



राष्ट्रीय विज्ञान शिक्षा एवं अनुसंधान संस्थान, भुवनेश्वर

(परमाणु उर्जा विभाग, भारत सरकार का एक स्वयं शासित संस्थान)

NATIONAL INSTITUTE OF SCIENCE EDUCATION AND RESEARCH, BHUBANESWAR

(AN AUTONOMOUS INSTITUTE UNDER DEPT. OF ATOMIC ENERGY, GOVT. OF INDIA)

Name of Work: -“Provision of 750 KVA DG set and associated electrical work for animal house inside NISER campus, Jatni”

NIT No. & Date:- NISER/IWD-ELECT /ANIMAL HOUSE/2018-19 /033
Dtd: 14.02.2019

Estimated cost of tender: - Rs 1, 39,90,962.00
Earnest Money Deposit : Rs. 2,79,819.00

Completion time: - 90 (Ninety) days

Pre bid meeting : 21.02.2019 11.30 AM
Last date of submission of E- tender : 04.03.2019 up to 11.30 AM
Opening of Technical Bids : 04.03.2019 at 3.00 P.M

This tender documents contains 19 (Including front page) pages.



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TENDER DOCUMENTS

File No. NISER/IWD-ELECT /ANIMAL HOUSE/2018-19 /033

Date: 14.02.2019

Name of work: -“Provision of 750 KVA DG set and associated electrical work for animal house inside NISER campus, Jatni”

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NOTICE INVITING TENDER

File No. NISER/IWD-ELECT / ANIMAL HOUSE/2018-19 /033

Date: 14.02.2019

Director, NISER invites E- tender on two bid system (Technical Bid and Financial Bid) for the following work:-

Name of the work: “Provision of 750 KVA DG set and associated electrical work for animal house inside NISER campus,Jatni”.

Estimated Cost	:	Rs 1,39,90,962.00
Earnest Money	:	Rs.2,79,819.00
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Tender can be downloaded and bided from website address: www.tenderwizard.com/NISER.

Tender documents for viewing only is also available in NISER web-site address: www.niser.ac.in.

**REGISTRAR
NISER**

Standard E-Tender Terms & Conditions

1. The details of tender notification can be downloaded from www.tenderwizard.com/NISER under "Tender Free View" link.
2. Vendors should obtain the USER ID and PASSWORD from www.tenderwizard.com/NISER by clicking on "REGISTER ME" link in the homepage.
3. The Vendor registration fees has to be paid to ITI Ltd for Rs. 1180/- including GST. Using the e-payment link provided at the time of registration, and the mode of payments are Credit Card, Debit Card and Internet Banking. Vendor Registration is Valid for 1year.
4. For further details on e-Tender participation, please contact ITI Help desk on
 - Telephone: 080-49352000/9686115318
 - Email: harishkumar.kb@etenderwizard.com, ambasa@etenderwizard.com.
5. Tenders should be submitted only through e-Tender portal and obtain the Tender Acknowledgement copy as a proof of successful submission.



राष्ट्रीय विज्ञान शिक्षा एवं अनुसंधान संस्थान, भुवनेश्वर
(परमाणु उर्जा विभाग, भारत सरकार का एक स्वयं शासित संस्थान)
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(AN AUTONOMOUS INSTITUTE UNDER DEPT. OF ATOMIC ENERGY, GOVT. OF INDIA)

Tender Notice

Director of NISER hereby invites E- tender on two bid system (Technical Bid and Financial Bid) for the following work from **registered electrical contractors** of CPWD, MES, Railways and State PWDs and/or those who have worked for DAE or its Organizations or Govt. /Semi Government organizations and **having a valid ELBO License** and have successfully carried out a minimum of one/two/three similar works of 80%/60%/40% respectively of the estimated cost or above, as indicated in the prescribed format of the E-Tender portal in last seven years. The eligible contractors may submit their bid along with supporting documents of fulfilling the above conditions otherwise the bids bear the risk of not being considered.

