NOTICE INVITING TENDER

BHEL/ SBD (A Govt. of India Enterprise) invites tenders for **Operation and Maintenance works of 100 MW floating Solar PV Power Project at NTPC Ramagundem, Telangana.**

E-procurement Tender ID: WCC-ASR-202223-002

For all clarifications/ issues related to the tender, please contact:

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Prof CNR Rao Circle, IISc Post, Malleswaram, Bangalore- 560 012
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(ii) Technical:

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PART – A

TENDER DOCUMENT

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1.	**GENERAL INFORMATION**	
1.1.	Tender Reference Number	**WCC-ASR-202122-002**
1.2.	Tender Name:	**Operation and Maintenance works of 100 MW floating Solar PV Power Project at NTPC Ramagundam, Telangana for thirty-six (36) months**
1.3.	Tender System	Single Stage, Two Part Bid
1.4.	Tender Type	O&M Works Contract
1.5.	Duration of Contract	Thirty-six (36) months from date of work order
1.6.	Qualifying Requirement	As per NIT Terms & Conditions
1.7.	Earnest Money Deposit to accompany Tender	**Rs. 10,00,000/-** in the form of a crossed Demand Draft/EFT/BG favoring BHEL-SBD, Bengaluru. If submitted through DD, the DD in original should reach to the office of undersigned within seven (07) days of Part A bid opening. **EXEMPTION FOR MSEs / NSIC Registered bidders is NOT applicable for this tender.**
1.8.	Security Deposit	5% of the contract value (excluding GST). Bidder agrees to submit performance security required for execution of the contract within the time period mentioned. In case of delay in submission of performance security, enhanced performance security which would include interest (SBI rate + 6%) for the delayed period, shall be submitted by the bidder. Further, if performance security is not submitted till such time the first bill becomes due, the amount of performance security due shall be recovered as per terms defined in NIT / contract, from the bills along with due interest.
1.9.	Cost of tender documents	NIL
1.10.	Issue of tender documents	As per Enquiry / RFQ / Notification on www.bhel.com & https://eprocurebhel.co.in
1.11.	Pre- BID Meeting	As per Enquiry / RFQ / Notification on www.bhel.com & https://eprocurebhel.co.in
1.12.	Last date for Issue of tender documents	As per Enquiry / RFQ / Notification on www.bhel.com & https://eprocurebhel.co.in
1.13.	Last date for submission of tender doc	As per Enquiry / RFQ / Notification on www.bhel.com & https://eprocurebhel.co.in
1.14.	Date and time of opening of Tender (Part-A)	As per Enquiry / RFQ / Notification on www.bhel.com & https://eprocurebhel.co.in
1.15.	Tender Submission Place	Online at https://eprocurebhel.co.in
1.16.	Tender Opening Place	Online at https://eprocurebhel.co.in
1.17.	Dealing Officer (For any Clarifications)	**Commercial:** Mr. Arjun S Raj, Deputy Manager / Works Contracts Cell, BHEL-SBD, Prof CNR Rao Circle, IISc Post, Malleswaram, Bangalore- 560 012 E-MAIL: arjun.raj@bhel.in Ph. No. +91-080-22182344

		Or Mr. Pradip C Baro, Senior Deputy Gen. Manager / Works Contract Cell, BHEL-SBD, Prof CNR Rao Circle, IISc Post, Malleswaram, Bangalore- 560 012 E-MAIL: pradipcbaro@bhel.in Ph. No. +91-080-22182142 **Technical:** Mr. Kapil Kumar Verma, Senior Engineer / PV O&M, BHEL-SBD BHEL-SBD, Prof CNR Rao Circle, IISc Post, Malleswaram, Bangalore- 560 012 E-MAIL: kapilverma@bhel.in Ph. No. +91-080-22182332
1.18.	Reverse Auction	"BHEL shall be resorting to Reverse Auction (RA) (Guidelines as available on www.bhel.com) for this tender. RA shall be conducted among the techno commercially qualified bidders. Price bids of all techno-commercially qualified bidders shall be opened and same shall be considered for RA. In case any bidder(s) do(es) not participate in online Reverse Auction, their sealed envelope price bid along with applicable loading, if any, shall be considered for ranking."
1.19.	Offer validity	Ninety (90) days from the date of bid opening.

