

All India Institute of Medical Sciences
Veerbhadra Marg, Pashulok,
Rishikesh-249203



Tender document for Planning, designing, supply, installation, testing, commissioning and handing over of 1 x 2250 KVA DG Set at AIIMS Rishikesh

Ref. No. : 47/01/S.I.T.C DG SETS/2019/RIS/ES-437
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Technical Bid Opening : 26-02-2020 at 03.00 PM

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Name of Work:- Planning, designing, supply, installation, testing, commissioning and handing over of 1 x 2250 KVA DG Set at AIIMS Rishikesh

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Certified that this bid document contains pages 1 to 92 (One to Ninety-two page).

Superintending Engineer
AIIMS, Rishikesh

**Tender document may be downloaded from CPPP site <https://eprocure.gov.in>
NIT may be downloaded from institute's website www.aiimsrishikesh.edu.in**

AIIMS, Rishikesh**NOTICE INVITING TENDER**

The Superintending Engineer, AIIMS Rishikesh on behalf of Director, AIIMS Rishikesh invites Item rate e-tenders from approved and eligible contractors of CPWD, MES, Railways, Original Equipment manufacturer or their authorized dealers for the following work :-

NIT No. : 47/01/S.I.T.C DG SETS/2019/RIS/ES-437

Name of Work: - Planning, designing, supply, installation, testing, commissioning and handing over of 1 x 2250 KVA DG Set at AIIMS Rishikesh

Estimated Cost: **Rs. 4,66,47,959.00** Earnest money: **Rs. 935000.00** & period of completion: **60 days**

Last date & time of submission of bids: 25-02-2020 upto 1500 hours

The tender forms and other details can be seen and downloaded from the website www.aiimsrishikesh.edu.in or CPPP site <http://eprocure.gov.in>

INFORMATION AND INSTRUCTIONS FOR CONTRACTORS FOR e-TENDERING FORMING PART OF NIT AND TO BE POSTED ON WEBSITE

The Superintending Engineer, AIIMS Rishikesh on behalf of Director, AIIMS Rishikesh invites Item rate e-tenders from approved and eligible contractors of CPWD, MES, Railways, Original Equipment Manufacturer or their authorized dealers for the following work :-

Name of work & Location	Estimated cost put to bid	Earnest Money	Period of Completion	Last date & time of submission of bid	Time & date of opening of technical bid
Planning, designing, supply, installation, testing, commissioning and handing over of 1 x 2250 KVA DG Set at AIIMS Rishikesh	Rs. 4,66,47,959.00	Rs. 935000.00	60 Days	25-02-2020 upto 1500 Hrs	26-02-2020 at 1500 Hrs

- The intending bidder must read the terms and conditions of CPWD-6 carefully. He should only submit his bid if he considers himself eligible and he is in possession of all the documents required.
- Information and Instructions for bidders posted on website shall form part of bid document.
- The bid document consisting of plans, specifications, the schedule of quantities of various types of items to be executed and the set of terms and conditions of the contract to be complied with and other necessary documents can be seen and downloaded from website www.aiimsrishikesh.edu.in or <https://eprocure.gov.in>
- But the bid can only be submitted after depositing tender fee in favour of AIIMS Rishikesh and uploading the mandatory scanned documents such as Demand draft or pay order or banker's cheque or deposit at call receipt or fixed deposit receipts and bank guarantee of any scheduled bank towards EMD in favour of AIIMS Rishikesh and other documents as specified.
- Those contractors not registered on the website mentioned above, are requested to get registered beforehand.
- The intending bidder must have valid class-III digital signature to submit the bid.
- On opening date, the contractor can login and see the bid opening process. After opening of bids he will receive the competitor bid sheets.
- Contractor should upload documents in the form of PDF format only and hard copy of all the documents should be submitted in tender office before the last date of submission of Bid.
- Contractor must ensure to quote rate of each item. In addition to this, while selecting any of the cells a warning appears that if any cell is left blank the same shall be treated as "0". Therefore, if any cell is left blank and no rate is quoted by the bidder, rate of such items shall be treated as "0" (Zero).
- The contractor should quote the rate of item including GST as per statutory rules.

11. (i) The bidder shall pay the respective amount of Bid Security (EMD) as mentioned in table by Demand Draft FD/TD/CD in favour of “ AIIMS, Rishikesh” drawn on any Nationalized Bank/ Scheduled Bank and payable at Rishikesh and must be valid for (6) six month. Bids received without Earnest Money deposit (EMD) shall stand rejected and thus shall not be considered for evaluation etc at any stage. The original EMD will be submitted alongwith bid documents.

(ii) Earnest Money deposited with AIIMS, Rishikesh in connection with any other tender enquiry even if for same/similar material / Stores by the tenderer will not be considered against this tender.

(iii) The EMD will be forfeited if the bidder withdraws or amends its tender or impairs or derogates from the tender in any respect within the period of validity of its tender or if it comes to the notice that the information/ documents furnished in its tender is incorrect or false.

12. The bid security (EMD) without interest shall be returned to the unsuccessful bidders after finalization of contract with successful bidder.

13. The successful bidders has to execute a contract on Indian non judicial stamp paper of Rs.100/- (Rupees one hundred only) within fifteen (15) days from the date of award of this tender in his favour and also required to furnish the security deposit @ 5% against performance guarantee of contract value in the form of FD/BG/TD/CD from any Nationalized/Schedule bank duly pledged in favour of AIIMS, Rishikesh & payable at Rishikesh only. The EMD deposited by successful bidder may be adjusted towards Security Deposit as demanded above. If the successful bidder fails to furnish the full security deposit or difference amount between Security Deposit and EMD within 15 (fifteen) days after the issue of Letter of Award of Work, his bid security (EMD) shall be forfeited and award of tender in suppliers favour automatically stands terminated at his cost & liability, unless time extension has been granted by AIIMS, Rishikesh.

14. The bid shall be valid and open for acceptance by the competent authority of AIIMS Rishikesh for a period of 60 (sixty) days from the published date of opening of the tenders and no request for any variation in quoted rates and / withdrawal of tender on any ground by bidders shall be entertained. The unilateral withdraw at any stage will cause forfeiture of EMD in addition to any remedy that the purchaser may have under the law. If any bidder withdraws his bid before the said period or issue of letter of acceptance, whichever is earlier, or makes any modifications in the terms and conditions of the bid which are not acceptable to the department, **then the Government shall, without prejudice to any other right or remedy, be at liberty to forfeit 50% of the said earnest money as aforesaid. Further the bidders shall not be allowed to participate in the re-bidding process of the work.**

15. List of Documents to be scanned and uploaded within the period of bid submission:

- I. Treasury Challan /Demand draft/Pay order or Banker’s Cheque/ Deposit at call Receipt/FDR/Bank guarantee of any scheduled bank against EMD and tender fee.
- II. Enlistment Order of the Contractor or authorization letter/certificate.
- III. Certificate of Registration for GST/ Sales Tax / VAT and acknowledgement of up to date filed return.
- IV. Certificate of work experience (As specified in Clause 1.2.1 of CPWD-6)

Note: In case the contractor not uploads the above documents in para 15 will be treated as disqualified.

16. The hard copies of documents uploaded by contractors should also be submitted in the office of engineering department before the last date/due time of submission of tender. Those who fail to submit hard copies are treated as disqualified for the further process of tendering

CPWD - 6

Govt. of India
AIIMS, Rishikesh
Notice Inviting e-Tender

Item rate tenders are invited on behalf of Director, AIIMS Rishikesh from approved and eligible contractors of CPWD, MES, and Railways, Original Equipment Manufacturer or their authorized dealers for the work of “Planning, designing, supply, installation, testing, commissioning and handing over of 2 x 2250 KVA DG Sets at AIIMS Rishikesh.”.

The enlistment of the contractors should be valid on the last date of submission of bids.

In case the last date of submission of bid is extended, the enlistment of contractor should be valid on the original date of submission of bids.

- 1.1 The work is estimated to Cost **Rs. 4,66,47,959.00**, this estimate, however, is given merely as a rough guide.
- 1.2 Intending tenderer is eligible to submit the bid provided he has definite proof from the appropriate authority, which shall be to the satisfaction of the competent authority, of having satisfactorily completed similar works of magnitude specified below:-

Criteria of eligibility for submission of bid documents

1.2.1 Criteria of eligibility

Three similar works each of value not less than **Rs. 1,86,59,183.00** or two similar work each of value not less than **Rs. 2,79,88,775.00** or one similar work of value not less than **Rs. 3,73,18,367.00** in last **7 years** ending last day of the month previous to the one in which the tenders are invited.

Similar works means:- Supply installation testing and commissioning of DG sets above 1500 KVA

The value of executed works shall be brought to current costing level by enhancing the actual value of work at simple rate of 7 % per annum; calculated from the date of completion to last date of receipt of tenders.

2. Agreement shall be drawn with the successful bidders on prescribed Form No. CPWD 8, which is available as a Govt. of India Publication and available on website www.cpwd.gov.in. Bidders shall quote his rates as per various terms and conditions of the said form, which will form part of the agreement.
3. The time allowed for carrying out the work will be 45 days from the date of start as defined in schedule ‘F’ or from the first date of handing over of the site, whichever is later, in accordance with the phasing, if any, indicated in the bid documents.
4. The site for the work is available.
5. The tender document consisting of plans if any, specifications, the schedule of quantities of various types of items to be executed and the set of terms and conditions of the contract to be complied with and other necessary documents except Standard General Conditions Of Contract Form can be seen from website www.aiimsrishikesh.edu.in or <https://eprocure.gov.in> . The cost of tender is Rs.1180 (inclusive GST). Those who downloads the tender document from website should upload scan copy of DD/Pay Order for Rs.1180.00 (non –refundable) in favour of “AIIMS, Rishikesh”, payable at Rishikesh.

The required EMD shall be uploaded with the required documents otherwise tender submitted may stand rejected.

6. After submission of the bid the contractor can re-submit revised bid any number of times but before last time and date of submission of bid as notified.
7. While submitting the revised bid, contractor can revise the rate of one or more item(s) any number of time (he need not re-enter rate of all the items) but before last time and date of submission of bid as notified.
8. The contractor whose bid is accepted will be required to furnish performance guarantee of 5% (Five Percent) of the bid amount within the period specified in Schedule F. This guarantee shall be in the form of cash (in case guarantee amount is less than Rs. 10000/-) or Deposit at Call receipt of any scheduled bank/Banker's cheque of any scheduled bank/Demand Draft of any scheduled bank/Pay order of any Scheduled Bank (in case guarantee amount is less than Rs. 1, 00,000/-) or Government Securities or Fixed Deposit Receipts or Guarantee Bonds of any Scheduled Bank or the State Bank of India in accordance with the prescribed form. In case the contractor fails to deposit the said performance guarantee within the period as indicated in Schedule 'F' including the extended period if any, the Earnest Money deposited by the contractor shall be forfeited automatically without any notice to the contractor. **The Earnest Money deposited along with tender shall be returned after receiving the aforesaid performance guarantee.**
9. A part of earnest money is acceptable in the form of bank guarantee also. In such case, minimum 50% of earnest money or Rs. 20 Laks, whichever is less, shall have to be deposited in shape prescribed above, and balance may be deposited in shape of Bank Guarantee of any scheduled bank having validity for Six months or more from the last date of receipt of bids which is to be scanned and uploaded by the intending bidders.

Copy of Enlistment Order and certificate of work experience and other documents as specified in the press notice shall be scanned and uploaded to the e-tendering website within the period of bid submission. However, certified copy of all the scanned and uploaded documents as specified in press notice shall have to be submitted by the lowest bidder only within a week physically in the office of tender opening authority.

Online bid documents submitted by intending bidders shall be opened only of those bidders, whose original EMD deposited and other documents scanned and uploaded are found in order.

10. The Bid submitted shall become invalid and e-Tender Processing Fee shall not be refunded if:
 - (i) The bidders is found ineligible.
 - (ii) The bidder does not deposit original EMD with Superintending Engineer, AIIMS Rishikesh (The EMD document shall only be issued from the place in which the office of receiving division office is situated).
 - (iii) The bidders does not upload all the documents (including service tax registration/GST/ VAT registration/ Sales Tax registration) as stipulated in the bid document including the copy of receipt for deposition of original EMD.
 - (iv) If any discrepancy is noticed between the documents as uploaded at the time of submission of bid and hard copies as submitted physically by the lowest bidder in the office of tender opening authority.
10. Intending Bidders are advised to inspect and examine the site and its surroundings and satisfy themselves before submitting their tenders as to the nature of the ground and sub-soil (so far as is practicable), the form and nature of the site, the means of access to the site, the accommodation they may require and in general shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their bid. A bidder shall be deemed to have full knowledge of the site whether he inspects it or not and no extra charge consequent on any misunderstanding or otherwise shall be allowed. The bidders shall be responsible for

arranging and maintaining at his own cost all materials, tools & plants, water, electricity access, facilities for workers and all other services required for executing the work unless otherwise specifically provided for in the contract documents. Submission of a bid by a bidder implies that he has read this notice and all other contract documents and has made himself aware of the scope and specifications of the work to be done and local conditions and other factors having a bearing on the execution of the work.

- 11 The competent authority does not bind itself to accept the lowest or any other bid and reserves to itself the authority to reject any or all the bids received without the assignment of any reason. All bids in which any of the prescribed condition is not fulfilled or any condition including that of conditional rebate is put forth by the tenderer shall be summarily rejected.
- 12 Canvassing whether directly or indirectly, in connection with bidders is strictly prohibited and the tenders submitted by the contractors who resort to canvassing will be liable to rejection.
- 13 The competent authority reserves to himself the right of accepting the whole or any part of the tender and the tenderer shall be bound to perform the same at the rate quoted.
- 14 The contractor shall not be permitted to tender for works in AIIMS Rishikesh in which his near relative is posted as Divisional Accountant or as an officer in any capacity between the grades of Superintending Engineer, Executive Engineer and Junior Engineer (both inclusive). He shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any gazetted officer in AIIMS Rishikesh. Any breach of this condition by the contractor would render him liable to reject his Bid submitted by him.
15. No Engineer of Gazetted rank or other Gazetted Officer employed in Engineering or Administrative duties in an Engineering Department of the Government of India is allowed to work as a contractor for a period of one year after his retirement from Government service, without the previous permission of the Government of India in writing. This contract is liable to be cancelled if either the contractor or any of his employees is found any time to be such a person who had not obtained the permission of the Government of India as aforesaid before submission of the tender or engagement in the contractor's service.
17. The bid for the works shall remain open for acceptance for a period of 60 days from the date of opening of bids/60 days from the date of opening of financial bid.. If any bidders withdraws his bid before the said period or issue of letter of acceptance, whichever is earlier, or makes any modifications in the terms and conditions of the bid which are not acceptable to the department, then the Government shall, without prejudice to any other right or remedy, be at liberty to forfeit 50% of the said earnest money as aforesaid. Further the bidders shall not be allowed to participate in the rebidding process of the work.
16. This notice inviting Bid shall form a part of the contract document. The successful bidders /contractor, on acceptance of his tender by the Accepting Authority shall within 15 days from the stipulated date of start of the work, sign the contract consisting of: -
 - a) The Notice Inviting Bid, all the documents including additional conditions, specifications and drawings, if any, forming part of the tender as uploaded at the time of invitation of tender.
 - b) Standard C.P.W.D. Form 8 or other Standard C.P.W.D. Form as applicable.

INTEGRITY PACT

To,

.....
.....
.....

Sub: 47/01/S.I.T.C DG SETS/2019/RIS/ES-437

Name of work :- Planning, designing, supply, installation, testing, commissioning and handing over of 1 x 2250 KVA DG Set at AIIMS Rishikesh

Dear Sir,

It is here by declared that AIIMS Rishikesh is committed to follow the principle of transparency, equity and competitiveness in public procurement.

The subject Notice Inviting Tender (NIT) is an invitation to offer made on the condition that the Bidder will sign the integrity Agreement, which is an integral part of tender / bid documents, failing which the tenderer / bidder will stand disqualified from the tendering process and the bid of the bidder would be summarily rejected.

This declaration shall form part and parcel of the Integrity Agreement and signing of the same shall be deemed as acceptance and signing of the Integrity Agreement on behalf of the AIIMS Rishikesh.

Yours faithfully,

Superintending Engineer
AIIMS Rishikesh

To,

The Superintending Engineer,
AIIMS Rishikesh,

Sub: Planning, designing, supply, installation, testing, commissioning and handing over of 1 x 2250 KVA DG Set at AIIMS Rishikesh

Dear Sir,

I / We acknowledge that AIIMS Rishikesh is committed to follow the principles thereof as enumerated in the Integrity Agreement enclosed with the tender/bid document.

I / We agree that the Notice Inviting Tender (NIT) is an invitation to offer made on the condition that I/We will sign the enclosed integrity Agreement, which is an integral part of tender documents, failing which I/We will stand disqualified from the tendering process. I/We acknowledge that **THE MAKING OF THE BID SHALL BE REGARDED AS AN UNCONDITIONAL AND ABSOLUTE ACCEPTANCE** of this condition of the NIT.

I/We confirm acceptance and compliance with the Integrity Agreement in letter and spirit and further agree that execution of the said Integrity Agreement shall be separate and distinct from the main contract, which will come into existence when tender/bid is finally accepted by AIIMS Rishikesh. I/We acknowledge and accept the duration of the Integrity Agreement, which shall be in the line with Article 1 of the enclosed Integrity Agreement.

I/We acknowledge that in the event of my/our failure to sign and accept the Integrity Agreement, while submitting the tender/bid, AIIMS Rishikesh shall have unqualified, absolute and unfettered right to disqualify the tenderer/bidder and reject the tender/bid in accordance with terms and conditions of the tender/bid.

Yours faithfully

(Duly authorized signatory of the Bidder)

To be signed by the bidder and same signatory competent / authorised to sign the relevant contract on behalf of Director AIIMS Rishikesh.

INTEGRITY AGREEMENT

This Integrity Agreement is made at on this..... day of..... 20

BETWEEN

AIIMS Rishikesh represented through Director.....
(Name of Division)
AIIMS Rishikesh....., (Hereinafter referred as the
(Address)

'Principal / Owner', which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns)

AND

(Name and Address of the Individual/firm/Company)
Through (hereinafter referred to as the
(Details of duly authorized signatory)

“Bidder/Contractor” and which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns)

Preamble

WHEREAS the Principal /Owner has floated the Tender (NIT No.) (hereinafter referred to as “Tender/Bid”) and intends to award, under laid down organizational procedure, contract for

(Name of work)

Hereinafter referred to as the “Contract”.

AND WHEREAS the Principal / Owner values full compliance with all relevant laws of the land, rules, regulations, economic use of resources and of fairness/transparency in its relation with its Bidder(s) and Contractor(s).

AND WHEREAS to meet the purpose aforesaid both the parties have agreed to enter into this Integrity Agreement (hereinafter referred to as “Integrity Pact” or “Pact”), the terms and conditions of which shall also be read as integral part and parcel of the Tender/Bid documents and Contract between the parties.

NOW, THEREFORE, in consideration of mutual covenants contained in this Pact, the parties hereby agree as follows and this Pact witnesses as under:

Article 1: Commitment of the Principal / Owner

- 1) The Principal/Owner commits itself to take all measures necessary to prevent corruption and to observe the following principles:
 - (a) No employee of the Principal/Owner, personally or through any of his/her family members, will in connection with the Tender, or the execution of the Contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.
 - (b) The Principal/Owner will, during the Tender process, treat all Bidder(s) with equity and reason. The Principal/Owner will, in particular, before and during the Tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential / additional information through which the Bidder(s) could obtain an advantage in relation to the Tender process or the Contract execution.
 - (c) The Principal / Owner shall endeavour to exclude from the Tender process any person, whose conduct in the past has been of biased nature.

- 2) If the Principal/Owner obtains information on the conduct of any of its employees which is a criminal offence under the Indian Penal code (IPC) / Prevention of Corruption Act, 1988 (PC Act) or is in violation of the principles herein mentioned or if there be a substantive suspicion in this regard, the Principal / Owner will inform the Chief Vigilance Officer and in addition can also initiate disciplinary actions as per its internal laid down policies and procedures.

Article 2: Commitment of the Bidder (s) / Contractor (s)

- 1) It is required that each Bidder / Contractor (including their respective officers, employees and agents) adhere to the highest ethical standards, and report to the Government / Department all suspected acts of **fraud or corruption or Coercion or Collusion** of which it has knowledge or becomes aware, during the tendering process and throughout the negotiation or award of a contract.

- 2) The Bidder(s) / Contractor(s) commit himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the Tender process and during the Contract execution:
 - a) The Bidder(s) / Contractor(s) will not, directly or through any other person or firm, offer, promise or give to any of the Principal / Owner's employees involved in the Tender process or execution of the Contract or to any third person any material or other benefit which he/she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the Tender process or during the execution of the Contract.