Name of Work	Estimated Cost ₹	Earnest Money ₹	Duration of work
Name of the work: -“ Provision of 750 KVA DG set and associated electrical work for animal house inside NISER campus,Jatni NISER/IWD-ELECT / ANIMAL HOUSE /2018-19 /033 Date: 14.02.2019	Rs 1,39,90,962.00	Rs. 2,79,819.00	90 (Ninety) days

The Bidders are requested to give detailed tender in E-Tender portal in the prescribed forms in two Bids i.e. Part - I Technical Bid. Part - II Financial Bid.

Tender process & award of contract.

The technical bids will be evaluated to shortlist the eligible bidders. The financial bids of only the short listed bidders shall be considered for further processing. Bidders whose technical offer is found acceptable and meeting the eligibility requirements as specified in this tender will be informed about the date and time of the opening of the financial bid.

NISER will open financial bids of only the technically qualified bidders. The Date and Time of opening the financial Bid will be intimated only to technically acceptable Bidders for the work at a later date.

The earnest money deposit and the cost of tender (Non Refundable) as indicated against the work should be send by post or by hand to “SO(D)-ELECTRICAL,INSTITUTE WORKS DEPARTMENT , NISER,Jatni Campus, PO-Bhimpur-Padanpur,Via-Jatni,District- Khurda, PIN- 752050” so that it reaches on or before the opening of the technical bid for e-tender system in the form of Account Payee Bank Draft payable on any branch of Nationalised/Schedule Bank at Bhubaneswar/Jatni in favour of “Director, National Institute of Science Education & Research, Jatni”, in a sealed envelope. All tenders submitted without requisite amount of earnest money and tender cost shall be rejected and their technical and financial bids shall not be opened. No interest is payable on EMD.

Director of NISER, reserves the right to accept/reject any/all tenders without assigning any reason whatsoever. Part or incomplete tenders will be summarily rejected. No further correspondences whatsoever shall be entertained in this regard. Canvassing in any manner shall result in rejection of the tender.Any dispute arising out of this shall subject to Bhubaneswar jurisdiction only.

**REGISTRAR
NISER**

General Terms and Conditions:

1. Director of NISER hereby invites E- tender on two bid system (Technical Bid and Financial Bid) for the following work from **registered electrical contractors** of CPWD, MES, Railways and State PWDs and/or those who have worked for DAE or its Organizations or Govt. /Semi Government organizations and **having a valid ELBO License** and have successfully carried out a minimum of one/two/three similar works (Supply erection testing and commissioning of street lighting system including conventional lighting, LED, high mast etc.) of 80%/60%/40% respectively of the estimated cost or above, as indicated in the prescribed format of the the E-Tender portal in the last seven years. The eligible contractors may submit their bid along with supporting documents of fulfilling the above conditions otherwise the bids bear the risk of not being considered.

In support of fulfilling all the essential conditions mentioned in the previous Para the contractor shall submit the details through E-Tender in the prescribed format the past details, mentioning the name of work, estimated cost, , date of commencement as per agreement & actual date of completion as per agreement along with schedule of quantities executed and any penalty levied due to delay in executing the work from an officer not below the rank of Executive Engineer (Electrical).

2. The estimated cost of the work is **₹ 1,39,90,962.00/- (Rupees One Crore Thirty Nine Lakhs Ninety Thousand Nine hundred and Sixty Two only.)**
3. Period for completion of the work will be **90 (Ninety Days)**. and the date of commencement shall be reckoned from the tenth day of issue of award letter.
4. The earnest money deposit as indicated against the work should be send by post or by hand to “SO(D)-ELECTRICAL,INSTITUTE WORKS DEPARTMENT , NISER,Jatni Campus, PO-Bhimpur-Padanpur,Via-Jatni,District- Khurda, PIN- 752050” so that it reaches on or before the opening of the technical bid for e-tender system in the form of Account Payee Bank Draft payable on any branch of Nationalised/Schedule Bank at Bhubaneswar/ Jatni in favour of “Director, National Institute of ScienceEducation&Research,Jatni”,in sealed envelope. All tenders submitted without requisite amount of earnest money and tender cost shall be rejected and their technical and financial bids shall not be opened. No interest is payable on EMD.

