REQUEST FOR QUOTATION

MMI:PU:RF:003

BHARAT HEAVY ELECTRICALS LIMITED
Electronics Division
PB No. 2606, Mysore Road Bangalore - 560026
INDIA

RFQ NUMBER: MANM900091

RFQ DATE : 25.AUG.2010

Due Date
22.SEP.2010
Time: 13:00 HRS

VENUE :
NEW ENGG. BLDG

(for all correspondence)
Purchase Executive : MANOJ K
Phone : 080-26998255
Fax : 00918026989225
E-mail: manoj@bheledn.co.in

Please submit your lowest quotation subject to our terms and conditions attached for the material mentioned below. The quotation must be enclosed in a sealed envelope / Fax superscribed with RFQ no.and due date, should reach us on or before the due date by **13.00** hours IST and will be opened on the same day at **13.30** hours at the venue mentioned above. **PLEASE DROP THE OFFER IN THE BOX PROVIDED AT RECEPTION.**

SPECIAL TERMS AND CONDITIONS:

1. TENDER/OFFER MUST BE SUBMITTED IN TWO PARTS: (1).TECHNO- COMMERCIAL BID (2).PRICE BID.

2. QUOTATIONS MAY BE SUBMITTED BY ORIGINAL EQUIPMENT MANUFACTURER'S (OEM'S) OR THEIR AUTHORISED DEALERS.

3. VENDOR HAS TO CONFORM ALL THE CLAUSES IN THE PURCHASE SPECIFICATIONS. DEVIATIONS, IF ANY, TO BE BROUGHT OUT CLEARLY IN THE TECHNICAL BID.

4. VENDOR IS ADVISED TO GO THROUGH THE GENERAL TERMS AND CONDITIONS, DOCUMENT CPD-20000MW ENCLOSED WITH THIS RFQ.

5. VENDOR HAS TO CONFORM TO ALL THE CLAUSES LISTED IN THE COMMERCIAL TERMS (ANNEXURE A/B). DEVIATIONS, IF ANY, TO BE HIGHLIGHTED AND BROUGHT OUT CLEARLY IN THE TECHNICAL BID.

6. DELIVERY REQUIRED: 16 WEEKS FROM THE DATE OF PO.

7. TERMS OF PAYMENT: 80% BY SIGHT DRAFT / WITH 30 DAYS CREDIT AFTER RECEIPT OF MATERIAL, 10% AFTER INSTALLATION & COMMISSIONING AND 10% AGAINST SUBMISSION OF PERFORMANCE BANK GURANTEE(PBG) OR AFTER WARRANTY PERIOD.

8. QUOTATION SHOULD BE VALID FOR 90 DAYS FROM DUE DATE.

9. BHEL RESERVES THE RIGHT TO RESORT TO REVERSE AUCTION BEFORE THE PRICE BID OPENING.

Sl No.	Description	Qty	Unit	Delivery qty	Delivery Date
1	1010 KVA DG Set Supply,Installation,Testing and Commissioning of 1010 KVA DG Set including Acoustic lining and Ventilation for DG Room for ESD Premises as per Annexure.	1	ST	1	01.FEB.2011

Total Number of Items - 1

Please note that the tender will be opened in the presence of the bidders or his authorised representatives (maximum two per organisation) who choose to be present with authorisation letters. Refer annexure for the terms and conditions.
Preference will be given to vendors who accepts our standard payment terms i.e.100% payment - 30 days after receipt of material at our works subject to acceptance.
Please specify Terms of delivery, Excise duty, sales tax, Ex-BHEL, Ex-works surcharge, Insurance,P&F, Freight and other taxes very clearly .

i). This is only RFQ not an order.
ii). In all correspondence quote RFQ No. & due date.
iii). In Quotation BHEL material code / RFQ Sl. No. should be mentioned clearly.
iv). Quotation Envelope / Fax not superscribed with RFQ No.and due date is liable for rejection.
v). Quotation should remain valid for a minimum peiod of 90 days from due date.
vi). In case of non-receipt of Quotation or regret letter for 3 consecutive RFQs you are liable to be removed from our vendors list.

For and On behalf of BHEL.

REQUEST FOR QUOTATION

MMI:PU:RF:003

BHARAT HEAVY ELECTRICALS LIMITED
Electronics Division
PB No. 2606, Mysore Road Bangalore - 560026
INDIA

RFQ NUMBER:
MANM900091

RFQ DATE :
25.AUG.2010

Due Date
22.SEP.2010
Time: 13:00 HRS

VENUE :
NEW ENGG. BLDG

(for all correspondence)
Purchase Executive : MANOJ K
Phone : 080-26998255
Fax : 00918026989225
E-mail: manoj@bheledn.co.in

Please submit your lowest quotation subject to our terms and conditions attached for the material mentioned below. The quotation must be enclosed in a sealed envelope / Fax superscribed with RFQ no.and due date, should reach us on or before the due date by **13.00** hours IST and will be opened on the same day at **13.30** hours at the venue mentioned above. **PLEASE DROP THE OFFER IN THE BOX PROVIDED AT RECEPTION.**

vii). All Prices should be written in words and numbers.
viii). Excise Chapter Heading should be mentioned for all items where VAT is applicable .

For and On behalf of BHEL.

Bharat Heavy Electricals Ltd.,
(A Government of India undertaking)
Electronics Division
PB No.2606, Mysore Road, Bangalore-560026,India

Enquiry - General Terms & Conditions for Supply of CAPITAL ITEMS (Imported &Indigenous) (Two parts bid), Doc Ref: CPD-20000

I. Enquiry / Request For Quotation (RFQ):

(a) Any Purchase Order resulting from this enquiry shall be governed by **thesegeneral terms and conditions listed below and special terms and conditions, if any, along with this enquiry** of Bharat Heavy Electricals Limited, Electronics Division, Bangalore-560026 (**hereinafter referred to as BHEL EDN**).

(b) Any of the terms and conditions not acceptable to vendor, shall be explicitly mentioned in the quotation. Otherwise, it will be treated as that all terms and conditions of this enquiry are acceptable.

(c) If counter terms and conditions are offered by vendor, BHEL EDN shall not be governed by such terms and conditions, unless it is agreed and incorporated in the Purchase Order of BHEL EDN.

(d) Any deviation to the terms and conditions not mentioned in the quotation by vendor in response to this enquiry will not be considered, if put forth subsequently or after issue of order, unless clarification is sought for by BHEL EDN and agreed upon in the Purchase Order of BHEL EDN.

(e) BHEL EDN reserves the right to adopt Reverse Auction for the enquiry sent, at its discretion.

(f) BHEL EDN shall be at liberty to cancel the tender at any time, before ordering, without assigning any reason.

II. General Terms and conditions:

1. TWO PARTS BID: Quotation shall be submitted in two parts bid i.e.

(a) Techno-commercial i.e., Un-priced Bid (in one sealed envelope):

Techno-commercial bid shall be submitted with complete description of the equipment, specification compliances to the enquired specification and all the commercial terms & conditions indicated in the **COMMERCIAL TERMS (**ANNEXURE-A / ANNEXURE-B). Any other enclosure, which the vendor wishes to submit like product catalogue, technical literature etc., may also be submitted in a sealed envelope super scribed clearly as **"TECHNO-COMMERCIAL BID" with RFQ No. and DUE DATE.**An un-priced copy of price bid (without price) shall also be enclosed with the techno-commercial bid for evaluation of commercial terms. The vendor shall not give the price in the technical bid.

Confirmation to BHEL specifications shall be indicated by the vendor in the respective columns provided in the purchase specification wherever applicable. Deviations to the specification /

item description, if any shall be brought out clearly indicating "DEVIATION TO BHEL SPECIFICATION" without fail as a part of technical offer.

Compliance to Pre-qualification criteria (if applicable) shall also be enclosed with the Techno-commercial bid.

Manufacturer's name, their trade mark and brand, part number, alternate material to the one asked in enquiry, if any, should be mentioned in quotation and illustrative leaflets giving technical particulars etc. are to be attached to facilitate consideration and technical evaluation of the quotation.

BHEL EDN material code number (as in enquiry) shall be indicated for each item quoted.

(b) Price Bid (in one sealed envelope):

Price bid should contain basic unit prices, discount if any, applicable taxes & duties, packing & forwarding charges (if applicable), Freight & insurances (if applicable) FOB charge (if applicable) etc., in a sealed envelope super scribed clearly as **"PRICE BID" with RFQ No. and DUE DATE.** Installation, commissioning, start-up and training charges (if any) shall also be indicated in the price bid.

It is preferred to indicate the rates in both figures and words. In such case, if there is difference / discrepancy between the rates in figures and words, the **least of the two** rates will be considered.

(c) Tender Offer (above two envelopes inside another sealed envelope):

Both these sealed envelopes [(a) Techno-commercial i.e., un-priced Bid and (b) Price Bids] shall be kept in a single sealed envelope and super scribed clearly with **RFQ No. and DUE DATE.**

2. The above sealed envelope (Tender) shall reach our office on or before the due date by **13:00 hrs.** Quotations are to be dropped in the tender box marked for the OPENING ON respective days i.e., MONDAY / WEDNESDAY / FRIDAY kept at BHEL-EDN's Reception area of our works with caption "CE, M&C, SC&PV, TSC, DEFENCE, TELECOM, CPD".**Quotations also can be dispatched by Couriers / Registered post / FAX / e-mail to the Purchase Executive indicated in the RFQ at the risk of vendor / bidder.**

Quotation through courier / register post / fax / email when addressed to the specific fax number and email address given in the enquiry, to be sent well in advance to enable BHEL EDN purchase personnel to drop in the tender box before the scheduled opening date and time. **Vendor is fully responsible for lack of secrecy on information of such quotations.** Vendor shall confirm with the concerned purchase executive after sending the offer regarding such delivery mode to ensure participation. BHEL EDN is not responsible for any delay in receipt of quotation sent by vendor through post/fax/email.

Late Tenders i.e., Tenders received after due date will be rejected.

3. The rate quoted against each item shall be in units stated in the enquiry. Where quotation is in terms of unit other than that in enquiry, relationship between the two units must be furnished in the quotation.

4. As far as possible, the quotations shall be free from corrections / overwriting. Corrections / overwriting, if any should be signed by authorized person with the company seal. Any typographical errors, totaling mistakes, currency mistakes, multiplication mistakes, summary mistakes observed in your priced bids, BHEL may consider whichever is beneficial to BHEL for evaluation. Vendor shall doubly ensure that the quote is correct and complete. The corrections / overwriting if any shall be signed with the seal.

5. Quotations are to be duly signed. Unsigned bids/offers are liable for rejection.

6. Tenders will be opened at **13:30 hrs.**& the venue is New Engg., Bldg., 2nd floor, MM conference hall. All the tenderers or their authorized representatives (with authorization letter from their principals) may witness opening of techno-commercial bid on the due date.

7. After evaluation of techno-commercial bids, price bids of only those which are technically & commercially accepted, will be opened on a subsequent date, which will be intimated to the concerned in advance for witnessing of price bid opening.

8. The quantity in each item to be purchased may vary from quantity enquired according to the actual requirement at the time of placing the purchase order. Quantity discount, if any, should be mentioned in the quotation.

9. BIDDERS (for indigenous purchase) shall indicate clearly Excise duty, Education Cess, Sales Tax/VAT, Octroi, Exit/Entry tax, Service Tax as applicable for the quoted items. In the absence of clarity of these, any claim at a later date will not be entertained. Any changes in Taxes and duties after award of the contract will not be considered except such are those, which are imposed by Govt., notification within the contractual delivery after placement of PO. Seeking price amendments for change in Excise duty due to crossing of turnover limits will not be considered under any circumstances.

10. **DUN &BRADSTREET REPORT (for Foreign purchase):**

In case of foreign vendors, the vendors should obtain a report from Dun & Bradstreet or equivalent and submit a copy of the report with their Duns number mentioned along with the technical offer. Offer without this report is liable for rejection.

11. **Payment of Agency Commission to Indian Agent (for Foreign purchase):**

The vendor shall give a certification to the following effect:
The seller confirms and declares to the Buyer that the seller is the original manufacturer of the stores referred to in this contract and has not engaged any individual or firm, whether Indian or Foreign whatsoever, to intercede, facilitate or in any way to recommend to the Government of India or any of its functionaries, whether officially or unofficially, to the award of the contract to the seller; nor has any amount been paid, promised or intended to be paid to any such individual or firm in respect of any such intercession, facilitation or recommendation. The seller agrees that if it is any way incorrect or if at a later stage it is discovered by the Buyer that the seller has engaged any such individual/ firm, and paid or intended to pay any amount, gift,

reward, fees, commission or consideration to such person, party, firm or institution, whether before or after the signing of this contract, the seller will be liable to refund that amount to the Buyer. The seller will also be debarred from entering into any supply contract with the Government of India for a minimum period of five years. The Buyer will also have a right to consider cancellation of the contract either wholly or in part, without any entitlement or compensation to the seller who shall in such event be liable to refund all payments made by the buyer in terms of the contract along with interest at the rate of 2% per annum above the LIBOR rate.The Buyer will also have the right to recover any such amount from any contracts concluded earlier with the Govt. of India

BHEL would like to procure the above item directly from you and not to involve services of Indian Agent for the procurement. The quotation submitted by your Indian Agent is not acceptable and liable to be rejected. However, in case you would like to involve your Indian Agent for supply of the items/service therefore you may furnish the following information along with the Techno Commercial bid.

(a) Registration status of Indian Agent with DGS&D and BHEL.

(b) Commission payable to Indian Agent and percentage.

(c) Currency in which payable to Indian Agent.

(d) If the agency commission is payable by the foreign principal/OEM, such commission shall be received by Indian Agent through inward FFE remittance through banking channels and disbursed in rupees only.

(e) Tax at source deduction is applicable to the Agency Commission paid to the Indian Agent as per the prevailing rules.

(f) If the respective Indian Agents are not registered with DGS&D or BHEL, are required to register their names with BHEL by providing the following information's for registration.

  (i) Name of the foreign firm/original equipment manufacturer represented by the Indian representative / Indian Agent.

  (ii) Agency agreement.

  (iii) PAN No, Name, Address of Bankers in India and Abroad.

  (iv) Nature of services to be rendered by Indian Agent/ Indian representative and percentage of commission payable to Indian Agent/ Indian representative by Principal /original equipment manufacturer.

(g) All particulars relating to Agency Commission will be reported to the enforcement Directorate of Income Tax Department.

(h) Undertaking to be submitted by Indian Representative/ Agent that the agency commission would be accepted in Indian Rupees only and through inward FFG remittance through banking channel for the services rendered towards the execution of the orders.

12. **TOTAL COST TO BHEL:** Purchase order will be placed on the lowest quotation (L1) only among the technically & commercially accepted quotations. Lowest quotation (L1) is determined on the basis of the total cost to BHEL.

(a) FOR FOREIGN PURCHASE:

Total cost to BHEL = Total basic value (including installation, commissioning, training, spares etc.) in foreign currency + FOB charges (if any) + Packing & Forwarding charges (if any) + Cost Insurance Freight (CIF) + Basic Custom Duty (BCD) + Counter Veiling Duty (CVD) + Educational Cess + Special Additional Duty (SAD) + Entry TAX + Service TAX (if applicable) + Loading factors for deviations to commercial terms & conditions.

Note: Exchange rate ruling on the date of Tender opening (Techno-commercial / un-priced Bid) will be considered for converting foreign currency to Indian currency. Exchange rates of banking TT selling will be considered.

No import license will be given by BHEL EDN unless otherwise specifically stated.

(b) FOR INDIGENOUS PURCHASE:

Total cost to BHEL = Total basic value (including installation, commissioning, training, spares etc.) + Packing & forwarding charges + Excise duty + Education cess + sales Tax/VAT + Octroi+Exit/Entry tax+ Freight & Insurance + Service Tax (if applicable) + Loading factors for deviations to commercial terms & conditions.

13. **FIRM PRICE:** Rates quoted should be firm from the date of P.O., to the completion of supply and no enhancement in the rates and changes in the techno-commercial terms will be allowed once the quotation is accepted and order is placed.

If Installation & Commissioning is in vendor's scope, then the price shall remain FIRM till commissioning & handing over of the complete system.

14. **TERMS OF PAYMENT:**

(a) FOR FOREIGN PURCHASE:

Payment will be made against **"SIGHT DRAFT"** on presentation of documents to our bankers. Payment throughLC is also made subject to loading factors as per **Clause27 (Ai).**For LC payment bank charges within India will be borne by BHEL and outside India will be to vendor's account.

The payment terms are as follows:

(i) 100% against complete dispatch documents i.e. AWB / BOL, Invoice, Packing list, Warranty certificate (if applicable), Nil shortage certificate, Certificate of country of origin etc., (where both commissioning &PBGare NOT applicable).

(ii) 90% against complete dispatch documents i.e. AWB / BOL, Invoice, Packing list, Warranty certificate, Nil shortage certificate, Certificate of country of origin etc., &balance 10 % on submission of Performance Bank Guarantee (PBG) (where PBG only isapplicable).

(iii) 80% against complete dispatch documents i.e. AWB / BOL, Invoice, Packing list, Warranty certificate, Nil shortage certificate, Certificate of country of origin etc., 10% after completion of commissioning & balance 10 % on submission of Performance Bank Guarantee (PBG) (where both commissioning & PBG are applicable).

(iv) If PBG could not be submitted, vendors can also accept for the final 10% payment,payable after the warranty period + 6 months of claim period against supplementary invoice subject to the completion of commissioning (if applicable). In such cases loading for PBG is not applicable.

(b) FOR INDIGENOUS PURCHASE:

(i) 100% payment with 30 days credit (where both commissioning &PBGare NOT applicable).

(ii) 90% basic payment + 100% taxes & duties with 30 days credit & balance 10% basic against submission of PBG (where PBG only is applicable).

(iii) 80% basic payment + 100% taxes & duties with 30 days credit 10% basic after completion of commissioning & balance 10% basic against submission of PBG (where both commissioning & PBG are applicable).

(iv) If PBG could not be submitted, vendors can also accept for the final 10% payment, payable after the warranty period + 6 months of claim period against supplementary invoice subject to the completion of commissioning (if applicable). In such cases loading for PBG is not applicable.

15. **ADVANCE PAYMENT:** Quotations with **"Advance payment" without fully securing with equal value of BG is liable for rejection. "Inland Letter of Credit"**is not encouraged.

16. **PENALTY:**Failure to supply within the delivery time as per purchase order will make the vendor liable to an unconditional **penalty of 0.5 % (half percent) per week at the basic price of the goods for the undelivered quantity, subject to a maximum of 10%.**

If pre-shipment inspection is involved, date of issue of pre-shipment call by the vendor along with test certificates / test reports / certificate of conformance / calibration reports as proof of completion will be treated as date of dispatch for the purpose of penalty calculation.

In the absence of reports stated above, actual date of inspection will be considered as date of dispatch for penalty calculation.

Date of receipt / Date of dispatch / Date of LR / Date of Airway bill / Date of pre-shipment inspection call with relevant documents as stated above, whichever is applicable shall be considered as delivery date for the purpose of penalty calculation. BHEL is not liable for delayed OA for opening LC or corrections/amendment to LC asked after opening of LC.

17. **PBG:**Performance Bank Guarantee (PBG) to be submitted on Rs.100/- non-judicial stamp paper as per the BHEL prescribed format given in **ANNEXURE - E / ANNEXURE - F** for 10% of the basic equipment value obtained from any BHEL member (consortium) banks indicated in **ANNEXURE-G**.

PBG shall be valid for 12 months from the date of commissioning or 18 months from the date of dispatch whichever is earlier. The PBG shall also have 6 months claim period from the date of dispatch/commissioning.

The Bank Guarantee shall be submitted directly to the concerned Purchase Executive by the issuing Bank with their forwarding letter.BHEL will verify independently with the bank to establish the authenticity.

18. **WARRANTY:** Goods dispatched shall have warranty period of 18 months from the date of dispatch or 12 months from the date of commissioning whichever is earlier or as mentioned in the RFQ.

19. **TERMS OF DELIVERY:**

(a)FOR IMPORTED PURCHASE:

Price offered shall be for goods packed and delivered **F.O.B.** (named international Airport / sea port) including packing, forwarding, Handling, Ancillary charges like processing of Sight Draft, Letter of credit (L/C) if applicable, negotiation of bank documents, Export declaration, Certificate of origin etc.

Packing shall be Road / Rail / Air / Sea worthy, best suitable for transshipment and to take care of transit damages. If containerized, no. of containers & size of container shall be mentioned. Packing weight (gross &nett) Packing dimensions shall be given prior to shipment to ascertain whether the consignment can be carried on standard cargo in contract or as ODC.

Wooden packing material for all the foreign consignmentsshould be treated as per ISPM-15 &**Fumigation / Phytosanitarycertificate** to be submitted to the freight forwarders/ BHEL along with the invoice, AWB, packing list etc.

Vendors shall indicate the name of International Airport/ Seaport.The consignment shall be handed over to BHEL approved freight forwarded as mentioned in PO.

Note: Name of International Airport has to be selected from any one of the airports indicated in the table provided in **ANNEXURE –C.**

(b) FOR INDIGENOUS PURCHASE:

Equipment shall be delivered on EX-EDN/BHEL, Bangalore basis, inclusive of freight, packing, insurance & forwarding charges.

Packing shall be Road / Rail / Air / Sea worthy, best suitable for transshipment and to take care of transit damages.