- b) The Bidder(s) / Contractor (s) will not enter with other Bidder (s) into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to cartelize in the bidding process.
- c) The Bidder(s) / Contractor(s) will not commit any offence under the relevant IPC/PC Act. Further the Bidder(s) / Contract(s) will not use improperly, (for the purpose of competition or personal gain), or pass on to others, any information or documents provided by the Principal/Owner as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.
- d) The Bidder(s)/ Contractor(s) of foreign origin shall disclose the names and addresses of agents / representatives in India, if any. Similarly Bidder(s)/Contractor(s) of Indian Nationality shall disclose names and addresses of foreign agents/representatives, if any. Either the Indian agent on behalf of the foreign principal or the foreign principal directly could bid in a tender but not both. Further, in cases where an agent participate in a tender on behalf of one manufacturer, he shall not be allowed to quote on behalf of another manufacturer along with the first manufacturer in a subsequent/parallel tender for the same item.
- d) The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose (with each tender as per performa enclosed) any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the Contract
- 3) The Bidder(s) / Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.
- 4) The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm indulge in fraudulent practice **means a willful misrepresentation or omission of facts or submission of fake / forged documents in order to induce public official to act in reliance thereof, with the purpose of obtaining unjust advantage by or causing damage to justified interest of others and/or to influence the procurement process to the detriment of the Government interests.**
- 5) The Bidder(s) / Contractor(s) will not, directly or through any other person or firm use Coercive Practices (means the act of obtaining something, compelling an action or influencing a decision through intimidation, threat or the use of force directly or indirectly, where potential or actual injury may befall upon a person, his / her reputation or property to influence their participation in the tendering process).

Article 3: Consequences of Breach

Without prejudice to any rights that may be available to the Principal/Owner under law or the Contract or its established policies and laid down procedures, the Principal / Owner shall have the following rights in case of breach of this Integrity Pact by the Bidder(s)/Contractor(s) and the Bidder / Contractor accepts and undertakes to respect and uphold the Principal / Owner's absolute right:

- 1) If the Bidder (s) / Contractor(s), either before award or during execution of Contract has committed a transgression through a violation of Article 2 above or in any other form, such as to put his reliability or credibility in question, the Principal/Owner after giving 14 days notice to the contractor shall have powers to disqualify the Bidder(s)/Contractor(s) from the tender process or terminate/determine the Contract, if already executed or exclude the Bidder/Contractor from future contract award processes. The imposition and duration of the exclusion will be determined by the severity of transgression and determined by the Principal / Owner. **Such exclusion may be forever or for a limited period as decided by the Principal/Owner.**

- 2) **Forfeiture of EMD/Performance Guarantee/Security Deposit:**

If the Principal/Owner has disqualified the Bidder(s) from the Tender process prior to the award of the Contract or terminated/determined the Contract or has accrued the right to terminate/determine the Contract according to Article 3(1), the Principal/Owner apart from exercising any legal rights that may have accrued to the Principal/Owner, may in its considered opinion forfeit the entire amount of Earnest Money Deposit, Performance Guarantee and Security Deposit of the Bidder / Contractor.

- 3) **Criminal Liability:**

If the Principal/Owner obtains knowledge of conduct of a Bidder or Contractor, or of an employee or a representative or an associate of a Bidder or Contractor which constitutes corruption within the meaning of Indian Penal code (IPC)/Prevention of Corruption Act, or if the Principal/Owner has substantive suspicion in this regard, the Principal/Owner will inform the same to law enforcing agencies for further investigation.

Article 4: Previous Transgression

- 1) The Bidder declares that no previous transgressions occurred in the last 5 years with any other Company in any country confirming to the anticorruption approach or with Central Government or State Government or any other Central/State Public Sector Enterprises in India that could justify his exclusion from the Tender process.
- 2) If the Bidder makes incorrect statement on this subject, he can be disqualified from the Tender process or action can be taken for banning of business dealings/ holding listing of the Bidder/Contractor as deemed fit by the Principal/ Owner.
- 3) If the Bidder/Contractor can prove that he has resorted / recouped the damage caused by him and has installed a suitable corruption prevention system, the Principal/Owner may, at its own discretion, revoke the

exclusion prematurely.

Article 5: Equal Treatment of all Bidders/Contractors/Subcontractors

- 1) The Bidder(s) / Contractor(s) undertake(s) to demand from all subcontractors a commitment in conformity with this Integrity Pact. The Bidder / Contractor shall be responsible for any violation(s) of the principles laid down in this agreement/Pact by any of its Sub- contractors/sub-vendors.
- 2) The Principal / Owner will enter into Pacts on identical terms as this one with all Bidders and Contractors.
- 3) The Principal / Owner will disqualify Bidders, who do not submit, the duly signed Pact between the Principal/Owner and the bidder, along with the Tender or violate its provisions at any stage of the Tender process, from the Tender process.

Article 6- Duration of the Pact

This Pact begins when both the parties have legally signed it. It expires for the Contractor / Vendor 12 months after the completion of work under the contract or till the continuation of defect liability period, whichever is more and for all other bidders, till the Contract has been awarded.

If any claim is made/lodged during the time, the same shall be binding and continue to be valid despite the lapse of this Pacts as specified above, unless it is discharged/determined by the Competent Authority, Director, AIIMS Rishikesh.

Article 7- Other Provisions

- 1) This Pact is subject to Indian Law, place of performance and jurisdiction is Rishikesh .
- 2) Changes and supplements need to be made in writing. Side agreements have not been made.
- 3) If the Contractor is a partnership or a consortium, this Pact must be signed by all the partners or by one or more partner holding power of attorney signed by all partners and consortium members. In case of a Company, the Pact must be signed by a representative duly authorized by board resolution.
- 4) Should one or several provisions of this Pact turn out to be invalid; the remainder of this Pact remains valid. In this case, the parties will strive to come to an agreement to their original intentions.
- 5) It is agreed term and condition that any dispute or difference arising between the parties with regard to the terms of this Integrity Agreement / Pact, any action taken by the Owner/Principal in accordance with this **Integrity Agreement/ Pact or interpretation** there of shall not be subject to arbitration.

Article 8- LEGAL AND PRIOR RIGHTS

All rights and remedies of the parties hereto shall be in addition to all the other legal rights and remedies belonging to such parties under the Contract and/or law and the same shall be deemed to be cumulative and not alternative to such legal rights and remedies aforesaid. For the sake of brevity, both the Parties agree that this Integrity Pact will have precedence over the Tender / Contract documents with regard any of the provisions covered under this Integrity Pact.

IN WITNESS WHEREOF the parties have signed and executed this Integrity Pact at the place and date first above mentioned in the presence of following witnesses:

(For and on behalf of Principal/Owner)

**Superintending Engineer
AIIMS , Rishikesh,
Virbhadra Road,
Rishikesh-249203**

(For and on behalf of Bidder/Contractor)

WITNESSES:

1. (Signature, name and address)

2. (Signature, name and address)

Place: -

Dated: -

निविदा TENDER

मैंने/हमने कार्य के लिए निविदा आमंत्रण सूचना, अनुसूची क,ख,ग,घ, ङ, और च, लागू विनिर्देश, नक्शे एवं डिजाइन, सामान्य नियम एवं निर्देश, ठेके के उपबंध, विशिष्ट शर्तें, दर अनुसूची एवं अन्य कागजात तथा ठेके की शर्तों में दिए गए नियम तथा निविदा कागजात में उल्लिखित अन्य बातों को पढ़ व जांच लिया है।

I/We have read and examined the notice inviting tender, schedule, A,B,C,D,E & F, specifications applicable, Drawings & Designs, General Rules and Directions, Conditions of Contract, clauses of contract, Special conditions, Schedule of Rate & other documents and Rules referred to in the conditions of contract and all other contents in the tender document for the work.

मैं/हम, एतद्वारा अनुसूची 'च' में विनिर्दिष्ट समय के भीतर विनिर्दिष्ट कार्य, यथा-मात्राओं की अनुसूची तथा सभी संबंधित विनिर्देशां, डिजाइनों, नक्शों के अनुरूप तथा सामान्य नियमावली के नियम-1 और ठेके की शर्तों के खंड-11 में उल्लिखित लिखित अनदेशों एवं ऐसी सामग्रियों, जो प्रदान की जाती है और उसके संबंध में, ऐसी शर्तें जो लागू हों, के अनुरूप निष्पादन हेतु निविदा देता हूँ/देते हैं।

I/We hereby tender for the execution of the work specified within the time specified in Schedule 'F', viz., schedule of quantities and in accordance in all respects with the specifications, designs, drawings and instructions in writing referred to in Rule-1 of General Rules and Directions and in Clause 11 of the Conditions of contract and with such materials as are provided for, by, and in respects in accordance with, such conditions so far as applicable.

We agree to keep the tender open for Ninety (90) days from the due date of opening of financial bid and not to make any modification in its terms and conditions.

₹ 935000.00 की धनराशि, धरोहर राशि के रूप में ट्रेजरी चालान रसीद/अनुसूचित बैंक की मांग जमा रसीद/ अनुसूचित बैंक की सावधी जमा रसीद /अनुसूचित बैंक का डिमांड ड्राफ्ट/ अनुसूचित बैंक द्वारा जारी बैंक गारंटी के रूप में इसके साथ भेजी जा रही है। यदि मैं / हम निर्धारित निष्पादन गारंटी को निर्धारित समय अवधि में प्रस्तुत करने में असफल रहते हैं तो मैं/ हम यह मंजूर करते हैं कि एम्स ऋषिकेश के निदेशक या उनके कार्यालय के उत्तराधिकारी किसी अन्य अधिकार या उपचारी उपाय पर प्रतिकूल प्रभाव डाले बिना उक्त धरोहर राशि जब्त करने के लिए पूर्णतया स्वतंत्र होंगे। इसके अलावा, यदि मैं/हम विनिर्दिष्ट कार्य प्रारंभ करने में असफल रहते हैं तो मैं/ हम यह मंजूर करते हैं कि एम्स ऋषिकेश के निदेशक या उनके कार्यालय के उत्तराधिकारी कानून में उपलब्ध किसी अन्य अधिकार या उपचारी उपाय पर प्रतिकूल प्रभाव डाले बिना उक्त धरोहर राशि, तथा निष्पादन गारंटी जब्त करने के लिए पूर्णतया स्वतंत्र होंगे अन्यथा उक्त धरोहर राशि निविदा कागजात के अनुसार उसमें निहित शर्तों व निबंधनों के अनुसार कार्यों के निष्पादन एवं आदिष्ट विचलनों का अनुसूची 'च' में वर्णित प्रतिशत से अनधिक व निविदा प्रपत्र के खण्डों 12.2 व 12.3 में निहित प्रावधानों के अनुसार निश्चित की जाने वाली दरों पर उस सीमा से अधिक के विचलनों के करने के लिए उनके द्वारा प्रतिभूति-निपेक्ष के रूप में रोक ली जाएगी। इसके अतिरिक्त मैं/हम सहमत हैं कि बयाना राशि या बयाना राशि तथा उपर्युक्त निष्पादन गारंटी जब्त हो जाने के मामले में मुझे/हमें कार्य की पुनः निविदा प्रक्रिया में भाग लेने से रोक दिया जाएगा।

A sum of ₹ 935000.00 is hereby forwarded in Multiple Treasury Challan or Demand Draft or Pay order or Banker's Cheque or Deposit at Call Receipt / Fixed Deposit receipts of a scheduled bank / demand draft of a scheduled bank/bank guarantee issued by a scheduled bank as earnest money. If I/We fail to furnish the prescribed performance guarantee within prescribed period, I/we agree that the said Director of AIIMS Rishikesh or his successors in office shall without prejudice to any other right or remedy, be at liberty to forfeit the said earnest money absolutely. Further, if I/We fail to commence work as specified, I/We agree that Director of AIIMS Rishikesh or his successors in office shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the said earnest money and the performance guarantee absolutely. The said Performance Guarantee shall be guarantee to execute all the works referred to in the tender documents upon the terms and conditions contained or referred to those in excess of that limit at the rates to be determined in accordance with the provision contained in Clause 12.2 and 12.3 of the tender form. **Further, I/we agree that in case of forfeiture of earnest money or both earnest money and performance guarantee as aforesaid, I/We shall be debarred for participation in the re-tendering process of the work.**

I/We undertake and confirm that eligible similar work(s) has / have not been got executed through another contractor on back to back basis. Further that, if such aviolation comes to the notice of AIIMS Rishikesh, then I/We shall be debarred for tendering in AIIMS Rishikesh in future forever. Also, if such a violation comes to the notice of Department before

date of start of work, The Engineer – in – Charge shall be free to forfeit the entire amount of Earnest Money Deposit / Performance Guarantee.

मैं/हम एतद्द्वारा घोषणा करते हैं कि मैं/हम निविदा कागजातों, नक्शों और कार्य से संबंधित अन्य अभिलेखों को गुप्त/गोपनीय कागजात के रूप में रखेंगे और उनसे प्राप्त/ली गई जानकारी किसी अन्य को, जिन्हें मैं/हम सूचित करने के लिए प्राधिकृत हो, से भिन्न किसी को नहीं बताएंगे या जानकारी को किसी ऐसे रूप में प्रयोग नहीं करेंगे जो राज्य की सुरक्षा के लिए प्रतिकूल हो।

I/We hereby declare that I/we shall treat the tender documents drawings and other records connected with the work as secret/confidential documents and shall not communicate information/derived therefrom to any person other than a person to whom I/We am/are authorised to communicate the same or use the information in any manner prejudicial to the safety of the State.

तारीख Dated #.....

ठेकेदार के हस्ताक्षर Signature of Contractor#
डाक का पता Postal Address#

साक्षी Witness : #

पता Address: #

उपजीविका Occupation : #

To be filled in by the contractor/witness as applicable

ACCEPTANCE

The above tender (as modified vide letters mentioned hereunder) is accepted by me for and on behalf of the Director, AIIMS Rishikesh for a sum of ₹. _____

(Rupees _____)

The letters referred to below shall form part of this contract Agreement:-

a)

b)

c)

For & on behalf of Director, AIIMS Rishikesh

Signature.....

तारीख Dated

Designation.....

अनुसूचियां SCHEDULES
[FOR MAJOR (ELECTRICAL) COMPONENT]

अनुसूची 'क' SCHEDULE 'A'
मात्राओं की अनुसूची (संलग्न)

Schedule of quantities (Enclosed)

Page No. -

अनुसूची 'ख' SCHEDULE 'B'

ढेकेदार की निर्गत की जाने वाली सामग्रियों की अनुसूची
Schedule of materials to be issued to the contractor.

NA

अनुसूची 'ग' SCHEDULE 'C'

ढेकेदार को भाड़े पर दिए जाने वाले औजार एवं संयंत्र

Tools and plants to be hired to the contractor

क्रम सं. Sl. No.	विवरण Description	भाड़ा प्रभार प्रतिदिन Hire charges per day	निर्गत स्थान Place of Issue
1	2	3	4
NIL			

अनुसूची 'घ' SCHEDULE 'D'

कार्य के लिए विशेष अपेक्षाएं/दस्तावेज, यदि कोई हों, की अतिरिक्त अनुसूची

Extra schedule for specific requirements/documents for the work, if any.

Addl. Specifications attached.

अनुसूची (ङ) SCHEDULE 'E'

1. ढेके की सामान्य शर्तों का संदर्भ
Reference to General Conditions of contract

General conditions of contract for CPWD works
2016 as amended upto date.

Name of work: Planning, designing, supply, installation, testing, commissioning and handing over of 1 x 2250 KVA DG Set at AIIMS Rishikesh.

कार्य की अनुमानित लागत Estimated cost of work	: ₹ 4,66,47,959.00
(i) धरोहर राशि Earnest money	: ₹ 935000.00
(ii) निष्पादन गारंटी Performance guarantee :	5% of tendered value. निविदित मूल्य का 5 प्रतिशत
(iii) प्रतिभूति निक्षेप: Security Deposit:	2.5% of tendered value plus 50% of performance guarantee for contract, involving maintenance of the building and services / other work after construction of same building and services / other work.
अनुसूची 'च' SCHEDULE 'F'	
सामान्य नियम एवं दिशानिर्देश:	
General Rules & Directions:	
निविदा आमंत्रण करने वाला प्राधिकारी	SE, AIIMS Rishikesh
Officer inviting tender -	
कार्य की मर्दों की मात्रा के लिए अधिकतम प्रतिशत जिससे अधिक निष्पादित मर्दों के लिए दरों का निर्धारण खण्ड 12.2 और 12.3 के अनुसार होगा	निम्नानुसार
Maximum percentage for quantity of items of work to be executed beyond which rates are to be determined in accordance with Clauses 12.2 & 12.3.	see below
Definitions:	
2(v) भारसाधक इंजीनियर	SE, AIIMS Rishikesh
Engineer-in-Charge	
2(viii) स्वीकार कर्ता प्राधिकारी	Director , AIIMS Rishikesh
Accepting Authority	
2(x) अतिरिक्त और लाभों को पूरा करने के लिए श्रम एवं सामग्रियों की लागत पर प्रतिशतता	15% (Fifteen per cent)
Percentage on cost of materials and labour to cover all overheads and profits.	
2(xi) Standard Schedule of Rates:	S.R.(Int., Ext.) with upto date correction slips & market rates
2(xii) Department:	AIIMS Rishikesh
9(ii) Standard CPWD contract Form:	GCC 2010, CPWD form 8 as modified & corrected up to date (Whether correction vide latest circulars are incorporated or not in this document).
9(ii) मानक के.लो.नि.वि. ठेका फार्म modified	CPWD form 8 (Print edition -2016) as
Standard CPWD contract Form	with up to date correction slip.

खण्ड Clause 1

;पद्ध स्वीकृति पत्र जारी होने की तारीख से निष्पादन

गारंटी के प्रस्तुतीकरण के लिए अनुमत समय
Time allowed for submission of performance guarantee from the date of issue of letter of acceptance : 15 days

परिपत्र (उपर्युक्त प) में दी गई अवधि के पश्चात् अधिकतम अनुमेय एक्सटेंशन
Maximum allowable extension with late fee @ 0.10% per day of performance guarantee amount beyond the period as provided in (i) above : 7 days

खण्ड Clause 2

खण्ड 2 के तहत प्रतिकार निश्चित करने वाला प्राधिकारी

Authority for fixing compensation under clause 2

Director , AIIMS Rishikesh

खण्ड Clause 2A

क्या खण्ड 2 क लागू होगा

Whether clause 2A shall be applicable

No

खण्ड Clause 5

कार्य आरंभ की तारीख की गणना के लिए स्वीकृति पत्र के जारी होने की तारीख से दिनों की संख्या

No. of days from the date of issue of letter of acceptance for reckoning date of start

15 days.

लक्ष्य नीचे दी गई सारणी के अनुसार

Milestone(s): -

NA

कार्य निष्पादित करने के लिए अनुमत समय
Time allowed for execution of work

60 days

Authority to decide

(i) Extension of Time

SE, AIIMS Rishikesh

(ii) Rescheduling of mile stones

SE, AIIMS Rishikesh.

(iii) Shifting of date of start in case of delay in handing over of site

SE, AIIMS Rishikesh

खण्ड Clause 6, 6A

खंड लागू—(6 या 6 क) Clause applicable

Clause 6

खण्ड Clause 7

अंतरिम भुगतान के लिए पात्र होने के लिए अंतिम ऐसे भुगतान के बाद कुल भुगतान एकत्रित सामग्रियों के अग्रिमों के समायोजन सहित किया जाने वाला कुल कार्य
Gross work to be done together with net

payment/adjustment of advances for material collected, if any since the last such payment for being eligible to interim payment **NA**

खण्ड 10 d Clause10A

कार्यस्थल प्रयोगशाला में टेकेदार द्वारा उपलब्ध कराये जाने परीक्षण उपकरण की सूची
List of testing equipment to be provided by the contractor at site lab. **N.A.**

खण्ड Clause10B(ii)

क्या खण्ड 10 ख ;पपद्ध लागू होगा
Whether clause 10B (ii) shall be applicable **No**

खण्ड Clause10C

Component of labour expressed as Percent of value of work **NA**

खण्ड Clause 10CC - NOT APPLICABLE.

खण्ड 10 गग उन सविदाओं पर लागू होगा जिसमें कार्य समापन की अवधि, अगले कालम में दर्शाई गई अवधि से अधिक अनुबंधित है।
Clause 10CC to be applicable in case of DELETED with stipulated period of compensation exceeding the period shown in next column : Months

खण्ड Clause 11

कार्य निष्पादन के लिए अनुपालन
Specifications to be followed for execution of work
General specifications for electrical works with up to date correction slips (Hereinafter called CPWD specifications also)

खण्ड Clause 12

12.2 & 12.3	Type of Work विचलन सीमा जिसके परे खण्ड 12.2 तथा 12.3 कार्य के लिए लागू होंगे Deviation limit beyond which clauses 12.2 & 12.3 shall apply for work (Other than foundation)	Original Work 30%
12.5	(i) Deviation limit beyond which clauses 12.2 & 12.3 shall apply for foundation work (except earth work)	NA

खण्ड Clause 16

घटी हुई दरे निर्धारित करने की लिए सक्षम प्राधिकारी
Competent Authority for deciding reduced rates **SE, AIIMS Rishikesh or successor thereof**

खण्ड Clause 18

कार्यस्थल पर ठेकेदार द्वारा लगाये जाने वाली अनिवार्य मशीनरी औजार एवं सयंत्रों की सूची :-
List of mandatory machines, tools and plants to be deployed by the contractor at site. **N.A.**

खण्ड Clause 25

Constitution of Dispute Redressal Committee (DRC)	Competent Authority to appoint DRC and Arbitrator
DRC shall constitute one Chairman and two members	Director, AIIMS Rishikesh

Clause 36(i) Requirement of Technical Representative(s) and Recovery Rate

Sl. No.	Minimum Qualification of Technical Representative	Discipline	Designation (Principal Technical/Technical representative)	Minimum experience	number	Rate at which recovery shall be made from the contractor in the event of not fulfilling provision of Clause 36(i) Per person	
						Figures (₹ Per person)	Words (₹ Per person)
1	i) Diploma/ Graduate Engineer	E & M	Principal Technical Representative	5/2 years	1 No	35000/50,000/- p/m	Thirtyfive thousand/Fifty Thousand

Assistant Engineers retired from Government services that are holding Diploma will be treated at par with Graduate Engineers. Even if contractor (or partner in case of firm/company) is himself an Engineer/Overseer(s), it is necessary on part of contractor to employ Engineer(s) and/or/Overseer for the supervision of the work(s) as per stipulation.