	Specifications	Bidder confirmation (Complied / not complied) Bidder to also mention whether documentary evidence, wherever required, is submitted along with the offer.
2.	**INSTRUCTIONS TO BIDDER**	
2.1.	Tender is a two part bid system. The tender documents consist of Part - A and Part - B as detailed below: a. Part 'A': **Techno-commercial Bid** duly sealed and signed to be submitted in sealed cover enabling us to open on tender due date. b. Part 'B': **Price Bid** to be submitted in sealed cover as per Tender conditions.	
2.2.	Envelope 1: Techno-Commercial Offer a. Documents to be uploaded in Envelope 1: i. Earnest Money Deposit (EMD) either in the form of DD or UTR Number (if paid through EFT) at the space provided. Part 'A': i. Duly completed tender documents signed and sealed. ii. Each and every page of tender documents should be signed and sealed. iii. Documents satisfying PQR/Eligibility Criteria as per relevant clause of NIT. iv. Any other documents as per Tender requirements. The tenderer shall not indicate the price or rate in the PART-A Envelope 2: Part 'B': Online Price-Bid. i. To be submitted online.	
2.3.	The tenderer shall expressly accept all the terms and conditions of the Tender. The tender which does not comply with the BHEL's Terms & Conditions may be rejected as Non-responsive/non-conforming and non-acceptable.	
2.4.	The techno-commercial offer will be opened on the due date mentioned above. The tenders meeting our techno-commercial requirements will be considered for online initial sealed bid auction at a later date for which eligible vendors will be intimated in due course.	
2.5.	The tender documents, both **Parts 'A' & 'B', duly filled in all respects shall be signed on each page by the tenderer**. Any alteration, erasing will render the tender invalid. Corrections, over writing, cutting(s) etc. are not permitted. All entries in the tender document should be in one ink. All the columns in the tender form should be filled without leaving any column blank in any page of the tender. In case any of the relevant columns are left blank, the tender can be rejected. However, alteration neatly carried out and duly attested over with the full signature of the tenderer is permitted.	

2.6.	The tenderer should submit the tender documents intact without detaching any page or pages.	
2.7.	Before making the offer, the bidders are advised to carefully go through the terms and conditions, which form part of the Agreement.	
2.8.	**Submission of tender documents:** Bidders to submit tenders only through NIC portal - https://eprocurebhel.co.in	
2.9.	BHEL reserves the right to assess the capacity and capability of the parties for pre-qualification. The company also reserves the right to accept or reject any or all the tenders or any part thereof at any stage of process without assigning any reason whatsoever. The company has no obligation to accept the lowest tender. Offer of the Tenderer if prima-facie found not comparable with the quantum of work envisaged and the bid is a desperate effort to be L1, then the offer is liable to be rejected. BHEL's decision in this regard shall be final and binding.	
2.10.	BHEL reserves the right to reject any bid, which is technically unacceptable and unworkable. Further BHEL also reserves the right to reject any or all tenders without assigning any reasons thereof.	
2.11.	BHEL reserves the right to cancel the contract at the initial stage or during the contract period without assigning any reason to the tenderer.	
2.12.	If a tenderer deliberately gives wrong information in his tender or creates conditions favorable for the acceptance of his tender, then BHEL reserves the right to reject such tender at any stage.	
2.13.	If the tenderer indulges in any unethical practice for securing the contract, the offer of such tenderer shall be rejected.	
2.14.	The opinion / decision of BHEL regarding the bid shall be final and conclusive.	
2.15.	In case the bidder has a relative employed in BHEL, the authority inviting tender shall be informed of this fact in writing at the time of submission of tender, failing which the tender may be disqualified, or if such fact comes to light subsequently, the contract may be terminated.	
2.16.	Any written communication required to be sent to the contractor in writing shall be sent at the address mentioned on the tender form or to any other address subsequently intimated by contractor in writing to BHEL SBD for the contract purposes.	
2.17.	Wherever prescribed formats are specified for the tenderers use, he shall use the same for making his claims.	
2.18.	**Techno-Commercial Bid & PQR**: The techno-commercial bid & PQR will be evaluated based on the eligibility criteria and on acceptance of NIT terms and conditions of BHEL. Only qualified bids will be eligible for price-bid opening.	
2.19.	**PRICE BID –** Tenderers are required to submit their quotation for all items listed in Price bid format given along with the tender documents. The price should be quoted for each activity after careful study of the actual job requirements so that, in case the contract is awarded, contractor should not express any difficulties in execution of the contract.	
2.20.	Rates should be quoted in Indian Rupees and Paisa only.	
2.21.	**Evaluation of Price-Bids:** i. Evaluation of the L-1 offer shall be computed on overall lowest cost to BHEL basis (Grand Total Price for all the items indicated in Price Bid minus tax credit, if, any)	