It is preferred to dispatch the consignments through EDN/BHEL approved transportersindicated in **ANNEXURE - D**on Door Delivery basis.

Smaller consignments can be dispatched through Courier services/ RPP with the prior approval of the purchasing Executive.

In case of ex–works dispatches, transit insurance shall be arranged by BHEL. Vendor shall intimate the dispatch details to BHEL immediately after effecting shipment, to arrange transit insurance accordingly.

20. **DELIVERY REQUIREMENT:** In the quotation, earliest firm delivery (number of days or weeks) by which material will be dispatched from the date of Purchase order must be indicated. It is recommended to avoid Quotations with delivery term such as `ex-stock', `subject to prior sale', or `delivery at the earliest'. Date of BHEL PO is the reference for all purposes.

21. **VALIDITY:** Quotation should remain valid for a period of **90 days** from the date of technical bid opening. Offer with Non-conformance is liable for rejection.

22. **POST-ORDER REQUISITES:**

(a) Vendor shall give an Order Acknowledgement indicating the delivery date within one week of receipt of PO.

(b) Pre-shipment inspection at vendor's works, if required, will be carried out by BHEL. Required assistance will have to be provided by the vendor at the time of pre-shipment inspection.

(c) Test certificates, Calibration certificates and warranty certificates as stipulated at the time of ordering shall be furnished.

(d) Items shall be dispatched by Air/Road/Rail/Sea worthy packing. Any damage and later rejection, due to poor / improper packing shall be to vendor's account.

(e) Any damage/rejection should be made good or replaced immediately without any extra cost to BHEL such as freight, duties, taxes etc. The liability is restricted to the value of the order.

(f) Wherever commissioning is involved, it shall be carried out by the vendor's qualified engineers. Scope of work includes installation, commissioning and start-up trials till satisfactory performance level is reached as certified by BHEL.

(g) BHEL will not be responsible for any loss, damage or injuries to vendor's personnel sustained during installation / commissioning / start-up trials. Vendor shall ensure compliance with all statutory requisites as laid down by local bodies, state & Central Government. Vendor shall indemnify BHEL for all damages/ losses to various personnel during their presence in BHEL's premises for whatever purpose.

(h) Suitable markings & damage control indicating devices shall be provided where applicable.

23. Equipment shall comply with the standard requirements of ISO 14001 & OHSAS 18001.

24. **GENERAL TERMS AND CONDTITIONS GOVERNING REVERSE AUCTION (RA):**

(a) Against this enquiry for the subject item/system with detailed scope of supply as per enquiry specifications, BHEL may resort to "REVERSE AUCTION PROCEDURE" i.e., ON LINE BIDDING ON INTERNET. • For the proposed RA, technically and commercially acceptable bidders only shall be eligible to participate.

(b) In case of RA, BHEL will engage the services of a service provider for conduct of theRA who will provide all necessary training and assistance to the bidders before commencement of on line bidding on internet.

(c) Business rules governing the RA will be communicated to the bidders through service provider for compliance.

(d) Vendors have to fax the Compliance form in the prescribed format (provided by Service provider) before start of RA. Without the compliance, the vendor will not be eligible to participate in the event.

(e) BHEL will provide a sample calculation sheet (in EXCEL format) which would help the bidders to arrive at "Net Cash outflow to BHEL" considering various price / cost elements like Packing & forwarding charges, Taxes and Duties, Freight charges, Insurance, Service Tax for Services and loading factors (for non-compliance to BHEL standard Commercial terms & conditions) etc. for each of the bidders to enable them to arrive at "Net Cash outflow to BHEL (Total Cost to BHEL)" which is the amount the bidder would be bidding during the RA.

(f) RA will be conducted on scheduled date & time and at the end of event, the lowest bidder value will be known on the network.

(g) The lowest bidder has to Fax the duly signed "Price Break-up" in prescribed format as provided on case-to-case basis to BHEL through Service provider within 24 hours of Auction without fail.

(h) Any variation between the on-line bid value and the signed document will be considered as sabotaging the tender process and will invite disqualification of vendor to conduct further business with BHEL, as per the prevailing procedure.

25. **REGRET LETTER:** In case any vendor is unable to quote, vendor shall send a regret letter without fail. In case of non-receipt of quotations or regret letters for three consecutive enquiries, such vendor is liable to be removed from our vendor list.

26. Any dispute arising out of this, shall be referred to the sole arbitration of Head of Dept. Materials Management of group concerned, BHEL EDN or any other officer nominated by him and his award shall be final and binding on the parties. The venue of the arbitration in all cases shall be Bangalore.

27. Any legal suit in respect of this enquiry lies in the court of Jurisdiction of Bangalore (India) only.

28. **LOADING FACTORS:**

Loading factors as detailed below will be added to the quoted price (basic) to evaluate the lowest quote for non compliance of BHEL standard commercial terms.

A(i). For non compliance of standard Terms of payment (For Foreign Purchase Orders)

Sl. No.	BHEL standard term	If you quote	Loading factor in % for non-compliance
1	100% against "SIGHT DRAFT" on presentation of dispatch documents to our Bankers (where both commissioning & PBG are not applicable).	Payment through Letter of Credit (LC) with bank charges to respective accounts	10 % x Percentage quoted through LC

2	90% against "SIGHT DRAFT" + 10% against PBG(where PBG only is applicable)	Payment through Letter of Credit (LC) with bank charges to respective accounts	10 % x Percentage quoted through LC
3	80% against "SIGHT DRAFT" + 10% after commissioning +10% against PBG(where both commissioning & PBG are applicable)	Payment through Letter of Credit (LC) with bank charges to respective accounts	10 % x Percentage quoted through LC

A(ii).For non compliance of standard Terms of payment (For Indigenous Purchase Orders)

Sl. No.	BHEL standard term	If you quote	Loading factor in % for non-compliance
1	100% payment with 30 days credit (where both commissioning & PBG are not applicable).	Payment through bank	10 % x percentage quoted through bank / proforma invoice
		Payment against proforma invoice	
2	90% basic payment + 100% taxes & duties with 30 days credit + 10% against PBG (where PBG only is applicable)	Payment through bank	10 % x percentage quoted through bank / proforma invoice
		Payment against proforma invoice	
		100% with 30 days credit &against submission of PBG	Nil
3	80% basic payment + 100% taxes & duties with 30 days credit + 10% after commissioning +10% against PBG (where both commissioning & PBG are applicable)	Payment through bank	10 % x percentage quoted through bank / proforma invoice
		Payment against proforma invoice	
		100% with 30 days credit after commissioning & submission of PBG	Nil

B. *For non compliance of Penalty clause for delayed delivery*:

Sl. No.	BHEL standard term	If you quote	Loading factor for non-compliance
1	Penalty of 0.5% per week subject to max. of 10% on the basic value of the items not supplied /delayed	Not agreed.	10 %
		5% max., agreed.	5%
		Other than the above.	10% - (minus) agreed max. %

C. For non compliance of Performance Bank Guarantee (PBG):

Sl. No.	BHEL standard term	If you quote	Loading factor for non-compliance
1	PBG for 10% of the basic material cost shall be furnished in the BHEL prescribed format.	Not agreed.	10 %
		5% agreed.	5 %
		Other than the above.	10% - (minus) agreed max. %

D. For non conformance to delivery requirement indicated in the RFQ:

Sl. No.	BHEL standard term	If you quote	Loading factor for non-compliance
1	Delivery requirement as indicated in the RFQ in number of weeks from the date of issue of PO	Not agreed for the stipulated delivery in the RFQ	0.5 % per week up to max., of 10% for the difference in delivery period

E. For non compliance of Warranty:

Sl. No.	BHEL standard term	If you quote	Loading factor for non-compliance
1	18 months from the date of dispatch or 12 months from the date of commissioning whichever is earlier or as indicated in the RFQ	Not agreed.	6%
		Less than 12 months or as indicated in the RFQ	0.5 % per month for the difference in period

F (i) For Non- agreement on delivery at BHEL-EDN (For Foreign Purchase Orders):

Sl. No.	BHEL standard term	If you quote	Loading factor for non-compliance
1	FOB / CIF to nearest international Airport/Seaport	Not agreed for the standard term of delivery	10 %

F(ii) For Non- agreement on delivery at BHEL-EDN (For Indigenous Purchase Orders):

Sl. No.	BHEL standard term	If you quote	Loading factor for non-compliance
1	Ex-EDN/BHEL, Bangalore (Free delivery to EDN/BHEL Bangalore including freight, packing & forwarding charges)	Not agreed for the standard term of delivery	10 %

ANNEXURE-A

COMMERCIAL TERMS (to be enclosed with TECHNO-COMMERCIAL BID)

(for Foreign Purchase Orders)

Sl. No.	Particulars	Bidder's confirmation
1	**Price basis:** Firm i.e., from the date of PO to completion of supply [Price Variation Clause (PVC) not acceptable]	Acceptable / Not acceptable
2	**Terms of Payment**: Against "SIGHT DRAFT" on presentation of documents to our bankers. (a) 100%is payable on negotiation of complete set of original documents (where commissioning & PBG are not applicable) (b) 90 % is payable on negotiation of complete set of original documents & balance 10% against submission of PBG (where PBG only is applicable). (c)80 % is payable on negotiation of complete set of original documents,10% after commissioning & balance 10% against submission of PBG (where both Commissioning & PBG are applicable). (d) Deviation if any please specify Note: Refer clause 14(a) above	(a) Acceptable / Not acceptable (b) Acceptable / Not acceptable (c) Acceptable / Not acceptable
3	**BHEL's penalty clause:** (a) Delay in delivery as per PO delivery date will result inpenalty of 0.5 % per week subject to maximum of 10% on the value of the items not vendor/delayed. (b) Deviation if any Please specify	(a) Acceptable / Not acceptable (b)
.4	**Performance Bank guarantee**: PBG for 10% of the basic material cost shall be furnished in the BHEL prescribed format as detailed in clause 17.	Yes / No
5	**Terms of delivery:** (a) F.O.B international Airport/Seaport as per clause 19 (a)(Indicate name of International Airport/Seaport) (b) Deviation if any Please specify	(a)Acceptable / Not acceptable (b)
6	**Warranty:** (a) 18 months from the date of dispatch or 12 months from the date of commissioning (b) Deviation if any Please specify	(a)Acceptable / Not acceptable (b)
7	**Delivery period:** Indicate number of weeks from the date of issue of Purchase order	_____Weeks
8	**Validity:** (a) Quotation should remain valid for a period of 90 days from the due date (b) Deviation if any Please specify	(a) Acceptable / Not acceptable (b)
9	**Bank charges(If applicable):** (a) Bank charges within India is to BHEL account and outside India is to Vendor's account (b) Deviation if any Please specify	(a) Acceptable / Not acceptable (b)
10	Weight and Dimension of consignment with packing	Furnished / To be furnished

Signature of tenderer / with seal

ANNEXURE-B

COMMERCIAL TERMS (to be enclosed with TECHNO-COMMERCIAL BID)

(For Indigenous Purchase Orders)

Sl. No.	Particulars	Bidder's confirmation
1	**Price basis:** Firm i.e., from the date of PO to completion of supply [Price Variation Clause (PVC) not acceptable]	Acceptable / Not acceptable
2	**Excise duty:** If applicable indicate %.	Applicable / Not applicable ED:_____%
3	**Sales tax:** If applicable indicate %	Applicable / Not applicable (a) VAT_____% (b) CST_____% against form C
4	**Payment terms:** (a) 100% payment with 30 days credit(where commissioning & PBG are not applicable) (b) 90 % basic payment + 100% taxes, duties & freight charges with 30 days credit & balance 10% against submission of PBG (where PBG only is applicable) (c) 80 % basic payment + 100% taxes, duties & freight charges with 30 days credit, 10% after commissioning& balance 10% against submission of PBG (where both commissioning & PBG are applicable) (d) Deviation if any please specify Note: As per clause 14 (b)	(a) Acceptable / Not acceptable (b) Acceptable / Not acceptable (c) Acceptable / Not acceptable (d)
5	**BHEL's penalty clause:** (a) Delay in delivery as per PO delivery date will result in penalty of 0.5 % per week subject to maximum of 10% on the basic value of the items not vendor/delayed. (b) Deviation if any Please specify	(a) Acceptable / Not acceptable (b)
6	**Performance Bank guarantee (PBG):** PBG for 10% of the basic material cost shall be furnished in the BHEL prescribed format as per clause 17.	Yes / No
7	**Terms of delivery:** (a) Ex EDN / BHEL, Bangalore (Free delivery to EDN/BHEL Bangalore including freight, packing & forwarding charges) (b) Deviation if any Please specify	(a) Acceptable / Not acceptable (b)
8	**Warranty:** (a) 18 months from the date of dispatch or 12 months from the date of commissioning (b) Deviation if any Please specify	(a) Acceptable / Not acceptable (b)
9	**Delivery period:** Indicate number of weeks from the date of issue of Purchase order	_____Weeks
10	**Validity:** (a) Quotation should remain valid for a period of 90 days from the due date (b) Deviation if any Please specify	(a) Acceptable / Not acceptable (b)
11	**Bank charges (If applicable):** (a) All Bank charges to vendor's account (b) Deviation if any Please specify	(a) Acceptable / Not acceptable (b)
12	Weight and Dimension of consignment with packing	Furnished / To be furnished

Signature of tenderer / with stamp

ANNEXURE- C

LIST OF INTERNATIONAL AIRPORTS

Sl. No	Country	Air Ports
1	Austria	Vienna, Linz, Graz
2	Australia	Sydney, Melbourne, Perth
3	Belgium	Antwerp, Brussels
4	Canada	Toronto, Montreal
5	China	Shangai
6	Cyprus	Lamaca
7	Czech Republic	Prague (Via Frankfurt)
8	Denmark	Copenhagen
9	Egypt	Cairo
10	Finland	Helsinki
11	France	Paris (Rossy), Lyon
12	Germany	Darmstadt, Manihiem, Nurnberg, Hamburg, Stutttgart, Munich, Koln, Dusseldorf & Hannover, Frankfurt, Berlin
13	Hongkong	Hongkong
14	Italy	Rome, Milan, Turin, Bologna, Florence
15	Ireland	Dublin
16	Isrel	Telaviv
17	Japan	Tokyo, Osaka
18	Malaysia	Kaulalampur, Penang
19	Neatherlands	Amsterdam, Rotterdam
20	Newzealand	Auckland
21	Norway	Oslo
22	Oman	Muscat
23	Philiphines	Manila
24	Romania	Bucharest
25	Russia	Moscow
26	Saudi Arabia	Riyad
27	Singapore	Singapore
28	Slovakia	Bartislowa
29	South Africa	Johannesburg, Durban
30	South korea	Kimpo
31	Spain	Barcelona
32	Sweden	Stockholm, Gothenburg, Milano
33	Switzerland	Basle, Zurich, Geneva
34	Taiwan	Taipei
35	U.A.E.	Dubai
36	U.K.	Landon (Heathrow), Newcastle, Oxford, Cheltham, Bristol, Wellingborough, Birmingham, East Midland, Manchester,Leeds, Glasgow.
37	U.S.A.	Newyork, Chicago, Sanfrancisco, Los Angeles, Atlanta
38	Ukraine	Kiev

ANNEXURE-D

BHEL EDN APPROVED TRANSPORTERS FOR INLAND ROAD TRANSPORTATION

1. M/s Awagaman Road Carriers ltd., Bangalore. (AWG)
2. M/s BLR India pvt., ltd., Bangalore. (BLR)
3. M/s Delhi Assam Roadways corporation ltd., Bangalore. (DRL)
4. M/s Indo Arya Central transport ltd., Bangalore. (IACT)
5. M/s Prakash parcel Services, Bangalore. (PPS)
6. M/s Road Carrier of India, Bangalore. (RCI)
7. M/s Union Roadways ltd., Bangalore. (URL)

ANNEXURE-E

PERFORMANCE BANK GUARANTEE
(FOR FOREIGN PURCHASE ORDERS)

BANK NAME AND ADDRESS

Bharat Heavy Electricals Limited (BHEL),
Electronics Division,
PB No. 2606,
Mysore Road,
BANGALORE- 560 026
INDIA

Dear Sir,

Ref: CONTRACT PERFORMANCE GUARANTEE.

WHEREAS you have entered into a contract reference No PO NO. _____ with M/s _____ having its registered office at_____for the supply of _____ as detailed in your purchase order No. _____ which is hereinafter referred to as "the said contract" and WHEREAS M/s _____ has undertaken to produce a Bank Guarantee for 10% (Ten Percent) of the contract price amounting to _____(_____ _____) to secure its obligations to Electronics Division, BHEL having its registered office at New Delhi for the performance of the contract including the warranty of the equipment supplied, We_____ Bank ,_____hereby expressly, irrevocably and unreservedly undertake and guarantee as principal obligors on behalf of M/s_____that in the event Bharat Heavy Electricals Ltd. (B.H.E.L.) declares to us in writing that M/s_____ has not fulfilled any obligation according to the contractual obligation of the said contract, to pay you on demand and without demur to Bharat Heavy Electricals Ltd., Electronics Division , Mysore Road, P.B.No. 2606, Bangalore-560 026, India an amount of _____(in words _____) subject to as may be determined below:

1) Notwithstanding any right M/s. _____ may have directly against you or any disputes raised by M/s _____, Your written demand shall be conclusive evidence to us that repayment is due under the terms of the said contract and shall be binding on us.

2) We shall not be discharged or released from this undertaking and Guarantee by any arrangements, variations made between you and M/s. _____ with or without our consent and Knowledge or by any alterations in the obligations of M/s. _____ by any forbearance whether as to payment, time, performance or otherwise.

3) This guarantee shall remain valid until the end of twenty-four weeks after the close of the warranty period or until the same is reported by BHEL to us whichever is earlier.

4) We agree and undertake not to revoke this guarantee during its validity unless discharged in writing by you subject to the provision of clause (7) below.

5) This guarantee shall be a continuing guarantee subject to the foregoing and shall not be discharged by any change in the constitution of the Bank or M/s. _____.

6) This guarantee shall be governed by and constructed in accordance with the Laws of India.

7) At any time _____ Bank may render this guarantee null and void by paying to Bharat Heavy Electricals Ltd. the full amount being _____ (in words _____)

For and on behalf of Bank
by its Authorised Signatory

Note:

(1) To be executed in INR 100 Non-Judicial stamp paper by any authorized Indian Bank.

(2) To be submitted directly by banker to concerned executive in purchase dept., Please give BHEL address to banker.

(3) Do not enclose with Bank document.

(4) Any Modification & omissions to this are not permitted

ANNEXURE - F

PERFORMANCE BANK GUARANTEE
(FOR INDIGENOUS PURCHASE ORDERS)

THIS DEED OF GUARANTEE made and executed on the _____ day of _____(year), by the _____ (Bank), registered under the Companies Act 1956/Nationalised Bank constituted under the Banking Companies (acquisition and transfer of undertakings) Act constituted under the State Bank of India Act / Subsidiary Banks Act, having its registered / head office at _____ represented herein by its Branch Manager / authorised representative Sri. _____ & Sri._____(Hereinafter called 'guarantor ' which term shall mean and include its successors and assigns)

IN FAVOUR OF BHARAT HEAVY ELECTRICALS LIMITED

_____ (Buyer's Name), a company registered under the companies Act, 1956 having its registered office at BHEL House at Siri Fort , New Delhi-100 049 and its Electronics Division at Mysore road, Bangalore-26 (hereinafter referred to as the 'Company' Which term shall include its successors and assigns):

Whereas the company has placed an order on _____ (State the name of the company / firm and its address) (hereinafter referred to as the 'Supplier' which term shall mean and include its liquidators, successors and assign) for the supply of system under order / Contract No_____Dt _____.

AND WHEREAS the supplier has agreed to supply the materials and carryout the works as detailed and in accordance with the terms set out in the said order/contract.

AND WHEREAS the company is not required to pay to the supplier a sum of Rupees _____being the 10% of the value of the goods supplied / Works performed / Services rendered under the said order / contract between the supplier and the company, till the company is satisfied with the mechanical Warranties and the performance standards stipulated in the said order / contract between the company and the supplier has been duly fulfilled, except against a Bank Guarantee for the said sum of Rs_____ in favour of the company by reputed Bank, in which case the company has agreed to make payment to the supplier of the said sum of Rupees _____ being (…%) of the value of the goods supplied / Works performed / Services rendered under the agreement between the supplier and the company and the Guarantor has at the request of the supplier, agreed to furnish this Guarantee subject to the terms and conditions stated below:

NOW THIS DEED WITNESSES THAT IN pursuance of the above said agreement, the guarantor hereby agrees and covenants With company is as follows :-

1) That during the period this contract of Guarantee remains effectual, the guarantor shall be liable in respect of the amount due and owing to the company in respect of the payments to the extent of Rs _____ (in words) _____ against any loss or damage caused to or suffered by the company by reasons of any breach of the terms of the said order / contract / Agreement by the supplier.

2) The Guarantor hereby undertakes to pay the amounts due and payable under this guarantee without any demur, merely on demand from the company intimating that the amount claimed is due by way of loss or damage caused to or suffered or would be caused or suffered by the supplier of any terms contained in the said order / contract. Any such demand made on the guarantor shall be conclusive as regards the amount due and payable by the Guarantor irrespective of the fact whether the Contractor / supplier admits or denies.