The EMD will be returned to the bidders(s)/Agents whose offer is not accepted by NISER within one month from the date of the placing of the final order(s) on the selected bidder(s). In case of the bidder(s) whose offer is accepted the EMD will be returned on submission of Performance Bank Guarantee (if applicable). However, if the return of EMD is delayed for any reason, no interest /penalty shall be payable to the bidders

5. .The details of tender notification can be download from www.tenderwizard.com/NISER under "**Tender Free View**" link. Vendors should obtain the USER ID and PASSWORD from www.tenderwizard.com/NISER by clicking on "**REGISTER ME**" link in the homepage.The Vendor registration fees has to be paid to ITI Ltd for Rs. 1180/-. Using the epayment link provided at the time of registration, and the mode of payments are Credit Card, Debit Card and Internet Banking. Vendor Registration is Valid for 1year.Tenders should be submitted only through e-Tender portal and obtain the Tender Acknowledgement copy as a proof of successful submission.

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i.e. Part - I Technical Bid.
Part – II Financial Bid.
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Opening of Technical Bids : **04.03.2019 at 3.00 P.M**
9. **Tender process & award of contract.**

The technical bids will be evaluated to shortlist the eligible bidders. The financial bids of only the short listed bidders shall be considered for further processing. Bidders whose technical offer is found acceptable and meeting the eligibility requirements as specified in this tender will be informed about the date and time of the opening of the financial bid.

NISER will open financial bids of only the technically qualified bidders. The Date and Time of opening the financial Bid will be intimated only to technically acceptable Bidders for the work at a later date.

Please note, that bids submitted without tender cost and EMD are summarily being rejected.

10. Director of NISER does not bind himself to accept the lowest or any tender and reserves the right to accept the tender either in whole or in part. The decision of the Director shall be final in this regard.
11. Canvassing in any manner or form will lead to rejection of the Bid.
12. The tenderer shall not be permitted to bid for works in any unit of DAE where any of his/her relatives are employed. He shall also intimate the names of any such persons who are working with him in any capacity or subsequently employed by him and whose relatives are working in DAE or its units.
13. **Contact for Technical information:** (Only E-mail enquiries will be entertained)

Mr. Amit Kumar Panigrahi
SA-D (Electrical),
Institute Works Department, NISER.
E-Mail – amit.panigrahi@niser.ac.in

Mr. Dilip Jha
SO-D (Electrical),
Institute Works Department, NISER.
E-Mail – dilipjha@niser.ac.in

NOTE :

A person shall be deemed to be a relative of another if, (a) they are members of a Hindu undivided family; or (b) they are husband and wife; or (c) the one is related to the other in the following manner : Father, Mother (including step mother), Son (including step son), Son's wife, Daughter (including step daughter), Father's father, Son's son, Son's wife, Son's daughter, Son's daughter's husband, Daughter's husband, Daughter's son, Daughter's son's wife, Daughter's daughter, Daughter's husband, Brother (including step brother), Brother's wife, Sister (including step sister), Sister's husband.

14. The Bid shall remain valid for a minimum period of 90 days from the date of opening of the tender for the purpose of acceptance and award of work. Validity beyond 90 days from the date of opening shall be by mutual consent.