	ii. Evaluation of this tender will be done on total package basis. Splitting of this tender is not applicable.	
3.	**EARNEST MONEY DEPOSIT (EMD)**	
3.1.	Earnest Money Deposit (EMD) is to be paid by tenderers for securing fulfilment of any obligations in terms of the NIT. Earnest Money Deposit as indicated in the NIT (Ref. General Information) is to be submitted along with tender documents Part – A.	
3.2.	**Modes of deposit** The EMD may be accepted only in the following forms: (i) Cash deposit as permissible under the extant Income Tax Act (before tender opening) (ii) Electronic Fund Transfer credited in BHEL account (before tender opening) Beneficiary name: BHARAT HEAVY ELECTRICALS LIMITED, EPD, MALLESWARAM, BENGALURU	

NAME OF THE COMPANY	BHARAT HEAVY ELECTRICALS LIMITED,
ADDRESS OF THE COMPANY	EPD UNIT, MALLESWARAM, BENGALURU-560012
NAME OF BANK	IDBI BANK LIMITED
NAME OF BANK BRANCH	Corporate Banking Branch, IDBI house, 58, 1st floor, mission road, Bengaluru-560027
CITY	Bangalore
ACCOUNT NUMBER	008103000003605
ACCOUNT TYPE	CURRENT ACCOUNT
IFSC CODE	IBKL0000377
MICR CODE	560259008

	(iii) Banker's cheque/ Pay order/ Demand draft, in favor of BHEL (along with offer) In case total EMD amount is more than Rs. 2 Lakhs, the amount in excess of Rs. 2 lakhs may be accepted in the form of Bank Guarantee from scheduled bank. The Bank Guarantee in such cases shall be valid for at least six months.	
3.3.	**Forfeiture of EMD** EMD by the Tenderer will be forfeited as per NIT conditions, if: i) After opening the tender and within the offer validity period, the tenderer revokes his tender or makes any modification in his tender which is not acceptable to BHEL. ii) The Contractor fails to deposit the required Security deposit or commence the work within the period as per LOI/ Contract EMD by the tenderer shall be withheld in case any action on the tenderer is envisaged under the provisions of extant "Guidelines on Suspension of business dealings with suppliers/ contractors" and forfeited/ released based on the action as determined under these guidelines.	
3.4.	Tenders received without Earnest Money in full, in the manner prescribed above, are liable to be rejected.	
3.5.	EMD given by all unsuccessful tenderers shall be refunded normally within fifteen days of award of work.	
3.6.	EMD shall not carry any interest.	
3.7.	EMD of successful tenderer will be retained as part of Security Deposit.	
4.	**SECURITY DEPOSIT (SD)**	

4.1.	Security Deposit means the security provided by the Contractor towards fulfilment of any obligations in terms of the provisions of the contract.	
4.2.	The total amount of Security Deposit will be 5% of the contract value. EMD of the successful tenderer shall be converted and adjusted towards the required amount of Security Deposit.	
4.3.	**Modes of deposit**: The balance amount to make up the required Security Deposit of 5% of the contract value may be accepted in the following forms: i. Cash (as permissible under the extant Income Tax Act) ii. Local cheque of Scheduled Banks (subject to realization)/ Pay Order/ Demand Draft/ Electronic Fund Transfer in favor of BHEL iii. Bank Guarantee from Scheduled Banks/ Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format should have the approval of BHEL iv. Fixed Deposit Receipt issued by Scheduled Banks/ Public Financial Institutions as defined in the Companies Act (FDR should be in the name of the Contractor, a/c BHEL) v. Securities available from Indian Post offices such as National Savings Certificates, Kisan Vikas Patras etc. (held in the name of Contractor furnishing the security and duly endorsed/ hypothecated/ pledged, as applicable, in favour of BHEL) (Note: BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith)	
4.4.	**Collection of Security:** i. At least 50% of the required Security Deposit, including the EMD, should be collected before start of the work. Balance of the Security Deposit can be collected by deducting 10% of the gross amount progressively from each of the running bills of the Contractor till the total amount of the required Security Deposit is collected. ii. If the value of work done at any time exceeds the contract value, the amount of Security Deposit shall be correspondingly enhanced and the additional Security Deposit shall be immediately deposited by the Contractor or recovered from payment/s due to the Contractor. iii. The recoveries made from running bills (cash deduction towards balance SD amount) can be released against submission of equivalent Bank Guarantee in acceptable form, but only once, before completion of work, with the approval of the authority competent to award the work.	
4.5.	Security Deposit shall be released to the Contractor upon fulfilment of contractual obligations as per terms of the contract. If the contractor duly performs and completes the work in all respects to the entire satisfaction of BHEL and presents an absolute "No demand certificate", returns properties belonging to BHEL, taken, borrowed or hired by him for carrying out the said works, and furnishes performance bond BG in the prescribed proforma as per ANNEXURE-K, Security Deposit will be released to the contractor after deducting all costs, expenses and other amounts that are to be paid to BHEL under this contract or other contracts entered into with the contractor. It may be noted that in no case the Security Deposit shall be refunded/released prior to passing of final bill.	
4.6.	The Security Deposit shall not carry any interest.	