3) The Guarantor further agrees that the agreement herein contained shall remain in force and effect till all the supplies to be made / Works to be performed / Services to be rendered under the said order / contract / agreement are completed to the entire satisfaction of the company or till company certifies that the terms and conditions of the said order / contract / agreement have been fully and properly carried out by the said supplier and accordingly discharges the Guarantee. Unless a demand or claim under this guarantee is made on the guarantor in writing on or before the expiry of claim period indicated in clause 6 below , the guarantor shall be discharged from all the liability under this guarantee thereafter.

4) The guarantor further agrees with the company that the company shall have the fullest liberty without the consent of the guarantor and without effecting in any manner the obligations of the guarantor hereunder to vary any of the terms of the said order / contract / agreement or extend the time of performance by the said supplier from time to time or refrain from exercising the power exercisable by the company against the said supplier or to forebear or omit to enforce any of the terms and conditions relating to the said order / contract / agreement, and the guarantor shall not be relieved of its liability in whole or in part , by reason of any act, commission or forbearance on the part of the company or by reason of any such variation, or extension being granted to the said supplier or by reason of any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving the guarantor.

5) The guarantor undertakes not to revoke this guarantee during its currency except with the previous consent of the company in writing.

6) Notwithstanding anything herein above contained, the liability of the guarantor under these presents is restricted to Rs_____. The guarantee shall be in force till its expiry on _____ unless a demand is made on the guarantor within SIX months from the date of expiry, all the liability of the guarantor under this guarantee shall stand fully discharged. The decision of the claimant in regard to breach of contract is final and binding on the Bank.

IN WITNESS whereof, the guarantor, acting through it authorised representative has executed this deed of Guarantee on the day, month and year first above written.

(Seal of the Bank to be affixed)

WITNESS

1.

2.

ANNEXURE - G

BHEL MEMBER BANKS (CONSORTIUM BANKS)

PBG SHALL BE ISSUED FROM THE FOLLOWING BANKS OR THEIR BRANCH OFFICES ONLY

1	**STATE BANK OF INDIA**
2	**PUNJAB NATIONAL BANK**
3	**HDFC BANK**
4	**SYNDICATE BANK**
5	**CANARA BANK**
6	**INDIAN BANK**
7	**ST. BANK OF HYDERABAD**
8	**ICICI BANK**
9	**STANDARD CHARTERED BANK**
10	**UCO BANK**
11	**KOTAK MAHINDRA**
12	**ORIENTAL BANK OF COMMERCE**
13	**STATE BANK OF TRAVANCORE**
14	**CENTRAL BANK**
15	**IDBI BANK**
16	**FEDERAL BANK**
17	**HSBC LTD**
18	**DEUTSCHE BANK**
19	**CORPORATION BANK**
20	**CITI BANK**
21	**BANK OF BARODA**
22	**ABN AMRO BANK**
23	**UNITED BANK OF INDIA**
24	**VIJAYA BANK**
25	**UNION BANK OF INDIA**
26	**PUNJAB & SIND BANK**
27	**ANDHRA BANK**
28	**BANK OF INDIA**
29	**AXIS BANK**

Annexure

Technical Bid (Part-I)

1.0 THE WORK:

Supply, installation, testing and commissioning of Diesel Generating set alongwith associated accessories / systems including Ventilation and Acoustic Treatment of DG Room for **ESD Premises of BHEL at Bangalore** as per the schedule of quantities, specifications and drawings.

Brief description of items included:

a. Diesel Engine.
b. Alternator.
c. Exhaust Chimney.
d. Diesel Tank. (Day Oil)
e. AMF Panel.
f. Control / signal wiring.
g. Cables and cable jointing.
h. Underground Diesel Storage Tank.
i. Piping for diesel.
j. Foundations, digging, refilling etc for UG Tank.
k. Ventilation System for DG Room.
l. Acoustic Treatment of DG Room.
m. Obtaining clearances / approvals / licenses from concerned authorities.

2.0 DG POWER SUPPLY SYSTEM

2.1 THE SITE

The site of works or installation is ESD Premises of Bharat Heavy Electricals Limited (BHEL), Bangalore.

2.2 SCOPE AND SPECIAL CONDITIONS

2.2.1 SCOPE:

In general, the contractor shall supply, store, erect, test and commission all the equipments required for DG set and associated Electrical Installation. The contractor shall furnish all the materials, Labour, tools and equipment as shown in the accompanying drawings and in the BOQ and specifications herein after described. The scope shall include supply, erection, testing and commissioning of DG set, exhaust chimney, Day Oil Tank, underground diesel storage tank including foundation / digging / refilling for the tank, power & control cabling, AMF Panel, acoustic treatment of DG room, ventilation system for DG room and associated accessories / work as required for satisfactory functioning of DG power supply system. The proposed DG set is planned to be installed in a hall (DG room) on ground floor in which two functioning DG sets of 500KVA each are already existing and the foundation for the proposed DG set is also existing. However, any modification, shifting etc of the existing foundation, if called for, shall be in the scope of this work.

Signature of the contractor

2.2.2 LICENSED CONTRACTOR:

The contractor shall be a licensed Electrical Contractor, possessing a valid Electrical Contractor's license in the state, employing licensed supervisors and skilled workers having valid permits as per the regulations of Indian Electricity Rules and local Electrical Inspector's requirements.

2.2.3 DEFINITIONS / ABBREVIATIONS :

The following abbreviations used in the Bill of Quantities specifications and drawings represent :-

I.S.S	:	Indian Standard Specifications.
B.I.S	:	Bureau of Indian Standards.
I.E.R	:	Indian Electricity Rules 1956 amended upto date.
B.S.	:	British Standard.
B.S.C.P.	:	British Standard Code of Practice.
H.R.C.	:	High Rupturing Capacity.
G.I.	:	Galvanized Iron.
MS	:	Mild Steel.
CI	:	Cast Iron.
PVC	:	Polyvinyl Chloride.
HT	:	High Tension.
A/AMP	:	Ampere.
KV	:	Kilo Volts.
PT	:	Potential Transformer.
CT	:	Current Transformer.
OCB	:	Oil Circuit Breaker.
VCB	:	Vacuum Circuit Breaker.
ACB	:	Air Circuit Breaker.
CFS	:	Combination Fuse Switch.
MCCB	:	Moulded Case Circuit Breaker.
MCB	:	Miniature Circuit Breaker.
IC	:	Iron Clad.
ICTPN	:	Iron Clad Triple Pole & Neutral.
ICDP	:	Iron Clad Double Pole.
DB	:	Distribution Board.
KVA	:	Kilo Volt Ampere.
NC	:	Normally Closed.
KVAR	:	Kilo Volt Ampere - Reactive.
SWG	:	Standard Wire Gauge.

2.2.4 REGULATIONS AND CODES & STANDARDS:

The installation shall conform in all respects to Environment Pollution Control Rules 1986 and Central Pollution Control Board with regard to noise and air pollution, Indian Standard Code of Practice for Electrical wiring installations. It shall also be in conformity with the current Indian Electricity Rules and the Regulations and requirements of the local Electric Supply Authority in so far as these become applicable to the installation. Wherever this specification calls for a higher standard of materials and/or workmanship than those required by any of the above regulations these specifications shall take precedence over the said regulation and standards.

Signature of the contractor

i. Diesel Generators
a. Installation:

The installation work shall conform to Indian Electricity Act and Indian Electricity Rules as amended up to the date this specification is issued. Any approval required from statutory authorities shall be obtained by the Contractor. Nothing in this specification shall be construed to relieve the Contractor of this responsibility.

b. Performance:
Equipment complying with other internationally accepted standards such as ASA, IEC, BS, VDE etc. will also be considered if they ensure performance and constructional features equivalent to or superior to standards listed above. In such a case, the Bidder shall clearly indicate the standard(s) adopted and also furnish a copy in English of the latest revision of the standards alongwith copies of all official amendments in force as on date of opening of bid. Bidder shall clearly bring out the salient features for comparison.

c. Type
Diesel Engine:
Stationary type, four stroke with Vertical in line or 'V' type cylinder arrangement and turbo charged, water cooled.

DG set including stack height, acoustics, air emission and fuel oil installation shall meet the requirement given by gazette notification of Ministry of Environment & Forest dated 17/05/02, 01/07/03, CPCB guidelines, all statutory requirement of Govt. of India and State Pollution Board Guidelines & as updated as on date of bid opening.

ii. Technical Requirements

a.	Electrical output	: As specified in BOQ.
b.	Ambient temperature	: 50 degree
c.	Relative Humidity	: 100%
d.	Fuel	: All types of diesel fuel available in India
e.	Rated Speed	: 1500 rpm
f.	Duty	: Round the clock continuous running, of which one hour at 10% overload at rated speed
g.	Governor	: Electronic Governor (A1 type as perBS:5514)
h.	Starting	: Electrical self starting thru battery
i.	Fuel service tank (day oil tank)	: 990 litres
j.	Air intake system	: Dry type air filter.
k.	Paint Shade	: Grey RAL9002 for all equipments

2.2.5 INSPECTION AND APPROVAL OF THE WORK BY LOCAL AUTHORITY:
On completion of this work, the contractor shall obtain and deliver to the Employer / Owners/Engineer-in-charge the certificate of inspection and approvals by the Electrical Inspectorate of Local Government and/or any other statutory authority as may be required. The Consultant/ Engineer-in-charge shall have access to the manufacturer's premises for inspection of any items of the tender for which the contractor has to make arrangement with different manufacturer minimum 15 days notice to be given to the consultants/Engineer-in-charge for the same.

2.2.6 DRAWINGS :
The Drawings, Specifications and bill of quantities shall be considered as a part of this contract and any work of materials shown on the drawing and not called for in the specifications or vice versa shall be

Signature of the contractor

executed as if specifically called for in both. The design drawings or tender drawings indicate the extent and general arrangement of various equipments and their wiring etc and are essentially diagrammatic. The work shall be installed as indicated on the drawings, however any minor change if found essential to coordinate the installation of the work with other traders shall be made without any additional cost to the Owners. The data given herein and on the drawings is as could be secured but its complete accuracy is not guaranteed. The drawings and specification are for the assistance and guidance of the contractor. The exact location, distance and levels etc will, be governed by the space conditions. The contractor shall visit site and examine all relevant Drawings before starting the work and report to the Engineer-in-charge / Consultants any discrepancies which in his opinion appear on them and get them clarified. He shall not be entitled for any extras for commissions or defects in Drawings when they conflict with other work.

2.2.7 SHOP DRAWINGS :

The contractor shall prepare and submit to the Consultants/Engineer-in-charge for their approval detailed shop drawings of the entire installation within 7 days from the date of signing of contract. The approval of drawings however will not exonerate the contractor of his responsibility to execute the work as per conditions of the contract.

2.2.8 COMPLETION DRAWINGS :

At the completion of the work and before issuance of certificate of 'virtual completion', the contractor shall submit to the Owner, layout drawings drawn at approved scale indicating the complete work as installed, in 6 sets and the originals after securing approval of the same from the Consultants.

2.2.9 FOREMAN / SUPERVISOR :

The contractor shall employ competent, licensed qualified full time electrical foreman/ supervisors to direct the work of electrical installations in accordance with the drawings and specifications. The Foremen/Supervisor shall be available at all times on the site to receive instructions from the Consultants/Engineer-in-charge for the day to day activities throughout the duration of the contract. The Foreman/Supervisor shall correlate the progress of the work in conjunction with all the relevant requirements of Electricity Supply Authority.

2.2.10 CONTRACTOR'S SITE OFFICE AND STORES :

Contractor shall build at the marked space his own accommodations to house his site office and stores at his own cost.

2.2.11 CLEANLINESS AND SITE CLEARANCE :

The contractor shall ensure to keep the site clean by removing the debris and waste/excess materials from the site then and there. All the fixtures, plant and equipments after their installation and commissioning shall be cleaned up by the contractor without leaving any marks or stains and a fresh coat of painting shall be applied before handing over.

2.2.12 GUARANTEE AND DEFECTS LIABILITY PERIOD :

The contractor shall guarantee that all equipments shall be free of any defects due to defective materials and bad workmanship and that the equipment shall operate satisfactorily and the performance and efficiencies of the equipment shall not be less than the desired values. The guarantee shall be valid for a period of 12 months, or more if so offered by tenderer, after taking over and any parts found defective shall be replaced free of cost by the contractor. If the performance during the guarantee period is not satisfactory, the guarantee will be extended till satisfactory which the performance should be found absolutely satisfactory. The services of the contractor's personnel if requisitioned during this period for such work shall be made available free of any cost of the Owner. If the defects be not remedied within a reasonable time, the Owner may proceed to do so the contractor's risk and expenses without prejudice to any other rights.

Signature of the contractor

2.2.13 PRICES AND RATES :

The prices quoted shall be inclusive of all taxes, duties, freight, labour, installation, inclusive of al taxes, duties freight, labour, installation, testing and commissioning etc complete as required. The space allocated for major equipment shall be taken into consideration before ordering the equipments and equipment shall fit into the space provided with required clearances all around as per relevant ISS and IER or as per manufacturer's recommendations.

2.2.14 AGREEMENT :

Successful Tenderer shall be required to enter into an agreement as per Standard proforma. The Tenderer shall indicate specifically the service facility available at the site of installation for servicing the Generating Set during the guarantee period and also providing service beyond the guarantee period.

2.2.15 TESTING:

DIESEL GENERATING SET:

The following tests shall be conducted on Alternator:

i. Routine tests as per IS 4722.

Site Tests:

After the erection and wiring and earthing of DG set, the following tests shall be conducted:

i. Insulation resistance of the generator.
ii. Speed, No-Load Voltage and full load voltage regulation.
iii. Frequency at no-load, half load & full load.
iv. Full load test for 6 hours at rated voltage, speed and frequency.

The readings shall be observed with calibrated meters. Only one meter shall be used for the test. The readings shall be properly tabulated and submitted in Triplicate.

Testing of Controls:

All the safety controls and protective devices of the DG set shall be tested for correct calibration and operation. The results of the tests shall be tabulated and submitted in Triplicate.

2.2.16 TESTING, COMMISSIONING AND TRIAL RUNS :

Contractor shall carry out the following works within the quoted rates.

a. Importing (if required), loading, unloading, handling, transporting to site, installing, testing and commissioning DG set.
b. Trial run of the set for a minimum period of 2 hours continuously on No Load. On satisfactory completion of no load run the set shall be run for a period of three days for 6 hours every day at 100% load. All consumables i.e. fuel oil etc shall be made available to the contractor by BHEL for testing.
c. Handing over of the entire work after satisfactory completion, testing and commissioning alongwith 3 sets of documents consisting of detailed data andcatalogue of the equipment. Before dispatch of the equipment it shall be got inspected (if so required by Owners) by the Engineer-in-charge / Consultants and its performance witnessed at manufacturers works.

3.0 TECHNICAL SPECIFICATIONS :

3.1

a. ALTERNATOR :

Signature of the contractor

• Synchronous alternator of rating as specified in BOQ, suitable for continuous operation at 1500 RPM, designed at 40 °C ambient temperature generating 415 volts at 0.8 p.f. (lag), 50 Hz, 3 phase, 4 wire system. The alternator shall be Brushless type, self excited & self regulated through an AVR. The alternator will be suitable for tropical climate and shall generally confirm to IS: 4722. The salient features of the alternator are:

• ± 0.5% voltage regulation (max) in static conditions
• IP: 23 protection with class 'H' insulation & temperature rise limited to class "H"
• Permanent lubricating bearing.
• Permissible overload of 10% for one hour in 12 hours of operation.

b. BASE FRAME

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

c. FUEL TANK (DAY OIL TANK)

Daily service fuel tank 990 ltrs from 14 SWG sheet metal complete with drain valve, air vent, inlet and outlet connection.

d. BATTERIES

Four nos. batteries of 12V, 180 AH capacity in dry and uncharged condition with its leads.

e. CONTROL PANEL :

Control Panel shall be totally enclosed dead front dust and vermin proof pattern free standing type sheet steel 14 gauge construction incorporating & complete with the following devices for each DG Set.

f. ARRANGEMENT :

The engine to be directly coupled to the Alternator through a specifically designed flexible coupling in order to form a compact arrangement and both the units engine and alternator to be mounted on a rigid fabricated steel bed plate including foundation bolts channels etc.

3.2 UNDERGROUND DIESEL STORAGE TANK :

The 15KL capacity cylindrical horizontal base, bulk HSD storage tank with 5.0 Mtr length and 2.0 Mtr dia, dish end both sides, suitable for underground installation as per IS:1098-1992, fabricated out of 8mm thick MS plate and 10mm thick dish end with 10mm thick 500 dia manhole, conforming to Indian Explosive Act including air vent, suitable nozzles drain, overflow, Inlet piping with self-holding socket brought out upto road to unload the fuel directly from lorry. The tank shall be painted with anticorrosion paints for protection against underground moisture/rust and then provided with two coatings of bitumen.

Outlet piping from underground tank to daily service tank including fire safe valves etc.

Foundation for tanks and clamping devices to hold the tank in the ground including excavation in earth / rock, sand filling, retaining wall, slab/column and RCC foundation complete.

2 Meter high welded wire mesh fencing shall be provided as per the Indian Explosive Acts with hinged steel doors, locking arrangement, angle iron supports, foundations for supports, painting of complete fence in red oxide primer and required weather proof colour complete as required.

3.3 DIESEL PUMP :

Diesel pump for transforming Diesel from main diesel tank to daily service tank shall be electrically driven and shall have generally the following specifications :

Signature of the contractor

Motor HP	: 2.0
Motor RPM	: 1440
Voltage	: 220, 50 cycles.
Suction	: 25mm
Discharge	: 25mm
Head	: 15 M
Capacity	: Approximately 40 litres per minute over a distance of 300 metre and 15 metre head.

3.4 SOAK PIT :
Soak Pit will be constructed away from the DG room to receive and dispose of diesel of the day oil tank in case of any exigency like fire in DG room when the diesel from the day oil tank has to be drained out by gravity quickly.

The soak pit will be as per details given in the drawings and bill of quantities and will have a valve chamber with a valve in it alongwith the pit. Opening of the valve will permit drainage of diesel from day oil tank to the soak pit by gravity.

The soak pit will be a circular pit with brick walls having proper foundation. The pit will be filled with boulders at bottom, gravel in the middle and coarse sand at the top as shown in the drawing with empty space above it. The soak pit will be provided with manhole cover and a vent pipe.

4.0 MV SWITCHGEAR MAIN BOARD / LT PANEL:

4.1 SCOPE:
This section covers the detailed requirements of medium voltage switch board for 415/433 V 3 phase 50 Hz 4 wire system to be supplied, installed and its testing & commissioning.

4.2 TYPE OF BOARD :
The medium voltage switch board shall comprise any one of the following types of switch gears or combination thereof as specified in schedule.

i. Air circuit breakers draw out type.
ii. Fuse Switch Units / MCCBs.

The board shall be indoor type having incoming, sectionalisation and outgoing switch gears as specified. The design shall be cubicle type or industrial type compartmentalised as specified.

4.3 GENERAL CONSTRUCTION:
The switch board shall be floor mounted free standing totally enclosed and extensible type. The switch board shall be vermin proof and shall be suitable for the claimant conditions as specified.

4.4 CUBICLE TYPE BOARDS:
Cubicle type switch board shall be fabricated out of sheet not less than 2.0 mm (14G) thick. Wherever necessary, such steel members shall be stiffened by angle iron frame work. General construction shall employ the principle of compartmentalisation and segregation for each circuit unless otherwise approved. Incomer and bus section panels or sections shall be separate and independent and shall not be mixed with sections required for feeders. Each section of the rear accessible type board shall have hinged access doors at the rear. Overall height of the board shall not exceed 2.35 meters. Operating levers, handle etc. of highest panel shall not be at a height more than 1.7 m. Multi-tier mounting of feeders is permissible. The general arrangement for multitier construction shall be such that the horizontal tiers formed presents a pleasing and esthetic look. The general arrangement shall be got approved before fabrication. Cable

Signature of the contractor

entries for various feeders shall be either from the rear/top or from the front as specified through cable alleys and shall be through gland plates. There shall be separate gland plate for each cable entry so that there will not be dislocation of already wired Circuit when new feeders are added. Cable entry plates shall, therefore, be sectionalized and shall be provided on top / bottom of panel. The construction shall include necessary cable supports for clamping the cable in the cable alley or rear cable chamber as the case may be. The lower part (200 mm from bottom) of the panel/Board will be left empty. No internals/accessories shall be fixed be fixed in this portion.

4.5 BUS BAR AND CONNECTIONS:

The bus bar shall be of Aluminium conductor of adequate section. The bus bar system may comprise a system of main horizontal bus bars and auxiliary vertical bus bar run in bus bar alleys. In the case of rear access, horizontal bus system shall run suitably either at the top or bottom. All connections to individual circuits from the bus bar shall be with solid connections. All bus bars and connections shall be suitably sleeved with PVC heat shrinkable sleeves in approved manner and colour coded.

4.6 INCOMER/TERMINATION :

Incomer / termination shall be suitable for receiving bus trunking or cable as required in BOQ.