15. The tenderer should see and obtain the drawings. In case of any queries, necessary clarifications may please be sought from the office of the Scientific Officer-D (Electrical). No claim whatsoever will be entertained in this regard for any alleged ignorance, thereof.
16. Before tendering, the tenderer shall inspect the site to fully acquaint himself about the condition in regard to accessibility to site, nature and extent of ground, working condition of site and locality including stacking of materials, conditions affecting accommodations and movement of labour, etc., which are required for satisfactory execution of the work. No ignorance of the same, whatsoever shall be entertained under any circumstances.
17. EMD is liable to be forfeited if the contractor fails to commence the work as per award letter.
18. Some of the provisions of the contract are given below.
 - a). **DEFECT LIABILITY PERIOD** - Twelve months from the date of completion as certified by the authorized engineer.
 - b). **MINIMUM VALUE OF WORK FOR THE INTERMEDIATE CERTIFICATE**
Intermediate certificate for a lesser amount can be admitted for payment at the discretion of the Institute.
 - c). **SECURITY DEPOSIT** - A sum @ 5% of the gross amount of the bill shall be deducted from each running bill of the contractor, till the sum along with the sum already deposited as earnest money, will amount to security deposit of 5% of the tendered value of the work. In addition, the contractor shall be required to deposit an amount equal to 5% of the tendered value of the contract as **Performance Security** within the period prescribed for commencement of work in the letter of award issued to him.
 - d) **COMPENSATION** – In the event of any delay in completion of the work beyond the scheduled period, the contractor shall pay an amount equal to one per cent of the total cost of work or such smaller amount as decided by Director of NISER (whose decision shall be final) as compensation to the institute, for every week that the work remains un-commenced or unfinished. Compensation to be paid shall not exceed ten per cent of the estimated cost of the total work as per award letter.
19. Stores to be issued: - No material shall be issued by the Institute. The responsibility for arranging all materials from approved manufacturer as per award letter lies with the contractor.
20. There will be deduction of TAX from every RA bill and also from the final bill of the contractor at the rate prescribed by govt. of India from time to time.
21. The successful bidder will be required to submit the names, qualifications and experiences of the supervising staff to be deployed for execution of the work. In case of any changes occurring during the course of execution of the said work, the same shall also be intimated by the bidder to the institute.

22. The tenderer should also submit the detail list of tools and plants/ machineries/ equipment, etc. that he proposes to place at the site of work.
23. The Contractor shall have to make his own arrangements for storage of materials required for execution of the work and NISER in any manner shall be held responsible for the storage and safe custody of the said materials at work site.
24. Electricity will be supplied to the site of work at one point only if required and Contractor can do onward distribution with metering arrangement as per the requirement. Electricity charges; if any will be recovered from the Contractor's bill based on meter readings towards its consumption.
25. Before commencement of the work, the contractor has to submit the list of tools and plants brought to the site of work. No items other than the list submitted will be allowed to be taken out from the work site.
26. All the mandatory testing charges will be borne by the contractor.
27. Cost escalation in any manner whatsoever, will not be accepted for the said work, where in the stipulated period of completion of work is 18 (eighteen) months or less.
28. The work will be executed as per CPWD guidelines and DAE works procedure under the supervision of Engineer-In-charge of NISER.
29. The price quoted in the financial bid must be inclusive all the tax. No extra claim for tax can be entertained.
- 30. Contractors are advised to make a site visit before quoting for the tender.**
31. **PRE-BID MEETING :** The pre-bid meeting shall be held on 21.02.2019 in the office of SO-D (Electrical) Institute Works Department, Building NISER.. The pre-bid conference with the prospective tenderers is being held to enable them to seek clarification on the technical specifications and in tender documents that they may consider necessary for submission of tenders. All clarifications sought for will be finalized during the pre-bid conference and confirmatory minutes for the pre-bid conference will be uploaded on the tender website. All prospective tenderers are requested to attend the same before submission of their tender.