खण्ड Clause 42

- l) क) सीमेन्ट और बिटुमन की अनुमानमूल मात्रा निर्धारित करने के लिए अनुसूची/विवरण
- l) (a) Schedule/statement for determining theoretical quantity of cement & bitumen **NA**
- ll) अनुमानमूलक मात्राओं में अनुमत्य विचलन Variations permissible on theoretical quantities. **NA**
- d½) सीमेन्ट जिन कार्यों के लिए निविदा में अनुमानित मूल्य रु. 5 लाख से अधिक न हो
- a) Cement for works with estimated cost put to tender not more than Rs. 5 lakhs जिन कार्यों के लिए निविदामें अनुमानित **NA**

	मूल्य रू. 5 लाख से अधिक हो	
	for works with estimated cost put to tender more than Rs. 5 lakhs	NA
ख)	बिटुमन सभी कार्यों के लिए	
b)	Bitumen for all works	NA
ग)	इस्पात प्रत्येक व्यास, कोट और श्रेणी के लिए	
	पूनर्वलन और संरचनात्मक इस्पात काट	
c)	Steel Reinforcement and structural steel sections for each diameter, section and category.	NA
घ)	सभी अन्य सामग्रियां	
d)	All other materials	NA

AMENDMENTS TO GENERAL CONDITIONS OF CONTRACT 2014**OM No. DG/CON/282 Dated 10-12-2014**

Sub: Modification in the 5th Paragraph of clause-25(ii) of GCC 2014
The following 5th Paragraph of clause-25(ii) of GCC 2014 is modified as under

EXISTING Provision	Modified Provision
<p>Clause 25 (ii) 5th Paragraph The arbitration shall be conducted in accordance with the provisions of the Arbitration and Conciliation Act- 1996 (26 of 1996) or any statutory modification or re-enactment thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceeding under this clause.</p>	<p>Clause 25 (ii) 5th Paragraph The arbitration shall be conducted in the accordance with the provisions of the Arbitration and Conciliation Act- 1996 (26 of 1996) /The Jammu & Kashmir Arbitration and Conciliation Act, 1997(35 of 1997) (as the case may be) or any statutory modification or re-enactment thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceeding under this clause</p>

OM No DG/SE/CM/CON/283 Dated 05-05-20158**Sujb- Payment of wages to the labour by Contractor****The Following provision of CPWD contractor labour Regulation of GCC2014 are amended**

Existing Provision	Modified Provision
<p>C.P.W.D. Contractor's Labour Regulations 5. Payment of Wages vi) Wages due to every worker shall be paid to him direct or to other person authorized by him in this behalf. vii) All wages shall be paid in current coin or currency or in both. x) It shall be the duty of the contractor to ensure the disbursement of wages in the presence of the Junior Engineer or any other authorized representative of the Engineer-in-Charge who will be required to be present at the place and time of disbursement of wages by the contractor to workmen. xi) The contractor shall obtain from the Junior Engineer or any other authorized representative of the Engineer-in-Charge as the case may be, a certificate under his signature at the end of the entries in the "Register of Wages" or the "Wage cum-Muster Roll" as the case may be in the following form :- "Certified that the amount shown in column Nohas been paid to the workman concerned in my presence</p>	<p>C.P.W.D. Contractor's Labour Regulations 5. Payment of Wages vi) Wages due to every worker shall be paid to him direct by contractor through Bank or ECS or online transfer to his bank account. vii) All wages shall be paid through Bank or ECS or online transfer. x) It shall be the duty of the contractor to ensure the disbursement of wages through bank account of labour. xi) The contractor shall obtain from the Junior Engineer or any other authorized representative of the Engineer-in-Charge as the case may be, a certificate under his signature at the end of the entries in the "Register of Wages" or the "Wage cum-Muster Roll" as the case may be in the following form:- "Certified that the amount shown in column Nohas been paid to the workman concerned through bank account of labour onat"</p>

OM No DG/CON/285 Dated 05-06-2015**Sub: Amendment in general conditions of contractor (GCC)-2014****The following provision of GCC 2014 is modified as under**

<p>Clause 5.1 As soon as possible after the Contact is concluded, the contractor shall submit a time and progress chart for each mile stone and get it approved by the Department. The Chart shall be prepared in direct relation to the time stated in the Contract document for completion of items of the works. It shall indicate the forecast of the dates of commencement and completion of various trades of section of the work and may be amended as necessary by agreement between the Engineer-in-Charge and the Contractor within the limitations of time imposed in the Contract documents, and further to ensure good progress during the execution of the work, the contractor shall in all cases in which the time allowed for any work, exceeds one month (save for special jobs for which a separate programme has been agreed upon) complete the work as per mile stones given in Schedule 'F'</p> <p>Clause 5.1</p>	<p>Clause 5.1 The contractor shall submit a programme Chart (Time and Progress) for each mile stone alongwith performanceguarantee and get it approved by the Department. The Chart shallbe prepared in direct relation to the time stated in the Contract document for completion of items of the works. It shall indicate theforecast of the dates of commencement and completion of various trades of sections of the work and may be amended as necessaryby agreement between the Engineer-in-Charge and the Contractor within the limitations of time imposed in the Contract documents,and further to ensure good progress during the execution of the work, the contractor shall in all cases in which the time allowed forany work, exceeds one month (save for special jobs for which a separate programme has been agreed upon) complete the work asper mile stones given in Schedule 'F'</p>
<p><u>Cluac 7A</u> <u>No Provision</u></p>	<p>Clause 7A No Running Account Bill shall be paid for the work till the applicable labour licenses, registration with EPFO, ESIC and BOCW Welfare Board, whatever applicable are submitted by the Contractor to the Engineer-in-Charge.</p>
<p>Clause 19 The Contractor shall obtain a valid license under the Contract Labour (R&A) Act, 1970 and the Contract Labour (Regulation and Abolition) Central Rules, 1971 before the commencement of the work, and continue to have a valid license until the completion of the work</p>	<p>Clause 19 The Contractor shall obtain a valid license under the Contract Labour (R&A) Act, 1970 and the Contract Labour (Regulation and Abolition) Central Rules, 1971 before the commencement of the work, and continue to have a valid license until the completion of the work. The contractor shall also comply with provisions of the Inter –State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979.</p>

FORM OF EARNEST MONEY (BANK GUARANTEE)

WHEREAS, contractor (Name of contractor) (Hereinafter called "the contractor") has submitted his tender dated (date) for the construction of (name of work) (hereinafter called "the Tender")

KNOW ALL PEOPLE by these presents that we (name of bank) having our registered office at (hereinafter called "the Bank") are bound unto (AIIMS Rishikesh) in the sum of Rs. (Rs. in words) for which payment well and truly to be made to the said AIIMS Rishikesh the Bank binds itself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this day of 20... .

THE CONDITIONS of this obligation are:

- (1) If after tender opening the Contractor withdraws, his tender during the period of validity of tender (including extended validity of tender) specified in the Form of Tender;
- (2) If the contractor having been notified of the acceptance of his tender by the Engineer-in-Charge:
 - (a) fails or refuses to execute the Form of Agreement in accordance with the Instructions to contractor, if required; OR
 - (b) fails or refuses to furnish the Performance Guarantee, in accordance with the provisions of tender document and Instructions to contractor, OR
 - (c) fails or refuses to start the work, in accordance with the provisions of the contract and Instructions to contractor, OR
 - (d) fails or refuses to submit fresh Bank Guarantee of an equal amount of this Bank Guarantee, against Security Deposit after award of contract.

We undertake to pay to the Engineer-in-Charge either up to the above amount or part thereof upon receipt of first written demand, without the Engineer-in-Charge having to substantiate his demand, provided that in his demand the Engineer-in-Charge will note that the amount claimed by him is due to him owing to the occurrence of one or any of the above conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including the date.* after the deadline for submission of tender as such deadline is stated in the Instructions to contractor or as it may be extended by the Engineer-in-Charge, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this Guarantee should reach the Bank not later than the above date.

DATE

SIGNATURE OF THE BANK

WITNESS

SEAL

(SIGNATURE, NAME AND ADDRESS)

*Date to be worked out on the basis of validity period of 6 months from last date of receipt of tender.

Scope of work

Scope of work under this section covers the Planning, Design, Detailed Engineering, Manufacture, Quality Control, Shop Testing, Delivery at Project Site, Unloading and placement at Site, Site Assembly, Erection, Testing and Commissioning including Performance & Acceptance Testing, Training of AllIMS personnel as required, Putting into Commercial Operation and handing over to the Owner of Diesel Generating Sets complete with all parts like exhaust system including piping up to desired height as per CPCB norms, cabling including control & power between the DG sets & AMF Cum Sync Control panel, Earthing, fuel system & all items, auxiliaries

i) Prime rated diesel engine suitable to give desired alternator output at site, complete with fuel system, lubrication system, cooling system, air intake and exhaust system, battery and battery charger, instruments and protection system, annunciations, coupling arrangements etc.

ii) 415V, 50Hz alternator with exciter, automatic Digital voltage regulator etc.

1.1.1 Scope

1.1.1.1 These specifications cover the general specifications pertaining to diesel engine driven generating sets & their installation.

1.1.1.2. These General Specifications cover the equipments and materials for the DG Sets, their testing and/ or inspection as may be necessary before their dispatch from their respective works, their delivery at site, all preparatory works, assembling, installation and adjustments, commissioning, final testing, putting into operation and handing over of the complete system.

1.1.1.3 These General Specifications are subject to revision from time to time.

1.1.1.4 Each DG Set installation work has its own particular requirements. These General Specifications shall be supplemented with tender specifications as may be required for a particular work. The tender specifications, wherever they differ from these 'General Specifications', shall have over-riding value and shall be followed for that particular work.

1.1.2 Related Documents

These General Specifications shall be read in conjunction with the General conditions of contract. These General Specifications shall also be read in conjunction with the tender specifications, schedule of work, drawings and other documents connected with the work.

All certificates that are to be produced in this tender shall be valid up-to-date and shall be issued by OEM and Certifying authority.

1.1.3 Site Information

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

1.2 CONFORMITY WITH STATUTORY ACTS, RULES, STANDARDS AND CODES

(i) All components shall conform to relevant and latest Indian Standard Specifications, wherever existing, amended to date.

(ii) All electrical works shall be carried out in accordance with the provisions of Indian Electricity Act, 2003 and Indian Electricity Rules, 1956 as amended up to date. They shall also conform to CPWD General Specifications for Electrical Works, Part-I (Internal), 2013 and Part-II (External), 1994 and Part IV (Sub- station), 2013, as amended up to date.

1.3 SAFETY CODES AND LABOUR REGULATIONS

- (i) In respect of all labour employed directly or indirectly on the work for the performance of the contractor's part of work, the contractor at his own expense, will arrange for the safety provisions as per the statutory provisions, B.I.S recommendations, factory act, workman's compensation act, CPWD code and instructions issued from time to time. Failure to provide such safety requirements would make the tenderer liable for penalty for Rs. 200/- for each violation. In addition the Engineer-in-charge, shall be at liberty to make arrangements and provide facilities as aforesaid and recover the cost from the contractor.
- (ii) The contractor shall provide necessary barriers, warning signals and other safety measures while executing the work of DG Set installation, cables etc. or wherever necessary so as to avoid accident. He shall also indemnify AIIMS Rishikesh against claims for compensation arising out of negligence in this respect. Contractor shall be liable, in accordance with the Indian Law and Regulations for any accident occurring due to any cause. The department shall not be responsible for any accident occurred or damage incurred or claims arising there from during the execution of work. The contractor shall also provide all insurance including third party insurance as may be necessary to cover the risk. No extra payment would be made to the contractor due to the above provisions thereof.

1.4 WORKS TO BE ARRANGED BY THE DEPARTMENT

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

- (i) Space for accommodating all the equipments and components involved in the work. However, watch and ward shall be responsibility of the contractor.
- (ii) Power supply (Single/three phase).

1.5 WORKS TO BE DONE BY THE CONTRACTOR

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

- (i) Foundations for equipments including vibration isolation springs/ pads,
- (ii) Making good all damages caused to the structure during installation and restoring the same to their original finish.
- (iii) Minor building works necessary for installation of equipments, foundation trench for fuel line & cable, making of opening in walls or in floors and restoring them to their original condition/ finish and necessary grouting etc. as required.
- (iv) All supports for exhaust & water pipes, chimney, bus trunking (if included in scope of contract), cables, anti-vibration pads etc. as are necessary.
- (v) All electrical work and neutral earthing, body earthing, required for engine & alternator, main board/ control panels, and control wiring including loop earthing, if specified in Schedule of Work.
- (vi) All pipes, bus trunking and/ or cable connections.
- (vii) POL i.e. HSD oil and lub. oil for diesel engine for testing & commissioning for 12 hours i/c 1hr of 10% overloading at OEA/ OEM works shall be arranged by the contractor. POL i.e. HSD oil and lub. oil for trial run of 4 Hrs. at site at available load shall be arranged by the department.
- (viii) Painting of all exposed metal surfaces of equipments and components with appropriate colour .

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

1.6 RATES

- 1.6.1 The rates quoted by the tenderer, shall be firm and inclusive of all taxes (including works contract tax), duties and levies and all charges for packing, forwarding, insurance, freight and delivery, installation, testing, commissioning etc. at site including temporary constructional storage, risks, overhead charges, general liabilities/ obligations etc. but exclusive of Service Tax, which shall be reimbursed on production of documentary proof of actual payment against this contract/ work.
- 1.6.2 Octroi exemption certificate will be issued by the department if required by the contractor. However, the department is not liable to reimburse the octroi duty in case exemption certificates are not honoured by the concerned authorities.
- 1.6.3 The contractor has to carry out routine operation and preventive maintenance as per manufacturer's standards for a period of 12 months (during guarantee period) from the date of handing over. However, all consumables (fuel/ lube oil etc.) including filters will be supplied by the department. No extra cost shall be paid on account of deploying manpower during guarantee period of 12 months.

1.7 POWER SUPPLY AND WATER SUPPLY

1.7.1 Power Supply

- (i) Unless otherwise specified, 3 phase, 415 volts, 50 Hz power supply shall be provided by the department free of charge to the contractor at one point for installation at site suitable for 10 KW load. Termination switchgear however, shall be provided by the contractor. Further extension if required shall be done by the contractor.
- (ii) The contractor shall not use the power supply for any other purpose than that for which it is intended for. No major fabrication work shall be done at site. Power shall be used only for welding/ cutting works. The power supply shall be disconnected in case of such default and the contractor shall then have to arrange the required power supply at his cost.

1.7.2 Water Supply

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

1.8 MACHINERY FOR ERECTION

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

1.9 COMPLETENESS OF THE TENDER, SUBMISSION OF PROGRAMME, APPROVAL OF DRAWINGS AND COMMENCEMENT OF WORK

(i) Completeness of the tender

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

(ii) Submission of programme

Within fifteen days from the date of receipt of the letter of acceptance, the successful tenderer shall submit his programme for submission of drawings, supply of equipment, installation, testing, commissioning and handing over of the installation to the Engineer-in-Charge. This programme shall be framed keeping in view the building progress.

(iii) **Submission of Drawings**

The contractor shall submit the drawings to the Engineer-in-Charge as per clause 1.19 of this specification for approval before start of work.

(iv) **Commencement of Work**

The contractor shall commence work as soon as the drawings submitted by him are approved. The drawings are to be submitted by the contractor within 15 days of stipulated date of start, and shall be approved by the Engineer-in- Charge within 10 days of receipt in his office.

1.10 DISPATCH OF MATERIALS TO SITE AND THEIR SAFE CUSTODY

The contractor shall dispatch materials to site in consultation with the Engineer-in- Charge. Suitable lockable storage accommodation shall be made by contractor if required . Watch & ward however, shall be the responsibility of contractor.

Programme of dispatch of material shall be framed keeping in view the building progress. Safe custody of all equipment/ items supplied by the contractor shall be the responsibility of the contractor till final taking over by the department.

1.11 CO-ORDINATION WITH OTHER AGENCIES

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

The unwanted and waste material will be shifted to place designated for it or as per instructions of Engineer-in-charge.

1.12 INDEMNITY

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

1.13 QUALITY OF MATERIALS AND WORKMANSHIP

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

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

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

1.14 CARE OF THE BUILDING

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

1.15 INSPECTION AND TESTING

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

1.15.2 Inspection and Testing of DG sets

1.15.2.1 For DG sets, testing shall necessarily be carried out at factory/ manufacturer premises in presence of representatives of the AIIMS Rishikesh.

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

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

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

1.15.3 Trial Run/ Running-in-Period

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

1.15.4 Safety measures

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

1.16 STATUTORY CLEARANCE(S)

Approval/ clearance of the complete installation shall be obtained by the contractor from CPCB/ State Pollution Control Boards/ Local Bodies/ Central Electricity Authority (CEA)/ other licensing authorities wherever required.

1.17 GUARANTEE

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

1.18 PAYMENT TERMS

1.18.1 The following percentage of contract rates shall be payable against the stages of work shown herein subject to availability of funds.

<i>Stage of Work</i>	<i>Engine-Alternator Set & AMF Panel</i>	<i>All other items</i>
I After initial inspection (wherever specified) & delivery at site in good condition on pro-rata basis	50%	50%
II On completion of pro-rata installation	25 %	25 %
III On commissioning and completion of successful running in period & taking over of the DG set by the department.	25 %	25 %

1.19 TENDER DRAWINGS, DRAWINGS FOR APPROVAL & COMPLETION DRAWINGS

1.19.1 Tender Drawings

The drawings appended with the tender documents are intended to show space allotted for various equipments. The equipments offered shall be suitable for installation in the spaces shown in these drawings.

1.19.2 Drawings for Approval on Award of the work

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

- (a) Lay out drawings of the equipments to be installed including control cables, fuel/ lube oil pipes and supports/ structure for exhaust piping, Chimney and bus ducts/ cable trays.
- (b) Drawings including section, showing the details of erection of entire equipments.
- (c) Electrical wiring diagrams from engine-alternator set to Electrical control panel, Electrical control panel to essential LT board including the sizes and capacities of the various electrical/ control cables and equipment.
- (d) Dimensioned drawings of Acoustic enclosure/ Engine-Alternator set and Electrical control panel.
- (e) Drawings showing details of supports for pipes, chimney cable trays, ductsetc.
- (f) Any other drawings relevant to the work.

1.19.2.1 Drawings/Documents to be furnished on completion of Installation

Two sets of the following laminated drawings shall be submitted by the contractor while handing over the installation to AIIMS Rishikesh. One set shall be laminated on a hard base for display in the DG set room/room where AMF panel is installed and another set shall be displayed in Junior Engineer's room. In addition, drawings will be given on Compact Disc (CD)/ Pen drive :

- (a) DG set installation drawings giving complete details of all the equipments, including their foundations.
- (b) Line diagram and layout of all electrical control/AMF panels giving switchgear ratings and their disposition, cable feeder sizes and their layout.
- (c) Control wiring drawings with all control components and sequence of operations to explain the operation of control circuits in AMF panel/PCC.

- 1.19.2.2 (i) Manufacturer's technical catalogues of all equipments and accessories.
- (ii) Operation and maintenance manual of all major equipments, detailing all adjustments, operation and maintenance procedure.

1.20 AFTER SALES SERVICES

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

2.1 SCOPE

This section deal with unloading procedures, location, standard capacities and climatic conditions for DG set installation.

2.1.1 Unloading

2.1.2 Location

2.1.2.1 DG Sets with Acoustic Enclosure

DG sets are required to be supplied with acoustic enclosure as per latest CPCB norms. DG Set with acoustic enclosure shall preferably be installed outside the building (including terrace subject to structural feasibility) & location should be finalized in consultation with the AIIMS rishikesh / Engineer in charge. However, DG set should be as near to the substation as possible i.e. as near to Essential LT Panel as possible. Associated AMF panel/ Electrical panel of the DG Set can be located inside the acoustic enclosure or outside the acoustic enclosure as per manufacturer standard. In case, AMF/ Electrical panel has to be installed outside the acoustic enclosure, location of room to house AMF/ Electrical panel should be decided in consultation with the AIIMS rishikesh /Engineer in charge so that it shall be as near to the acoustic enclosure as possible. Specially, in case of connection through bus trunking, care should be taken for aesthetics.