4.7.	BHEL reserves the right of forfeiture of Security Deposit in addition to other claims and penalties in the event of the contractor's failure to fulfil any of the contractual obligations or in the event of termination of contract as per terms and conditions of the contract. BHEL reserves the right to set off the Security Deposit, against any claims of any other contracts with BHEL	
4.8.	Bidder shall agree to submit performance security required for execution of the contract within the time period mentioned. In case of delay in submission of performance security, enhanced performance security which would include interest (SBI rate + 6%) for the delayed period, shall be submitted by the bidder. Further, if performance security is not submitted till such time the first bill becomes due, the amount of performance security due shall be recovered as per terms defined in NIT / contract, from the bills along with due interest.	
4.9.	The BG shall be submitted only through the Banker. Along with the BG, the Bank shall also furnish a letter of confirmation (in the prescribed formats enclosed with general conditions of contract).	
4.10.	The validity of the Bank Guarantee furnished towards Security Deposit shall be up to three months more than the period of completion of work as stipulated in the work order and the same will be kept valid by proper renewal till the completion of the work	
4.11.	<u>Conditions for acceptance of bank guarantees</u> Contractors are advice to obtain Bank Guarantee preferably from any of the following BHEL consortium banks	

Sl. No.	Nationalized Bank		Nationalized Bank
1	Central Bank		Private bank
2	State Bank of India	15	Axis Bank
3	Bank of Baroda	16	Federal Bank Limited
4	Canara Bank	17	HDFC Bank Limited
5	Exim Bank	18	Kotak Mahindra Bank Limited
6	Indian Bank	19	ICICI Bank Limited
7	Indian Overseas Bank	20	Indusind Bank Limited
8	Punjab National Bank	21	Yes Bank Limited
9	Union Bank of India		
	Public Sector Banks		
10	IDBI Bank Limited		
	Foreign bank		
11	CITI Bank N.A		
12	The Hong Kong and Shanghai Banking Corporation Limited		
13	Standard Chartered Bank		
14	RBL Bank Limited		

Bank Guarantees from Banks outside BHEL's consortium shall be as below:

i. The Bank Guarantees of all Public sector banks of India / Republic of Chad can be accepted (in addition to consortium banks)