4.7 INSTRUMENTS :

All voltmeters and ammeters shall be digital flush mounted type conforming to class 1.5 of IS-1248 for accuracy. All voltmeters shall be protected with HRC cartridge fuses and provided with selector switch. Ammeter of suitable range with required ratio CTs & ammeter selector switch shall be provided.

i. Indicator Lamps:

On all the incomers of M. V. panels, ON/Off indicator lamps shall be provided suitable for operation on AC 230V supply. Necessary filter lenses G/Y/R/A shall be provided depending upon the function. All lamps shall be protected by proper rating HRC fuses. Where specified phase indicator lamps are provided. These shall be associated with necessary ON/OFF toggle switch for each l amp.

ii. Control (Auxiliary Wiring) :

All control/auxiliary wiring, indication etc. shall be with suitable, copper conductor cable PVC insulated conforming to IS : 1554 Part-I. Wiring shall be suitably protected within the switch board. Runs of wires shall be neatly bunched and suitably supported and clamped. Means shall be provided for clear identifications of the wires where wires are drawn through steel conduits. Identification ferrules shall be used at both ends of the wires. All control wirings meant for external connections are to be brought out on a terminal board.

4.8 OPERATIONAL REQUIREMENTS:

The indoor type MV board shall conform to the following:

i. The board shall comprise of incomers outgoing feeders and bus coupler as specified. The incomer shall be Air Circuit Breaker/MCCB or fuse switch unit as specified. The bus coupler shall be either a circuit breaker of double break isolating switch or switch fuse unit as specified. The outgoing feeders shall be Air circuit breaker or switch fuse units or MCCBs as specified.
ii. The incomer panel shall be suitable for receiving bus trunking/Cables as specified.
iii. The entire board shall have a common earth bar of 50x6mm GI with two terminals for earth connections.

4.9 RATING AND REQUIREMENTS :

i. TEST AT MANUFACTURES WORK :

Signature of the contractor

All routine tests shall be carried out and test certificates produced to the Owners/Consultants.

ii. INSTALLATION :
The installation work shall cover assembly of various sections of the panels lining up, grouting the units etc. In the case of multiple panel switch boards after connecting up the bus bars etc., all joints shall be insulated with necessary insulation tape or approved insulation compound. A common earth bar shall be at the back of switch board connecting all the sections for connection to frame earth, system. All protection and other control wirings for indication etc. shall be completed before calibration and commissioning checks are commenced. All relays, meters etc. shall be mounted and connected with appropriate wiring.

iii. TESTING AND COMMISSIONING:
Commissioning checks and tests shall include all wiring checks and checking up of connections. Primary/secondary injection tests for the relay adjustment to routine megger test. Checks and test shall include the following.

a. Operation checks.

b. Interlock function checks.

c. Continuity checks of wiring fuses etc. as required.

d. Insulation test: When measured with 500 V megger the insulation resistance shall not be less than 100 mega ohms.

e. Trip tests.

4.10 ENGRAVED PVC LABELS
Engraved PVC labels shall be provided on all incoming and outgoing feeders. Circuit diagram showing the arrangement of the circuit inside the distribution board shall be pasted on the inside of the panel door and covered with a transparent laminated plastic sheet.

4.11 LT PANEL FABRICATION AND ACCESSORIES (CONDITIONS):
i. The execution of the job shall be done in a workman like manner to give structurally sound and neat appearance. Bad workmanship will not be accepted and defects, if any, shall be got rectified at contractors own risk and cost to the satisfaction of Owners/Consultant.

ii. If any item is to be different than whatever mentioned in the schedule, it should be specifically brought out while quoting for the tender, otherwise no deviation will be allowed for the change of items and Schedule of items will be strictly followed.

iii. Whenever, the make of items is not given, the tenderer should clearly mention the make offered by him while quoting the rates.

iv. The awardee of this work shall, if so required by the Owners, get inspected the equipments like DG Set, transformers and LT panels by the authorised representatives of the Owners at manufacturer's works. Prior intimation shall be given by the Contractor about the readiness of the equipment at factory/works. The Owners shall bear the expenses for this inspection by its representatives at works of particular firms.

v. Routine and manufacturer's type test certificates for the DG Set, transformers, LT panels and ACBs shall be furnished by the contractor while delivering the above equipments.

Signature of the contractor

vi. All material required to be used on work should be as per NIT Specifications and should be got approved from Owners/Consultant before installation. All rejected material should be removed from site immediately. The contractor shall stand guarantee for a period of one year from handing over of installation for the materials and equipments installed.

vii. Earthing shall invariably be done in presence of authorised representatives of Owners/Consultant.

Viii.The Contractor shall terminate cables and make necessary connection and interconnections.

ix. Contractor or his representative will have to sign site order book and comply with remarks therein.

x. The LT panels/switch boards shall be got fabricated from the panel builders who generally satisfy the following conditions :

a. Panel manufacturer should have CPRI certificate for short circuit test for LT panels.

b. Panel manufacturer should have full facility of seven tank process for treatment of panels to the satisfaction of Owners/Consultant.

c. Panel manufacturer should have the facility and should perform the temperature rise test at rated current to the satisfaction of Owners/Consultant, if required.

d. Panel manufacturer should have full facility for conducting other specified tests at works to the satisfaction of Owners/Consultant.

xi. Tenderer should indicate in his technical bid the make of ACB etc. He should also enclose alongwith the tender :

a. The test certificates.

4.12 EVEN DISTRIBUTION :
It shall be ensured that total load of various distribution boards panels or consuming devices is divided evenly between the phases and number of ways.

5.0 CABLES AND EARTHING :
5.1 CABLES :
5.1.1 GENERAL :
The cables shall be supplied, inspected, laid, tested and commissioned in accordance with drawings. Specifications, cable manufacturer's Instructions and Indian Standard IS:1554- 1976.

5.1.2 MATERIAL :
The MV cable shall be PVC insulated aluminium conductor armoured cable of 1100 volt grade.

5.1.3 INSPECTION :
All cables shall be inspected upon receipt at site and checked for any damage during transit.

5.1.4 JOINTS IN CABLES :
The contractor shall take care to see that all the cables received at site are apportioned to various locations in such a manner as to ensure maximum utilisation and avoidance of cable jointing. This apportioning shall be got approved by the Engineer-in-charge before the cables are out to lengths. Where joints are unavoidable the location of such joints shall be got approved.

5.1.5 JOINTING BOXES FOR CABLES :

Signature of the contractor

Cable joint boxes shall be of appropriate size, suitable for PVC insulated armoured cables of particular voltage rating.

5.1.6 JOINTING CABLES :
All cable joints shall be made in suitable, approved cable joint boxes, jointing of cables in the joint boxes and the filling in of compound shall be done in accordance with manufacturer's instructions and in approved manner.

All cables shall be joined colour to colour and tested for continuity and insulation resistance before jointing commences. The sheath of cables must not be removed until preparations for jointing are completed. Joints shall be finished on the same day as commenced and sufficient protection from the weather shall be arranged. Joints shall be made by means of suitable solder for conductors, the conductors being firmly butted into the connections or thimbles or ferrules and the whole soldered with proper solder and soldering flux or crimped. The conductors shall be efficiently insulated with high voltage insulating tape and by using spreaders of approved size and pattern. The joints shall be completely topped up with epoxy compound so as to ensure that the box is properly filled.

5.1.7 CABLE TERMINATIONS:
Cable termination shall be done in cable terminal box using cable glands and crimping type lugs.

5.1.8 LAYING OF CABLES:
Cables shall be laid by skilled and experienced workmen using adequate rollers to minimise stretching of cable. The cable drums shall be placed on jacks before unwinding the cable. Great care shall be exercised in laying cables to avoid forming kinks. The relative position of the cables, laid on the cable tray shall changes in direction in horizontal and vertical planes, the cable shall be bent smooth with a radius of bend not less than 12 times the diameter of cable. distinguishing marks shall be made on the cable ends for identification. Insulation tapes of appropriate voltage and in red, yellow and blue colours shall be wrapped just below the sockets for phase identification.

5.1.9 CABLES INSIDE BUILDING:
Cables inside buildings shall be laid on the cable trays/trenches. All cables passing through walls shall run as directed. Parallel cables shall be spaced atleast 50 mm apart maintaining their relative position over the entire length.

5.1.10 TESTING OF CABLES:
Test shall be conducted for insulation between phases and between phase and earth for each length of cable, before and after jointing. On completion of cable laying work, the following tests shall be conducted in the presence of the Engineer-in-charge.

a. Insulation Resistance Test (Sectional and Overall)

b. Continuity/Resistance Test.

c.Sheathing Continuity Test

d. Earth test.

All tests shall be carried out in accordance with relevant standard code of practice and electricity rules. The Contractor shall provide necessary instruments, equipment and labour for conducting the above tests and shall bear all expenses in connection with such tests. All tests shall be carried out in the presence of the Engineer-in-charge.

5.2 EARTHING SYSTEM :

Signature of the contractor

5.2.1 EARTHING :
All the non-current carrying metal parts of electrical installation shall be earthed properly. All metal conduits, trunking, cable sheaths, switchgear, distribution boards, light fittings and all other parts made of metal shall be bonded together and connected by means of specified earthing conductors to an efficient earthing system. All earthing shall be in conformity with Indian Electricity Rules and Indian Standards IS:3043-1966.

5.2.2 RESISTANCE TO EARTH:
The resistance of earthing system shall not exceed 3 ohm.

5.2.3 EARTHING STATION (PLATE EARTHING):
Earthing electrode shall consist of a tinned copper plate not less than 600 mm x 600 mm x 3 mm thick or GI plate not less than 600 mm x 600 mm x 6 mm as the case may be. The plate electrode shall be buried as far as practicable below permanent moisture level but in any case not less than 3 meters or as per IS 3043 below ground level.
Wherever possible, earth electrodes shall be located as near the water tap, water drain or a down take pipe as possible. Earth electrodes shall not be installed in proximity to a metal fence. It shall be kept clear of the building foundations and in no case shall it be nearer than 2 meters from the outer face of the wall.

The earth plate shall be set vertically and surrounded with 150 mm thick layer of charcoal dust and salt mixture. A 20 mm GI pipe shall run from the top edge of the plate to the ground level. The top of the pipe shall be provided with a funnel and a mesh for watering the earth through the pipe. The funnel over the GI pipe shall be housed in a masonry chamber.

5.3 TESTING:

5.3.1 GENERAL:
At the completion of the work, the entire installation shall be subjected to the following tests:

1. Wiring continuity test.

2. Insulation resistance test.

3. Earth continuity test.

4. Earth resistivity test.

Beside the above, any other test specified by the local authority shall also be carried out. All tested and calibrated instruments for testing, labour, materials and incidentals necessary to conduct the above tests shall be provided by the contractor at his own cost.

5.3.2 TESTING OF WIRING:
All wiring system shall be tested for continuity of circuits, short circuits, and earthing after wiring is completed and before installation is energized.

5.3.3 TESTING OF EARTH CONTINUITY PATH:
The earth continuity of conductor metallic envelopes of cables shall be tested for electric continuity and the electrical resistance of the same, alongwith the earthing lead but excluding any added resistance or earth leakage circuit breaker, measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation, shall not exceed 3 ohm.

6.0 DG ROOM VENTILATION:

Signature of the contractor

After providing acoustic treatment to the walls ceiling, the DG room becomes an air tight cubical with no provision for natural ventilation thru windows or doors. Therefore, an effective mechanical ventilation system should be provided for pushing in the DG room required quantity of fresh air and also for exhausting out 80 to 85% room air. The difference of 15 to 20% in quantities of fresh air and exhaust air will keep the room air pressurized, which is functional requirement of the DG sets.

The proposed ventilation scheme comprises four sets of Fresh Air Fan Assemblies and four sets of Exhaust Air Fan Assemblies, all installed within DG room along the ceiling without occupying any floor area. The fan assembly rests on MS channel frame with chequered plate spread over it. One end of the frame rests on grouted bracket on the wall and the other is suspended thru the ceiling.

Components remain same for both fresh air as well as exhaust air assembly fans, only the configuration of components changes. Main components are :

a. Air intake hood
b. Sound Attenuator
c. Axial Fan
d. Supply Air Duct Piece
e. MS Channel Frame as base with Chequered Plate on it
f. Flexible Connection
g. Vibration Isolators
h. Brackets and Suspenders

The scheme is explained thru the drawings enclosed.

6.1 FRESH AIR SUPPLY PACKAGE

The Fresh Air Supply Package consists of all components of Air Intake Assembly like hood, sound attenuator, fan, duct piece assembled together by means of flexible connections and then fixed rigidly on the supporting frame incorporating vibration isolation pads.

6.2 FRESH AIR INTAKE ASSEMBLY

The air intake assembly comprises hood, sound attenuator, fan and the duct piece placed on the supporting base frame in required sequence and fixed firmly on to the base frame. Flexible connections will be provided between sound attenuator and the fan and between fan and the duct piece. A typical Fresh Air (FA) supply package is shown in Fig. FA-1.

Signature of the contractor

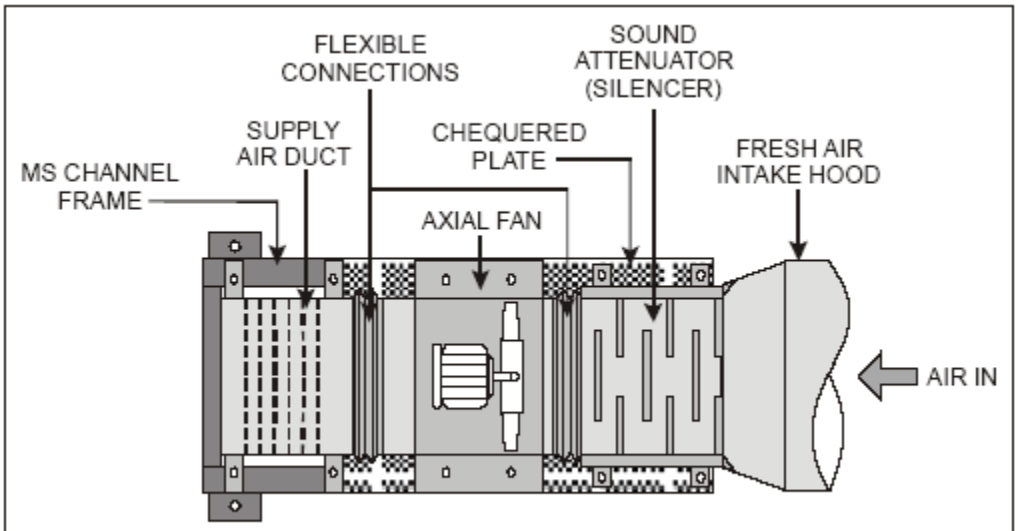


FIG. FA-1 : FRESH AIR SUPPLY PACKAGE

6.3 EXHAUST PACKAGE

The Exhaust Package consists of all components of Exhaust Assembly like hood, sound attenuator, fan, duct piece assembled together by means of flexible connections and then fixed rigidly on the supporting frame incorporating vibration isolation pads.

6.4 EXHAUST ASSEMBLY:

The exhaust assembly comprises exhaust hood, sound attenuator, fan and the duct piece placed on the supporting base frame in required sequence and fixed firmly on to the base frame. Flexible connections will be provided between sound attenuator and the fan and between fan and the duct piece. A typical Exhaust Package is shown in Fig. EX-1.

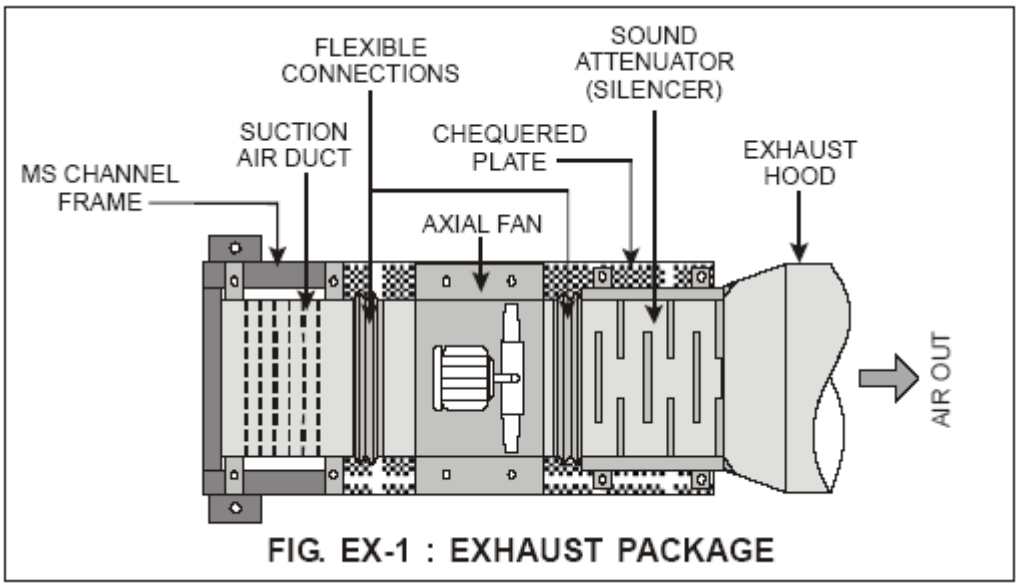


FIG. EX-1 : EXHAUST PACKAGE

6.5 SUPPORTING BASE FRAME

Signature of the contractor

The supporting base frame will comprise MS channel frame with MS chequered plate placed on it as described below :

6.5.1 MS Channel Frame :

The supporting frame for mounting the Fresh Air / Exhaust Package will be welded MS channel frame (100mm x 50mm x 6mm thick). Two main pieces of MS channel will be placed parallel to each other and will be connected by welding MS channel pieces placed in-between in perpendicular direction to the main channel pieces. The number of such perpendicular pieces will normally be four or as per specification given in drawing / schedule of quantities. Necessary holes will be drilled in the frame for fixing Chequered plate as well as components of ventilation assembly placed over the Chequered plate. The welded portions will be given smooth finish by suitably grinding the spots and the entire frame will be provided with anti corrosive paint and then given two coats of approved shade and quality of paint.

6.5.2 MS Chequered Plate:

MS chequered plate of 8 mm size matching to the frame will be placed on the above MS channel and fixed to the frame by fastening nuts and bolts. One end of the supporting base frame will be placed on the MS channel bracket grouting in the wall and the other end will be suspended from the ceiling. Where grouting in the wall is not feasible both the ends will be suspended from the ceiling with adequate provision to keep the assembly firmly in place without any swing in suspenders.

6.6 AIR DISTRIBUTION

6.6.1 SCOPE

The scope of this section comprises supply, fabrication, installation and testing of all sheet metal ducts, supply installation testing and balancing of all grilles and diffusers in accordance with these specifications, BOQ and the general arrangement shown on the Drawings.

6.6.2 DUCT FABRICATION

All ducts will be machine made thru Triplex lock former or Multiple lock former and will be fabricated and installed in workmanlike manner, generally conforming to relevant with latest amendment. Round exposed ducts will be die-formed for achieving perfect circle configuration.

a. Ducts will be straight and smooth on the inside with neatly finished joints. All joints will be made air tight/sealed with silicon sealant.

b. Changes in dimensions and shape of ducts will be gradual. Air turns will be installed in all vanes, arranged to permit the air to make the turn without appreciable turbulence.

c. Ducts will be fabricated as per details shown on Drawings. All ducts will be rigid and will be adequately supported and braced where required with standing seams, tees, or angles, of ample size to keep the ducts true to shape and to prevent buckling, vibration or breathing.

d. All sheet metal connection, partitions and plenums required to confine the flow of air to and through the filters and fans will be constructed of 18 gauge GSS thoroughly stiffened with 25 mm x 25 mm x 3 mm angle iron braces.

e. Rubber gasket 4 mm thick will be used between duct flanges instead of soft rubber, in all ducting installation for complete sealing.

f. The thickness of all four sides will be determined by the thickness required for the longest side of the duct.

Signature of the contractor

g. The gauges, joints and bracings for sheet metal duct work will conform with the approved shop drawing.

h. Ducts larger than 450 mm in width will be cross broken.

i. Changes in section of duct work will be affected by tapering the ducts with as long a taper as possible. All bracings will be taken off at not more than 45° angle from the axis of the main duct unless otherwise approved by the Engineer.

6.6.3 DUCT INSTALLATION

All ducts will be installed generally as per tender Drawings and in strict accordance with approved shop drawings to be prepared by the Contractor.

a**.** The Contractor will provide and neatly erect all sheet metal work as may be required to carry out the intent of these Specifications and Drawings. The work will meet with the app roval of Engineer-in-Charge or his site representative in all its parts and details.

b. All necessary allowances and provisions will be made by the Contractor for beams, pipes, or other obstructions in the building, whether or not the same are shown on the Drawings. Where necessary to avoid beams or other structural work, plumbing or other pipes, and / or conduits, the ducts will be transformed, divided or curved to one side, (the required area being maintained) all as per the site requirements.

c. All duct work will be provided with adequate hangers, brackets or supports to ensure rigid support. The supports will also be provided with vibration isolators to prevent vibration. Hangers will be in plumb and will have provision for adjusting height with locking nut/washer arrangement. Spacing of duct supports will not exceed 2.4 m centres.

d. Where ducts pass through brick or partition wall within the opening and crossing ducts provided with heavy flanged collars on each side of angle iron frame work, so that duct crossing is made leak-proof.

e. All ducts will be totally free from vibration under all conditions of operation.

f. All joints, tapping and seams in duct work will be sealed to prevent air leakage. Sealant will be fast setting or polysulphide or that remains flexible after drying.

g. The duct work will be thoroughly cleaned of oils, grease, lubricants, dirt and dust upon the completion of fabrication.

h. All air turns of 45° or more will include curved metal blades or vanes arranged so as to permit the air to make the abrupt turns without an appreciable turbulence. Turning vanes will be securely fastened to prevent noise or vibration. All ducts will be fabricated and installed in accordance with modern design practice.

i. Flanges and supports are to be of black mild steel and are to be primer coated on all surfaces before erection and painted with aluminium paint thereafter. Accessories such as damper blades and access panels are to be of materials of appropriate thickness and finish similar to the adjacent ducting, as specified in BOQ.

j. Joints requiring bolting may be fixed by hexagonal nuts and bolts, stove bolts or buck bolts, rivets or closed center top rivets. All fixtures must have a permanently non-corrosive finish such as cadmium plating or galvanising as appropriate Spot Welds and bronze welds are to be coated on all surfaces with zinc rich paint, as approved by Engineer.

k. Flexible joints are to be fitted to the suction and delivery of all fans and/or as required on drawings / BOQ. The material is to be normally double heavy canvas confirming to fire retardant applications. On all circular spigots the flexible materials is to be screwed or clip band with adjustable screw or toggle fitting. For rectangular ducts, the material is to be flanged and bolted with a backing flat or bolted to mating flange with backing flat.

l. Flexible joints are to be not less than 75 mm and not more than 125mm between faces. Both ends of the ducts at such joints will be provided with chicken wire mesh screen. The duct work should be carried out in a manner and a such time as not to hinder or delay the work of other agencies especially boxing or false ceiling contractor.