Installation of acoustic enclosure / canopy of DG set with its necessary electrical panel , bus duct from synchronizing panel to LT panel will be under the cover of tin structure / concrete structure with wheather proof enclosure.

2.1.3 Climatic Conditions

2.1.4 The output of DG Set shall be specified in tender documents under actual site conditions. The tenderer has to certify that the engine & alternator meets the capacity requirement after deration as per IS/ BIS.

2.1.5 DG Set should be type tested for Noise and Emission norms/standards as per latest CPCB norms.

2.2 DIESEL ENGINE

Scope: This section covers engine rating, standard components of a diesel engine including exhaust piping.

2.2.1 Diesel Engine

2.2.1.1 Engine Rating

The engine shall be of standard design of the original manufacturers. It should be 4 stroke cycles, water cooled, naturally aspirated/ turbo charged (as per manufacturer standard), diesel engine developing suitable BHP for giving a power rating as per ISO 8528- Part-1 in KVA at the load terminals of alternator at 1500 rpm at actual site conditions.

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

The testing procedure shall be as mentioned in para 1.15.

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

2.2.1.2 Necessary certificate indicating the compliance of the above capacity requirement for the engine model so selected along with compliance of Noise and Emission norms as per latest CPCB guidelines for DG set capacity up to 2250 KVA, should be furnished from the manufacturers along with the technical bid.

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

- (i) Dynamically balanced Fly wheel
- (ii) Necessary flexible coupling and guard for alternator and engine (applicable only for double bearing alternator)
- (iii) Air cleaner (dry/ oil bath type) as per manufacturer standard,
- (iv) An electronic governor to maintain engine speed at all conditions of load.
- (v) Daily fuel service tank of minimum capacity as per Table below, fabricated from M.S. sheet with inlet, outlet connections air vent tap, drain plug and level indicator (gauge) M.S. fuel piping from tank to engine with valves, unions, reducers, flexible hose connection and floor mounting pedestals, twin fuel filters and fuel injectors. The location of the tank shall depend on standard manufacturers design.

Recommended Minimum Capacity of Daily Fuel Service Tank shall be as per Original equipment manufacturer specifications or recommendation.

- (vi) Dry exhaust manifold with suitable exhaust residential grade silencer to reduce the noise level.
- (vii) Suitable self-starter for 12 V/ 24 V DC.
- (viii) Battery charging alternator unit and voltage regulator, suitable for starting batteries, battery racks with interconnecting leads and terminals.
- (ix) Necessary gear driven oil pump for lubricating oil, priming of engine bearing as well as fuel systems as per manufacturer recommendations.

- (x) Naturally aspirated/ turbo charger (as per manufacturer standard)
- (xi) Lubrication oil cooler
- (xii) Lubrication oil filters with replaceable elements
- (xiii) Crank case heater as per manufacturer recommendations
- (xiv) Fuel injection: Engine should have suitable fuel injection system in order to achieve low fuel consumption
- (xv) Fuel control solenoid
- (xvi) Fuel pump with engine speed adjustment
- (xvii) Engine Control Panel: fitted and having digital display for following:
 - (a) Start/stop key switch.
 - (b) Lube oil pressure indication
 - (c) Water temp. indication
 - (d) RPM indication
 - (e) Engine Hours indications
 - (f) Battery charging indication
 - (g) Low lub. Oil trip indication
 - (h) High water temp. indication
 - (i) Over speed indication.
- (xviii) All moving parts of the engine shall be mechanically guarded in such a manner that a human finger cannot touch any moving part.
- (xix) Radiator
- (xx) Any other item not included/ specified but is a standard design of the manufacturer

2.2.1.4 Governor

Electronic governor of class A1 for capacity above 200 KVA, as per ISO 3046/ BS 5514 with actuator shall be provided as per standard design of manufacturer. Governor shall be a self-contained unit capable of monitoring speed.

2.2.1.5 Frequency Variation

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

2.2.1.6 Fuel System

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

2.2.1.7 Lubricating Oil System

It shall be so designed that when the engine starts after a long shut down lubrication failure does not occur. Necessary priming pump for the lub. oil circuit as per recommendation of manufacturer shall be installed, to keep bearings primed. This pump shall be normally automatically operative on AC/ DC supply available with the set.

2.2.1.8 Starting System

This shall comprise of necessary set of heavy duty batteries 12V/ 24V DC (as per manufacturer standard), and suitable starter motors, axial type gear to match with the toothed ring on the fly wheel. A timer in the control panel to protect the starter motor from excessively long cranking runs shall be

suitably integrated with the engine protection system and shall be included within the scope of the work. Battery capacity shall be suitable for meeting the needs of starting system (as three attempt starting), as well as the requirements of control panel, indications and auxiliaries such as priming pump as applicable etc. The scope shall cover all cabling, terminals, including initial charging etc. The system shall be capable of starting the DG set within 20-30 sec., even in winter condition with an ambient temperature down to 0°C.

2.2.1.9 Battery Charger

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

2.2.1.10 Piping Work

All pipe lines and fittings and accessories requirement inside the room/ enclosure and outside for exhaust piping shall be provided by the contractor. This shall include necessary flexible pieces in the exhaust, fuel, lub. oil and water lines as are necessary in view of the vibration isolation requirement in the installation. Piping of adequate size shall be used for lub. oil of the material as per manufacturer standard. However, only M.S. pipes for the exhaust shall be used. For fuel lines within the acoustic enclosure, PVC braided pipe as per manufacturer recommendations can be used. However, for fuel lines outside the acoustics enclosure only MS pipe be used.

The pipe work shall be inclusive of all fittings and accessories required such as bends, reducers, elbows, flanges, flexible connections, necessary hardware etc. The installation shall cover clamps, supports, hangers etc. as are necessary for completing the work. However, the work shall be sectionalized with flanged connections as are necessary for easy isolation for purposes for maintenance of unit as approved by Engineer-in-charge.

2.2.1.11 Common Bed Plate

Engine and alternator shall be directly coupled or coupled by means of flexoplate/ flexible coupling as per manufacturer standard design and both units shall be mounted on a common bed plate together with all auxiliaries to ensure perfect alignment of engine and alternator with minimum vibrations. The bed plate shall be suitable for installation on suitable anti-vibration mounting system.

2.2.1.12 *Exhaust System:* (wherever applicable)

2.2.1.12.1 *Exhaust Piping:* All M.S. Pipes for exhaust lines shall be conforming to relevant IS. The runs forming part of factory assembly on the engine flexible connections up to exhaust silencer shall be exclusive of exhaust piping item. The work include necessary cladding of exhaust pipe work using 50 mm thick Loosely bound resin (LBR) mattress/ mineral wool/ Rockwool, density not less than 120 kg/m³ and aluminium cladding (0.6 mm thick) for the complete portion. The exhaust pipe work includes necessary supports, foundation etc. to avoid any load & stress on turbo charger / exhaust piping. The exhaust pipe shall be *run along the existing wall of the building duly clamped/*supported on independent structure for which, the design and Drawing for such structure shall be got approved from the Engineer-in-charge.

- 2.2.1.12.2
- (a) Exhaust system should create minimum back pressure.
 - (b) Number of bends should be kept minimum and smooth bends should be used to minimize back pressure.
 - (c) Pipe sleeve of larger dia. should be used while passing the pipe through concrete wall & gap should be filled with felt lining.
 - (d) Exhaust piping inside the Acoustic Enclosure/ Genset room should be lagged with asbestos rope along with aluminium sheet cladding / insulated as per clause 2.2.1.12.1 to avoid heat input to the room.
 - (e) Exhaust flexible shall have it's free length when it is installed. For bigger engines, 2 flexible bellows can be used.
 - (f) Bellows shall be installed OEM recommendations.

- (g) 'Schedule B' MS pipes and long bend/elbows should be used.
- (h) The exhaust outlet should be in the direction of prevailing winds and should not allow exhaust gases to enter air inlet/ windows etc.
- (i) When tail end is horizontal, 45 Degree downward cut should be given at the end of the pipe to avoid rain water entry into exhaust piping.
- (j) When tail end is vertical, there should be rain trap to avoid rain water entry. If rain cap is used, the distance between exhaust pipe and rain cap should be higher than diameter of pipe. Horizontal run of exhaust piping should slope downwards away from engine to the condensate trap. Silencer should be installed with drain plug at bottom.

221.123

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

<i>Optimum Location of Silencer (In meters)</i>		
	<i>In-line Engine</i>	<i>'V' Engine</i>
Best	2L/5	(4L – 1.5) / 5
Second best	4L/5	(2L – 4.5) / 5
Worst Location of Silencer	L/5 or 3L/5 or at tail end of Exhaust piping	(3L - 10)/ 5 or at the tail end of Exhaust piping

Exhaust Stack Height: In order to dispose exhaust above building height, minimum exhaust stack height should be as follows:-

- (a) For DG set :-
30 m High or as per latest norms of CPCB.

221.124

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

221.125

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

2.2.1.13**Air System**

It is preferable to provide vacuum indicator with all engines to indicate choked filter. Maximum air intake restrictions with clean and choked filters should be within prescribed limit as per OEM/ manufacturer recommendation for the particular model of the engine. Gensets should be supplied with medium duty/ heavy duty air cleaners (specify one only). (Heavy duty air cleaner should be used for installations in dusty or polluted surroundings.)

2.2.1.14**Cooling System**

221.141

System should be designed for ambient temperature of 50 Deg.C

221.142

Water softening/ demineralizing plants should be used, if raw water quality is not acceptable.

221.143

Coolant should be used mixed with additive (in suitable proportion) as per recommendation of OEM /Manufacturer for various engine models.

221.144

Radiator fan flow should be free from any obstruction.

221.145

For radiator cooled DG Set, proper room ventilation should be planned at the time of construction of DG room.

221.146

Optional items as under may be included as per site requirement at the discretion of Technical Sanctioning authority:

- (i) Cooling System**
 - (a) Jacket Water Heater
 - (b) Crankcase Oil Heater
 - (c) After cooler jacket turbo charger electrical pre heat systems.
- (ii) Fuel System**
 - (a) Fuel Water Separator
 - (b) Auxiliary Fuel Pump
- (iii) Exhaust System**
 - (a) Industrial Grade Muffler
 - (b) Residential Grade Muffler
 - (c) Critical Grade Muffler
 - (d) Super Critical Grade Muffler
- (iv) Start System**
 - (a) Battery Warmer Plate
 - (b) Battery Charger
 - Automatic Float Equalizing
 - Trickle

2.3 ALTERNATOR

Scope : This section covers technical requirement of the alternator.

2.3.1 Synchronous Alternator

Self excited, screen protected, self-regulated, brush less alternator, Horizontal foot mounted in Double bearing construction suitable for the following:

Rated PF.	: 0.8 (lag)
Rated voltage	: 415 volts
Rated frequency	: 50 Hz
No. of Phases	: 3
Enclosure	: SPDP
Degree of protection	: IP-23
Ventilation	: Self ventilated air cooled Ambient
Temperature	: 50° C Maximum Insulation Class: H
Temperature Rise	: Within class H limits at rated load Voltage
Regulation	: +/- 1%
Voltage variation	: +/- 5%
Overload duration/capacity	: 10% for one hour in every 12 hours of continuous use.
Frequency variation	: As defined by the Engine Governor (+/- 1%)
Excitation	: Separately excited
Type of AVR	: Electronic
Type of Bearing and arrangement	: Anti-friction bearings with Grease lubrication Lubrication
Standard	: IS 4722 & IEC:34 as amended upto date.

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

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

2.3.4 Excitation

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

2.3.5 Automatic Voltage Regulators (AVR)

In order to maintain output terminal voltage constant within the regulation limits i.e. +/- 1%, Automatic voltage regulator unit shall be provided as per standard practice of manufacturer.

2.3.6 Fault tripping

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

2.3.7 Standards

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

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

2.3.8 Performance

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

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

The performance characteristics of the alternator shall be as below:

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

2.3.9 Terminal Boxes

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

2.3.10 Earth Terminals

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

2.3.11 Space Heaters

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

2.4 SYNCHRONIZING PANEL, BATTERIES AND ELECTRICAL SYSTEM

Scope: This section covers technical and functional requirements of synchronizing Panel, Battery/ Electrical System.

2.4.1 Location of Panel

2.4.1.1 DG Set with Acoustic Enclosure

Associated synchronizing panel of the DG Set can be located inside the acoustic enclosure or outside the acoustic enclosure as per manufacturer's standard. In case, synchronizing panel has to be installed outside the acoustic panel, location of room to house synchronizing panel should be decided in consultation with the Architect as near to the acoustic enclosure as possible. In case of connection through bus trunking, care should be taken for aesthetics vis-à-vis surrounding.

2.4.2 Type of Control Panel

Control panel shall be either Auto-manual type / synchronizing type as per the requirement of work to be decided by AIIMS Rishikesh approving authority.

2.4.2.1 Manual Control Panel

The control panel shall be fabricated out of 1.6 mm sheet steel, totally enclosed, dust, damp and vermin proof wall mounted/ free standing floor mounted type with IP-53 degree of protection & front operated.

The Standard control panel shall consist the following instruments:

- (a) Composite meter for digital display of :
 - (i) Voltage
 - (ii) Current
 - (iii) Power factor
 - (iv) Frequency
 - (v) Energy Meter
- (b) HRC fuses of suitable rating.
- (c) One MCB of suitable rating for DG sets or Switch Disconnecter Fuse Unit (SDFU) for higher ratings.
- (d) Push button-switch or ON/ OFF Switch for ON and OFF operation
- (e) Pilot lamps 3 numbers in case of three phase DG sets.
- (f) Battery charger complete with voltage regulator, Voltmeter and Ammeter for charging the battery from external mains. This will be in addition to the battery charging alternator fitted on the engine.
- (g) Instrument fuses.

All the components in the control panel shall be properly mounted, duly wired and labeled. Suitable terminals are to be provided for panel incoming and outgoing connections.

2.4.2.2 Synchronizing Panel

24.22.1 *General Features:* The control panel shall be fabricated out of 1.6 mm thick sheet steel, totally enclosed, dust, damp and vermin proof free standing floor mounted type & front operated. It shall be made into sections such that as far as feasible, there is no mixing of control, power, DC & AC functions in the same section and they are sufficiently segregated except where their bunching is necessary. Hinged doors shall be provided preferably double leaf for access for routine inspection from the rear. There is no objection to have single leaf hinged door in the front, all indication lamps, instruments meter etc. shall be flushed in the front. The degree of protection required will be IP-42 conforming to IS 2147.

24.22.2 *Terminal Blocks and Wiring:* Terminal blocks of robust type and generally not less than 15 Amps capacity,

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

- 24.2.2.3 *Labeling:* All internal components shall be provided with suitable identification labels suitably engraved. Labels shall be fixed on buttons, indication lamps etc.
- 24.2.2.4 *Painting:* The entire panel shall be given primer coat after proper treatment and powder coating with 7 tanks process before assembly of various items.
- 24.2.2.5 *Equipment requirements:* The control cubical shall incorporate into assembly general equipment and systems as under:
- (a) Control system equipments and components such as relays, contactors, timers, etc. both for automatic operation on main failure and as well as for manual operation.
 - (b) Equipment and components necessary for testing generating set's healthiness with test mode and with load on mains.
 - (c) Necessary instruments and accessories such as voltmeter, power factor meter, KW meter, KWH meter, Ammeter, Frequency meter etc. in one energy analyzer unit with selector switch to obtain the reading of desired parameters.
 - (d) Necessary indication lamps, fuses, terminal blocks, push buttons, control switches etc. as required.
 - (e) Necessary engine/generating set shut down devices due to faults/abnormalities.
 - (f) Necessary visual audio alarm indication and annunciation facility as specified.
 - (g) Necessary battery charger.
 - (h) Necessary excitation control and voltage regulating equipment. (Alternatively provided on the Alternator itself).
 - (i) Necessary over head bus trunking terminations all internal wiring, connections etc. as required.
 - (j) Breakers as specified in the schedule of work.
- 24.2.2.6 *System Operation:* The above mentioned facilities provided shall afford the following operational requirements.
- 24.2.2.6.1 *Auto Mode:*
- (a) A line voltage monitor shall monitor supply voltage on each phase. When the mains supply voltage fails completely or falls below set value (variable between 80 to 95% of the normal value) on any phase, the monitor module shall initiate start-up of diesel engine. To avoid initiation due to momentary disturbance, a time delay adjustment between 0 to 5 second shall be incorporated in start-up initiation.
 - (b) A three attempt starting facility shall be provided 6 seconds ON, 5 seconds OFF, 6 seconds ON, 5 seconds OFF, 6 seconds ON, if at the end of the third attempt, the engine does not start, it shall be locked out of start, a master timer shall be provided for this function. Suitable adjustment timers be incorporated which will make it feasible to vary independently ON-OFF setting periods from 1-10 seconds. If alternator does not build up voltage after the first or second start as may be, further starting attempt will not be made until the starting facility is reset.
 - (c) Once the alternator has built up voltage, the alternator circuit breaker shall close connecting the load to the alternator. The load is now supplied by the alternator.
 - (d) When the main supply is restored and is healthy as sensed by the line voltage monitor setting, both for under voltage and unbalance, the system shall be monitored by a suitable timer which can be set between 1 minute to 10 minutes for the load to be transferred automatically to main supply.

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

2.4.2.2.62 *Manual Mode:*

- (a) In a manual mode, it shall be feasible to start-up the generator set by the operator on pressing the start push button.
- (b) Three attempt starting facility shall be operative for the start-up function.
- (c) Alternator circuit breakers close and trip operations shall also be through operator only by pressing the appropriate button on the panel and closure shall be feasible only after alternator has built up full voltage. If the load is already on 'mains', pressure on 'close' button shall be ineffective.
- (d) Engine shut down, otherwise due to faults, shall be manual by pressing a 'stop' button.

2.4.2.2.63 *Test Mode:*

- (a) When under 'test' mode pressing of 'test' button shall complete the start up sequence simulation and start the engine. The simulation will be that of mains failure. Sequence 2.4.2.2.6.1(a) and (b) shall be completed.
- (b) Engine shall build up voltage but the set shall not take load by closing of alternator circuit breaker. When the load is on the mains, monitoring of performance for voltage/ frequency etc. shall be feasible without supply to load.
- (c) If during test mode, the power supply has failed, the load shall automatically get transferred to alternator.
- (d) Bringing the mode selector to auto position shall shut down the set as per sequence of 2.4.2.2.6.1(d) provided main supply is ON. If the mains supply is not available at that time, the alternator shall take load as in (c) above.

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

- (a) *Engine:*
- (i) Low lubricating oil pressure shut down. This shall be inoperative during start up and acceleration period.
 - (ii) High coolant (water) temp. shut down.
 - (iii) Engine over speed shut down.
- (b) *Alternator Protection:* Following protection arrangement shall be made:
- (i) Over load
 - (ii) Short circuit
 - (iii) Earth fault
 - (iv) Over voltage

2.4.2.2.8 *Monitoring and Metering Facilities:*

- (a) Necessary energy analyzer unit for visual monitoring of mains, alternator and load voltage, current, frequency, KWH, power factor, etc.
- (b) A set of visual monitoring lamp indication for:
- (i) Load on set
 - (ii) Load on mains

- (iii) Set on test (Alternator on operation duty, Alternator on standby duty).
- (iv) Set of lamp for engine shut down for over speed, low lub. oil pressure and high coolant water temperature, overload trip of alternator, earth fault trip of alternator, engine lock out and failure to start etc. All these indications shall have an audio and visual alarm. When operator accepts the alarm, the hooter will be silenced and the fault indication will become steady until reset by operating a reset button.

2.4.2.2.9 *Operating Devices:* A set of operation devices shall be incorporated in the front of panel as under:

- (a) Master Engine Control Switch: This shall cut off in 'OFF' position DC control to the entire panel, thus preventing start-up of engine due to any cause. However, battery charger, lamp test button for testing the healthiness of indication lamps, DC volt meter / ammeter etc. shall be operative. It shall be feasible to lock the switch in OFF position for maintenance and shut down purposes.
- (b) Operation selector switch OFF/AUTO/MANUAL/TEST position.
- (c) Energy analyzer unit for display of various electrical parameters like voltage, current, frequency, KW, power factor, etc.
- (d) A set of push button as specified.
- (e) Relays, contactors, timers, circuit breakers as required.
- (f) Necessary battery charger with boost/ trickle selector, DC voltmeter and DC ammeter.

2.4.2.2.10 *Compatibility with 'Building Management System'(BMS):*

PLC compatibility and required nos. of Input/ Output terminals points should be provided in the Synchronizing panel.

2.4.3 Battery/ Electrical System

2.4.3.1 Batteries supplied with Genset are generally dry and uncharged. First charging of uncharged batteries is very important and should be done from authorized battery charging centre. Initial charging should be done for 72-80 hours.

