b	Supply & Installation of standard copper plate earth for earth station depth of 3.5 mtr with 600mmX600mmX3.15mm electrolytic copper plate, conforming to IS 3043 with latest amendments including supply of all materials (charcoal and salt) and providing chamber complete as required. Note: 1. The copper plate shall be tinned. 2. Rates of earth station includes the cost of suitable medium class GI pipe for watering.	**Sets**	2	Not to be filled	Not to be filled
c	Providing and laying of electrolytic copper strip of 50x6mm size from earth station to equipments with all interconnections with inclusive of supply of all hardwares complete as required.	**Mtrs**	75	Not to be filled	Not to be filled
d	Providing and laying of GI strip of 50x6mm size from earth station to equipments with all interconnections with inclusive of supply of all hardwares complete as required.	**Mtrs**	75	Not to be filled	Not to be filled
	TOTAL OF SUB-HEAD 'C'				

5	**Sub Head 'D' - Annual Maintenance Contract(non-comprehensive)**				
a	Proposal for Non comprehensive Annual maintenance contract for 3 years from post warranty period of 2 years as per specifications.				
a'	1 year	year	1	Not to be filled	Not to be filled
b'	2nd year	year	1	Not to be filled	Not to be filled
c'	3rd year	year	1	Not to be filled	Not to be filled
	TOTAL OF SUB-HEAD 'D'				
	Total (A+B+C+D)				

Note: The tenderers will have to fill up their rates only in the price bid issued by the department. Tenders in which the price bids are given in any other format are liable to be rejected.

Total amount in words:

Signature of the Contractor

Date :

Address:

ANNEXURE 'F'

Technical Particulars

The technical particulars are needs to be filled by tenderer. The following details are mandatory requirement, if any columns are not filled, tenders are liable for rejection.

I. Engine	
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 at Full load	
18. Any other data	

II. Alternator	
1. Make	

2. Enclosure details	
3. Full load output in kVA	
4. Full load output in KW at 0.8 PF	
5. Designed overload capacity at max.ambient temp.	
6. Efficiency at Full load	
7. Class of Insulation of Rotor	
8. Class of Insulation of stator+-	

III. General	
1. Overall Length of DG set LxWxH	
2. Overall weight of the DG set	
3. Noise level of the DG set at one Metre with acoustic enclosure	

IV. AMF Panels.	
1. Make	
2. Type (Floor / Wall mounted)	
3. Overall dimension (LxBxH)	
4. Finish	

V. Generator Control Panel.	
1. Make	

VI. Acoustic Enclosure:	
1. Make	
2. Size	
3. Details of acoustic lining material & Make	

Annexure 'G'

LIST OF TECHNICAL LITERATURE & CATALOGUE AND ANY OTHER INFORMATION

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

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

Date :

Signature of Tenderer

Annexure 'H'

Acceptable Makes:

Sl.NO	Item	Makes
1.	Engine	Cummins / kirloskar/ Greaves / Caterpiller
2.	Alternator	Stamford / Kirloskar or as per engine OEM choice
3.	AMF panel	OEM choice
4.	ACB	L&T/ABB
5.	Acoustic enclosure	OEM choice
6.	Relays	L&T / Siemens / ABB
7.	Contactors	L&T / Siemens / ABB
8.	Control Cables	Finolex / Havells
9	Power Cables	Finolex / Havells
10.	Current Transformer	Kappa / Kalpa

APPENDIX- I

List of Relevant Indian/International standards

(A)	**GENERATING SET**	
ISO 8528	Part- I	Application, rating and performances.
	Part - II	Engines
	Part - III	A.C. Generator for generating set
	Part - IV	Control gear & switch gear
	Part - V	Generating Sets
	Part - VI	Test methods
	Part - VII	Technical declaration for specification and design
	Part - VIII	Low power general purpose generating sets
	Part - IX	Measurement and evaluation of mechanical vibration
	Part - X	Measurement of Airborne Noise - Enveloping surface method
	Part - XI	Security generating sets with uninterruptible power system
(B)	**ENGINES**	
IS 10000 (Naturally Apirated)	Part - I 1980	Methods of tests for I.C. Engines Part - I - Glossary of terms relating of test method
	Part - II 1980	Standard reference condition

	Part - III 1980	Measurements for testing units and limits of accuracy.
	Part - IV 1980	Declaration of Power, Efficiency, fuel consumption, lubricating oil consumption.
	Part - V	Preparation for tests and measurement of wear
	Part - VI	Recording of test results.
	Part - VII	Governing test for constant speed engines and selection of engines for use with electrical generators.
	Part - VIII	Performance tests
	Part - IX	Endurance test
	Part - X	Tests for smoke level, limit and correction for smoke level for variable speed.
	Part - XI	Information to be supplied by the purchaser to the manufacturer and information to be supplied by the manufacturer along with the engine.
	Part - XII	Specimen test certificates
	Part - XIII	Recommendations on nature of tests required for functional changes in critical components.
BS 5514	Part 5 – 1979	Reciprocating Internal Combustion engines,
ISO-3046	Part V 2001	Performance, torsional vibrations.