<table>
<tr><td></td><td>ii. The Bank Guarantees of Co-operative banks shall not be accepted.
iii. In case of private sector banks a clause to be incorporated in the text of Bank Guarantee that it can be enforceable by being presented at any branch of the bank.
iv. In case of foreign vendors, the bank guarantees issued by foreign banks may be confirmed by our consortium bank in India</td><td></td></tr>
<tr><td>4.12.</td><td>Bank Account Details for submission of Security Deposit through electronic fund transfer mode
<u>Beneficiary name:</u> BHARAT HEAVY ELECTRICALS LIMITED, EPD, MALLESWARAM, BENGALURU
<table>
<tr><td>NAME OF THE COMPANY</td><td>BHARAT HEAVY ELECTRICALS LIMITED,</td></tr>
<tr><td>ADDRESS OF THE COMPANY</td><td>EPD UNIT, MALLESWARAM, BENGALURU-560012</td></tr>
<tr><td>NAME OF BANK</td><td>IDBI BANK LIMITED</td></tr>
<tr><td>NAME OF BANK BRANCH</td><td>TRADE FINANCE, IDBI house, 58, 1st floor, mission road, Bengaluru-560027</td></tr>
<tr><td>CITY</td><td>Bangalore</td></tr>
<tr><td>ACCOUNT NUMBER</td><td>008103000003605</td></tr>
<tr><td>ACCOUNT TYPE</td><td>CURRENT ACCOUNT</td></tr>
<tr><td>IFSC CODE</td><td>IBKL0000377</td></tr>
<tr><td>MICR CODE</td><td>560259008</td></tr>
</table></td><td></td></tr>
<tr><td>5.</td><td><u>SCOPE OF WORK</u></td><td></td></tr>
<tr><td>5.1.</td><td>Operation and Maintenance works of 100 MW floating Solar PV Power Project at NTPC Ramagundam, Telangana for thirty-six (36) months (Details as per Annexure – I)</td><td></td></tr>
<tr><td>6.</td><td><u>PERIOD OF CONTRACT</u></td><td></td></tr>
<tr><td>6.1.</td><td>Duration of contract is for Thirty-Six (36) MONTHS from the date of award of contract. The parties, if mutually agreed upon, may extend the period of contract for a further period on the same terms and conditions.</td><td></td></tr>
<tr><td>6.2.</td><td>BHEL is at liberty to terminate / short close the contract by giving a notice of ten (10) days in advance in writing.</td><td></td></tr>
<tr><td>7.</td><td><u>ELIGIBILITY CRITERIA</u></td><td></td></tr>
<tr><td>7.1.</td><td>The bidder shall also mention the PAN Number issued by Income Tax Department, copy of the PAN card or PAN number allotment letter shall be submitted along with the tender documents.</td><td></td></tr>
<tr><td>7.2.</td><td>Bidder should have an independent ESI Employer code under ESI Act 1948. Photocopy of letter from ESI Corp. to establish that bidder is independently registered as an employer under ESI to be produced.</td><td></td></tr>
<tr><td>7.3.</td><td>Bidder should have an independent PF code under Employee Provident Fund and Miscellaneous Provisions Act 1952. Photocopy of letter from PF Commissioner’s Office to establish that bidder is independently registered as an employer PF to be produced.</td><td></td></tr>
</table>

7.4.	There should be no litigation or charge under investigation / enquiry / trial against the Tenderer, or conviction in a court of law or suspension or blacklisting by any organization on any ground. During the course of work, if any such information comes to light, the contract may be terminated.	
7.5.	Average Annual Financial turnover during the last 3 years ending 31st March of the previous financial year, should be at 30% of the NIT value. Audited Balance sheet and profit & Loss account OR Turn over Certificate from Chartered Accounted to be enclosed for the FY 2018-19, 2019-20 & 2020-21.	
7.6.	Bidders who wish to participate should have executed works of similar nature during last seven years as per below, as on the date of opening of Technical Bid. **(Bidders should meet the one of the requirements mentioned under Condition 1 or Condition 2)** **Condition 1:** 1. Three "similar works" completed and costing not less than the amount of **Rs. 468.36 lakhs EACH (Excluding taxes)**. OR 2. Two "similar works" completed and costing not less than the amount of **Rs. 585.45 lakhs EACH (Excluding taxes)**. OR 3. One "similar work" completed and costing not less than the amount of **Rs. 936.72 lakhs (Excluding taxes)**. **Condition 2:** 1. Three similar completed works, each having capacity not less than 40% of the total plant capacity, for a minimum period of one year. (i.e. 40 MW) OR 2. Two similar completed works, each having capacity not less than 50% of the total plant capacity, for a minimum period of one year. (i.e. 50 MW) OR 3. One similar completed work having capacity not less than 80% of the total plant capacity, for a minimum period of one year. (i.e. 80 MW) Note: a. "Similar work" is defined as contract which includes Operation and Maintenance / Electrical Installation & Commissioning of Power Plants / Sub Stations of voltage level 33KV and above, in India. b. Overall contract value will be considered for each similar work irrespective of the O&M / I&C value. As evidence to this, the vendor shall submit (a) Copies of work orders from the clients, (b) Completion Certificate from client/client certified invoice. c. The term 'executed' means the bidder should have achieved the criteria specified in the PQR even if the total contract has not been completed or closed.	