2.4.3.2 Batteries should be placed on stands and relatively at cool place.

2.4.3.3 Battery capacity and copper cable sizes for various engine capacity are recommended as indicated in the table below. Cable sizes shown are for maximum length of 2 m. If length is more, cable size should be selected in such a way that voltage drop does not exceed 2 V. However capacity as recommended by manufacturer may be taken.

<i>DG Set Capacity</i>	<i>Battery Capacity (AH)</i>	<i>Cable Size (Material Copper) Sq. mm</i>	<i>Electrical System (Volts)</i>
Above 500 KVA	360	70	24

2.4.3.4 For AMF applications, a static battery charger working on mains supply is recommended to keep the batteries charged at all times.

2.4.3.5 1.5 sq.mm copper wire should be used for wiring between junction box and Control Panel.

2.4.4 Cabling

2.4.4.1 Typical cable sizes for 415 V application are provided in Appendix VI.

2.4.4.2 DG Set connection between alternator to synchronizing & synchronizing panel to Essential panel shall be

through bus- trunking. For exposed/ outdoor bus trunking protection requirement should be IP-65 or above

- 2.4.4.3 LT panel is part of tender of the DG Set , LT Panel specified, should be one of the reputed brands.
- 2.4.4.4 While terminating R, Y& B phase notations should be maintained in the alternator and control panel for easy maintenance.
- 2.4.4.5 Multi-core copper cables should be used for inter connecting the engine controls with the switchgear and other equipments.
- 2.4.4.6 For AMF application, multicore 1.5 sq.mm flexible stranded copper cable for control cabling should be used.
- 2.4.4.7 External wirings, when provided for remote voltage / excitation monitoring/ droop CT etc. shall be screened sheathed type. Maximum length of such wiring shall not exceed 5 meters.

2.4.4.8 *Alternator Termination Links*

- 2448.1 For proper terminations between links and switchgear terminals, the contact area must be adequate. The following situations should also be avoided as they lead to creation of heat sources at the point of termination:

- (i) Point contact arising out of improper position of links with switchgear terminals [Figure 2(i)].
- (ii) Gaps between busbars / links and terminals being remedied by connecting bolt/stud [Figure 2(ii)]. In such cases the bolt will carry the load current. Normally these bolts / studs are made of MS and hence are not designed to carry currents.

- 2448.2 Adequate clearance between busbars / links at terminals should be maintained (IS 4232 may be referred to for guidelines).

Figure 2(iii) indicates the quality of different configurations.

- 2448.3 Improper termination will lead to local heat generation which may lead to failure.

2.5 FOUNDATION

Scope: This section covers details of foundations for DG set with or without acoustic enclosures.

2.5.1 Genset with Acoustic Enclosure

- (a) For DG Sets installed inside the DG Set Room - A PCC foundation (1:2:4, M-20 grade) of approximate depth 150 mm above the finished Genset Room Floor level is required so as to provide leveled surface for placement of the acoustics enclosure. The length and breadth of foundation should be at least 250 mm more on all sides than the size of the enclosure. Genset should be mounted on AVM's inside the enclosure.
- (b) For DG Sets installed outside in open area - A PCC (1:2:4, M-20 grade) foundation of weight 2.5 times the operating weight of the Genset with enclosure or as recommended by the Genset manufacturer OEM/OEA, whichever is higher, is required to be provided and is included in scope of work for SITC of Genset. 300 mm of this foundation height should be above the ground level. The length and breadth of foundation should be at least 250 mm more on all sides than the size of enclosure. Genset should be mounted on AVM's inside the enclosure.

Design of the foundation as recommended by the OEM shall be submitted by the contractor before execution of work along with the drawings as mentioned in section 1.19.

2.6 ACOUSTIC ENCLOSURE

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

2.6.1 As per CPCB norms, restriction has been imposed for new DG sets upto 2250 KVA for noise level (see Appendix 'II'). Therefore, in terms of these norms, acoustic enclosure should be type tested at the climatic conditions specified in para 2.1.4 through one of the authorized laboratory.

2.6.2 Installation

2.6.2.1 Acoustic enclosures are supplied with built in Anti Vibration Mountings (AVMs). As such Genset can be installed directly on the leveled surface.

2.6.2.2 Exhaust piping outlet should not be turned towards window / ventilator of home or occupied building. Provision of rain cap should be ensured.

2.6.2.3 The acoustic enclosure placement should be such that there is no restriction in front of air inlet and outlet from canopy.

2.6.3 Service Accessibility

2.6.3.1 Genset / Engine control panel should be visible from outside the enclosure.

2.6.3.2 Routine / periodical check on engine / alternator (filter replacement and tappet setting etc.) should be possible without dismantling acoustic enclosure.

2.6.3.3 For major repairs / overhaul, it may be required to dismantle the acoustic enclosure.

2.6.3.4 Sufficient space should be available around the Genset for inspection and service.

2.6.4 General Design Guidelines

2.6.4.1 To avoid re-circulation of hot air, durable sealing between radiator and canopy is must.

2.6.4.2 Ventilation fans are must for the Gensets cooled by heat-exchanger/cooling tower system.

2.6.4.3 Exhaust piping inside the enclosure must be lagged (except bellow).

2.6.4.4 Temperature rise inside the enclosure should not be more than 5°C for maximum ambient above 50°C and it should be below 10°C for ambient below 50°C.

2.6.4.5 There should be provision for oil, coolant drain and fill. Fuel tank should have provision for cleaning.

2.6.4.6 The enclosure should be designed to meet the total air requirement for the D.G. Set at full load at site conditions as recommended by the engine manufacturer.

2.6.5 Specifications for Acoustic Enclosure

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

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

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

- 2.6.5.4 The hinged doors shall be made from not less than 16 SWG (1.6 mm) thick CRCA sheet and will be made air tight with neoprene rubber gasket and heavy duty locks.
- 2.6.5.5 All sheet metal parts should be processed through 7-tank process.
- 2.6.5.6 The enclosure should be powder coated.
- 2.6.5.7 The enclosure should accommodate the daily service fuel tank of the D.G. Set to make the system compact. There should be provision of fuel gauge, which should show the level of the fuel even when the DG Set is not running. The gauge should be calibrated. The fuel tank should be filled from the out side as in automobiles and should be with a lockable cap.
- 2.6.5.8 The batteries should be accommodated in the enclosure in battery rack.
- 2.6.5.9 The canopy should be provided with high enclosure temperature safety device.
- 2.6.5.10 The acoustic lining should be made up of high quality insulation material i.e. rockwool/ glass/ mineral wool/ PU foam of appropriate thickness & density for sound absorption as per standard design of manufacturer's to reduce the sound level as per CPCB norms. The insulation material shall be covered with fine glass fiber cloth and would be supported by perforated M. S. Sheet duly powder coated / GI sheet/ aluminium sheet.
- 2.6.5.11 The enclosure shall be provided with suitable size & No. of hinged type doors along the length of the enclosure on each side for easy access inside the acoustic enclosure for inspection, operation and maintenance purpose. Sufficient space will be provided inside the enclosure on all sides of the D.G. set for inspection, easy maintenance & repairs.
- 2.6.5.12 The canopy should be as compact as possible with good aesthetic look.
- 2.6.5.13 The complete enclosure shall be of modular construction.
- 2.6.5.14 The forced ventilation shall be as per manufacturer design using either engine radiator fan or additional blower fan(s). If the acoustic enclosure is to be provided with forced ventilation then suitable size of axial flow fan (with motor and auto-start arrangement) and suitable size axial flow exhaust fan to take the hot air from the enclosure complete with necessary motors and auto start arrangement should be provided. The forced ventilation arrangement should be provided with auto stop arrangement to stop after 5 minutes of the stopping of D.G sets.
- 2.6.5.15 The acoustic enclosure should be suitable for cable connection/connection through bus-trunking. Such arrangements on acoustic enclosure should be water proof & dust-proof conforming to IP-65 protection.
- 2.6.5.16 The inside of enclosure should be provided with at least two nos. 28 W-T5 fluorescent tube light luminaire controlled by a 5A switch for adequate lighting during servicing etc. of the DG Set. The power supply to this luminaire should be from the load side of the AMF Panel so that it can remain energized under all conditions.

SYNCHRONIZATION

3.1 SCOPE

This section covers synchronization of DG sets as required and comprises of running of DG set in parallel i.e. their synchronization on common bus bar, auto load sharing and auto load management.

3.2 PLC PANEL

Operation of DG sets shall be monitored and controlled by PLC panel i.e. Programmable logic controller based logic panel. In case of mains failure, this logic panel shall control auto changeover from mains to DG Sets supply and interlocking of ACBs, auto synchronizing and auto load management functions along with annunciation for alternator control and protection.

The logic panel must be provided with a total manual over ride facility. There shall be Smooth transfer of DG set operation from PLC to manual system & vice versa without any interruption/tripping. The logic panel shall be complete with all Auxiliary Relays, Timers, Contactors, Programmable logic controller, control wiring, interconnections etc. with 2.5 sq.mm. PVC insulated, 1.1 KV grade copper conductor wires.

3.3 CONTROL PHILOSOPHY

3.3.1 Automatic Start & Stop of Engine

The system should come in operation after sensing of grid failure and automatically control the start & stop of engines, depending on the predefined load setting in the PLC. In case engine does not start in the first cranking, two more auto commands should be given with proper intervals. Even then if engine fails to start, indication must appear on MMI (Man Machine interface). In the event the engines are under loaded i.e. load sensed is capable of being catered by less than the capacity of running DG sets then command must be given to stop required number of excess DG sets after running idle for short duration. Provision to select no. of DG sets to be started and synchronised at no load to cope up with sudden load without tripping the DG's should also be inbuilt into the system.

3.3.2 Automatic Synchronisation

The facility of synchronisation will be available in both Auto & Manual mode. In normal circumstances the auto synchronisation will work, however if due to any reason auto synchronisation fails repeatedly the facility for closure of ACB must be available automatically. In manual mode ACB will be closed by panel push button.

3.3.3 Automatic Load Sharing

The load sharing will also be automatic, by sensing both active & reactive power.

3.3.4 Back up Protection

The system should also have following inbuilt protection other than external relays in synchronization panel:

Reverse power, Reverse KVAR, Over Current, Under voltage, Over voltage, Under frequency, Over frequency, synchro-check & earth fault relay except differential relay. Due to any electrical fault PLC shall trigger the master trip relay.

These PLCs will be state of the art equipments using latest technology and of most rugged and reliable design. Since they shall be operating in the harsh & unfriendly environment of DG room, they will be suitable to operate trouble free in those conditions. The chosen equipment should be able to withstand high temperature, humidity & voltage fluctuations, thus making it suitable for the operating conditions described above.

3.5 SEQUENCE OF OPERATION

The following sequence of operation shall be achieved through PLC based logic panel in addition to hardware interlocks as well as software interlocks:

- (i) Selection of any generator as a lead generator to achieve the uniform running hours of all generators.
- (ii) Three attempts to start the engine of lead generator. In case the engine fails to start or does not achieve the requisite speed within the predetermined time, PLC system declares engine of generator faulty. In this event PLC automatically selects next generator as the lead generator.
- (iii) The PLC system automatically selects starting sequence of other generators on the basis of the lead generator being selected by the operator.
- (iv) Before issuing close command to lead generator air circuit breaker, PLC checks that ACB of any other

generator is not in close position. Then PLC system gives close command to lead generator ACB. The PLC system tries two times with interval of 5 secs. to close the ACB. Simultaneously, it also gives starting command to next generator engine in queue depending upon load.

- (v) The speed, excitation, frequency and voltage of incoming generator is controlled identically as per the lead generator starting sequence described above, except closing of ACB.
- (vi) When the lead generator KW crosses more than the 85% of rated capacity of DG set, the PLC system performs synchronization sequence for paralleling of generator prior to switching on of the ACB of 2nd generator. When the KW of 2nd generator crosses 80% of rated capacity of DG set then the PLC system performs synchronization sequence for paralleling of next generator prior to switching on the ACB of 3rd generator and similar sequence to be followed for other DG sets.
- (vii) The last incoming generator ACB is tripped when PLC system senses that the total load on the system is less than the specified load and stops the engine after 5 minutes of idle running.
- (viii) DG sets will start and stop automatically depending on the pre defined load setting in the PLC & also all DG sets will operate in load sharing mode.

EARTHING

4.1 EARTHING

Scope: This section covers the earthing requirement of DG Set installations. Copper plate earthing (Neutral Grounding) shall be provided for DG Sets,. The body earthing shall generally be of G.I.

- 4.1.1 The generating set and all associated equipments control and switch gear and switch gear panels must be earthed before the set is put into operation.
- 4.1.2 Four numbers earth sets for each DG Sets are required as under:
 - 2 earthing sets for Genset/ control panel body.
 - 2 earthing sets for neutral.

In case there are more than one DG Set in one location, independent two nos. neutral earthing shall be provided for each DG set. However, two nos. earthing sets shall be common for the body earthing of DG Sets, Control Panel, AMF Panel and Essential LT Panel.
- 4.1.3 Earthing job should be carried out per General Specifications for Electrical Works, (Part 1-Internal), 2013 .
- 4.1.4 Copper or GI strips of suitable size shall be used for earthing as detailed hereunder for interconnection:
 - 4.1.4.1 DG Set of 500 KVA capacity or above:- Copper strip
- 4.1.5 For Gensets with AVM's between engine/ alternator and base rail, the body earthing must be done at the engine/ alternator and not at base-rail.
- 4.1.6 Genset should be earthed at two distinct points through a conductor strip having cross-section suitable to carry the short circuit (three phase dead short circuit with ground) current without burning out in conformity to General Specifications for Electrical Works (Part 1-Internal), 2013 in vogue.
- 4.1.7 Earth Bus: For body earthing, an earth-bus shall be provided.
- 4.1.8 In case, DG Set is being installed inside the substation building or near to the sub- station, for body-earthing of DG set, AMF Panel and Essential Panel, earth bus provided for sub-station shall be used.
- 4.1.9 Test joints should be provided for testing the earthing as and when required.
- 4.1.10 For further details of Earthing work, like size of plate/ earth strip, depth of earthing, method etc., please refer "CPWD General Specifications For Electrical Works (Part 1-Internal), 2013 in vogue.

APPENDIX I

INTERNATIONAL STANDARD ISO 8528-PART 1

RECIPROCATING INTERNAL COMBUSTION ENGINE DRIVE
ALTERNATING CURRENT GENERATING SETS

PART 1

APPLICATION, RATINGS AND PERFORMANCE

FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject on which a technical committee has been established has the right to be represented on that committee. International organization, governmental and non-governmental, in liason with ISO, also take part in the work. ISO collaborates closely with the International Electro technical Commission (IEC) on all matters of electro technical standardization.

Draft international Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75% of the member bodies casting a vote.

International Standard ISO 8528-1 was prepared by Technical Committee ISO/TC 70, Internal combustion engines, Sub-Committee SC 2, Performance and tests.

ISO 8528 consists of the following parts, under the general title Reciprocating internal combusting engine driven alternating current generating sets.

- Part 1: Application, ratings and performance
- Part 2: Engines
- Part 3: Alternating current generators for generating sets
- Part 4: Controlgear and switchgear
- Part 5: Generating sets
- Part 6: Test methods
- Part 7: Technical declarations for specification and design
- Part 8: Low-power general purpose generating sets
- Part 9: Measurement and evaluation of mechanical vibration
- Part 10: Measurement of airborne noise —Enveloping surface method
- Part 11: Security generating sets with uninterruptible power systems

Parts 7, 8, 9 and 10 are in course of preparation. Part 11 is at an early stage of preparation and may be split into two parts.

RECIPROCATING INTERNAL COMBUSTION ENGINE DRIVEN ALTERNATING CURRENT GENERATING SETS

PART 1

APPLICATION, RATINGS AND PERFORMANCE

1. SCOPE :

This part of ISO 8528 defines various classifications for the applications, ratings and performance which arise out of the combination of generating sets consisting of a reciprocating internal combustion (RIC) engine, alternating current (a.c.) generator, controlgear, switchgear and auxiliary equipment. It applies to a.c.~ generating sets driven by RIC engines for land and marine use, excluding generating sets used on aircraft or to propel land vehicles and locomotives.

For some specific applications (for example, essential hospital supplies, high-rise buildings, etc.) supplementary requirements may be necessary. The provisions of this part of ISO 8528 should be regarded as a basis.

For other reciprocating-type prime movers (e.g. sewage-gas engines, steam engines), the provisions of this part of ISO 8528 should be used as a basis. The generating sets according to this International Standard are used to generate electrical power for continuous, peak-load and standby supplies. The classifications laid down in this part of ISO 8528 are intended to help understanding between manufacturer and customer.

2. NORMATIVE REFERENCES

The following standards contain provisions, which, through reference in this text, constitute provisions of this part of ISO 8528. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 8528 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and IO maintain registers of currently valid International Standards.

ISO 3046-1:1986, *Reciprocating internal combustion engines-Performance – Part 1: Standard reference conditions and declarations of power, fuel consumption and lubricating oil consumption.*

ISO 8528-2:1993, *Reciprocating internal combustion engine driven alternating current generating sets - Part 2 : Engines.*

ISO 8528-3:1993, *Reciprocating internal combustion engine driven alternating current generation sets - Part 3 : Alternating current generators for generating sets.*

ISO 8528-4:1993, *Reciprocating internal combustion engine driven alternating current generating sets - Part 4 : Control gear and switchgear.*

ISO 8528-5:1993, *Reciprocating Internal combustion engine driven alternating current generative sets - Part 5 : Generating sets.*

IEC 34-1:1983, *Rotating electrical machines - Part 1: Rating and performance*.

IEC 298:1990, *A.C. metal-enclosed switchgear and controlgear for rated voltages above 1 KV and up to and including 52 KV*.

IEC 439-1:1985, *Low-voltage switchgear and controlgear assemblies - Part 1: Requirements for type-tested and partially type-tested assemblies*.

IEC 439-2:1987, *Low-voltage switchgear and controlgear assemblies – Part 2: Particular requirement for busbar trunking systems busway*.

3. SYMBOLS AND ABBREVIATIONS

P Power in kilowatts

P_r Total barometric pressure, in kilopascals T_{er}

Charge air coolant temperature, in kelvins T_r

Air temperature, in kelvins

t Time, in seconds

\varnothing_r Relative humidity, as a percentage

a.c. Alternating current COP

Continuous power

LPT Limited-time running power PRP

Prime power

4. OTHER REGULATIONS AND ADDITIONAL REQUIREMENTS

4.1 For a.c. generating sets used on board ships and offshore installations which have to comply with rules of a classification society, the additional requirements of the classification society shall be observed. The classification society shall be stated by the customer prior to placing of the order.

For a.c. generating sets operating in non-classed equipment, such additional requirements are in each case subject to agreement between the manufacturer and customer.

4.2 If special requirements from regulations of any other authority (e.g. Inspecting and/or legislative authorities) have to be met, the authority shall be stated by the customer prior to placing of the order.

Any further additional requirements shall be subject to agreement between the manufacture and customer.

5. GENERAL DESCRIPTION

5.1 Generating set

A generating set consists of one or more RIC engines to produce mechanical energy and one or more generators to convert the mechanical energy into electrical energy together with components for transmitting the mechanical energy (e.g. couplings, gearbox) and, where applicable, bearing and mounting components.

5.1.1 Prime movers

These may be of two types:

- compression ignition engines, and
- spark-ignition engines.

Depending on the application of the generating set the following criteria, among others may be important for the selection of the prime mover to be used:

- quality of fuel and fuel consumption;
- exhaust gas and noise emission;
- speed range;
- mass and dimensions;
- sudden loading and frequency behaviour;
- short-circuit characteristics of the generator;
- cooling systems;
- starting systems;
- maintenance;
- waste heat utilization.

5.1.2 Generators

These may be of two types:

- synchronous generators, and
- asynchronous generators.

Depending on the application of the generating set, the following criteria, among others, may be important for the selection of the generator to be used:

- voltage characteristics during starting, nominal operation and overload operation, as well as, after load changes taking into account the power factor;
- short-circuit behaviour (electrical, mechanical);
- efficiency;
- generator design and type of enclosure;
- parallel-operation behaviour;
- maintenance.

5.1.3 Controlgears and Switchgears

Equipment for control, switching and monitoring is combined into controlgear and switchgear systems, for the operation of the generating set.

5.1.4 Auxiliaries

Auxiliaries are items of equipment essential for pre-operation of the generating set, such as :

- starting system;
- air intake and exhaust gas systems;
- cooling system;

- lubricating oil system;
- fuel system (including fuel treatment where applicable);
- auxiliary electrical power supply.

5.2 Power station

A power station comprises one or more generating sets and their auxiliary equipment, the associated controlgear and switchgear and, where applicable, the place of installation (e.g. a building, an enclosure or special equipment for protection from the weather).

6. APPLICATION CRITERIA

6.1 Modes of operation

The mode of operation of the generating set may affect certain important characteristics (e.g. its economical and reliable operation, the intervals between maintenance and repair), and shall be taken into account by the customer when agreeing the requirements with the manufacturer (see also clause 11).

6.1.1 Continuous operation

Continuous operation is operation of a generating set without a time limit, but considering the maintenance period.

6.2 Site Criteria

6.2.1 Land use

Land use covers generating sets, either fixed, transportable or mobile, which are used on land.