6.6.4 SUPPLY AND RETURN AIR GRILLES

Supply & return grilles will be of either mild steel or aluminium sections as specified in BOQ. Steel construction grilles will have primer Coat finished and powder coated whereas extruded aluminium grilles will be either Anodized or Powder Coated as given in BOQ. These grilles will have individually adjustable louvers both horizontal and vertical. Supply air grilles will be provided with key operated opposed blade M.S volume control dampers painted in matt black shade with stove enamel paint.

6.6.5 METALLIC FRAME

Supply and fixing of metallic frames for grilles and diffusers, if required, will be in the scope of ducting work.

6.6.6 AIR INTAKE / EXHAUST HOOD

Air intake / exhaust hood will be fabricated from GI sheet in the shape and size as explained in the drawing and BOQ. The inner side of the hood will match the component to which it is attached and the outer side will have relatively larger cross section area with suitable bend for protection against rain. The air inlet point of the hood will be provided with suitable flange / clamp to be fixed with wall or other supporting structure to avoid vibration. This end of the hood will also be provided with proper bird screen duly fixed to the periphery of the hood along the flange with necessary strip supports wherever required. The inner end of the hood will also be provided with matching flange to connect it to other components like fan / silencer / duct. The portion of the hood exposed to weather will be provided with suitable paint of approved quality and shade to protect the hood against weather.

6.6.7 CONNECTING DUCT PIECE FOR SUPPLY / SUCTION

The connecting duct piece will work as supply air plenum for fresh air and suction air plenum for exhaust air. The duct piece will be fabricated from 20/18 G, GI sheet with necessary provision for guide vanes within the duct and aluminium grille at the mouth for supply / suction of air. The grille will have arrangement for adjustment of direction of air in two planes. Both the end of the duct piece will be provided with suitable flanges for connection to grille on one side and other components like duct / fan / silencer on the other side.

6.6.8 MEASUREMENT FOR DUCTING

Unless otherwise specified, measurements for ducting for the work will be on the basis of centre-line measurements described herewith.

i. Duct : Duct Work will be measured on the basis of external surface area of ducts.

ii. Grilles : width multiplied by height, excluding flanges. Volume control dampers will form part of the unit rate for grilles and will not be separately accounted.

iii. Diffusers : cross section area for air flow at diffuser neck. Volume control dampers will form part of unit rate for supply air diffusers and will not be separately accounted.

Signature of the contractor

iv. Flexible Connection : will be measured by multiplying the periphery of duct by the straight distance between the two flanges of the ducts being jointed. Quoted rates will include the necessary mounting arrangement, flanges, nuts and bolts and treated-for-fire requisite length of canvas cloth, and neoprene gasket.

6.6.9 TESTING AND BALANCING

After the installation of the entire air distribution system is completed in all respects, all ducts will be tested for air leaks by visual inspection and, if required, smoke test. The entire air distribution system will be balanced using an anemometer. Measured air quantities at fan discharge and at various outlets will be identical to or less than 5 percent in excess of those specified and quoted.

Complete air balance report will be submitted for scrutiny and approval, and four copies of the approved balance report will be provided with completion documents.

6.6.10 DESIGN PARAMETERS FOR DUCT

Design parameters for duct will be :

a. Max. flow velocity **:** 760 M/min.
b. Max. friction **:** 1.5 cm WG/100 M Run.
c. Max. velocity at supply air outlet **:** 360 M/min.

7.0 ACOUSTIC TREATMENT OF DG ROOM:

7.1 SCOPE OF WORK

The scope of work in the proposed scheme is as briefed below :

i. To provide acoustic lining on walls and ceiling.

ii. To provide acoustically treated double /single panel hinged doors where rolling shutter / openings exist in the DG room walls.

7.2 MATERIAL

i. Duct Acoustic Lining

Material used for duct acoustic lining will be 32 Kg/M^3 density glass wool slabs.

ii. Room Acoustic Lining

The material for room acoustic lining will be : inner layer 64 Kg/M^3 density mineral wool and the outer layer will be 32 Kg/M^3 density glass wool.

7.3 METHOD OF APPLICATION

i. DUCT ACOUSTIC LINING

a. Ducts so identified and marked on Drawings and in Schedule of Quantities will be provided with acoustic lining of thermal insulation material as follows :

b. The inside surface of the ducts will be cleaned and covered with adhesive, and frame work of 20 gauge G.I. 'C' channel 50 mm x 't' mm ('t' being specified thickness of acoustic lining) with 25 mm integral flanges on either side spaced not more than 60 cm centres will be fixed rigidly with the surface of duct creating suitable squares/rectangles on the surface. The gaps between frames will be filled with 25 to 50mm thick, about 60 x 60 cm wide cut panels of resin bonded fiberglass slabs.

Signature of the contractor

c. These insulation panels will be fixed to the sheet metal with cold setting adhesive compound. The inside surface of the duct will be covered with fiberglass tissue (over the insulation panels) and 28 gauge perforated aluminium sheet having at least 15 percent perforation will cover the fiberglass tissue. The aluminium sheet will be screwed to GI frame using cup washer and neatly finished to give true inside surfaces.

ii. ACOUSTIC LINING OF DG ROOM:

The walls and ceiling of DG room shall be provided acoustic lining with mineral wool and resin bonded fiberglass as shown in Schedule of Quantities and the Drawings. The surface of walls and ceiling shall be cleaned and frame work of 20 gauge GI 'U' Channel 25 x 100 x 50 x 100 x 25mm (25mm being integral flanges on either side) at 75 cm centres shall be provided. All cut edges of frames shall be treated with rust resistant primer. The GI 'U' Channel shall be firmly and securely fixed on the wall and ceiling with dash fastener support fixed at suitable spacing, not more than 50 cm centres.

The space or gap thus created by the channel frames shall be filled with first layer of 50 mm thick and about 75cm x 75cm cut size panels of mineral wool slab with 64 Kg/M_3 density covered with chicken wire mesh fixed with nail fasteners fixed at 30cm centre, followed by the second layer of 50 mm thick and about 75cm x 75cm cut size panels of resin bonded fiberglass slabs with 32 Kg/M_3 density. The combination of layers will be so placed and pressed that the upper layer (the second layer) rests within the 100mm depth of 'U' channel.

The hollow space of GI 'U' channel (100 x 50 x 100mm) shall also be filled (stuffed) with two layers of acoustic lining in the same fashion as the main space has been filled. The entire surface shall then be covered with fiberglass tissue and finally with 24 gauge perforated aluminium sheet, having at least 15 percent perforations, fixed with stainless steel/brass screws. Over lapping / joints of sheets shall be covered with 18G x 100mm wide GI Strip placed securely along the frame of 'U' channel in both directions, 'X' and 'Y'. Acoustic lining of walls shall be terminated approximately 15cm above the finished floor to prevent damage to insulation due to accidental waterlogging in room.

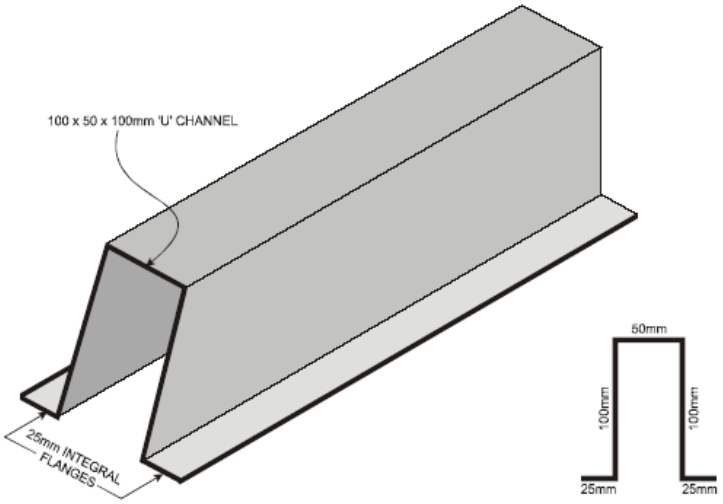


FIG.-1 : 'U' CHANNEL WITH INTEGRAL FLANGES

iii. DOORS

The doors meant for access to the DG room shall be provided with acoustic treatment. The door frame shall be 100mm MS channel and fixed to the masonry wall by means of suitable hold fast / fasteners after giving anti-corrosive treatment to the frame. The door near AMF Panel shall be single panel opening inside and the doors in the front wall of the room shall be double panel opening outside. The doors shall be fabricated from 14 G (2mm) MS sheet. The doors will have double leaf (two wall) construction. The inner wall will be bolted on the outer wall duly sandwiched with acoustic line media as used for the walls.

Signature of the contractor

The acoustic lining for the doors shall be applied in the same fashion as explained above for wall and ceiling. Both the sides of door wall shall be given anti-corrosive treatment before the leaves are assembled. The doors so constructed will be finally finished with epoxy coating to withstand against corrosion. Suitable provision shall be made for hinges and door closing latches. The sides of the door panels meeting each other when the doors are closed shall be so designed and fabricated that there is partial overlap and there is no gap when the doors are closed. Same arrangement will be made for the single panel door with its frame.

7.4 SOUND ATTENUATOR (SILENCER)

The sound attenuator will consist of an outer shell/casing of 18G, GS sheet fabricated in circular or rectangular cross section to suit the requirement of the air handling equipment which may be axial /centrifugal fan or supply / exhaust air hoods. The entire inner area of the shell will be acoustically treated with two layers of sound absorbing material as explained in section for duct acoustic lining. Inner layer of acoustic lining will be 64 Kg/M_3 density mineral wool and the outer layer will be 32 Kg/M_3 density glass wool. The space within the shell will accommodate baffle plates fabricated from 20G GI sheet with angle iron frame and supports duly fixed to the shell. The baffle plate will also be provided with acoustic lining duly covered with perforated tissue paper and 24G perforated GI sheet as the shell. The baffle plates will be arranged in a zigzag manner with the side being hit by air provided with aerofoil finish to avoid turbulence. Both the ends of the shell (one end for entry of the air and the other for exit of air) will be provided with suitable flanges for connection to fan housing / hood / duct.

7.5 MEASUREMENT OF INSULATION / ACOUSTIC LINING

Unless otherwise specified measurement for duct insulation for the project will be on the basis of centre line measurements described herewith:

Duct Insulation and Acoustic Lining:

Duct insulation and acoustic lining will be measured on the basis of surface area of the duct including cladding, tapered pieces, bends, tees, branches, etc. as measured for bare ducting. However, the average of the inner and outer perimeters will be used for computing the surface area of the insulation.

For example, for a 12 ft long duct piece of size 48" x 18" provided with 2" thick insulation, the surface area of insulation will be worked out as shown below in Fig.-1:

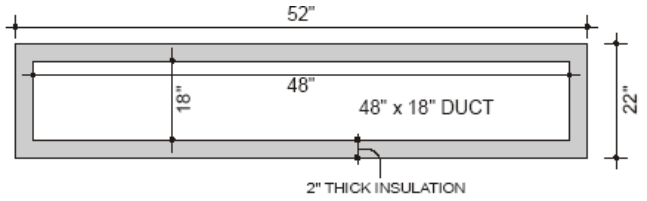


Fig. 1 : Cross Section of an Insulated Duct

Outer Perimeter: (52 + 22) x 2 = 148 Inches

Inner Perimeter: (48 + 18) x 2 = 132 Inches

Average Perimeter: (148 + 132) ÷ 2 = 140 Inches = (140 ÷ 12) ft.

Surface area of Insulation: Average Perimeter x Length
= (140 ÷ 12) x 12 = 140 SFT

Signature of the contractor

Same procedure will be used for working out the surface area of acoustic lining within the duct where the duct will form the outer periphery and the inner surface of acoustic lining will form the inner periphery. Acoustic lining of room will be measured on the basis of the surface area.

8.0 FANS (AXIAL FLOW FANS) :
Fans will be complete with motor, motor mount, belt driven (or direct driven) and vibration isolation type, suspension arrangement as per approved shop drawings.

8.1 Casing:
Casing will be constructed of heavy gauge sheet steel. Fan casing, motor mount and straightening vane will be of welded wheel construction. Motor mounting plate will be minimum 20 mm thick and machined to receive motor flange. An inspection door with handle and neoprene gasket will be provided. Casing will have flanged connection on both ends for ducted applications. Support brackets for ceiling suspension will be welded to the casing for connection to hanger bolts. Straightening vanes will be aerodynamically designed for maximum efficiency by converting velocity pressure to static pressure potential and minimizing turbulence. Casing will be bonder ized, primed and finish coated with enamel paint.

8.2 Rotor:
Rotor hub and blades will be cast aluminium or cast steel construction. Blades will be dieformed aerofoil shaped for maximum efficiency and will vary in twist and width from hub to tip to effect equal air distribution along the blade length. Fan blades mounting on the hub will be statically and dynamically balanced. Extended grease leads for external lubrication will be provided. The fan pitch control may be manually readjusted at site upon installation, for obtaining actual airflow values, as specified and quoted.

8.3 Motor:
Motor will be of approved make, squirrel-cage, totally-enclosed, protected to IP55, with an external terminal box to IP55, fan cooled standard round frame, constant speed, continuous duty, single winding, suitable for 415 ± 10% volts, 50 cycles, 3 phase AC power supply, provided with Class 'B' insulation. Motor nameplate horsepower will be exceed brake horse-power by a minimum of 10%. Motor will be specially designed for quiet operation. The speed of fans will not exceed 1000 RPM for fans with impeller diameter above 450mm, and 1440 RPM for fans with impeller diameter 450mm and less. For lowest sound level, fan will be selected for maximum efficiency or minimum horsepower. Motor conduit box will be mounted on exterior of fan casing, and lead protected from the motor to the conduit box will be protected from the air stream by enclosing in a flexible metal conduit.

8.4 Drive:
Drive to fan will be provided through belt drive with adjustable motor sheave and standard sheet steel belt guard with vented front for heat dissipation. Belts will be of oil-resistant type. The fan may be belt driven or direct driven as specified in BOQ.

8.5 Vibration Isolation:
The assembly of fan and motor will be mounted on base frame with vibration isolating pads or suspended from the ceiling by vibration isolation suspensions of rubber-in-shear type.

8.6 Accessories:
The following accessories will be provided with all fans :
a. Outlet cone for static pressure regain.
b. Inlet Cone

Signature of the contractor

Fan silencers may be provided where specifically called for in Schedule of Quantities.
Fans will be factory assembled and shipped with all accessories ready for installation and use.

Note: These are general specifications for axial flow fans. In case of any conflict between these specifications and that of the manufacturer of approved make, the latter will prevail.

8.7 PERFORMANCE DATA
All fans will be selected for the lowest operating noise level. Capacity ratings, power consumption with operating points clearly indicated, will be submitted with Technical Bid and verified at the time of testing and commissioning of the installation.

8.8 TESTING
Capacity of all fans will be measured by an anemometer. Measured air flow capacities will conform to the specified capacities and quoted ratings. Power consumption will be computed from measurements of incoming voltage and input current.

9.0 VIBRATION ISOLATORS
Vibration isolators shall be provided for all moving (rotating) equipments to isolatevibration of equipment and prevent it from being transmitted to supports of the equipments, which may be foundations or suspenders. Such equipments may be the water chilling machines, DG Sets, pumps, motors, AHUs, CSUs/ FCUs, fans etc. Vibration isolators shall also be provided for fluid / air carriers like pipes and ducts. The objective of these isolators will be to prevent the possibility of vibrations of equipments / materials getting transmitted to their foundations / supports / suspenders. Depending upon the actual application different types of vibration isolators shall be provided to suit the actual requirement at site.

9.1 RUBBER FOOT ISOLATORS :
The rubber foot mountings shall be so designed that the rubber is protected from oil and physical damage and only good quality of synthetic rubber shall be used. It shall be loaded in shear and compression, a combination to give longer life with the best load / deflection characteristics. It should retain its cushioning effect and should have no tendency to get compressed and gradually become solid in due course of time.

9.2 SPRING ISOLATORS :
Spring isolators will be of categories :

a. Category-1 :
Category-1 spring isolators will consist of MS housing, MS cap with rubber pads of good quality provided at top and bottom. The housing shall be provided with suitable retainer holes for fixing nuts and bolts to keep the housing in position. The upper part will be flat to provide floating support to the equipment. This is for lighter loads and requires no side guides.

b. Category-2 :
Category-2 spring isolators will consist of steel casting housing with rubber pad sprovided at the top and bottom and side guides around the spring to keep the upper portion in position. Category-2 isolators are used for relatively heavier loads.

9.3 HANGING SUPPORTS / RUBBER IN SHEAR :
These supports are mostly used in suspenders of pipes and ducts. The support is provided with spring and rubber pad on its top enclosed in a housing. The suspender (support) passes thru the rubber pad and

Signature of the contractor

spring below it, and comes out of the housing. The pipe or duct is suspended to this support. This can be single or twin depending upon the load andactual requirement.

9.4 RESISTOFLEX PADS :

These are specially designed resilient materials in the form of pads to isolate vibration. The pads will be in standard size of 4" × 4", 6" × 6", 9" × 9" or even bigger size to suit the requirement. Thickness of the pad will vary according to load requirements. However, in place of thicker pad, two or three pads of smaller thickness may be used with adequate provision of retaining housing ensuring these pads in their position.