	d. Bidder should not have been banned by "any BHEL unit" or "Government of India" or "Government of Karnataka" or Government of other states in India. e. Bidder to submit following documents as proof of completion/execution of work: 1. P.O/ W.O copy. 2. Work completion certificate. f. BHEL reserves the right for independent verification of Documents.	
7.7.	For the works which are continuous in nature, and which require regular interaction and monitoring, the bidder shall have an Office/Establishment in Bengaluru. Absence of such an arrangement may lead to disqualification of the Tenderer.	
7.8.	**Start-ups registered with DIPP are exempt to fulfill the criteria of minimum turnover and minimum years of experience.**	
8.	**PAYMENT TERMS**	
8.1.	No advance payment is applicable for this tender.	
8.2.	The periodicity of payment to the contractor shall be on a calendar month basis. The contractor shall raise the invoice for payment as per the contractual terms & conditions, which should be duly certified by the BHEL official in charge of the contracted work. Payment will be made within Forty-Five (45) days after the receipt of the correct invoice and all required supporting documents.	
8.3.	Overall contract value will be considered for each similar work irrespective of the O&M / I&C value. As evidence to this, the vendor shall submit (a) Copies of work orders from the clients, (b) Completion Certificate from client/client certified invoice.	
8.4.	Invoices shall be sent along with certification of attendance, duly certified by BHEL official in charge of the of the contracted work.	
8.5.	All payments will be made from our HQ through NEFT / EFT. Necessary details like bank Account No., etc., to be provided by you for effecting the EFT payment. (To be filled in BHEL EFT form available in Part-A of this tender).	
8.6.	GST will be reimbursed to the contractor after the contractor pays GST, files return and submits a proof of the same to BHEL. GST TDS will be done @ 2%. Income Tax TDS will be done as applicable.	
9.	**PRICE VARIATION CLAUSE**	
9.1.	Not applicable	
10.	**SITE CONDITIONS**	
10.1.	Before tendering the Contractor shall get themselves acquainted with site conditions. The rates quoted by the contractor shall be deemed to have been quoted after getting acquainted with the prevailing site conditions. No claims on the pretext of ignorance of site conditions shall be entertained.	
10.2.	The site of work is as mentioned in the Tender document.	
11.	**SITE FACILITIES**	
11.1.	The Employer will allot land as available free of cost to the contractor for his office stores. He must maintain the areas allotted to him in a neat and clean conditions as required by	

	the Employer. The contractor shall provide adequate storage and office facilities with approval from the Engineer. The rate quoted by the contractor shall be deemed to include for these and no separate payment will be made towards these. On completion of work, the site shall be cleaned by the contractor of all materials, temporary debris, rubbish plants and equipment's, belonging to the contractor at no extra cost. The site and surroundings shall be handed over in a neat and clean condition. In case of any failure by the contractor, the employer will get inside cleared at risk and cost of the Contractor.	
12.	**ESCALATION**	
12.1.	The rates to be quoted by the tenderer shall be firm and shall cover and include all statutory levies, arising from, acts passed by parliament or by state legislature, the rates shall further be deemed to include statutory levies arising from such Acts, Central or State, which may come in to force subsequent to submission of tenders. The tenderer shall note that no claim for enhancement of rates, on the ground that existing statutory levies have been increased, or that new statutory levies have come in to effect after tender, or on any other ground, will be entertained on any account	
13.	**FAILURE TO COMPLY WITH CONTRACT**	
13.1.	Notwithstanding anything contained in any other clause, BHEL reserves the right to terminate the contract due to any failure on the part of the Tenderer in discharging his obligations under the contract or in the event of his becoming insolvent or going into liquidation. The decision of the BHEL about the failure on the part of the Tenderer shall be final and binding on the tenderer.	
13.2.	In case of any damage to the existing building, structures, materials, tools, furniture and fixtures, machines etc., caused from contractor's end, the cost of its repairs or replacement will be recovered from the contractor. If there is any work stoppage in any area of the Plant due to the fault of the tenderer, the tenderer is liable to compensate the same.	
13.3.	In the event of any failure on the part of the tenderer, BHEL shall have the right without prejudice to any other right or remedies, to get the work done through any other agency and the Tenderer shall be liable to compensate BHEL for any losses on this account. The additional cost, loss, if any incurred by BHEL will be recovered from the bills, security deposits, other dues as well as directly from the Tenderer.	
14.	**SUB-CONTRACTING**	
14.1.	The contractor shall not sub-contract or transfer or assign the contract in full or any part thereof to any other person or firm or company without the previous express written approval of BHEL.	
15.	**LAWS GOVERNING THE CONTRACT**	
15.1.	The contract will be governed by the Laws of India for the time being in force and as amended or made from time to time.	
15.2.	All disputes shall be settled in accordance with the Laws of India for the time being in force and as amended from time to time.	