Technical Specifications

1. **Work should be carried out as per CPWD electrical specification revised from time to time.**
2. **Circuit wiring:** - Phase, Neutral & Earth wire shall be connected up to Switch Box.
3. In wiring, no joints in wiring will be permitted anywhere, except in switch box or point outlets, where jointing of wires will be allowed with use of suitable connector.
4. **2.5** sq mm for **points & circuit** wiring, **4** sq. mm for **power plug point** wiring, **6** sq mm & **above size** for **Sub-main** wiring, i.e. Panel to DB etc. as per site plan/project requirement as directed by Engineer-in-charge.
5. Drawing of PVC insulated copper conductor cable should not be excess from maximum capacity of conduit, as per clause [4.2.1 (ii)]
6. MCB DBs pre-wired type & brand name/make as specified in the tender only.
7. Only quality materials of reputed make as specified in the tender will be used in work.
8. The contractor shall engage suitably **skilled/licensed workmen** of various categories for execution of work & **supervised by supervisors / Engineer of appropriate qualification** & experience to ensure proper execution of work. They will carry out instructions of Engineer-in-charge & other senior officers of the Institute during progress of work.
9. **Inspection and Testing** Testing shall necessarily be carried out at factory/ manufacturer premises in presence of representative of the Department. 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. The department also reserves the right to inspect the fabrication job at factory and the successful tenderer has to make arrangements for the same.
10. All electrical works shall be carried out in accordance with the provisions of Indian Electricity Act,2003 and Indian Electricity Rules, 1956 amended to date. They shall also conform to CPWD General Specifications for Electrical Works, Part-I: Internal 2005 and Part-II External, 1994, amended to date.
11. Within ten days from the date of receipt of the letter of acceptance, the successful tenderer shall Submit his programme for submission of drawings, supply of equipments, installation, testing, commissioning and handing over of the installation to the Engineer-in-Charge.
12. **The contractor shall submit the drawings to the Engineer-in-Charge for approval before start of work.**
13. **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 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 cost of the contractor. The decision of the Engineer-in-Charge in this regard shall be final.

MEASUREMENT AND RA/ FINAL BILL

1. The contractor shall submit his running and final bills with detail measurement for the purpose of payment & bills shall be processed by the various offices for payment, as per existing procedure. He has to sign the MB Book as an acceptance to the measurements carried out by the engineer in charge of NISER, based on which the RA/Final Bill shall be generated for payment.
2. The contractor shall extend all possible co-operations for checking the measurement. Decision of the engineer in charge (electrical) of NISER shall prevail. In case of any dispute, the final decision lies with the Director of NISER, which shall be binding on both the parties.

OTHERS

If, the contractor has to remove/dismantle any old, damaged wiring & fixtures etc. for the purpose of execution of the said work, the same shall be deposited with NISER Stock Yard along with the list of materials under intimate to the concerned Engineer in- Charge. No extra payment will be made by the institute for this purpose.

Detailed Technical specification for 750KVA DG set

Name of the work: Supply, Installation, Testing and Commissioning of Silent Type Diesel Generating set along with 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 ,6 cylinder ,liquid 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.
 - (b) Lube oil pressure indication
 - (c) Coolant temp. Indication
 - (d) RPM indication
 - (e) Engine Hours indications
 - (f) Battery charging indication
 - (g) Low lub. Oil trip indication
 - (h) High coolant 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 connections up 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/m³ 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 be higher 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.

2.12.3: 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.

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 : 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 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, nonferrous 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 have two numbers 1250 A ACB and 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)

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. However tenderer shall visit the site to know about the location before submitting the bids.

6.0 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.

6.1 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.

6.2 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.

6.3 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.

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6.4 Specifications for Acoustic Enclosure:

The acoustic enclosure shall be designed and manufactured conforming 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.

7.0 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.

8.0 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

9.0 INSPECTION AND TESTING

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

b. Pre dispatch Inspection and Testing of DG sets: All functional testing including 110% overload 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. Inspection and Testing of DG sets at site:-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.

10. Safety measures

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

11. 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.

12. 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.

13. 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.

14. 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.