10.0 LIST OF APPROVED MAKES FOR EQUIPMENT AND MATERIALS

SI No.	Description of Items	Manufacturer
1	**DG Set :** i. Engine	Cummins /Caterpillar/ FG Wilson(Perkins) / Mitsubishi
	ii. Alternator	Stamford / Leroy Somer / Jyoti/ Kirloskar Electric Co
2	a. AMF Panel	Manufacturer of DG set whose DG set is accepted / Trinitron / KEPL / Tricolite
	b. LT Panels / Emergency Panel	Trinitron / KEPL / Tricolite/Brite Engineering / Stahllform Technik Pvt.Ltd.
3	Cables	Finolex / Skytone / CCI / Universal/ Fort Gloster/ Asian/ Nicco/ Premier/ Polycab/ Havells
4	PVC Insulated Copper Conductor FRLS Wires	Finolex / Skytone / CCI/ Wincap/ Polycab/ Anchor
5	Cable Glands	Comet / Dowells/ Lotus/ Braco/ Jainson
6	Crimping type Lugs / Thimbles	Dowells/ Comet/ Uma
7	Air Circuit Breaker (ACB)	L&T / Siemens / Alstom/ E.E/ GE/ C & S/ ABB
8	Moulded Case Circuit Breaker (MCCB)	L&T / Alstom / Crompton/ Siemens/ GE/ MDS/ Legrand
9	Miniature Circuit Breaker (MCB)	Indo Kopp / MDS / Havells / Siemens / L&T/ GE/ Legrand/ Indo Asian/ BCH/ C&S.
10	E.L.C.B.	Legrand / Siemens / L&T/ GE/ MDS.
11	Starters	L&T / Siemens / Crompton/ BCH
12	Contactors	L&T / Siemens / Crompton/ BCH/ Telemechanique/ C&S/ Schneider

Signature of the contractor

13	Push Button	L&T / Siemens / Crompton/ Vaishno/ Technic
14	Overload Relays	L&T / Siemens / Crompton/ BCH/ C&S/ Schneider.
15	Battery Charging Panel	Statcon / Excide
16	Batteries	Amaron / Exide
17	Battery Charger	Logicstat / BCH / Amaraja / Volstate / HVL Knife
18	Current Transformers	Automatic Electric / Kappa / Maxgilbor/ TELK/ Seimens/ Indcoil/ AEL/ Kalpa.
19	Analogue Energy / Power Meter	IMP / Rishab (L&T) / SPI/ AE/ MECO/ Conserve/ Alacrity/ Elmeasure.
20	Electronic Digital Energy/Power Meter (A/V/PF/Hz/KW/KWH) with LED Display	Enercon / AE / Secure Meter/ BHEL/Conserve/ Alacrity/ MECO/ Elmeasure.
21	Toggle Switches	Kaycee / Salzer (L&T)/ Reco
22	Selector Switches	Kaycee / Salzer (L&T)/ Siemens/ Thaker/ Reco/ Switchtron.
23	Push Buttons and Indicating Lamps(LED Type)	Schneider / L&T (ESBEE) / Siemens / Vaishno/ Technic
24	Protective Relays	Alstom / ABB / L&T / Siemens/ AREVA/ Easun Rerole/ EMCO/ ProkDvs
25	Auxiliary Relays	Alstom / ABB / L&T / Siemens
26	Overload Relays with Built-in Single Phase Preventer	Schneider (Telemechanique) / ABB / L&T/ Siemens/ BCH/ C&S.
27	Time Delay Relays	LT-LK / Bhartiya Cutler Hammer / L&T/ Siemens/ EE/ C&S/ Schneider.
28	APFC Relay (Digital Microprocessor Based Compatible PC/PLC)	L&T / Siemens / Enercon
29	Timer	Schneider (Telemechanique) / L&T / Siemens
30	Changeover Switches	HH Elcon / C&S/ HPL/ Indo Asian/ Havells/ L&T.
31	Switch Fuse Units	L&T / Siemens / Alstom/ E.E/ GE/ C&S/ Havells
32	HRC Fuses	L&T / Siemens / Alstom/ GE/ Standard/ Indo Asian/ Havells/ C&S.
33	Capacitors Banks	Siemens / L&T / Ducati
34	Cable Trays	Slotco / Pilco / MEK/ Bharati/ Venus/ Indiana
35	MS Conduits and its Accessories	Steel Craft / BEC/ GB/ Bharat
36	Terminal Strip	Connectwell / Elmex
37	Jointing Kit XLPE (11 KV)	Ray Chem / Xicon / Birla 3M
38	UPS (Online)	Tata Libert / Aplab / APC (American Power Co)
39	Portable Fire Extinguishers	Vijay Fire / Minimax / Reliable
40	Fuel Transfer Pump (flame proof)	Kirloskar / Crompton / Bharat Bijlee/ Thusako
41	**Pipes / Valves / Sheet :**	
	a. MS Pipes upto 200mm dia	TATA Steel / Jindal Hissar/ Zenith
	b.MS Pipes above 200 & upto 400mm dia	SAIL / Jindal (Heavy Duty Factory Rolled)/ Zenith
	c. MS Pipes above 400mm dia	SAIL (Heavy Duty Factory Rolled)
	d.GS Sheet : For All Thicknesses	SAIL/Jindal/Nippon/ Tata Steel/ Ispat
	: For 22 G & 24 G	ISPAT / Nippon-Denro
	e. Aluminium Chequered Plate	Bharat Aluminium / Hindalco
	f.Gate / Globe Valve (Fire Safe)	Leader / Castle / Audco / Arpita
	g. Check Valve / NRV(Fire Safe)	Advance / Castle / Audco / Arpita
	h. Ball Valve (Fire Safe)	Advance / Castle / Audco / Arpita

Signature of the contractor

42	Axial Fan	Humidin / Nicotra / Comefri / Kruger
	a. Extruded Aluminium Grilles/ Diffusers (Anodised / Powder Coated).	Caryaire/ Dynamic/ Opella / Ravi Star/ TANUS
	b. Volume Control Dampers	Caryaire/ Ravistar/ Dynamic/ Continental/ Humidin
	c.Butterfly damper	Caryaire/ Dynamic/ Ravistar/ Continental/ Humidin
	d.Fire retarding canvas for flexible connection and Hessian	Navair / Pyroguard
	e. Sound Attenuator	Caryaire / Ravistar / Noisecon / Continental
43	**Acoustic Lining :**	
	a. Fiberglass / Mineral Wool	Lloyd Insulation / Supreme / Owens Corning / Up-Twiga
	b. Hessian Fire Retarding	Navair/Pyroguard
44	**Vibration Isolators :**	
	• Springs, Neoprene Pads	Resistoflex / Emerald / Dunlop/ Flexonics/ CORI
	• Flexible Connections	Flexonics / Mason / Resistoflex/ Easyflex/ CORI
45	Paint	Asian / Nerolac / ICI
46	Any Other Item	Make and sample to be approved by Engineer-in-charge.

11.0 EQUIPMENT DATA

The following informations regarding the equipments offered shall be furnished by tenderer alongwith tender. The tenderer should fill out this proforma and attach to his offer alongwith technical catalogues / details without which the offer may not be considered.

S.No.	**Description**	**Details furnished by Tenderer**
1.0	**DG Set (Engine + Alternator)**	
	a. Make and Model	
	b. Prime Power Rating : KVA	
	c. Output Voltage and Frequency	
	d. Power Factor	
	e. No. of Phases	
	f. Dimensions of assembled DG set : L x W x H (mm)	
1.1	**Engine**	
I.	**PHYSICAL PARAMETERS :**	
	a. Manufacturer	
	b. Make	
	c. Model	
	d. Configuration of Cylinders. (Vertical inline or V-type)	
	e. Number of cylinders	

Signature of the contractor

	f. Bore: mm	
	g. Stroke: mm	
	h. Displacement: Cub, Inch, Ltrs:	
	i. Dimensions:	
	i) Length : mm	
	ii) Width : mm	
	iii) Height : mm	
	j. Total wet weight (Engine + Radiator and Fan) : Kg	
	k. Aspiration (turbocharged after cooling)	
	l. Fuel	
	m. Vibration Isolators	
	n. Governor (Electronic)	
	o. Type of coupling	
	p. Day tank capacity: Ltrs	
	q. Compression Ratio	
	r. Combustion air intake at 100% load: M^3 per minute	
	s. Piston Speed: M/sec	
II.	**PERFORMANCE PARAMETERS:**	
	a. Power developed in BHP:	
	b. RPM to give above output	
	c. Fuel consumption at full load with radiator and fan: Ltr per hour	
	d. Fuel consumption at 75% load with radiator and fan: Ltr per hour	
S.No.	**Description**	**Details furnished by Tenderer**
	e. Lube oil consumption at full Load (Ltr per hour):	
	f. Lube oil system capacity: Ltrs	
	g. Cooling Capacity (Engine + Radiator) in Ltrs:	
	h. Fan air flow across radiator: M^3/min	
	i. Exhaust Temperature: Deg C	
	j. Starting mechanism (Battery):	
	k. Battery: Make: Capacity- 180 Amp hours	
	l. Battery charger: Make	
1.2	**ALTERNATOR**	
	a. Manufacturer	
	b. Make	
	c. Model	
	d. Type (Brushless)	
	e. Power: KVA	
	f. Voltage regulation (± 0.5%)	
	g. Insulation class :	
	h. P F :	
	i. RPM:	
	j. Rating (continuous) :	
	k. Voltage (415 V)	

Signature of the contractor

	l. Voltage regulator (Automatic):	
	m. Connection:	
	n. Rated voltage:	
	o. No. of Phases:	
	p. Standard Enclosure (IP class) :	
	q. Winding pitch:	
	r. Stator winding:	
	s. Rotor (dynamically balanced):	
	t. Wave form distortion:	
	u. Total harmonic factor:	
1.3	**MAKE OF AMF PANEL:**	
1.4	**BUS BAR (ALUMINIUM)**	
1.5	**CABLE MAKES:**	
1.6	**FUEL PUMP:**	
	a. Manufacturer	
	b. Make	
	c. Model	
	d. Type	
	e. HP	
	f. RPM	
	g. Voltage	
	h. Suction/discharge size : mm	
	i. Capacity Ltrs / Hour	
	j. Head Metric	
S.No.	**Description**	**Details furnished by Tenderer**
1.7	**TIME FOR STARTING / LOAD TRANSFER :**	
	a. Minimum time gap between mains failure and starting & attaining full speed of the set. : Seconds	
	b. Minimum time gap between mains failure & transfer of full load to the set : Seconds	
	c. Specify stages if load is to be transferred to the set in stages and time taken by each stage and total time : Seconds	
	d. Confirm if the full load can be transferred at a time.	
1.8	Total dry weight of the set including engine alternator frame and all other accessories mounted together. : Kg	
1.9	Total quantity of Lube oil for one charge. : Litres	
2.0	**DG ROOM VENTILATION / ACOUSTIC TREATMENT**	
2.1	**AXIAL FANS**	
	a. Manufacturer	
	b. Type / Model	
	c. Bearings	

Signature of the contractor

	d. Blades material	
	e. Vibration Isolator	
	f. Capacity (CFM)	
	g. Static pressure (mm)	
	h. Speed (RPM)	
	i. Limit load HP	
	j. Outlet velocity (M/Minute)	
	k. Fan size and model	
	l. Motor type	
	m. Manufacturer of motor	
	n. Motor BHP	
	o. Motor HP	
	p. Motor RPM	
	q. Permissible voltage Fluctuations (415 ±…..%V)	
	r. Type of starter	
	s. Manufacturer of Starter	
2.2	**GRILLES / DIFFUSERS / DAMPERS**	
	Make and material of the following :	
	a.Grilles / Diffusers	
	b.Sound Attenuator	
2.3	**ACOUSTIC LINING**	
	a. Make (Manufacturer)	
	b. Density - Fiber Glass Kg/ M^3 - Mineral Wool Kg/ M^3	
2.4	**VIBRATION ISOLATION SYSTEM**	
	a. Manufacturer	
	b. Type	

LIST OF DRAWINGS

S.No	**Drg. No.**	**Description**
I. DG SET :		
i.	NDCG:DG:02	Site Layout Showing Electric Sub-Station, DG Room and UG Storage Tank
ii.	NDCG:DG:03	AMF Panel for Proposed DG Set : Single Line Diagram
iii.	NDCG:DG:04	Underground Diesel Storage Tank : Plan & Section
iv.	NDCG:DG:05	Diesel Storage and Distribution System
v.	NDCG:DG:06	Soak Pit : Plan & Section
II. DG ROOM VENTILATION :		
i.	NDCG:DG:07	DG Room Ventilation System Layout
ii.	NDCG:DG:08	Section ‘X-X’ showing DG Room Ventilation System
iii.	NDCG:DG:09	Supply Air Assembly with Sound Attenuator & Fan : Typical Section

Signature of the contractor

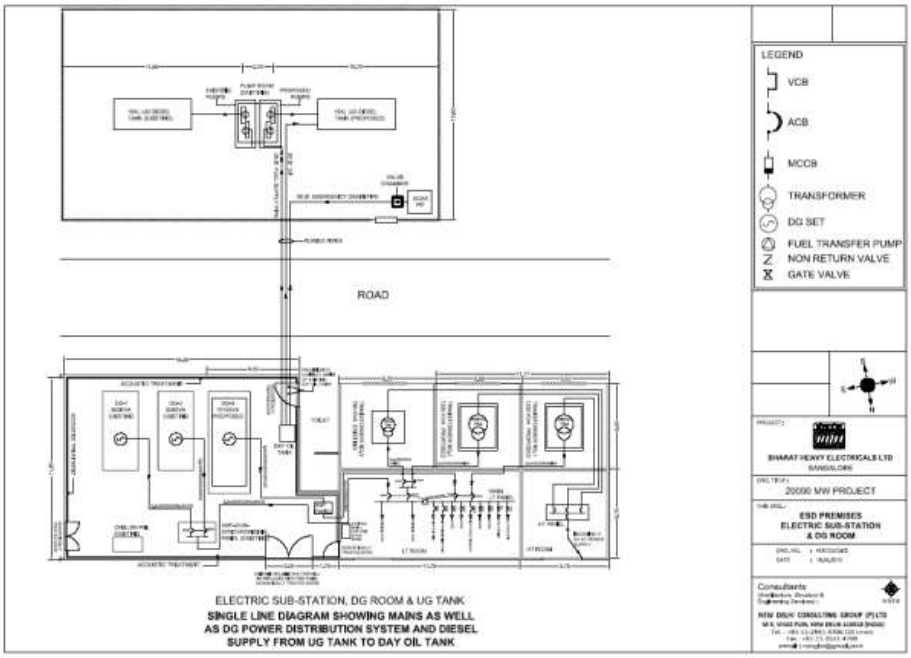
iv.	NDCG:DG:10	Exhaust Air Assembly with Sound Attenuator & Fan : Typical Section
v.	NDCG:DG:11	MS Channel Frame with Aluminium Chequered Plate
vi.	NDCG:DG:12	Control Panel for DG Room Ventilation System.

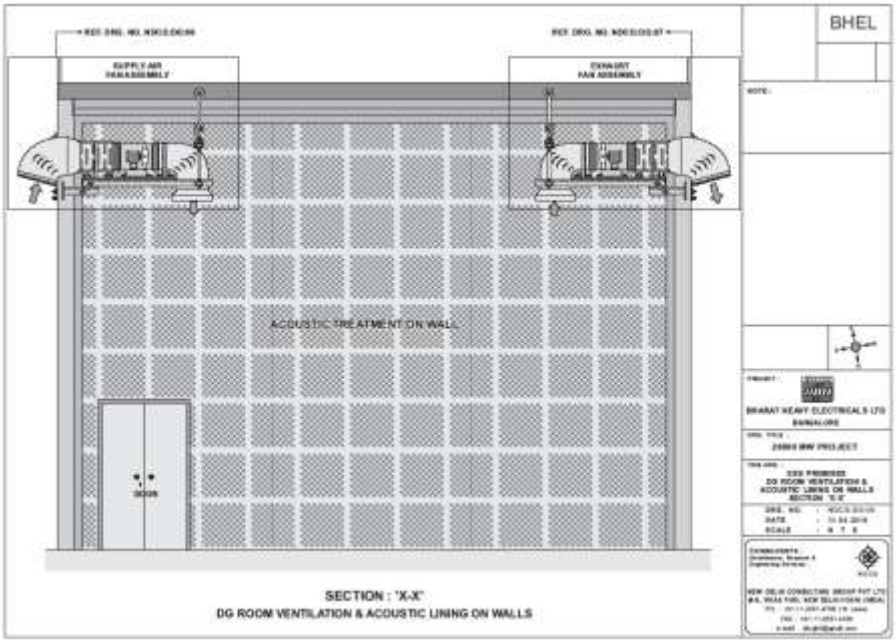
III. DG ROOM ACOUSTIC TREATMENT :

i.	NDCG:DG:13	DG Room Layout showing DG Sets and acoustic lining on Walls and Doors.
ii.	NDCG:DG:14	Section 'Y-Y' : DG Room showing acoustic lining on walls.