6.3 Single and Parallel Operation

Generating sets may have two types of operation, defined in 6.3.1 and 6.3.2.

6.3.1 Single operation

Single operation refers to a generating set, irrespective of its configuration or modes of start-up and control, which will operate as the sole source of electrical power and without the support of other sources of electrical supply.

6.3.2 Parallel operation

Parallel operation refers to the electrical connection of a generating set to another source of electrical supply with the same voltage, frequency and phase to share the power supply for the connected network. The characteristics of the mains supply, including range and variation of voltage, frequency, impedance of the network, etc., shall be stated by the customer.

6.3.2.1 *Parallel operation by generating sets*

In this type of operation, two or more generating sets are electrically connected (not mechanically connected) after having been brought into synchronism. Generating sets with different outputs and speeds can be used.

6.3.2.2 *Operation in parallel with mains*

In this type of operation, one or more parallel-operating generating sets (as described in 6.3.2.1) are electricity connected to a mains supply.

NOTE 2 : In the case of a public mains, permission for parallel operation has to be obtained from the public electricity board. Protective equipment has to be harmonized.

NOTE 3 : This also applies to generating sets which, in order to check the start up, have to run supplying power into the mains for a time period laid down by the generating set manufacturer.

6.4 Modes of start-up and control

The modes of start-up and control involved in the operation of a generating set are normally:

- starting,
- monitoring,
- voltage and frequency adjusting and synchronization where applicable,
- switching, and
- stopping.

These can be fully or partly manual or automatic (see also ISO 8528-4).

6.4.1 Manual operation

Manual operation covers generating sets which are started and controlled manually.

6.4.2 Semi-automatic operation

Semi-automatic operation covers generating sets in which some of the functions are started and controlled manually and the remainder automatically.

6.4.3 Automatic operation

Automatic operation covers generating sets which are started and controlled automatically.

6.5 Start-up time

Start-up time is the time from the moment when power is first required to the moment when it is first available. It shall meet the demands of the particular application.

6.5.1 Generating set with no specified start-up time

This is a generating set where, due to the conditions under which it operates, the start-up time is of no importance. Such generating sets are normally started manually.

6.5.2 Generating set with specified start-up time

This is a generating set where the start-up time is specified; starting is normally automatic. Such generating sets may be further classified (see 6.5.2.1 to 6.5.2.3).

6.5.2.1 Long-break set

This is a generating set with a specified start-up time (defined in seconds). The time between a power supply failure and power from the generating set being available is fairly long. In this case the entire set is started from the stationary condition after power is demanded.

6.5.2.2 Short-break set

This is a generating set with running electrical machines where the power supply is interrupted while the necessary switchgear change-over takes place, for a time defined in milliseconds. A source of stored mechanical energy is used to supply power to the connected equipment for a short period necessary to start and accelerate the RIC engine.

6.5.2.3 No-break set

This is a generating set with continuous rating electrical machines that ensure an uninterrupted supply of power in the event of mains failure. A source of stored mechanical energy is unable to supply power to the connected equipment for a short period and, where necessary to start and accelerate the RIC engine. As the drive is transferred from one power source to another there may be temporary deviation in frequency.

7. PERFORMANCE CLASSES

Four performance classes are specified to the various requirements of the supplied electrical systems see 7.1 to 7.4.

7.1 Performance class G1

This is required for application where the connected loads are such that only basic parameters of image and frequency need to be specified.

EXAMPLES

General-purpose applications (lighting and other simple electrical loads).

7.2 Performance class G2

This is required for applications where the demands on voltage characteristics are very much the same as for the commercial power system. When load changes occur, there may be temporary but acceptable deviations of voltage and frequency.

EXAMPLES

Lighting systems, pumps, fans and hoists.

7.3 Performance class G3

This is required for applications where the connected equipment may make severe demands on frequency, voltage and waveform characteristics.

EXAMPLES

Telecommunications and thyristor-controlled loads. It should be especially recognized that both rectifier and thyristor-controlled loads may need special consideration with respect to their effect on generator-voltage waveform.

7.4 Performance class G4

This is required for applications where the demands made on the frequency, voltage and waveform characteristics are exceptionally severe.

EXAMPLES

Data-processing equipment of computer systems.

8. INSTALLATION FEATURES

Requirements to meet local regulations may affect the design of the generating set. They shall be taken into account by the customer and manufacturer in addition to the installation features given in 8.1 to 8.5.

8.1 Installation configurations

The installation configurations in 8.1.1 to 8.1.3 may or may not have all necessary auxiliary equipment integrally mounted.

8.1.1 Fixed

This configuration includes all generating sets which are permanently installed.

8.1.2 Transportable

This configuration includes all generating sets not permanently installed or mobile.

8.1.3 Mobile

This configuration includes all generating sets having an integral chassis fitted with wheels whereby the generating set is mobile.

8.2 Generating Set Configurations

In order to simplify contractual information for various RIC engine driven generating set applications, some typical set configurations are given below:

- A: without baseframe;

- B: with baseframe;
- C: with baseframe, integrally mounted controlgear, switchgear and auxiliaries;
- D: configuration as given in C with enclosure (see also clause 9);
- E: configuration as given in C having an integral set of wheels or mounted on a trailer (see also 8.1.3).

8.3 Types of Mounting

The type of mounting (see 8.3.1 to 8.3.3) should be agreed between the customer and the generating set manufacturer.

8.3.1 Rigid Mounting

This is mounting the generating set without the use of resilient mountings. If foundations for mounting generating sets are set up on substrates of low elasticity, for example corktiles, with no resilient layers, inserted, the method of mounting is considered to be rigid.

8.3.2 Resilient Mounting

This is mounting the generating set with the use of resilient mountings. For special application (e.g. marine or mobile), restrained resilient mountings may be required.

8.3.2.1 Fully resilient mounting

Fully resilient mounting is mounting the RIC engine and the generator resiliently on a baseframe or a foundation with components to provide insulation against vibration.

8.3.2.2 Semi-resilient mounting

Semi-resilient mounting is mounting the RIC engine resiliently with the use of components to provide insulation against vibration and mounting the generator rigidly on a baseframe or a foundation.

8.3.2.3 Mounting on resilient foundation

This is mounting the generating set on resilient foundation (damping mass) which is isolated from the load-bearing foundation by, for example, anti-vibration mounts.

8.4 Connection between Engine and Generator

The connection between the RIC engine and the a.c. generator is determined by the type of components transmitting the power and the assembly between the engine and the generator. It depends on the design of the engine, generator and mounting, the power and the speed.

8.4.1 Coupling Arrangements

Typical coupling arrangements are rigid, torsionally rigid, flexible, torsionally flexible or clutch coupling.

8.4.2 Assembly Arrangements

The assembly between the RIC engine and the generator may be with or without flange housing.

8.5 Additional Installation Features—Weather Effects

8.5.1 Inside Installation

This is installation of the generating set in places where it is not exposed to the direct effects of weather. Consideration shall be given to maximum and minimum room temperatures.

8.5.2 Outside Installation with Protection from Weather

This may be sub-divided into:

- installation in a protective enclosure;
- installation under a protective roof.

8.5.3 Open-air Installation

This is installation in the open, fully exposed to the weather.

9. EMISSIONS

When a generating set operates, it produces emissions including noise, vibration, heat, waste gases and electromagnetic disturbances. Any applicable legislation relating to the protection of the environment and to the health and safety of personnel shall be taken into account by the manufacturer and customer at the time of agreeing a performance specification.

10. STANDARD REFERENCE CONDITIONS

In determining the rated power of the generating set, it should be noted that different standard reference conditions apply to the engine, a.c. generator and switchgear. For conditions on site, see clause 11.

10.1 For the rated power of the RIC engine, the following standard reference conditions apply in accordance with ISO 3046-1:

- total barometric pressure, P_r : 100 kPa (1000 mbar)
- air temperature, T_r : 298 K (25 °C)
- relative humidity, ϕ_r : 30%
- charge air coolant temperature, T_{cr} : 298 K (25 °C)

10.2 For the rated power of the a.c. generator, the following standard reference conditions apply in accordance with IEC 34-1 and ISO 8528-3:

- cooling air temperature : below 313 K (40°C)
- coolant temperature at cooler inlet: below 298 K (25°C)
- altitude: up to 1000 m above sea level.

10.3 For the ratings of the controlgear and switchgear equipment, the following standard reference conditions apply in accordance with IEC 298, IEC 439-1 and IEC 439-2:

- ambient temperature, temporary maximum 50°C
- relative humidity: 95% at 50°C

11. SITE CONDITIONS

The site conditions under which a generating set is required to operate may affect certain characteristics of the set; they shall be taken into account by the customer and manufacturer.

These conditions shall be clearly defined by the customer and any particular hazardous conditions, such as explosive atmospheres or flammable gases, shall be described. Such characteristics may include but are not limited to those indicated in 11.1 to 11.9.

NOTE 5 : In cases where the site conditions are unknown, and if not otherwise specified, the following nominal site conditions should be used:

- total barometric pressure: 89,9 kPa (for altitude above sea level 1000 m)
- ambient temperature: 50°C
- relative humidity: 95%

11.1 Ambient Temperature

The customer shall inform the manufacturer of the upper and the lower ambient temperature limits at which the generating set will operate.

11.2 Altitude

The customer shall inform the manufacturer of the altitude above sea level at which the generating set will operate. However, it is preferable to have exact values of the barometric pressure on site.

11.3 Humidity

The customer shall inform the manufacturer of the humidity values related to the temperature and pressure on site (see 11.1 and 11.2).

11.4 Shock and Imposed Vibration

If the generating set is required to operate under conditions where shock and/or vibration may occur (for example, earthquake on the one hand and externally imposed vibration from adjacent reciprocating machinery on the other), this shall be clearly stated by the customer.

11.5 Chemical Pollution

If the generating set is required to operate under conditions where chemical pollution exists, the nature and extent of this shall be clearly stated by the customer.

11.6 Radiation

Various kinds of radiation may affect some of the components of the generating set, and such components may need special protection and/or a special maintenance programme. Any such condition of operating shall be specified by the customer.

12. POWER ADJUSTMENT FOR AMBIENT CONDITIONS

To determine the appropriate generating set ratings, the customer shall specify the operating conditions prevailing at the site.

- (a) site barometric pressure (highest and lowest readings available or, if no pressure data are available, the altitude above sea level);
- (b) the monthly mean, minimum and maximum air temperatures during the hottest and coldest months of the year;
- (c) the highest and lowest ambient air temperatures around the engine;
- (d) the relative humidity (or alternatively the water vapour pressure or the wet and dry bulb temperature) ruling at the maximum temperature conditions;
- (e) the maximum and minimum temperatures of the cooling water available.

When the operating conditions differ from the standard reference conditions given in clause 10, any necessary adjustment to the RIC engine, a.c. generator or switchgear rating shall be made in order to determine the rated power of the generating set.

For generating sets to be installed on board ships intended for unrestricted service, according to the International Association of Classification Societies (IACS), the rated power shall be based on the nominal ambient conditions as specified in ISO 3046-1: 1986, 7.4.2.

13. POWER RATING DEFINITIONS**13.1 General**

The power of the generating set is the power output available at the generating set terminals excluding the electrical power absorbed by the essential independent auxiliaries. (See also ISO 8528-2:1993, 5.1 and ISO 8528-3:1993, clause 5)

13.2 Power Ratings

Power ratings of generating sets shall be expressed in kilowatts at rated frequency and a power factor ($\cos \emptyset$) of 0.8 lagging unless otherwise stated.

The power rating classifications are necessary for the generating set manufacturer's declaration concerning the power which the generating set will deliver under the stated operating conditions.

13.3 Kinds of Power Output

The generating set manufacturer shall be responsible for determining the power output according to 13.3.1 to 13.3.3 [see figures (i) to (iii)] in accordance with the service and maintenance schedule specified by the engine, a.c. generator and controlgear and switchgear manufacturers.

For all kinds of power output, defined in 13.3.1 to 13.3.3, it is necessary to provide additional engine power for governing purpose only (e.g. transient load conditions and suddenly applied load). This additional engine power is usually 10% of the rated power of the generating set and shall not be used for the supply of electrical consumers.

This additional engine power is not identical to the overload power for RIC engines as defined in ISO 3046-1.

The power limit of a generating set [see figures (i) to (iii)] depends on the power limit of the RIC engine, e.g. fuel stop power, taking into account the efficiency of the a.c. generator.

13.3.1 Continuous Power (COP)

Continuous power is that which a generating set is capable of delivering continuously for an unlimited number of hours per year between the stated maintenance intervals and under stated ambient conditions, the maintenance being carried out as prescribed by the manufacturers. [See figure (i)].

13.3.2 Prime Power (PRP)

Prime power is the maximum power available during a variable power sequence, which may be run for an unlimited number of hours per year, between stated maintenance intervals and under the stated ambient conditions, the maintenance being carried out as prescribed by the manufacturers.

The permissible average power output (P_{pp}) [See figure (ii)] during a 24 h period shall not exceed some percentage of the prime power to be stated by the RIC engine manufacturer. When determining the actual average power output P_{pa} , powers of less than 30% of the prime power shall be taken as 30% and time at standstill shall not be counted.

The actual average power, P_{pa} is calculated as follows:

$$P_{pa} = \frac{P_1 t_1 + P_2 t_2 + P_3 t_3 + \dots + P_n t_n}{t_1 + t_2 + \dots + t_n}$$

$$\frac{\sum_{i=1}^n P_i t_i}{\sum_{i=1}^n t_i}$$

where $P_1, P_2 \dots P_n$ is the power at the $t_1, t_2 \dots t_n$

NOTE 6 : The customer should be made aware that if any of these conditions are not fulfilled the RIC engine life will be reduced.

NOTE 7 : Time periods at standstill do not enter into the formula.

NOTE 8 : The period of running at prime power is expected to be long enough to enable the generator to reach thermally stable conditions.

13.3.3 Limited-time Running Power (LTP)

The limited-time running power is the maximum power which a generating set is capable of delivering for up to 500 h per year of which a maximum of 300 h is continuous running, between stated maintenance intervals and under the stated ambient conditions, the maintenance being carried out as prescribed by the RIC engine manufacturers. It is accepted that operation at this rating will affect the life of the set. [See figure (iii).]

NOTE 9 : The period of running at limited-time running power is expected to be long enough to enable the generator to reach thermally stable conditions.

NOTE 10 : The customer should be made aware that if any of these conditions are not fulfilled the RIC engine life will be reduced.

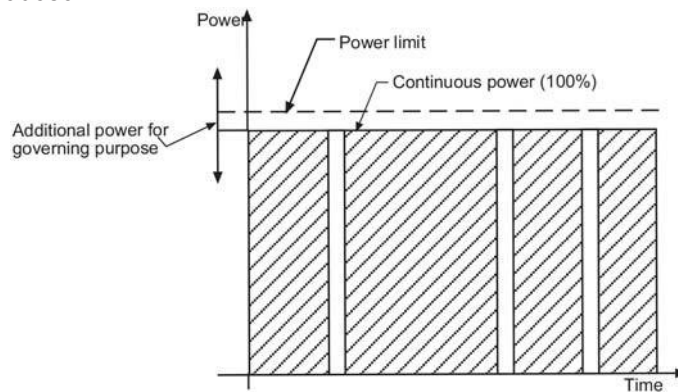


Fig. (i) Illustration of continuous power

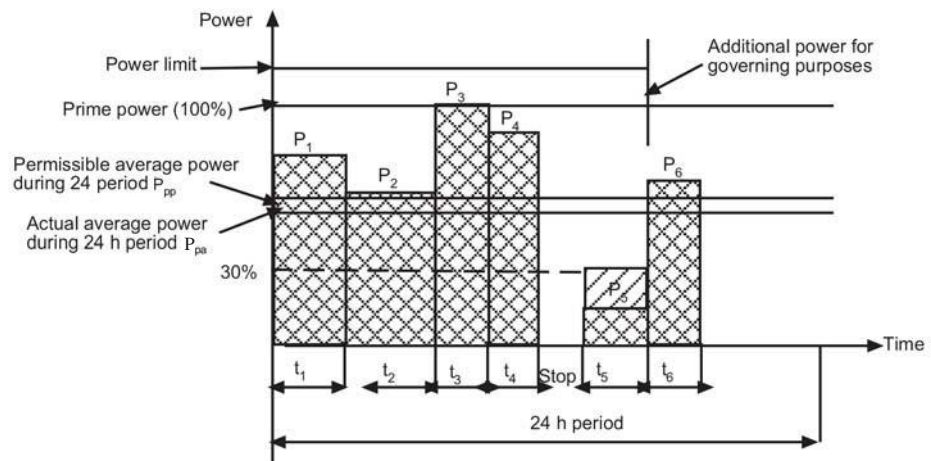


Fig. (ii) Illustration of prime power (not to scale)

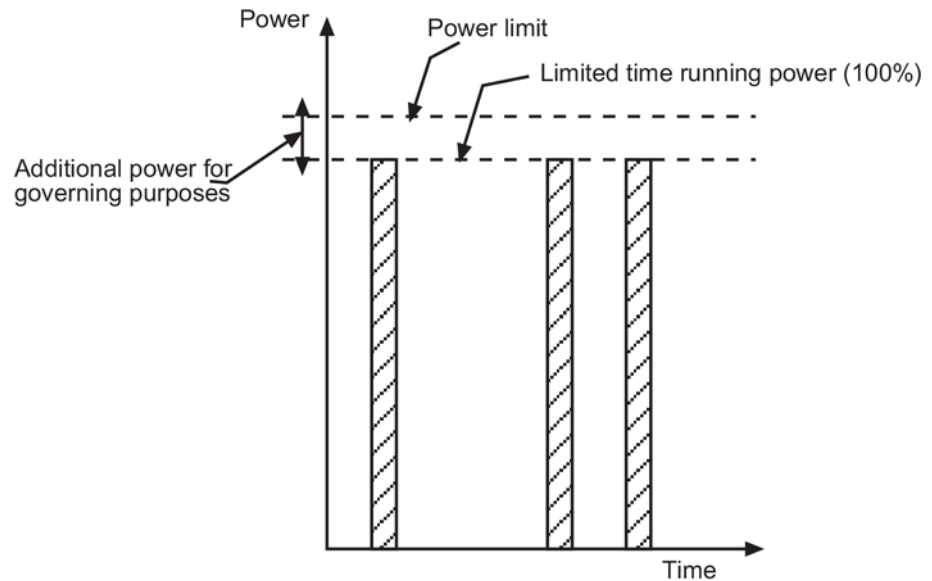


Fig. (iii) Illustration of limited-time running power

14. OPERATING PERFORMANCE

14.1 Starting Temperature

The RIC engine manufacturer shall state the minimum temperatures at which the generating set will start with the starting system and start aids - provided.

14.2 Load Acceptance

When load is suddenly applied to a generating set there will be transient deviation in voltage and frequency. The magnitude of these deviations will depend both on the magnitudes of the active power (in kilowatts) and reactive power (in kilovars) changes, relative to the total available capacity and to the dynamic characteristics of the generating set. (See also ISO 8528-5 and ISO 8582-5)

If load acceptance capability is an important requirement, then it shall be clearly stated by the customer.

14.3 Cyclic Irregularity

The cyclic irregularity imposed on the generator by the RIC engine combustion process may cause modulation of the voltage. (See ISO 8528-3).

14.4 Generator Temperature Rise

The temperature rise of the generator windings of a generating set may be an important factor limiting the long-term reliability of a generating set. An increase in allowable temperature rise may be possible if the generating set is to be used on a limited time basis.

14.5 Fuel and Lubricating Oil Consumption

The manufacturer shall state the consumption of fuel and lubricating oil, if verification of fuel consumption is required, the method of measurement shall be agreed between the customer and manufacturer, as outlined in ISO 3046-1. Statements of fuel consumption shall be made with reference to the electrical power available at the terminals, taking into account the electrical power required for the essential independent auxiliaries (see ISO 3046-1) and the power loss in the a.c. generator for a given power and power factor. The lower calorific value of the fuel shall be stated.

14.6 Minimum Running Hours

The capacity of fuel and lubricating oil tanks may impose a limit on the generating set running hours. The manufacturer shall state the minimum running hours together with power delivered of the generating set without replenishment, if such tanks are provided.

14.7 Regulation

14.7.1 Frequency Regulation

The steady-state and transient frequency regulation may be an important requirement when specifying the performance of a generating set. If this is the case, then it shall be clearly stated by the customer.

14.7.2 Voltage Regulation

It is necessary to consider both steady/state and transient voltage regulation when specifying a generating set. It must also be noted that the nature of the load current waveforms imposed on the generating set may affect the voltage waveform and the steady-state voltage accuracy. If voltage regulation is an important requirement, then it shall be clearly stated by the customer.

COMMERCIAL AND ADDITIONAL CONDITIONS

1.0 General

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

1.2 Location

The DG Set will be installed at AIIMS Rishikesh

1.3 The work shall be executed as per CPWD General Specifications for Electrical Works (Part VII DG Sets–2013), as per relevant IS and as per directions of Engineer-in-Charge. These additional specifications are to be read in conjunction with above and in case of variations, specifications given in this additional conditions shall apply. However, nothing extra shall be paid on account of these additional specifications & conditions as the same are to be read along with schedule of quantities for the work.