15.3.	All disputes arising out of or in relation to this contract or Agreement shall be settled by mutual discussions and in the event of failure such disputes shall be referred to the Arbitrator.	
16.	**LEGAL JURISDICTION**	
16.1.	In respect of all matters arising out of or pertaining to the contract, the cause of action thereof shall be deemed to have arisen only at Bengaluru, where BHEL - SBD is situated. All legal proceedings pertaining to the above matters or dispute shall be instituted only in courts having territorial jurisdiction over the place where BHEL-SBD is situated and no other court shall have the jurisdiction.	
17.	**CARTEL FORMATION**	
17.1.	The Bidder declares that they will not enter into any illegal or undisclosed agreement or understanding, whether formal or informal with other Bidder(s). 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 introduce cartelization in the bidding process. In case, the Bidder is found having indulged in above activities, suitable action shall be taken by BHEL as per extant policies/ guidelines.	
18.	**ARBITRATION & CONCILIATION**	
18.1.	Except as provided elsewhere in this Contract, in case amicable settlement is not reached between the Parties, in respect of any dispute or difference; arising out of the formation, breach, termination, validity or execution of the Contract; or, the respective rights and liabilities of the Parties; or, in relation to interpretation of any provision of the Contract; or, in any manner touching upon the Contract, then, either Party may, by a notice in writing to the other Party refer such dispute or difference to the sole arbitration of an arbitrator appointed by Head of the BHEL Solar Business Division.	
18.2.	The Arbitrator shall pass a reasoned award and the award of the Arbitrator shall be final and binding upon the Parties	
18.3.	Subject as aforesaid, the provisions of Arbitration and Conciliation Act 1996 (India) or statutory modifications or re-enactments thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceedings under this clause. The seat of arbitration shall be Bengaluru.	
18.4.	The cost of arbitration shall be borne as per the award of the Arbitrator.	
18.5.	Subject to the arbitration, the Courts at Bengaluru shall have exclusive jurisdiction over any matter arising out of or in connection with this Contract.	
18.6.	Notwithstanding the existence or any dispute or differences and/or reference for the arbitration, the Contractor shall proceed with and continue without hindrance the performance of its obligations under this Contract with due diligence and expedition in a professional manner except where the Contract has been terminated by either Party in terms of this Contract.	
19.	**COMPENSATION**	
19.1.	"BHEL shall recover the amount of compensation paid to victim(s) by BHEL towards loss of life / permanent disability due to an accident which is attributable to the negligence of contractor, agency or firm or any of its employees as detailed below. a) Victim: Any person who suffers permanent disablement or dies in an accident as defined below. b) Accident: Any death or permanent disability resulting solely and directly from any unintended and unforeseen injurious occurrence caused during the manufacturing/ operation and works incidental thereto at BHEL factories/ offices and precincts	

	thereof, project execution, erection and commissioning, services, repairs and maintenance, trouble shooting, serving, overhaul, renovation and retrofitting, trial operation, performance guarantee testing undertaken by the company or during any works / during working at BHEL Units/ Offices/ townships and premises/ Project Sites. c) Compensation in respect of each of the victims: (i) In the event of death or permanent disability resulting from Loss of both limbs: ₹10,00,000/- (Rupees Ten Lakhs) (ii) In the event of other permanent disability:₹7,00,000/- (Rupees Seven Lakhs) d) Permanent Disablement: A disablement that is classified as a permanent total disablement under the proviso to Section 2 (I) of the Employee's Compensation Act, 1923."	
20.	**REVERSE AUCTION**	
20.1.	BHEL shall be resorting to Reverse Auction (RA) (Guidelines as available on www.bhel.com) for this tender. RA shall be conducted among all the techno-commercially qualified bidders. • Start price of RA to be L1 of sealed envelope Price bid. • Minimum 2 Techno-commercially qualified bidders are required to conduct RA. • Wherever 6 or more techno-commercially qualified bidders are available, RA would be conducted amongst the first 50% of bidders arranged in order of process from lowest to highest. . Guidelines for RA will be as per those mentioned in Doc. No. AA:SSP:RA:05 dated 08.03.2021. (enclosed if BHEL resorts to RA for this tender)	
20.2.	Bidders have to submit 'Process compliance form' (to the designated service provider) in the Reverse Auction. Non-submission of 'Process compliance form' by the agreed bidder(s) will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com). However, if the same bidder again defaults on this count in any subsequent tender in the unit, it will be considered as fraud and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com)	
21.	**PENALTY/ LD FOR DELAYED DELIVERY**	
21.1.	AS per GCC.	
21.2.	The monthly/ quarterly (as applicable) O&M payment of the contractor shall be released on submission of comparison of generation as per guaranteed parameter vis-à-vis Actual generation. The shortfall (if any) w.r.t. guaranteed generation shall be duly supported by documentary evidence. In case of shortfall w.r.t. guaranteed generation parameter, the Engineering department to certify that "the reasons submitted by the contractor are beyond its control. The amount equivalent to shortfall in generation may be absorbed by BHEL on exceptional basis.	
21.3.	Bidder agrees to submit performance security required for execution of the contract within the time period mentioned. In case of delay in submission of performance security, enhanced performance security which would include interest (SB/ rate + 6%) for the delayed period, shall be submitted by the bidder. Further, if performance security is not submitted till such time the first bill becomes due, the amount of performance	