SCHEDULE OF QUANTITIES

SI No.	Description	Unit	Quantity
1	M.V. CABLE : Supply, installation, testing & commissioning of 1.1 KV grade PVC insulated, inner sheath PVC tapped, extruded outer sheath PVC , G.I. strip/wire armoured, multistranded aluminium conductor power cable conforming to IS-1554 PART-I with upto date amendments. Laid 900mm below final ground level including excavation in all type of soil including hard murrum and soft rock temporary reinstatement sand bedding, covering cable on top and side with baked bricks conforming to IS-1077 back filling of trench and removal excess earth within a radius of 500 mtrs.		
1.1	3.5C X 300 Sqmm	Meter	3,600.00
2	Supplying and making end termination with brass compression gland and tinned copper lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 kV grade as required.		
2.1	3½ X 300 sq. mm	Each	12.00
3	Supply, installation, testing & commissioning of floor mounting front operated front access extensible type cubicle panel totally enclosed, dust and vermin proof with IP-42 protection with hinged and lockable doors. Switchboards fabricated from 2 mm thick CRCA sheets including interconnections, tinned copper crimping lugs, bonding to earth and painting suitable for use at 415 V, 3 phase 4 wire 50 Hz system, and to withstand a fault level of 35KA symmetrical for 1 sec at 415 V complete MULTIFUNCTION METER, ammeter, voltmeter, CT-1200/5 R Y B INDICATOR . Necessary interlock for panel should be there. All busbars should be tinned copper. CONTROL FEEDERS as per Details Incoming 1 -1250A 4 P 50 KA ACB Incoming 2 -1250A 4 P 50 KA ACB Buscoupler- 1250A 4 P 50 KA ACB Outgoing-1, 800 A 4 P 50 KA ACB Outgoing-2,3,4 300 A 4P 50 KA MCCB Outgoing-5,6,7 250 A 4P 50 KA MCCB Outgoing- 8,9 100 A 50 KA MCCB Outgoing-10,11,12 63A MCCB 36 KA	Set	1.00
4	Supply installation testing a commissioning and retrofitting of 1250A MCCB with all protection and busbar, insulator of appropriate size in the existing panel with tinned copper busbar size as per IS code .	Each	2.00
5	Providing and fixing 50 mm X 5 mm GI strip on surface or in recess for connections etc. as required	Meter	150.00
6	Chemical Earthing:- Earthing value should be less than 5 ohm. Electrode -The Electrode will be a solid steel rod (Copper Cladded Earth Electrode) of 17mm Dia and min 3 mtr length. The thickness of the copper coating will be minimum 250 microns and uniform with tolerance level of 0.1 micron Earth electrode will carry UL Marking on each electrode. Earth electrodes will be visually inspected and checked for diameter and length before installation.	Each	10.00

	Electrodes should not get physically crack or depleted in case of bending. (Including excavation and filling of material with the back field compound/Bentonite powder etc.) The electrode to be used to be tested and approved by CPRI Back fill Compound:- The Earth enhancement material (backfill material) - Back filled compound must have composition of Carbon, silica, chloride, calcium, tin, Mg, Lead, PBB, PBDE etc.as per the ISO standard and ISO certified by Govt. of India and "LOHM" compound may be used if ISO certified.		
7	Supply installation and testing and commissioning of 750 KVA DG set as per specification mentioned in NIT	Each	1.00

Acceptable Makes

Following are the makes/manufacturers for diesel engines and alternators.

a) **750 KVA Diesel Engine**

- i) Cummins
- ii) CAT
- iii) Volvo
- IV) PERKINS

b) **Alternators**

Stamford model no.

Leroy Somer

c) **Cushy foot mountings**

GERB/ Dunlop.

d) **MCCB**

Legrand (DPX3)/ Siemens (3VL) / L&T (D-Sine MTX2)/ Schneider Electric (Easy Pact).

e) **Contactors**

Siemens/Legrand/Schneider/ L&T

f) **Measuring Instruments**

A.E/ Rishab

g) **Battery**

Exide/Prestolite/Cummins.

h) **Control Cable & Power Cable**

Finolex/L&T/BCH/CappKable/Havells (It should be ISI marked)

i) **CTs**

AE/ Kappa

j) **Selector Switches**

L&T/ Kay Cee/ BCH

k) **Indicating Lamp**

BCH/ L&T

l) **MS Pipe/GI pipe**

Jindal (Hisar)/ TATA

j) **Acoustic Enclosure** Manufactured by OEM/OEA of above makes of engine and as per CPCB norms.

k) **AMF** Manufactured by OEM/OEA of above makes of Panel" engine/DG Sets.

l) **Changeover switch**

L&T/BCH/SocoMec.

m) **ACB**

Legrand (DMX3),Siemens-3WT, L&T (U power),Schneider (master pact NW)

REGISTRAR

NISER