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

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

2.0 Commercial Conditions

2.1 Type of Contract

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

2.2 Submission and Opening of Tenders

2.2.1 The tender is in two parts:

(a) Part I – Technical Bid

(b) Part II – Price Bid

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

- 2.2.3 The date of sale, receipt and opening of the sealed technical-cum-commercial bids will be notified to all such tenderers in advance. The technical-cum-commercial part will have to be submitted by the tenderers complete with the following:
- Complete tender documents (Part-I), as purchased from AIIMS or downloaded from website including the schedule of work (without indicating the price) duly signed in token of acceptance of all terms and conditions along with Part-II (Price Bid). Prices should be indicated/filled only in "Price Bid" part and should be placed in separate sealed envelope clearly superscribed "Price-Bid". The tenderers will have to fill up their rates only in the price bid issued by the department. Tenders in which the price bids are given in any other format are liable to be rejected. The abstract of cost will be required to be filled in.
- Complete technical particulars of all equipment & materials as per list attached.
- 2.2.4 The tenderers are advised not to deviate from the technical specifications/ items, commercial terms and conditions of NIT like terms of payment, guarantee, arbitration clause, escalation etc.
- 2.2.5 The Part-I of the tender documents i.e. Technical-cum-Commercial bid only, shall be opened on the due date and time, as specified in form CPWD-6 in the presence of tenderers or their authorised representatives.
- 2.2.6 Scrutiny/ evaluation of the Technical-cum-commercial bid shall be done by the department in consultation with any agency as deemed necessary. In case it is found that the technical-cum-commercial bid of a tenderer is not in line with NIT specifications, requirements and/or contains many deviations, the department reserves the right to reject the technical bid of such firm(s) without making any reference to the tenderer(s).
- 2.2.7 Necessary clarifications required by the department shall have to be furnished by the tenderer within the time given by the department for the same. The tenderer will have to depute his representative to discuss with the officer(s) of the department as and when so desired. In case, in the opinion of the department a tenderer is taking undue long time in furnishing the desired clarifications, his bid will be rejected without making any reference.
- 2.2.8 After obtaining clarifications from all the tenderers, the department may modify the technical & commercial conditions/ specifications if required, and will intimate the same to the tenderers, whose technical-cum-commercial bids are acceptable. At the same time, date and time of opening of price-bid will also be intimated. A tenderer will also not be allowed to withdraw or modify any condition at a time after the technical bids have been accepted and the decision to open the price bid has been taken by the department unless revised bid is allowed due to measure changes made during negotiations on technical-bid.
- 2.2.9 The Part II of the tender i.e. price bid of technically qualified bidders will be opened by the Executive Engineer (E) in the presence of the interested representatives of the tenderers who wish to be present.
- 2.2.10 The department reserves the right to reject any or all the price bids and call for fresh prices/ tenders as the case may be without assigning any reason.
- 2.2.11 *Validity*
- Tenders shall be valid for acceptance for a period as prescribed in CPWD-6 from the date of opening of price bid.
- 2.2.12 *Completion of period*
- The completion period indicated in the tender documents is for the entire work of planning, designing, supplying, installation, testing, commissioning and handing over of the entire job to the satisfaction of the Engineer-in-charge.

Note :- NIT approving authority shall modify above Commercial conditions as per up-to-date guidelines issued for e-tendering by the department.

TECHNICAL SPECIFICATIONS

The work shall be carried out as per latest CPWD General Specifications for DG Set Works and as amended upto date along with the following changes, CPWD General Specifications for Electrical Works Part-I, II & IV, as amended upto date, relevant IE rules, and as per directions of Engineer- in-Charge. For electrical panels, CPWD General Specifications for Electrical Works Part-IV shall be applicable.

Note: Any deviations from CPWD General Specifications for DG Set Works, may be given by the NIT approving authority. In case there is no deviation, no deviations should be mentioned below this note.

ANNEXURE 'A'

SCHEDULE OF TECHNICAL PARTICULARS

Sl. No.

- I. Engine
 1. Make
 2. Model/ISS reference
 3. No. of cylinders
 4. Rated R.P.M.
 5. Method of Starting
 6. Aspiration Method
 7. BHP
 8. Specific Fuel oil consumption (gm/BHP/hr.)
 9. Lub. Oil recommended
 10. Lub. Oil pressure
 11. Qty. of lub. oil required
 12. Time required for starting
 13. Lub. oil sump capacity
 14. Nos. of exhaust pipe required.

15. Dia. of exhaust pipe
16. Whether meets CPCB norms for Emission
17. Fuel Consumption at full load
18. Any other data.

II. Alternator

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

III. General:

1. Overall Length of DG set L x W x H
2. Overall Weight of DG set
3. Noise Level of DG Set at one Metre with
Acoustic Enclosure

IV. AMF Panels

1. Make
2. Type (Floor/Wall mounted)
3. Overall dimensions (L x B x H)
4. Finish

V. Generator Control Panel:

1. Make

VI. Acoustic Enclosure:

1. Make
2. Size
3. Details of Acoustic lining Material & Make

Note: - Above mentioned schedule of technical particulars shall be filled and submitted in hard copy along with technical bid and tender documents.

ANNEXURE 'B'**LIST OF TECHNICAL LITERATURE & CATALOGUE AND ANY OTHER INFORMATION**

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

<i>Sl. No.</i>	<i>Data / Information</i>	<i>Remarks</i>
1.	Technical submittal/ literature	
2.		
3.		

Date:

Signature of Tenderer

LIST OF ACCEPTABLE MAKES

1. ENGINE	: CUMMINS / CATERPILLAR / MTU / PERKINS
2. ALTERNATOR	: STAMFORD/LEROYSONER DPS/KIRLOSKAR
3. NGR Panel	: Reputed Manufactures
4. HT Isolators	: Pentagon/Essen/Crompton
5. CTs & PT	: Kappa/Kalpa/Instrans
6. PBs & Lamps (LED)	: BCD/RASS
7. MCBs	: MDS/HPL/ABB/Indokopp
8. Local Remote Switch	: Kaycee/Switron
9. Terminals	: Connectwell
10. HT CABLE	: Universal/CCI/Gloster/Polycab/havels
11. LT CABLE	: Universal/Polycab/Nicco/Gemscab /havels
12. Measuring instruments Digital	: Konzerv/IMP/AE/Consol/Cadel
13. Energy meter (Sealable type)	: Konzerv/AE/IMP/Meco/Consol/L&T
14. Power contactors	: ABB/Telemecanique/L&T/Crompton
15. Current transformer	: Kappa/Kalpa/Cortina/Indcoil
16. Overload relays/Timers	: L&T/ABB/Telemecanique
17. Indication lamps/Pushbuttons :	: LED star/Vaishnav
18. Line Voltage monitor	: Minilec (VMR).
19. Three attempt starter	: PIC or eqt.
20. Low fuel sensor	: PIC or eqt.
21. Control relays	: L&T/Ariva
22. Selector switches :	: Kaycee/L&T.
23. DC hooter with audible control	: Vaishnav
24. Control wire	: Finolex - FRLS
25. MCB	: MDS/Merlengerin/ABB/Siemens
26. Phase reversal protection	: Minilec (VMR)
27. 11 KV HT VCB	: ABB/Siemens/Schneider/MEI
28. Panel appd.)	: Shalabh , Advance , Adlec (CPRI
29. Numerical Relay	: L&T/Ariva
30. Digital Meters	: Konzerv/AE/ICD/Elecon/IMP/Cadel
31. Trivector Meter	: L&T/Konzerv/ICD
32. Indicating Lamps	: Tecknic/L&T
33. Selector Switches	: Kaycee/L & T
34. DC Hooter with audible control	: Vaishnav
35. Control Wiring	: Finolex/Polycab/RR
36. MCB	: MDS/Merlengerin/ABB/Siemens
37. Power contactors	: ABB/Telemecanique/L&T
38. Terminals	: Connectwell
39. Auto Synch & Auto Load Relay	: Woodward/DIEF
40. Glass wool	: Twaiga / Lloyd / eqt.
41. Fresh air / Exhaust fan	: GEC / Almonard / Nadi
42. Bus Trunking	: C&S , Advance

APPENDIX V

LIST OF RELEVANT INDIAN / INTERNATIONAL STANDARDS

(A) Generating Set		
ISO 8528	Part - I	Application, rating and performances.
	Part - II	Engines
	Part - III	A.C. Generator for generating set
	Part - IV	Control gear & switch gear
	Part - V	Generating Sets
	Part - VI	Test methods
	Part - VII	Technical declaration for specification and design
	Part - VIII	Low power general purpose generating sets
	Part - IX	Measurement and evaluation of mechanical vibration
	Part - X	Measurement of Airborne Noise - Enveloping surface method
	Part - XI	Security generating sets with uninterruptible power system
(B) Engines		
IS 10000 (Naturally Aspirated)	Part - I 1980	Methods of tests for I.C. Engines Part - I - Glossary of terms relating of test method
	Part - II 1980	Standard reference condition
	Part - III 1980	Measurements for testing units and limits of accuracy.
	Part - IV 1980	Declaration of Power, Efficiency, fuel consumption, lubricating oil consumption.
	Part - V	Preparation for tests and measurement of wear

	Part - VI	Recording of test results.
	Part - VII	Governing test for constant speed engines and selection of engines for use with electrical generators.
	Part - VIII	Performance tests
	Part - IX	Endurance test
	Part - X	Tests for smoke level, limit and correction for smoke level for variable speed.
	Part - XI	Information to be supplied by the purchaser to the manufacturer and information to be supplied by the manufacturer alongwith the engine.
	Part - XII	Specimen test certificates
	Part - XIII	Recommendations on nature of tests required for functional changes in critical components.
BS 5514	Part 5 - 1979	Reciprocating Internal Combustion engines,
ISO-3046	Part V 2001	Performance, torsional vibrations.
	Part - I 2002	Declaration of powers, fuel and lubrication oil consumption and test methods.
	Part - 3 - 1989	Test measurement
	Part - 4 - 1997	Speed Governing
	Part - 6 - 1990	Overspeed protection.
BS 649		Reciprocating Internal Combustion engines, performance, torsional vibrations.
(C) Alternator		
IS 4889/BS - 269		For declaring efficiency of electrical machines.
IS 4722 - 1992		Capability of machine to withstand over current/overload.
IS – 13364	Part I 1992	Alternator - Voltage Regulation upto 20 KVA

IS – 13364	Part II 1992	Alternator - Voltage Regulation above 20 KVA to 80 KVA
IEC 34 -1 - 1983		Rotating Electrical machines - Rating & Performance
IP – 21	IS - 4691/85	Alternator (Degree of Protection)
(D) Acoustic Enclosure		
IS – 8183		Insulation material for sound absorption.
ISO 3744	1998 (E)	Acoustics - Determination of sound power levels of noise sources.
ISO 8528	Part - 10 1998 (E)	Measurement of Air borne noise by enveloping surface method.
ISO 9614 -	1993 Part - I	Requirement of grade - II. Accuracy for insulation.
ISO 9614 -	1996 Part - II	Requirement of grade - II. Accuracy for insulation.
(E) Control Panel/ AMF Panel		
IS -2147 1962		Degree of protection.
IS – 4722		H.V. testing for panel

APPENDIX VII

TESTING OF DG SET AT OEM WORKS

S. No.	Description of the Item	Details
1.	Name of the work	
2.	Name of the Agency	
3.	Name of the OEM	
4.	Address of OEM	
5.	Mean height from Sea Level (a) of site (b) of OEM works	
6.	Max. Ambient Temperature (a) at site (b) at OEM Works	
7.	Relative Humidity (a) (b)	
8.	Make, model & capacity of engine (a) Requirement of de-rating/ up-rating of engine of DG set and alernator	
9.	Make, model & capacity of the alternator	
10.	De-rating/up-rating capacity of the alternator at OEM works	
11.	Theoretical full load current in amperes at power factor of testing load	

12.	Test Results on various parameters		Voltage	Power Factor	Frequency	Engine Oil pressure	Radiator Water Temp.	Test	Current in	Amp	Any other observation during testing of DG set
		1st Hr.						R	Y	B	
		2nd Hr.									
		3rd Hr.									
		4th Hr.									
		5th Hr.									
		6th Hr.									
		7th Hr.									
		8th Hr.									
		9th Hr.									
		10th Hr.									
		11th Hr.									
		12th Hr.									
13.	Balancing of DG Set										
14.	Battries used (make, AH rating & Capacity)	Satisfactory/Not satisfactory									
15.	Fuel tank capacity										
16.	If accoustic enclosure is provided db75 level at 1.0 mt. distance from DG set										
17.	Accoustic enclosure specification	As per Agreement or NOT									
18	AMF panel	As per Agreement or NOT									

Deptt. Officer's Signature

Contractor's Signature

Signature of OEM's Engineer

Important Note :-

DG Set critical technical data sheet is mandatory to be filled-in with by the bidders with all relevant details and shall be submitted along with bid in hard copy.

DATA SHEET FOR ENGINE & ALTERNATOR

S.No.	DESCRIPTION			Details to be furnished by bidders
	ENGINE			
1	Applicable standard ISO 8528 Chapter 1,ISO 3046 Chapter 1,BS 5000	BS/IS		
2	Engine Make			
3	Engine Model			
4	Duty			
5	Rated capacity	KVA		
6	Design Temp.	Deg C		
7	Engine RPM			
8	Engine configuration, Bore x stroke	mm		
9	Piston Speed	M/sec		
10	Compression ratio			
11	Displacement	Ltrs		
12	Single step block load capability	% of prime		
13	Stroke/ No of Cylinder			
14	Aspiration and cooling			
15	Governor type			
16	Flywheel			
17	Coupling			
18	Fuel Pump			
19	Fuel Filter type			
20	Lube Oil Filter type			
21	Silencer			
22	Method of starting			
23	Radiator Fan power	BHP		
24	Standard Radiator arrangement data :			
	Air flow (Max.@ rated speed)Air flow restriction (after radiator)	m ³ /min		
25	Battery make, type & rating			
	Exhaust system			

26	Heat rejection to Coolant (Total)	Kcal/hr		
i)	Heat rejected to exhaust	Kcal/hr		
ii)	Exhaust temp.	Deg. C		
lii)	Exhaust gas flow rate	m ³ /min		
iv)	Heat rejected from Engine to	Kcal/hr		
	Atm.			
v)	System back pressure (Max. allowable)	mm of H ₂ O		
27	Exhaust flange size	mm		
	Cooling System			
28	Engine coolant capacity with radiator	Liters		
29	Coolant pump external resistance	M water		
30	Coolant pump flow at max. allowable resistance	Ltrs/min		
	ALTERNATOR			
31	Alternator Make			
32	Alternator Model			
33	Efficiency of alternator at full load and 0.8 pf	%		
34	Rated Voltage, variation			
35	Rated Frequency, variations			
36	Power factor			
37	Excitation type			
38	AVR type			
39	Regulation			
40	Protection Degree	IP		
41	Insulation class/Temp. rise	H class with temp. rise to that of class H		
42	Bearing type			
43	Direct axis reactance			
44	Direct axis transient reactance			
45	Direct axis subtransient reactance			
	Performance			
46	Specific fuel consumption	Ltrs/bhp-hr.		

47	Fuel Consumption	Liters/hr.	At 100% Load :	
			At 75% Load :	
			At 50% Load :	
48	Energy output		___ KWH/Liter of fuel	
49	Permissible overload and duration		10% for 1 Hr in any 12 Hrs operation	
50	DG set Loading pattern (No load to full load)	Seconds	Within _____ seconds	
	LUBE OIL SYSTEM			
51	Lube Oil Sump capacity	Lit		
	Dimensions and weight(approx.)			
52	Engine Dimension	mxmxm		
53	Engine weight	kg		
54	Alternator Dimension	mxmxm		
55	Alternator weight	kg		
56	Overall weight	kg		
57	Overall dimension	LxWxH		

1. The control cabling of reputed / approved make from the DG set to the control panel as may be required shall be carried out by the supplier.

2. The warrantee for the DG set shall be for two year from the date of successful commissioning or 24 months from the date of dispatch whichever is earlier. The warrantee shall cover all the components including electrical /electronics and rubber parts. During first year the supplier shall provide 5 free services plus any number break down calls.

The system shall be designed, supplied and executed in accordance with prevailing and applicable

- Bureu of Indian Standards
- Indian Electricity Rules
- Indian Electricity Act
- Fire Insurance Regulations
- Indian Factory Act
- State Statutory Requirement

and any other applicable Indian Act. Wherever Indian standards are not available / applicable, the contractor shall follow international standards, In case of non-availability /applicability of both the standards mentioned above, Din British or American standards shall be used.

The supplier shall be responsible for arranging approval from various central and state statutory authorities viz. electrical inspectorate etc. for the entire execution carried out by them on behalf

of the purchase / owner .submission of filled-in application and pro-forma furnishing all the necessary details, drawing test reports to the appropriate authorities shall be the responsibility of the supplier. Copy of any documents related to site / plant like approved site plan shall be provided by supplier, approved SLD of plant's Electrical system, plant's overall pollution NOC etc. if require by supplier and the actual prescribed statutory fees shall, however, be reimbursed by the purchaser on production of money-receipt.

Installation, testing and commissioning:

The DG set along with control panel shall be installed, tested and commissioned by the supplier to the entire satisfaction of the Engineer-in-Charge. **The supplier shall demonstrate the performance of the set as detailed in the specification for two shifts of 8 hours each for a minimum period of THREE days.** Necessary log sheets are to be maintained for the performance period and shall be jointly signed by the representative of supplier and the project authority/client. In case of non-performance of any of the component / parts of the system the entire performance test shall be re-done.

Training:

During testing and commissioning of the set, the supplier shall provide necessary training to the operators on operation and maintenance of the set.

FUEL HANDLING SYSTEM DAY TANK (990 L Capacity)

The design and construction of the tank shall comply with:

- IS: 10987:1992 and the other complimentary and reference standards stated there in.
- Rules and Regulations of the Chief Inspector of Explosives
- India Petroleum Rules 1956.

All site welding shall be carried out by fusion welding. For all butt welds, the root run and final run shall be carried out.

The HSD tanks shall be of min 3 mm thick M S construction, horizontal, cylindrical in shape with plain ends and shall be suitable for storage of fuel upto a maximum temperature of 50 Deg C at atmospheric pressure. Tanks shall be painted externally to prevent corrosion and shall have a reflecting surface. The external surface of the storage tanks shall be cleaved to remove rust, scale, etc. and apply two coat of zinc chromate anti-rust primer followed by two coats of finishing paint - epoxy paint.

The tank shall be designed for a pressure of 0.05 MPA when full of water. Minimum corrosion allowance of 1.5 mm shall be considered. The design temperature shall be the lowest one-day mean temperature where the tank is to be installed.

The following accessories shall be part of the tank:

- Filling point and Drain off point
- Dip Connection
- Vent pipe
- Over flow pipe
- Drain-pipe
- Continuous Level gauge with dial type indicator on top of the tank.

- 550 mm dia manhole with cover and locking arrangement.
- High /Low level sensors
- Lifting lugs
- Painting with Anti corrosive treatment.
- Spill tray to be located below the tank and all around it
- Metal Support structure, wear plates, stiffeners etc

PIPING

All fuel piping shall be minimum 25mm dia M.S Class B and as per IS: 1978 and IS: 2062. All fittings shall be of heavy duty. Flanges shall conform to ASA-Class 150 weld neck. The piping shall generally be installed in already prepared under ground trenches with fixing hardware as required.

FREE STANDING CHIMNEY

Total Gas flow from 2 x 2250 KVA – 1 Set : To be confirmed by vendor.

Temp - deg C : To be confirmed by vendor.

Chimney material : IS 2062

Design code : IS 6533

Wind Load : as per IS 875 (Part 3)-1987

Earth Quake stability : as per IS 1893 – 2002

Foundation to be designed : To withstand wind load and earthquake

Painting : Anti corrosive black painting shall be carried out on the
Inner surface of the chimney. Shall confirm to IS 158 – 1968.

Note: The exhaust from the Generators shall be directly exhausted to atmosphere without any treatment. This requirement shall meet the norms of State Pollution Control Board.

17. INSPECTION OF SITE :

The bidder to inspect and examine the site and its surrounding and shall satisfy as to the nature of the ground and sub soil, the quantities and nature of work, materials necessary for completion of the work and their availability, means of access to site and in general to obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect his offer. No extra claim consequent on any misunderstanding or otherwise shall be allowed.

19 MAKES

- In general make of various items shall be as per the list enclosed. Wherever makes have not been indicated in the list, the items shall be of ISI marked subject to approval by AIIMS Rishikesh Engineer in Charge .
- Sample of the items or makes or the items for manufacture/ supply/ use in the work irrespective of appearing in the approved list shall be got approved from Engineer- in-charge before incorporation.

20 NEW MATERIALS:

All equipment, materials used in the work shall be brand new and free from manufacturing defects.

21. REPLACEMENT OF DEFECTIVE/ DAMAGED ITEMS

All defective/damaged items shall be replaced with the good ones without any extra cost as per guarantee clause.