	Part - I 2002	Declaration of powers, fuel and lubrication oil consumption and test methods.
	Part - 3 - 1989	Test measurement
	Part - 4 – 1997	Speed Governing
	Part - 6 – 1990	Overspeed protection.
BS 649		Reciprocating Internal Combustion engines, performance, torsional vibrations.
(C)		**ALTERNATOR**
IS 4889/BS - 269		For declaring efficiency of electrical machines.
IS 4722 – 1992		Capability of machine to withstand over current/overload.
IS – 13364	Part I 1992	Alternator - Voltage Regulation up to 20 KVA
IS – 13364	Part II 1992	Alternator - Voltage Regulation above 20 KVA to 80 KVA
IEC 34 -1 – 1983		Rotating Electrical machines - Rating & Performance
IP – 21	IS - 4691/85	Alternator (Degree of Protection)
(D)		**Acoustic Enclosure**
IS – 8183		Insulation material for sound absorption.
ISO 8528	Part - 10 1998 (E)	Measurement of Air borne noise by enveloping surface method.

ISO 3744	1998 (E)	Acoustics - Determination of sound power levels of noise sources.
ISO 9614	1993 Part - I	Requirement of grade - II. Accuracy for insulation.
ISO 9614	1996 Part – II	Requirement of grade - II. Accuracy for insulation.
(E)	**CONTROL PANEL / AMF PANEL**	
IS -2147 1962		Degree of protection.
IS – 4722		H.V. testing for panel

APPENDIX -II

Criteria for Evaluation of the Performance of Contractors for pre-eligibility

The following Parameters of Technical Bid will be taken into account for Short listing the Commercial Bid. The Proposals shall be evaluated in two stages: (1) Technical and (2) Price / Financial. A Minimum qualifying mark is set as per Table 'A' below and only those Agencies whose Technical Proposals score the minimum mark of 60% and above shall be considered for Financial Evaluation.

Table 'A'

Sr. no	Evaluation of vendor	Max marks	Evaluation
1	Attended the pre-bid meeting? (Indicates seriousness & interest shown in understanding the institute's requirements/the scope of work).	5	100% marks for whoever attended the pre-bid meeting
2	Financial Strength: (i)Average annual turnover (6 marks) (ii)current financial year Solvency certificate (4 marks)	10	(i)60% marks for minimum eligibility criteria (ii)100% marks for twice the minimum eligibility criteria or more In between (i) & (ii)- on pro rate basis.
3	Contractor should have Experience in Similar class of works from last Seven years period.	10	100% marks for minimum eligibility criteria
4	Contractor should have minimum Three similar completed works costing not less than the amount equal to Rs.30.73 Lakhs or minimum Two similar completed works, costing not less than the amount equal to Rs.46.09 Lakhs or minimum One similar completed work of aggregate cost not less than the amount equal to Rs.61.46 Lakhs of the estimated cost.	15	(i) 60% marks for minimum eligibility criteria (ii)100% marks for twice the minimum eligibility criteria or more In between (i) & (ii)- on pro rate basis.

5	One Completed work of any nature (either part of (sr.no.4) or a separate one) costing not less than the amount equal to Rs.30.73 Lakhs of the estimated cost put to tender with some Central/State Government Organization/Central Autonomous Body/ Central Public Sector undertaking/State public sector undertaking/City development authority/Municipal corporation of city formed under any Act by Central/State government and published in central/state gazette..	10	(i) 60% marks for minimum eligibility criteria (ii)100% marks for twice the minimum eligibility criteria or more In between (i) & (ii)- on pro rate basis.
6	Technical particular as per tender specifications. (All parameters are very critical).	30	100% marks for minimum eligibility criteria.
7	Minimum two performance certificate from the existing clients for the similar capacity (i.e for 750 kVA Silent DG set).	10	100% marks for minimum eligibility criteria.
8	Client feedback from any of the contact list provided to NCBS by the vendor. This marking shall be awarded by direct telephone enquiry/site visit as deemed fit by the concerned Engineer-in-charge/Head SE&M.	10	(i)60% marks for minimum eligibility criteria (ii)100% marks for more eligibility criteria In between (i) & (ii)- on pro rate basis.

To become eligible for short listing, the bidder must secure at least **fifty percent (50%)** marks in each and **sixty percent (60%)** marks in aggregate.

The department, however, reserves the right to restrict the list of such qualified contractors to any number deemed suitable by it.

Even thought any bidder may satisfy the above requirements, he would be liable to disqualification if he has;

a. Made misleading or false representation or deliberately suppressed the information in the forms, statements and enclosures required in the eligibility criteria document.

b. Record of poor performance such as abandoning work, not properly completing the works, or financial failures / weaknesses etc.