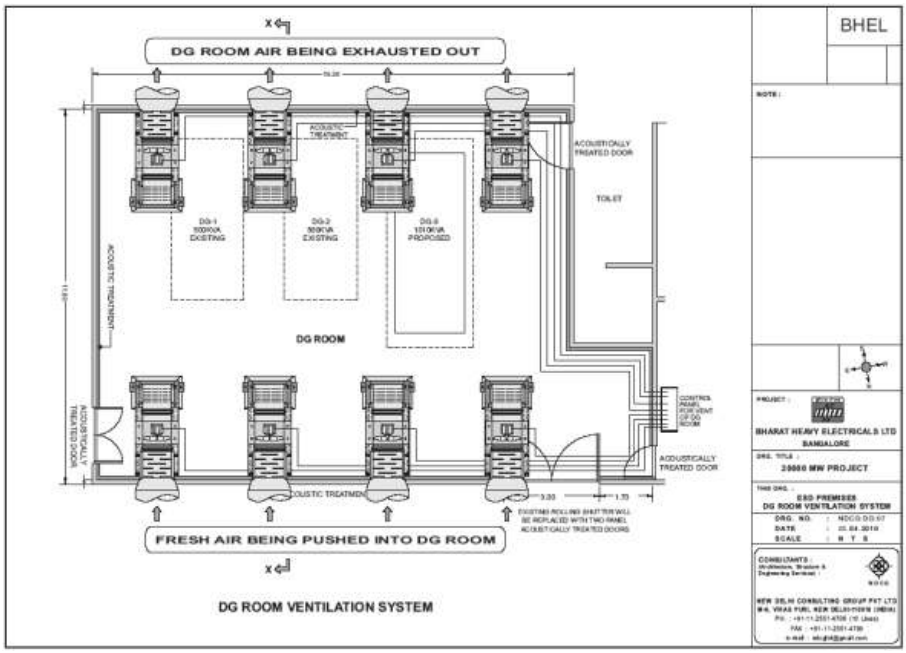
*****

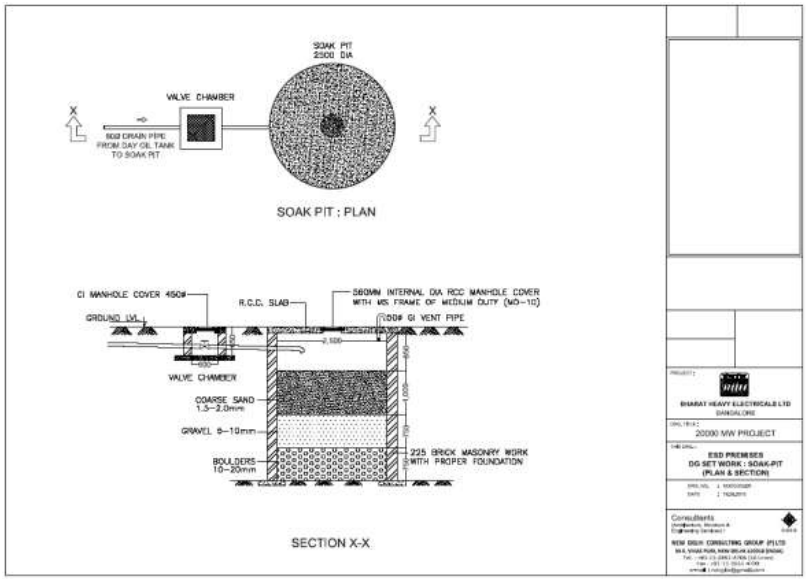
Signature of the contractor



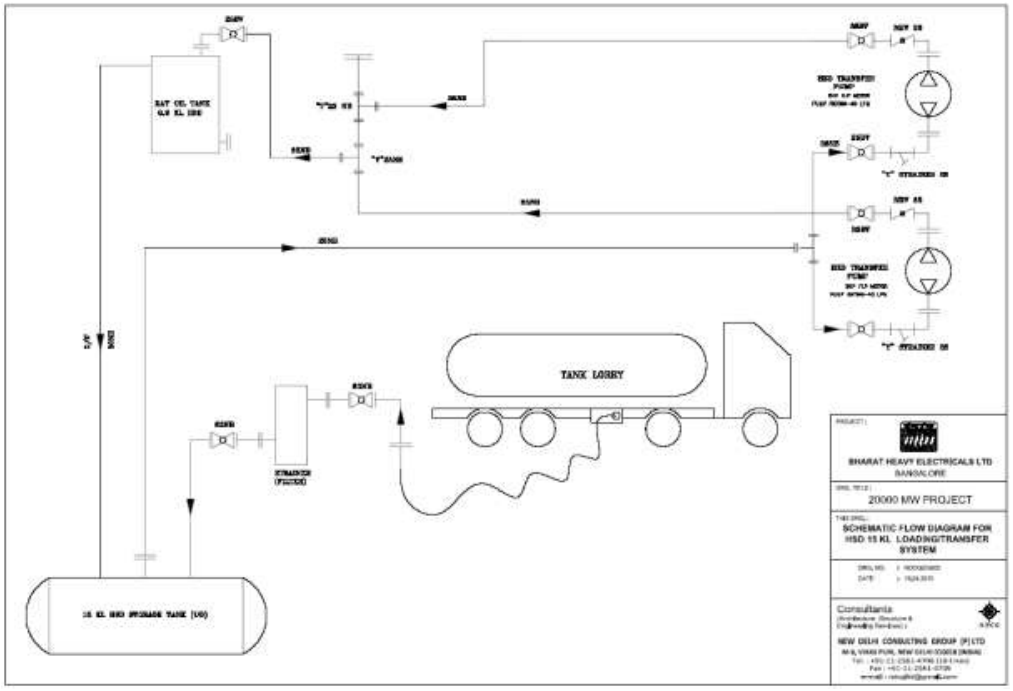


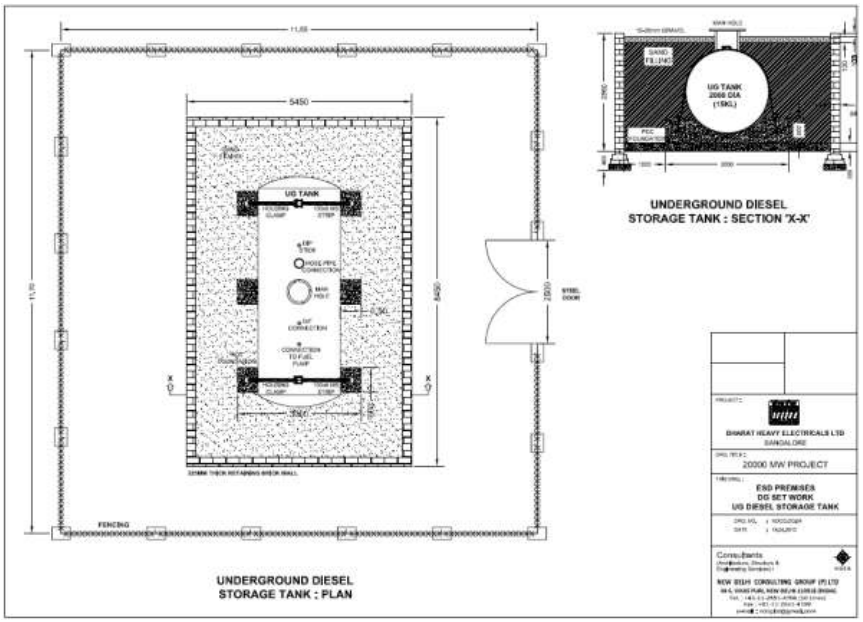
Signature of the contractor



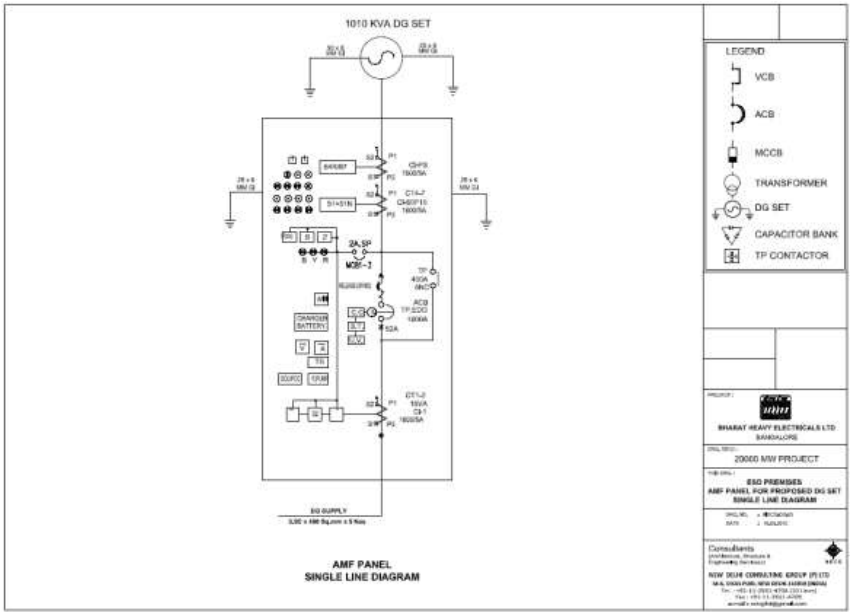


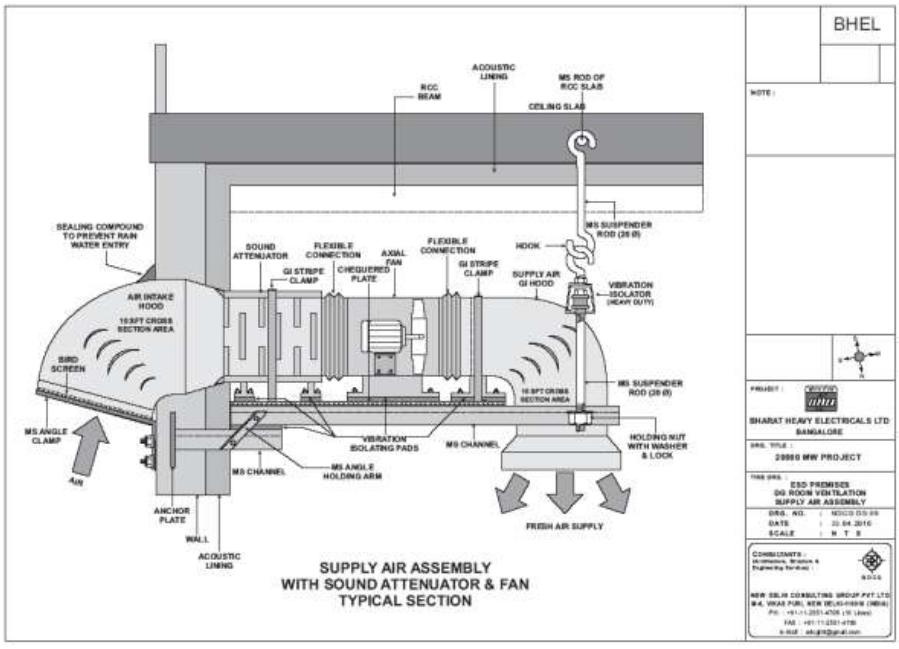
Signature of the contractor



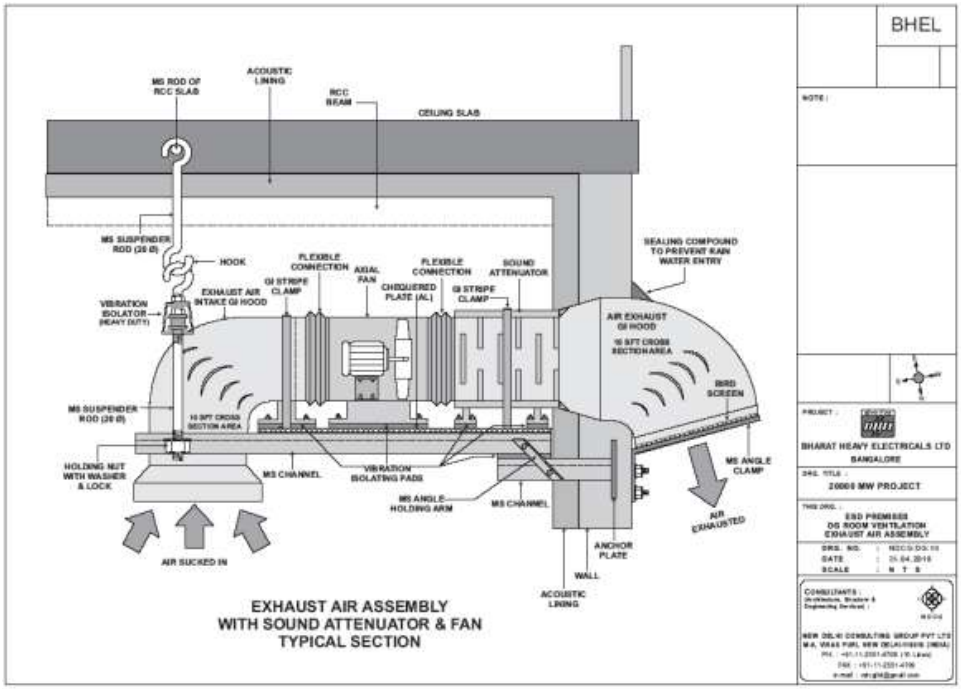


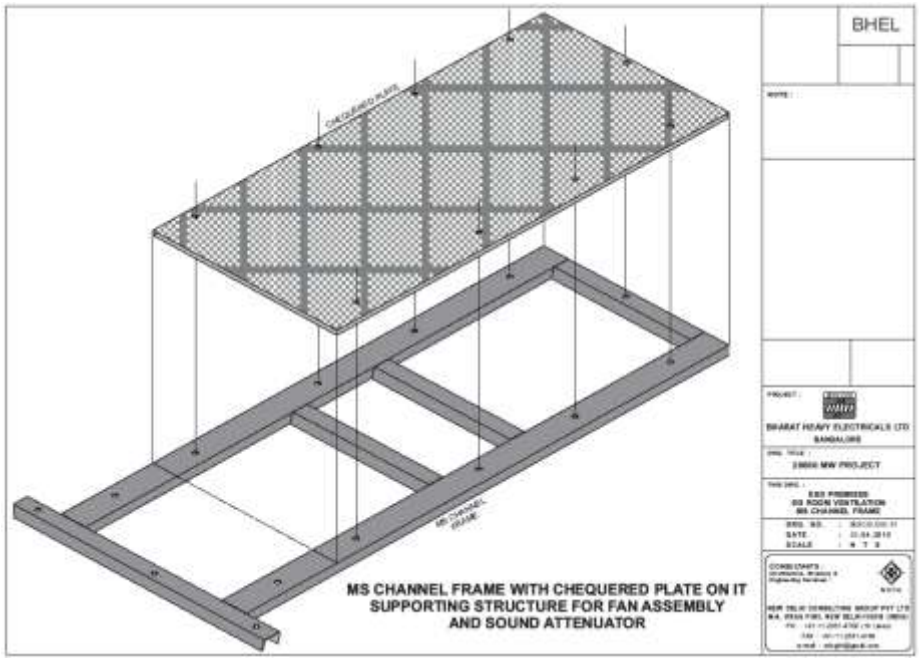
Signature of the contractor



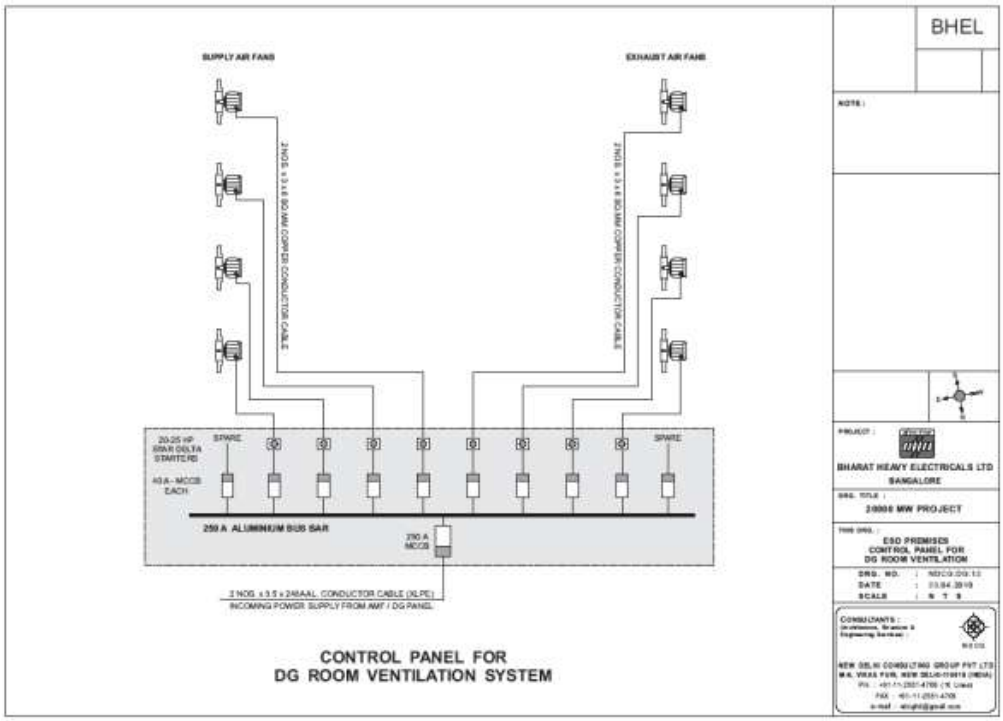


Signature of the contractor

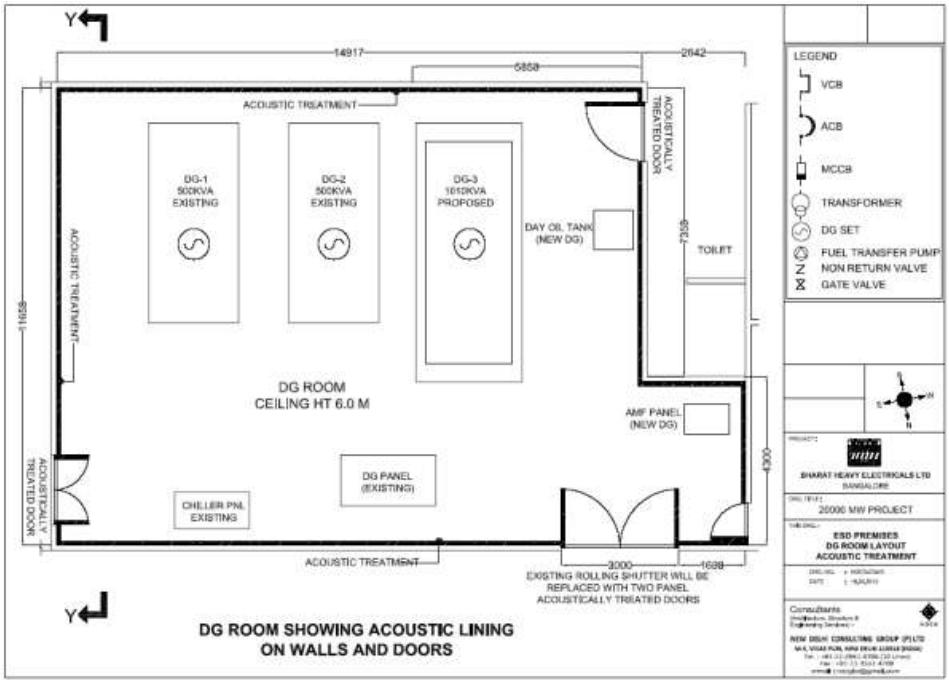




Signature of the contractor

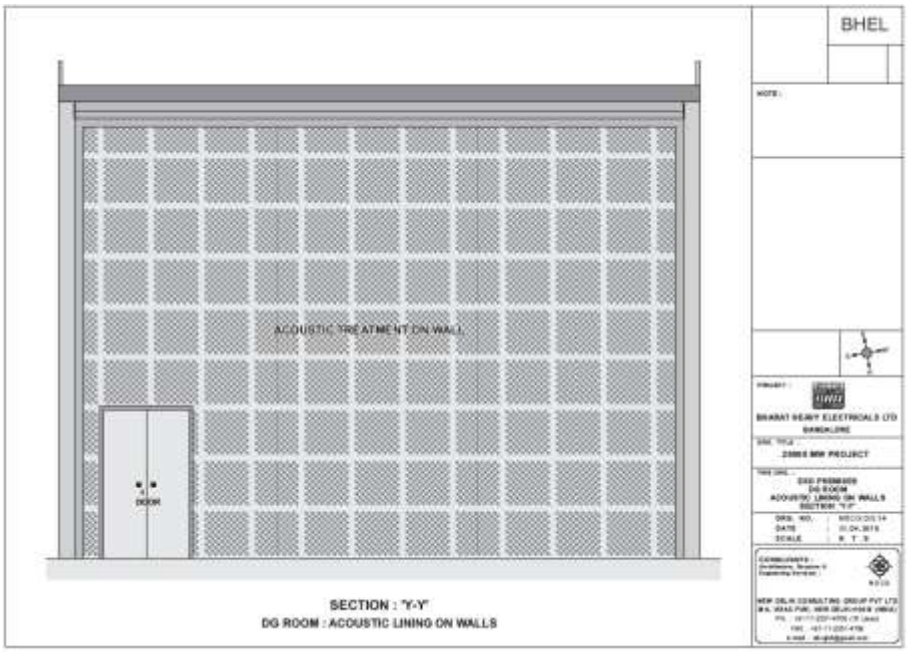


CONTROL PANEL FOR
DG ROOM VENTILATION SYSTEM



DG ROOM SHOWING ACOUSTIC LINING
ON WALLS AND DOORS

Signature of the contractor



Signature of the contractor

1.0 General Notes :

All items of work under this Contract shall be executed strictly to fulfill the requirements laid down in the specifications. Type of equipment, material specification, methods of installation and testing and type of control shall be in accordance with the specifications, approved shop drawings.

2.0 The unit rate for all equipments or materials shall include cost in RUPEES for equipment and materials including all taxes and duties and also including forwarding, freight, insurance and transport into Contractor's store at site, storage, installation, testing, balancing, commissioning and other works required.

3.0 The rate for each item of work included in the Schedule of Quantities shall, unless expressly stated otherwise, include cost of :

a. All materials, fixing materials, accessories, appliances tools, plants, equipment, transport, labour and incidentals required in preparation for and in the full and entire execution, testing, balancing, commissioning and completion of work called for in the item and as per Specifications and Drawings.

b. Wastage on materials and labour.

c. Loading, transporting, unloading, handling/double handling, hoisting to all levels, setting, fitting and fixing in position, protecting, disposal of debris and all other labour necessary in and for the full and entire execution and for the job in accordance with the contract documents, good practice and recognize principles.

d. Liabilities, obligations and risks arising out of Conditions of Contract.

e. All requirements of Specifications, whether such requirements are mentioned in the item or not. The Specifications and Drawings where available, are to be read as complimentary to and part of the Schedule of Quantities and any work called for in one shall be taken as required for all.

4.0 All equipments, quantities and technical data indicated in this Schedule are for the Contractor's guidance only.This schedule must be read in conjunction with other documents. The Contractor shall be paid for the actual quantity of work executed by him in accordance with the approved Shop Drawings at the contract rates.

5.0 This Schedule shall be fully priced and the extensions and totals duly checked. The rates for all items shall be filled in INK.

6.0 No alteration whatsoever is to be made to the text or quantities of this Schedule.

7.0 Any error in totaling in the amount column and in carrying forward total shall be corrected.

8.0 The Contractor shall procure and bring Materials/Equipment to the site only on the basis of drawings approved for construction and shop drawings and not on the basis of Schedule of Quantities, which are provisional only. This also applies to the Contractor's requisition for Owner supplied materials, if any.

9.0 The Contractor shall obtain and submit to the Engineer-in-Charge all clearances / approvals / licenses from concerned authorities as may be required for the installation including Underground Diesel Storage Tank and the rates quoted shall be inclusive of all such requirements. However, actual fees payable to the Govt. Departments in this regard shall be reimbursed to the contractor on actuals on production of requisite proof / receipt of such payments having been made by the contractor. It will be ensured by Owners / contractor that the installations conform to relevant byelaws and statutory requirements.

Signature of the contractor

Annexure - I (DG Set and Accessories)

Sl No	Description	Unit	Qty	Rate	Amount
1.0	**Diesel Generating Set :**				
	Supply, installation, testing and commissioning of 1010 KVA / 808 KW Diesel Generating Set.Engine conforming to BS:5514. Prime Power Rating in accordance with ISO:8528. DG set shall be capable of 10% overload for 1 hour in every 12 hours of operation. The set will comprise Diesel Engine, Alternator, common MS base frame, anti-vibration mountings. **A.Diesel Engine :** **i. Cooling System** • Radiator Cooled • Engine water pump • Coolant Inhibitor • Outboard after coolers **ii. Fuel System** • PT fuel pump • STC Injectors • Fuel filters - Paper element type **iii. Lubricating System** • oil pump • Lub oil cooler : Plate type • Oil filter : Paper element type • Bypass filter • Self contained piping **iv. Air Intake System** • Dry type paper elementAir cleaners • Air intake manifold with necessary connections • Turbo charged after cooled • Restriction Indicator **v. Exhaust System** • Exhaust manifold • Stainless steel flexible connections • Silencers : Residential type **vi. Governing System** • Electronic Digital Governor **vii. Starting System** • Starter, 24V, DC • Battery Charging Alternator **viii. Safety System (Engine Protection - Trip)** • Low lub oil pressure • High water temperature • Over speed • Low Coolant oil level (alarm)				

Signature of the contractor

ix. Other System

• Flywheel

• Flywheel housing

x. Genset Controls

The control shall be a microprocessor based generator set monitoring, metering, protection and control system for high reliability and optimum Genset performance with digital display and having in-built provision to allow the system parameters to be integrated, monitored and adjusted with a PC, and having following features :

• Digital governing

• Digital voltage regulation

• AmpSentry protection for true alternator O/C protection on PCC 2100.

• Analog/bargraph/digital AC output metering.

• Battery monitoring system to sense and warn against a weak battery condition.

• Digital alarm and status message display.

• Genset monitoring : displays status of all critical engine and generator set functions.

• Smart starting control system : Integrated fuel ramping to limit black smoke and frequency overshoot.

• Advance serviceability.

B.Alternator :

The alternator shall be of self-excited, self regulated,brushless construction and shall confirm to IS 4722 or, BS:5000 and shall give rated output. Salient technical parameters shall be as given below :

i. Rated power : 1010 KVA

ii. Type : Brushless

iii. Power Factor : 0.8

iv. Rated voltage : 415 volts

v. Supply system : 3 phase and neutral

vi. Frequency : 50 cycles/sec.

vii. Rated rpm : 1500 RPM

viii. Casing protection : As per IP-23

ix. Insulation : Class 'H'

x. Bearings : Double bearing

xi. Overload capacity : 10% of one hour in any 12 hours of operation.

xii. Voltage regulation : ± 0.5% for all loads between no load to full load.

C. Accessories :

The Diesel Engine shall be equipped with following devices / accessories built in type.

i. Daily service fuel tank of 990 ltr. capacity, constructed of MS 6 mm sheet complete with inlet and outlet connection, drain plug, man hole, wire braided hose etc and oil level indicator.

Signature of the contractor

	ii. Battery 12 V DC, set of four dry type batteries 180 AH each with battery leads for electric starting of DG set. iii. Suitable range automatic battery charger unit with 'trickle' and 'boost' charging. iv. 0-30V DC Voltmeter and 0-30 A DC Ammeter with control fuse for DC supply.	Set.	1		
2.0	**AMF Control Panel :**				
	Designing, fabrication, supply, installation, testing & commissioning of floor mounted, self supported, compartmentalized LT cubical pattern (Extendable Type) Auto Mains Failure (AMF) panel, fabricated from 2mm (14 G) thick CRCA sheet steel 415 V, 3 phase, 4 wire, 50 Hz AC supply and equipped with PVC sleeved Aluminium bus bars of 1600 Amps rating with 1 amp per Sqmm and following switch gears inter connected by PVC sleeved conductors, including 7-tank cleaning, de-greasing, phosphating process and treatment of panel with anti-corrosive primer paint before applying 2 coats of enameled paint of approved shade, complete with earthing terminals, cable and bus bar alleys as required. The panel will have the following major accessories and their associated controls and indication : **A. Air Circuit Breaker (ACB) :** 1 No. 1600A, 4 pole electrically operated, draw out type ACB with short circuit and over current protection. each with following accessories : i. Suitable range digital voltmeter with selector switch & control fuses. ii. Suitable range digital ammeter, 1600/5A ratio CTs & selector switch. iii. Power factor meter and control fuses. iv. Frequency meter with control fuses. v. 0-1000 KW range KW meter. vi. KWH meter. vii. Phase indicating lamps with control fuses. viii. CT operated over current relay IDMT type with 1600/5A CT and indicating lamp. ix. IDMT earth fault relay with indication lamp. Reverse power relay. Under voltge relay. Over Voltage relay. x. Automatic voltage regulator. xi. INDICATION FOR : a. Main supply 'ON'. b. DG Supply 'ON'. c. DG set supply 'OFF'. d. Mains failure. e. DG set trip. f. DG set tripped due to 'Low Lube Oil Pressure'.				