22. **TOOLS & TACKLES:**

- All the required special tools & tackles for executing this work shall be in the scope of the vendor

23. **MAN POWER:**

- Authorized, experienced, competent work force shall be deployed with competent supervision.
- They should possess requisite qualifications/ valid permits/ license/ competency certificates to work on LT Electrical Installations.
- The Electrical Engineer shall have minimum qualification of degree in electrical engineering. Where as Electrical Supervisor shall have minimum qualification of diploma in electrical engineering and technicians shall have minimum ITI.

24 QUALITY OF WORK & WORKMANSHIP:

The quality of work, workmanship, finishing etc should be satisfactory to the AIIMS Rishikesh.

25 PRIOR APPROVAL FOR DISPATCH SCHEDULE:

Dispatch schedules are to be informed and got approved by the vendor from Engineer in charge, before dispatch of materials.(2 persons)

27 **PACKING/ TRANSPORTATION/ HANDLING :**

- Professional packing shall be made. Equipment/ materials are to be properly packed with appropriate packing materials & means. Special care shall be taken for fragile items. Item description, qty, code, instructions etc to be marked for easy identification etc. The equipment/ materials have to be transported by appropriate transport mode like Road/ Rail/ Air transport etc. up to the site/ destination.
- Due care to be taken for loading, handling, unloading, shifting, lifting, jacking etc by suitable means like Cranes, Fork lifts, Chain pulley blocks, mechanized means etc. and experienced man power.
- Relevant documents shall be accompanied with the items.

29 TOOLS & TACKLES:

Wherever special tools & tackles are required for operation & maintenance of units/systems, the contractor supplying the equipment shall provide the same free of cost.

30 STATUTORY LAWS/RULES/APPROVALS/LICENSE:

The contractor/agency shall abide by the relevant statutory rules, laws, and guidelines and arrange for the approvals, if any required. That include adhering to labour laws, abiding local electricity rules etc.

Where ever formal approvals/ license are essential like CEA approval, clearance by the Electrical inspectorate etc,. the same shall be arranged by the bidder

31 FEES FOR TESTING/CALIBRATION/APPROVALS/LICENSE:

Unless otherwise specified, the fees/charges involved for this purpose shall be borne by the bidder.

32 SITE TESTS/ PERFORMANCE TESTS:

Necessary site tests/ performance tests shall be conducted on the equipment to ascertain the functional / design/ site requirements. Reports shall be prepared recording the various values, parameters, observations, settings made etc. In case of unsatisfactory results, the same shall be replaced/ rectified as per the requirement without any extra cost.

33 HANDING OVER/ CERTIFIED DATE OF COMPLETION:

Up on the satisfactory commissioning of the entire system, the system shall be observed for 15 days. After this satisfactory trial period, the work shall be handed over officially and completion date recorded by Engineer-in-charge with all the prescribed formalities for handing over.

This date shall be reckoned, as the certified date of completion and the defects liability period shall commence from this date.

Until the handing over of the installation, the responsibility lies with the vendor for safety, upkeep etc.

TERMS AND CONDITIONS

1. The work shall be carried out strictly in accordance with CPWD specifications for electrical works Part-I Internal 2013 and 1995 (external) as amended upto date and in accordance with Indian Electricity Rules, 1956, Indian Electricity Act, 1910 as amended upto date and as per instructions of the Engineer-in-Charge including as below and nothing will be paid extra.
2. All materials to be used on this work by the contractor shall be got approved from the Engineer-in-Charge and deptt. Has right to inspect the material at manufacturers' place before installation at site.
3. The work shall be carried out according to approved drawings/details which shall be subsequently issued to the successful for execution of work and as per instructions of the Engineer-in-Charge who will have the right to change the layout as per requirement at site and the contractor shall not have any claim due to change in layout.
4. All damages done to the building, roads, pathways, floors, walls during execution of electrical work shall be the responsibility of the contractor and the same will be made good immediately at his own cost to the satisfaction of the Engineer-in-Charge. Any expenditure incurred by the department in this condition shall be recovered from the contractor and decision of the Engineer-in-Charge about recovery shall be final.
5. The bad workmanship will not be accepted and defects shall be rectified at contractor's cost of the satisfaction of the Engineer-in-Charge. The programme of electrical works are to be co-ordinated in accordance with the building work and no claim for idle labour will stipulated in the tender, electrical work shall have to be completed within 30 days of the completion of civil work.
6. All the debris of the electrical works should be removed and the site should be cleared by the contractor immediately after the accruing of debris. Similarly any rejected material should be immediately cleared off from the site by the contractor.
7. Issue of material to the contractor wherever stipulated, shall be according to the requirement at site from time to time depending upon the progress of work.
8. Cement for this bonafied work is to be arranged and used by the contractor himself and nothing extra will be paid on this account.
9. The contractor or his representative is bound to sign the site order book as and when required by the Engineer-in-Charge and to comply with the remarks therein.
10. The size of conduit and wiring shall be got approved from the Engineer-in-Charge before taking upto the execution.
11. The contractor shall make his own arrangement at his own cost for electrical/general tools and plants required for the work
12. Main board and main distribution board: The work shall be carried out according to the drawings/details as approved by the Engineer-in-Charge. The contractor shall have to get the samples approved before the whole lot is brought to site and it shall include all inter connections etc.
13. No Central/State sales tax/VAT/Contract tax/Excise duty etc. shall be separately paid by the department. The rates tendered should be inclusive all taxes and duties (exclusive of service tax) Deduction of contract tax at source shall be made while releasing payment through running/final bills as applicable . A certificate specifying the rate and amount of deduction shall however be issued. No Form-D, 31/32 (Road permit) shall be issued by the department. The road permit shall be arranged by the tenderer on his own.

14. The entire installation shall be at the risk and responsibility of the contractor until these are tested and handed over to the department. However if there is any delay in construction from the department side, the installation may be taken over in parts, but the decision on the same shall rest with Engineer-in-Charge which shall be binding on the contractor.
15. Notwithstanding the schedule of quantities, all items of interrelated works considered necessary to make the installation complete and operative are deemed to be included shall be provided by the contractor at no extra cost.
16. The connection, inter connection, earthing and inter earthing shall be done by the contractor wherever required and nothing extra shall be paid on this account.
17. Some of the items of work, if already executed: on that case the successful tenderer shall have to use these items for completing the work. For wiring, the existing conduit wherever required shall be used by the contractor. The recovery will be made for these items as accepted rate of other agencies.
- 18. Operation and comprehensive maintenance of DG sets for 2 years that is during warranty period of 2 years after successful handing over will be in scope of vendor. For this no extra cost payment shall be done. Suitable required manpower shall be engaged by successful bidder for 24x7x2 years (warranty period)**

Superintending Engineer ,
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TECHNICAL SPECIFICATIONS

1. All hardware items such as screws, thimbles, G.I. wires etc. which are essentially required for completing an item as per specifications will be deemed to be included in the item even when the same have not been specifically mentioned.
2. All hardware materials such as nuts/bolts/screws/washers etc. to be used in the work shall be zinc/cadmium plated iron.
3. Any conduit which is not be wired by the contractor shall be provided with GI fish wire for wiring by some other agency subsequently. Nothing extra shall be paid for the same.
4. While laying conduit, suitable junction boxes shall be left for pulling the wires.
5. Copper wire shall be FRLS PVC insulated multi-stranded conductor. Termination of multi-stranded conductors shall be done using crimping type thimbles at both the ends. Nothing extra shall be paid for the same.
6. The makes of material have been indicated in the list of acceptable makes. No other make will be acceptable. The material to be used in the work shall be got approved from the Engineer-in-Charge before its use at site. The Engineer-in-Charge shall reserve the right to instruct the contractor to remove the material which, in his opinion, is not as per specifications.
7. The proof of purchase in the form of Invoice/cash memo, of all the major components such as Cables, Wires, Fittings, MCB DB's, Geysers, Exhaust fans etc. shall have to be produced by the contractor at the time of final bill or as and when demanded by the deptt.
8. Test report of all the XLPE insulated PVC sheathed armoured power cables used at site of work shall have to be submitted by the contractor at the time of submission of final bill.
9. Where switches/sockets/telephone outlets are to be provided, the same shall be of only one make.
10. The MCB distribution boards shall be factory fabricated in the works of the manufacturer of the MCB's of any of the makes specified and the same shall be duly pre-wired in the works. The board shall be brought to site in ready for installation condition. The MCBs and the MCB distribution board shall be of the same make.
11. The earthing shall be carried out in the presence of the Engineer-in-Charge or his authorized representative.
12. All fittings/fans will be earthed as per specifications.
13. The Bus ducting will be ordered on the approved manufacturer. The manufacturer will prepare detailed working drawings to work out exact lengths and various accessories required for each rating of bus ducting. Bus ducting fabrication will start only after this exercise . All the erecting accessories required like brackets, bolts etc will supplied by themanufacturer. The erection testing and commissioning of the bus ducting will be done by themanufacturer with the help of the erection team/ supervisor / engineers.
14. The work will be executed as per CPWD specificatoins for Electrical works. Part VII DG Sets, as per latest amendemnt in case of contradiction between CPWD specifications and BOQ and its specificatoins, the latter will prevail.
15. Any item/ items left out of the BOQ but required for turnkey completion of the job will be executed without additional cost However quantity deviations with respect to BOQ items will be allowed as per site requiremnet
16. Multifunction meter (consisiting of Voltage, Current, Frequency, PF , kwh, kva parameter) with RS-485 port. EM 6400 or Equivalent.
17. Panel shall be suitable for 2x2250 KVA DG Set synchronization , complete with relays , timers , set of CTs for metering and protection and energy analyzer to indicate currents, phase and line voltages, frequency, power factor, KWH, KVARH, and provision for overload, short circuit, restricted earth fault, under frequency protection, control cabling from panel to diesel engine and elsewhere, if required, all complete and interlocking including the following:

- (i). 4000 amp 4 pole EDO ACB , 65 KA With O/C,/E/F release, microprocessor control.
- (ii) Auto/ Manual/ Test selector switch OVER volt/ under volt/ reverse power relays.
- (iii). CTs as required
- (iv). Energy Analyzer
- (v). Indicating lamps: for Load on mains or Load on DG set
- (vi). Fuse for instruments
- (vii). Battery charger with selector switch for trickle/ off/ boost and current adjustment
- (viii). Main supply failure monitor.
- ix. Supply failure timer.
- x. Restoration timer.
- xi. Control unit with three impulse automatic engine start/ stop and failure to start lock out.
- Xii. Impulse counter with locking and reset facility.
- xiii On/ off control circuit switch with indicator.
- xiv Audio/ Video annunciation for:- high water temperature
low lub oil pressure engine over speed engine fails to start
full load/ maximum load warning

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TECHNICAL SPECIFICATION OF CONTROL PANEL				
SWITCHBOARD: AUTO SYNC, AUTO LOAD SHARING PANEL SUITABLE FOR 2X2250KVA DG SETS				
GENERAL NOTES				
1	Sheet Material & thickness	CRCA Sheet, Load Bearing Member 2.0mm, Doors & Cover 1.6mm		
2	Horizontal & Vertical Bus -Bar	Alu.TPN		
3	Paint shade 7 Thickness	RAL 7035 (50 micron (Min))		
4	Partially type tested	IEC 60439		
5	Weight in KG (Approx.)	1500Kg.		
6	Cosntruction of Panel Type	Indoor	IP	52
7	Deimension in mm (Approx.)	H-2200	W-4000	D-1600
SN.	Description	Make	Qty.	Unit
A	DG INCOMER -2500KVA		2	
1	4000A 65KA FP EDO ACB with O/L, S/C, E/F with Microprocessor Based Protection Release	ABB- PR121 Reputed	1	No
2	Breaker Control Switch , 25A	Kaycee/ Reputed	1	No
3	Digital Multifunction Meter Acc CL - 1.0 RS-485	Conzerv/AE/Reputed	1	No
4	4000/5A Metering CT 15V A, Accuracy CL-1.0	Saviour/Matrix/Reputed	3	No
5	Indicating Light	C&S /Reputed	1	set
6	Push Button	C&S /Reputed	1	set
7	Auto / Manual Sel. Switch 3P, 3 way+ off	Kaycee/ Reputed	1	No
8	Emergency Stop Push Button (Stayput Type)	Schneider/ ABB	1	No
9	Cranking Relay, 2C/ O, 24 V DC, 16A	PLA/Reputed	1	Nos
10	Control MCB 10 KA C Type	C&S /Reputed	1	Set
11	Aux. Contractor 2 NO+ 2NC	C&S /Reputed	1	Set
12	Hooter, 96Sq.mm., Electronic Type, 24V DC	Reputed	1	No

13	4W Annunciator with T/A /R Push Button with Hooter contact, 24V DC	Minilec/ Reputed	1	No
14	Automatic Battery charge Trickle boost Single Phase IP 230 V AC, 18A OP 24 V DC with DC Ammeter , DC Voltmeter	Mahamai/Jakson	1	No
15	On Delay Timer, 0-10 Min. 24 V DC	EAPL	3	No
16	Terminal	Reputed	1	No
D	BUSCOUPLER		1	
1	4000A 65KA FP EDO ACB with O/L, S/C, E/F with Microprocessor Based Protection Release	ABB- PR121 Reputed	1	No
2	Breaker Control Switch , 25A	Kaycee/ Reputed	1	No
3	Indicating Light	C&S /Reputed	1	Set
4	Control MCB 10 KA C Type	C&S /Reputed	1	Set
5	Aux. Contractor 2 NO+ 2NC	C&S /Reputed	1	Set
F	Voltage Monitoring Relay, 415 V AC	Omron	1	No

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**PRICE SCHEDULE FOR SUPPLY & INSTALLATION OF 1 NOS OF 2250 KVA
DG SETS**

S.no	DESCRIPTION	UNIT	QTY	Rate	Amount
1	<p>Planning, Designing, Supply, Installing, Testing and Commissioning of 'Silent Type' Diesel Generating set alongwith having Prime Power Rating of 2250 KVA, 415 volts at 1500 RPM, 0.8 lagging power factor at 415 V suitable for 50 Hz, 3 phase system & for 0.85 Load Factor and consisting of the followings: A) Diesel engine:- Diesel engine 4 stroke radiator cooled, electric start, of suitable BHP at 1500 RPM suitable for above output of alternator at 50 Degree C, 95% RH & at 1000 Meter MSL and conforming to BS 5514, BS 649, IS 10000, capable of taking 10% over loading for one hour after 12 hours of continuous operation. The engine will be fitted complete with all the required accessories. B) Alternator : Synchronous alternator rated at 2250 KVA, 415 volts at 1500 RPM, 3 phase 50 Hz, AC supply with 0.8 lagging power factor at 50 Degree C, 95% RH & at 1000 Meter MSL. The alternator shall be having SPDP enclosure, brushless, continuous duty, self-excited and self-regulated through AVR conforming to IS: 4722/BS 2613 suitable for tropical conditions and with class- H insulation. (a) Fuel tank 990 Ltrs. (Outside Enclosure) (b) Batteries 7 Leads. c) AVM Pads (d) Silencer. (e) First fill of lube oil. (f) Radiator</p>	Set	1		
1.1	Supply and Installation of Acoustic Enclosure for 2250 KVA DG Set	Set	1		
1.2	PCC3.3 BASED AUTO SYNC, AUTO LOAD SHARING PANEL SUITABLE FOR 2X 2250 KVA DG SETS AS PER THE BOM (Technical specifications as per tender document)	Lot	1		
1.3	Load side terminal box	Set	1		
2	EXHAUST SYSTEM				

2.1	<p>Fabrication , Installation of Exhaust Pipe/ Chimney with MS pipe B class IS 3589 of suitable diameter as per DG Set manufacturers requirements including cost of pipes, supports, bends, flexible joints etc. Chimey height 30 meteres as per Local pollution control Authority requiremnt The pipe will be insulated with 75mm thick rockwool slabs (96 kg/ Cu. Meter density) and caldded with 24 swg aluminum sheet and stainless steel bellows.Supply of exhaust piping of following, sizes MS B Class exhaust pipes conforming to IS:3589 with welding joint including bends, clamps, dash fastener, flanges, nuts, bolts etc complete as required and as per specification detailed below.</p>				
a	12" dia. (300 mm NB), MS, 4.85 mm thick plate, Exhaust pipe	RM	12		
b	18" dia. (450 mm NB), MS, 5.0 mm thick plate , Exhaust pipe	RM	65		
2.2	Supply of 50 mm thick glass wool/ mineral wool, wire chicken mesh over insulation and 26 gauge aluminum sheet cladding over the following sizes exhaust pipes from silencer to atmosphere.				
a	12" dia. (300 mm NB), MS, 4.85 mm thick plate, Exhaust pipe	RM	12		
b	18" dia. (450 mm NB), MS, 5.0 mm thick plate , Exhaust pipe	RM	65		
2.3	Supply and installation of Aluminum cladding for residential silencers with Mineral wool 50mm Thick, density 64kg/cu. Mtr., wire mesh and 24 gauge aluminum cladding	No.	2		
2.4	Supply and instalation of SS Flexible Bellows, 18" dia. (450 mm NB), complete with counter flanges, heat resistant gaskets, nuts-bolts-washers etc. , complete as rquired	No.	2		
2.5	Supply and installation of MS Support Structure The MS Structure will be duly coated with two coats of red-oxide primer and two coats of enamel paint. The colour shade of final paint will be as decided by the client.	Kg	9000		

2.6	Supply and installation of Lightning Arrestors Non Seamer Type with GI Strip upto Earth Pit	No.	1		
2.7	Supply and installation of Aviation light with UPS and Cable upto light	No.	1		
3	CONTROL CABLES				
1	Supply 7 Laying of Power & Control Cables				
a	24CX2.5 Sqmm CU armoured Control Cable.	Mtrs.	60		
b	4CX2.5 Sqmm CU armoured Control Cable.	Mtrs.	60		
c	2Cx 2.5 Sqmm CU armoured Control Cable.	Mtrs.	60		
d	2Cx 4 Sqmm CU armoured Control Cable.	Mtrs.	60		
e	8Cx0.75 Sqmm	Mtrs.	60		
2	Providing 7 Fixing of Cables End Termination for following size of cables.				
a	24CX2.5 Sqmm CU armoured Control Cable.	Nos.	2		
b	4CX2.5 Sqmm CU armoured Control Cable.	Nos.	2		
c	2Cx 2.5 Sqmm CU armoured Control Cable.	Nos.	2		
d	2Cx 4 Sqmm CU armoured Control Cable.	Nos.	2		
e	8Cx0.75 Sqmm	Nos.	2		
4	FUEL PIPING				
4.1	Supply and Installation of MS Class C Pipe 50 mm (Considering DG set to be placed at distance of 12 mtr)	Mtrs.	60		
4.2	Supply and fixing of set of Fuel Pipe fittings like bends, flanges, valves, tee, elbows etc.	Lot	2		
4.3	Supply and Installation of MS Class C Pipe 80 mm (Considering Day tank of DG set to be placed at a distance of 20 mtr from main existing fuel line)	Mtrs	25		
4.4	Supply and fixing of CS Ball valve of 80 mm dia.	Nos.	1		
4.5	Supply and installation of 1 No. of buffer tank of 990 ltrs & 1 No of over flow tank of 990 ltrs	Set	1		
5	EARTHING				

a	Earthing with copper earth plate 600 mm X 600 mm x 3 mm thick including accessories and providing masonry enclosure with cover palte having locking arrangement and watering pipe of 2.7 meter long etc. with charcoal/ coke and salt as required.	Nos	2		
b	Earthing with GI earth plate 600 mm X 6 mm thick including accessories and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 meter long etc. with charcoal/ coke and salt as required.	Nos	2		
c	Supply, Installation of following bare strips including all necessary fixing accessories and effecting connections as per specifications.				
i	Cu Flat size 50 X 6 mm	Mtrs.	25		
ii	GI MS flat size 50x6 mm	Mtrs.	25		
6	BUS DUCT				
	Sandwich Busduct				
	Supply of C&S Make Sandwich 4 pole bus trunking (3 Ph 4 W system) of Aluminium busbars with 50 % integral G. I. housing earth, Bus Trunking enclosure shall be made of 1.6mm thick G.I., IP55 for Indoor application, multi layer insultaion of Class-F , Temperature rise as per IEC 60439-I & 60439-2 runs of external Aluminium earthing of size 50X 6mm				
6.1	5000A Indoor type (IP68) (Straight Length) (Aluminium Busbar)	Mtrs.	120		
6.2	Vertical / Horizontal Bend	Nos	10		
6.3	Flange End with Adoptor Box	Nos	10		
6.4	Copper Flexible (at One End)	Set	4		
6.5	Supply and installation of MS Support for Bus duct	Kg.	8000		
7	Misc Items				
7.1	Load testing of assembled DG Set at our manufactures works for load trial of 12 Hours	Job	1		
7.2	Civil Foundation of two DG set	Job	1		
7.3	Civil Foundation of Syn Panel	Job	1		
7.4	Civil Foundation of MS support Structure	Job	1		
7.5	CEIG Approval for 2x 2250 KVA DG set	Job	1		
7.6	Cosntuction power for erection & commissioning for	Month	1		

	DG set				
7.7	First fill up of 990 Ltrs day tank	Job	1		
	TOTAL				