Signature of the contractor

	g. DG set tripped due to 'High Water Temperature'. h. DG set tripped due to 'Over speed of engine'. i. DG set locked due to 'Engine fault'. j. DC supply failure. k. DC supply 'ON' l. Battery Charger 'Failure'. m. Battery Charger 'ON'. n. Mode selector switch. (AUTO/MANUAL) o. Hooter. p. Push button (START/STOP/RESET). q. Complete wiring and arrangement for auto start and required inter locking. **B. Controls :** a.As soon as the mains supply goes off, the DG set starts automatically and take the full load prescribed within 15 seconds. **C. Outgoing to Lubricating Oil Pump of DG Set :** 1 No. suitable/matching isolator with contactor to supply power to lubricating oil pump of the engine. **D. Control Cable & Jointing :** Control cables from GEN. SET to AMF panel, Main LT panel etc. Cable termination and jointing for all control cables.	Set.	1		
	Associated Accessories:				
3.0	**Flue Exhaust System :** MS / Black Pipe Providing and fixing of suitable size of MS pipes, heavy gauge / 'C' class, including fittings like bends, reducers, flanges etc, with suitable supports for Flue Exhaust system for DG set including providing fiber glass insulation 100 mm thick on all sides in three layers with first layer (innermost) of 50mm and subsequent two layers of 25mm each and each layer being covered with chicken wire mesh wrapping throughout and 75mm wide 18 G GI sheet straps / clamp over wire mesh at every 1.50 metre length of the exhaust pipe and finally providing 26 G aluminium cladding. a. 250 mm dia MS Pipe.	Mtrs	30		
4.0	**EXHAUST PIPE SUPPORT**				
	a. Supply & Installation of MS support for exhaust pipe and turbo charger with 1 coat of red oxide & enamel paint.	Kgs	750		
	b. Self supporting MS Structure with 1 coat red oxide and 2 coats enamel paint.	Ton	3.5		
	c. Lightning Arrestor, Aviation Lamp & 25X3 GI Strip for exhaust Structure.	Set.	1		
	d. Spring support.	Nos.	4		
5.0	**Insulation of Residential Silencer**				

Signature of the contractor

	Providing and fixing insulation for 200 Ø residential silencer with 25mm thick two layers of glass wool covered with chicken wire mesh, GI sheet straps and 26G aluminium sheet.	Nos	2		
6.0	**Underground Fuel Oil Storage Tank :** Supply, installation, testing and commissioning of 15KL capacity cylindrical horizontal base, bulk HSD storage tank with 5.0 Mtr length and 2.0 Mtr dia, dish end both sides, suitable for underground installation as per IS 1098:1992, fabricated out of 8mm thick MS plate and 10mm thick dish end with 10mm thick 500 dia manhole, conforming to Indian Explosive Act including air vent, suitable nozzles drain, overflow, Inlet piping with selfholding socket brought out upto road to unload the fuel directly from lorry. The tank shall be painted with anticorrosion paints for protection against underground moisture/rust and then provided with two coatings of bitumen. The tank shall be provided with necessary hooks for hoisting and clamps for grouting the tank to foundation and shall be complete in all respects.	No	1		
7.0	**Fuel Transfer Pump :** Supply, installation, testing and commissioning of rotary type, positive displacement, gear pump for fuel transfer from underground storage tank to daily service tank including flame proof motor with base frame, coupling and other associated accessories complete in all respects and outdoor cubicle GI housing with cement concrete base for pump including control and power wiring or cabling between main panel to switch, switch to starter and starter to pump. The pump shall be electrically operated, with flame proof motor Controlled by a Switch, Starter and wiring or cabling and will be of following specifications : HP 2.0, RPM 1440, Voltage 220 AC, 50 cycles/sec., Suction 25mm, Discharge 25mm, Head 15 M, Capacity 40 LPM over a distance of 300 M, and 15 M head. Fuel transfer pump as described above, as per specifications and complete in all respects.	Nos	2		
8.0	**Piping :** Supply, laying / fixing, testing and commissioning of piping buried underground as mentioned below alongwith fire safe valves including necessary supports, digging and refilling of earth.				
	a. Piping :				
	i. 80mm dia black pipe	Mtrs	45		
	ii. 50mm dia black pipe	Mtrs	25		
	iii. 25mm dia black pipe	Mtrs	70		
	b. Valves :				

Signature of the contractor

	i. 80mm dia flange end fire safe Ball Valve	Nos	3		
	ii. 25mm dia flange end fire safe Ball Valve	Nos	5		
	iii. 25mm dia Non-Return Valve of cast iron	Nos	2		

9.0	**Pot Strainer :** Supply, installation, testing and commissioning of pot strainer of MS body with 40 mesh SS jali alongwith inlet outlet connection of 80mm size.	No	1		
10.0	**Y-Strainer :** Providing and fixing of 25mm dia Y-strainer.	Nos	2		
11.0	**Dip Stick :** Supplying aluminium measuring gauge for HSD measurement in storage tank.	No	1		
12.0	**SS Hose Pipe :** Providing and fixing of 80 mm dia flexible SS hose for HSD unloading from tanker to underground tank.	Mtrs	5		
13.0	**Foundation :** Providing and laying foundation for UG diesel tank and clamping devices to hold the tank in the ground (with foundation) including excavation in earth / rock, 225mm thick retaining brick wall on all four sides, sand filling and levelling complete in all respects.	No	1		
14.0	**Steel Gate and Fencing for UG Diesel Tank:** Providing and fixing 2 Meter high welded wire mesh fencing required as per the Indian Explosive Acts with hinged steel doors, locking arrangement, 50mm x 50mm x 6mm angle iron supports at 2.5 metre span, with 300 x 300 x 450mm deep PCC foundations for supports, painting of complete fence in red oxide primer and required weather proof colour complete as required.	Lot	Lot		
15.0	**Soak Pit**				

Signature of the contractor

	Providing and fixing / constructing cylindrical soak pit with 2500 inner dia, 3350 inner depth, constructed with 225 brick wall on proper foundation with RCC slab on top with 560mm dia RCC manhole cover alongwith a 600 x 650 size valve chamber with brick wall and 450 x 450 CI cover by the side of the soak pit. The soak pit will be filled with 10-20mm boulders at bottom, 5-10mm gravel in the middle and 1.5-2.0mm coarse sand on top leaving about 850 empty space above the coarse sand as per details shown in the drawing including the vent pipe for the soak pit including digging and refilling. Soak pit with valve chamber as described above, as per specifications and complete in all respects.	No	1		
16.0	**Cables:** Supplying and laying, testing and commissioning of following 1100 volt grade XLPE FRLS, insulated sheathed aluminium conductor armoured cables.				
16.1	3.5 Core × 400 sq.mm aluminium conductor armoured cable.	Mtrs	200		
16.2	3 Core × 400 sq.mm aluminium conductor armoured cable.	Mtrs	110		
16.3	4 core 6 Sqmm armmoured aluminium conductor cable	Mtrs	60		
17.0	**End termination:** Supply and making of end termination for below listed cables using cable gland and crimping type copper lugs.Cable identification tags to be provided.				
17.1	3.5 Core × 400 sq.mm aluminium conductor armoured cable.	Ends	10		
17.2	3 Core × 400 sq.mm aluminium conductor armoured cable.	Ends	10		
17.3	4 core 6 Sqmm armmoured aluminium conductor cable	Ends	6		
18.0	**Earthing :**				
18.1	**GI Earthing Station :** Supply, making , testing and commissioning of Earth station using 600 x 600 x 6 mm GI plate electrode, 2 nos of 25 x 6 mm GI flats from electrode to bridge plate in the chamber, complete with earth excavation, watering funnel, pipe,chamber, chamber cover of size 450 mmx450 mm & neccesary civil works.	Nos	4		
18.2	**Copper Earthing Station :** Supply, making, testing and commissioning of Earth station using 600 x 600 x 2.7 mm to 3 mm (Minimum 9.6 Kgs) Copper plate electrode, 2 no's of 25 x 6 mm copper flats from electrode to bridge plate in the chamber, complete with earth excavation, watering funnel, pipe,chamber, chamber cover of size 450 mm x 450 mm & neccesary civil works.	Nos	2		

Signature of the contractor

18.3	**GI Wires / Tapes :**				
	Supplying and fixing of following bars GI wire & tapes including all necessary fixing accessories & effecting connections :				
	i. 50 mm x 6 mm thick GI tape.	Mtrs	70		
	ii. 25 mm x 6 mm thick GI tape.	Mtrs	150		
	iii. 8 SWG GI wire.	Mtrs	250		
	iv. 50 mm x 6 mm copper flat.	Mtrs	50		
18.4	**GI Pipe :**				
	Supply and laying of class 'A' GI pipe in ground/wall/pavement including cutting chases and making good.				
	i. 50 mm dia.	Mtrs	50		

19.0	**Safety Equipments**				
	Supplying& fixing of following safety equipments at suitable places as required :				
	i. CO2 (Carbon-di-oxide) Type Fire Extinguisher: CO2 (Carbon-di-oxide) type fire extinguisher, with cylinder fully charged with 4.5 KG CO2, ISI marked conforming to IS 2878-1976/2/71/1976.	No	1		
	ii. ABC Type Fire Extinguisher : Providing and fixing 5 Kg capacity Fire Extinguishers (A, B, C type powder) complete with all accessories as per manufacturer's specifications.	No	1		
	iii. Fire Buckets : Set of 3 Nos. fire bucket with sand and 50 mm x50mm angle iron suitable stand with lettering etc. as required (conforming to IS 2546-1974).	Set.	1		
	iv. 11 KV Teak Wood Platform : Supplying and fixing in position 1000 mm wide and 25 mm thick 1st class teak wood platform with 15mm thick 1000mm wide rubber matt.	Mtrs	5		
	v. MV Danger Plate : Providing and fixing MV danger plate of 200mm x 150 mm made of mild steel sheet atleast 2mm thick and vitreous enameled white on both side and with inscription in signal red colour on front side as required and as per standard.	Nos.	2		
	Total				

Annexure -I

Total in Words: (Rupees_____

_____)

Signature of the contractor

Annexure - II (Acoustic Treatment of DG Room)

Sl No	Description	Unit	Qty	Rate	Amount
1.0	**Acoustic Lining : Wall / Ceiling** Providing and fixing acoustic lining of DG Room walls (starting 200mm above floor) and ceiling by forming 61 cm centre to centre squares grid of GI, 20 G, U-channel size 100 x 50 x 100 with 25mm integral flanges on either side, both sides opening outward, duly stuffed with sound absorbing media having two layers : one layer of 50mm thick x 64 Kg/M3 Density mineral wool and covered with another layer of 50mm thick x 32 Kg / M3 Density glass wool. The lining thus fixed shall be duly covered with fiber glass tissue paper and perforated aluminium sheet and finally secured and fixed with 18G x 100mm wide GI strips along the 'U' channel as per specifications and complete in all respects.	SM	470		
2.0	**Acoustically Treated Doors** Procurement of material, fabrication, supply and fixing of acoustically treated two panel / single panel doors made of MS sheet with 50mm x 2 layers of acoustic lining sandwiched in between with necessary frame, chrome plated brass hinges and handles to make the room air tight when closed without permitting leakage of air. The doors shall be complete in all respects as per specifications including accessories like hinges, handles etc and shall be of following sizes (approx.) :				
	a. Two panel door, each panel of size 1.5m length x 3.5m height. : 2 Nos.	SM	10.5		
	b. Two Panel door, with panel size of 0.9m length x 2.5m height. : 1 No.	SM	4.5		

Signature of the contractor

	c. Single Panel door, with panel size of 1.5m length x 2.5m height. : 1 No.	SM	3.75		
	d. Single Panel door, with panel size of 1.07m length x 2.5m height. : 1 No.	SM	2.68		
	Total				

Annexure -II

Total in Words: (Rupees_____

_____)

Annexure - III (DG Room Ventilation)

Sl No	Description	Unit	Qty	Rate	Amount
1.0	**Fan Assembly :**				
i.	**Axial Flow Fan**				
	Supply, installation, testing and commissioning of AMCA certified Axial Flow Fan made out of MS casing with flanges on both sides (suction as well as discharge) having cast aluminium alloy impeller with aero-foil section blade directly driven by TEFC squirrel cage induction motor suitable for 3 phase AC supply 415V, 50 Hz with vibration isolating pads, to be fixed on MS base frame /platform (MS base frame / platform is described below separately) with following capacities / technical parameters :				
	CFM **SP (mm)** **Motor HP**				
a.	28000 50 20	Nos	4		
b.	25000 50 20	Nos	4		
ii.	**Sound Attenuator** Supply, installation, testing and commissioning of Sound Attenuator. The casing shall be 18G, GS sheet fabricated in circular or rectangular cross section, entire area will be acoustically treated with two layers of sound absorbing material each layer being 25mm thick. The baffle plates shall be fabricated from 20G GS sheet with angle iron frame and supports duly fixed to the shell. The baffle plates will also be provided with acoustic lining of two layers each with 25mm thick.				

Signature of the contractor

	The attenuator shall be as per specifications and drawings and complete in all respects. The attenuator shall be fixed on MS base frame / platform (MS base frame / platform is described below separately) and shall be connected to intake / exhaust hood one end and to the vane axial fan casing on the other end and shall be suitable to handle following air quantities :				
	CFM **SP (mm)**				
a.	28000 50	Nos	4		
b.	25000 50	Nos	4		
iii.	**Acoustically Treated Air Intake / Exhaust Hood** Supply, installation, testing and commissioning of air intake/exhaust hood fabricated out of 20 G, GI sheet with necessary guide vanes / deflectors, flanges, bird screen, angle iron support and 75mm, 18G, GI strip clamp and acoustically treated with 50mm thick acoustic lining as per approved shop drawings and specifications.	SM	50		
iv.	**Supply / Exhaust Air Duct** Supply, installation, testing and commissioning of supply / exhaust air duct piece fabricated out of 20 G, GI sheet with necessary guide vanes / deflectors, flanges, angle iron support / clamp and 75mm, 18G, GI strip clamp.	SM	60		
v.	**Flexible Connection** Supply, fixing and testing of flexible connections with fire resistant and flexible canvas for connecting sound attenuator and duct piece to the axial flow fan housing, as per the approved shop drawings.	SM	50		
vi.	**Supply / Exhaust Air Grilles** Supply, installation, testing and commissioning of double louvered, powder coated aluminium supply / exhaust air grilles to be provided at the supply air outlet and exhaust air inlet in accordance with approved shop drawings and the specifications. The grille shall be provided with individually adjustable air distribution patterns, air distribution grids for straightening the air flow through the collar and register.	SM	15		
vii.	**MS Base Frame (Platform)**				

Signature of the contractor

	Supply and fixing of base frame fabricated out of 100mm size x 50mm x 6mm thick MS channel duly welded with connecting MS channel pieces placed at perpendicular in between two parallel running main channels with additional cross members as shown in the drawings and providing and fixing on the base frame 8mm thick aluminium chequered plate between the base frame and the equipments, providing & fixing necessary nuts, bolts, fasteners as required, supporting the base frame on the MS channel bracket grouted in the wall on one end and suspending it from the ceiling at the other end with 20mm dia MS rod, duly fixed / welded to the reinforcement bars of roof slab, thru heavy duty vibration isolator as shown in the drawing. Approx size of the base frame will be 3M x 2M with 2M x 2M approx. size of chequered plate placed on it.				
a.	MS channel for base frame as described above, as per specifications and complete in all respects.	RM	120		
b.	Aluminium chequered plate as described above, as per specifications and complete in all respects.	SM	40		

viii.	**Assembly and Installation** Assembling the above components namely axial flow fan, sound attenuator, supply/exhaust air duct hood, connecting these components with fire retardant flexible canvas connection and fixing the components on to the MS channel frame with nuts and bolts providing vibration isolators and installing the complete assembly at site by supporting the MS base frame on the MS channel bracket thru the wall including creating required opening in the wall and making the same good for support as well as for duct and suspending the other end to the ceiling thru MS suspenders with vibration isolators in-between, connecting the assembly to air intake/exhaust hood and testing and commissioning the fresh air / exhaust air assembly system.	Nos	8		
2.0	**Control Panel** Design, fabrication, assembling, wiring, supply, installation, testing & commissioning of distribution panel fabricated out of 14G CRCA sheet steel and16 gauge CRCA sheet steel for Doors				

Signature of the contractor

	Panels shall be treated with all anticorrosive process before painting as per specifications with 2 coats of red oxide primer & final approved shade of enameled paint. 2 Nos earthing terminals shall be provided for 3 phase distribution panels. Panels shall be suitable for 415, 3 phase, 4 wire, 50 Hz supply system. Lifting hooks shall also be provided for the panels. Galvanised hardware with zinc passivation shall be used in fabrication of panels. The scope of work shall also include aluminum / copper conductor cables (feeders) of suitable rating from this panel to various fan motors, as well as to existing source of power supply, as per quantities of cables described under the heading 'Cables' in this BOQ.					
a.	**Incoming MCCB Features** All the incoming MCCBs of panel shall consist of following accessories: i. Digital voltmeter of suitable range and size with selector switch and back up fuses. : **1 Set.** ii. Digital ammeter suitable size with selector switch and current transformers as mentioned in schedule. : **1 Set.** iii. Phase indicating lamps with back-up fuse protection. : **3 Sets.** iv. Breaker 'ON'/'OFF' indication lamp with backup fuse protection. : **2 sets.**					
b.	**Outgoing MCCB Features** All outgoing MCCBs of panel shall consist of following accessories : i. Phase indicating lamps with back-up protection. : **3 Sets** ii. Breaker 'ON'/'OFF' indication lamp with backup fuse protection.: **2 sets** **Incoming** 1 No. of 250 Amps MCCB with 250/5A ratio CTs, 0-250A ammeter and selector switch alongwith shunt trip,overload,short circuit and earthfault protection and other associated accessories as specified above. (MCCB breaking capacity not less than 35 KA.) **Bus Bars** 300 amps Aluminium bus bars with heat shrinkable insulation sleeves. **Outgoing** 10 Nos of 40 Amps MCCB with Shunt Trip,Overload, Short circuit and Earth fault protection.(MCCB breaking capacity not less than 35 KA.)	Set	1			

Signature of the contractor

	Star Delta Starters for 20–25 HP motors : 8 Nos. Control panel as described above, conforming to specifications and complete in all respects.				
3.0	**Cables, Cable Trays, Earthing and Excavation.**				
3.1	**Cables:** Supplying and laying, testing and commissioning of following 1100 volt grade XLPE FRLS, insulated sheathed aluminium /copper conductor armoured cables.				
a.	**Aluminium Armoured Cables XLPE (FRLS) :** 3.5 x 240 sq.mm armoured aluminium conductor cable. (Incomer to Panel)	RM	60		
b.	**Copper Cables (Un-armoured)** 3 x 6 sq.mm copper Cable.	RM	280		
3.2	**End termination:** Supply and making of end termination for below listed cables using cable gland and crimping type copper lugs.Cable identification tags to be provided.				
a.	**Aluminium Armoured Cables XLPE (FRLS) :** 3.5 x 240 sq.mm armoured aluminium conductor cable.	Ends	2		
b.	**Copper Cables (Un-armoured)** 3 x 6 sq.mm copper Cable	Ends	2		
3.3	**Cable Trays (Perforated)** Supplying and fixing cable trays of GI slotted sheets including grouting supports etc in the following sizes :				
	a. 40 x 300 x 40 x 2 mm	RM	20		
	b. 40 x 200 x 40 x 2 mm	RM	60		

3.4	**Earthing** Supplying and fixing of following bare copper wire and tapes including all necessary fixing accessories & effecting connections :				
i.	25 mm x 6 mm thick GI tape.	RM	30		
ii.	8 SWG GI wire.	RM	75		
iii.	6 SWG GI wire.	RM	40		
3.5	**Excavation:**				
a.	Excavation of trench & back filling after laying of cable	CMtrs	50		
b.	Excavation of trench & back filling after laying of cable.The rate shall include cost of burnt bricks covering & sand cushioning.	CMtrs	50		
3.6	Supply & laying of following size 16 G MS Rigid Pipe. The pipe shall be laid as per site condition (Concealed/Surface).				
i.	3/4" MS Rigid Pipe	Mtrs	280		
ii.	1" MS Rigid Pipe	Mtrs	10		
	Total				

Annexure -III

Signature of the contractor

Total in Words: (Rupees_____

_____)

Summary of Costs

SI.No	Description	Amount (Rupees)
1	Annexure - I (DG Set and Accessories)	
2	Annexure - II (Acoustic Treatment of DG Room)	
3	Annexure - III (DG Room Ventilation)	
	Grand Total	

Grand Total in Words:
(Rupees_____
_____)

Signature of the contractor