	security due shall be recovered as per terms defined in NIT I contract, from the bills along with due interest.	
22.	**LABOUR**	
22.1.	The Contractor shall employ labour in sufficient numbers either directly or through sub-contractors to maintain the required rate of progress and of quality to ensure workmanship of the degree specified in the contract and to the satisfaction of the Engineer-in-charge. The contractor shall not employ in connection with the works any person who has not completed his eighteen years of age	
22.2.	The contractor shall furnish to the Engineer-in-charge at the intervals specified by him. A distribution returns of the number and description by trades of the people employed on the works. The Contractor shall also submit on the 4th and 19th or every month to the Engineer-in-charge a true statement showing in respect of the second half of the preceding month and the first half of the current month (i) the accidents that occurred during the said fortnight showing the circumstances under which they happened and the extent of damage and injury caused by them and (ii) the number of female workers who have been allowed maternity benefits as provided in the maternity benefit Act, 1961 or Rules made there under and the amount paid to them	
22.3.	The contractor shall pay to labour employed by him either directly or through sub-contractors wages not less than fair wages as defined in the contractors Labour Regulations.	
22.4.	The Contractor shall in respect of labour employed by him either directly or through sub-contractors comply with or cause to be complied by with sub-contractors, labour Regulations in regard to all matters provided therein.	
22.5.	The Contractors shall comply with the provisions of all the applicable Central or State laws/Rules in general and in particular to the Factories Act 1948, Child Labour Prohibition Act 1986, Employer's Liability Act 1938, Employees Provident Fund & Miscellaneous Provisions Act 1952, Employees State Insurance Act 1948, Industrial Disputes Act 1947, Minimum Wages Act 1948, Payment of Wages Act 1936, Employee's Compensation Act 1923, Payment of Gratuity Act 1972, the Contract Labour [Regulation & Abolition] Act 1970, Payment of Bonus Act 1965, Income Tax Act 1961, Maternity Benefit Act 1961, Arbitration and Conciliation Act 1996, Goods & Services Tax Act 2017 and other relevant laws/Rules applicable from time to time.	
22.6.	The contractor shall also comply with all statutory requirements, applicable Acts/Rules, provisions, regulations, notifications and amendment made there under by concerned authorities from time to time.	
22.7.	The Contractors shall be liable to pay his contribution and the employees' contribution of the State Insurance Scheme in respect of all labour employed by him for the execution of the contract, in accordance with the provision of "The Employees', State Insurance Act, 1948", as amended from time to time. The Contractors shall apply to the ESI Authorities, get himself registered with them and obtain a code Number. He shall pay the remittances under his code Number only. The Contractor shall be liable to pay his contribution and the Employees' contribution towards PF as per Provident Fund Rules and Regulations in respect of all labour employed by him for the execution of the contract.	
22.8.	The contractor shall apply to the PF Authorities, get himself registered and obtain a code number from them. He shall pay the remittances towards PF under his code Number only. The Engineer-in-charge shall on a report having been made by an Inspecting Officer	

	as defined in the Contractors Labour Regulations have the power to deduct from the moneys due to the Contractor any sum required or estimated to be required for making good the loss suffered by a worker or workers by reason of non-fulfilment of the conditions of the contract for the benefit of workers, non - payment of wages or of deductions made from him or their wages which are not justified by the terms of the contract of non-observance of the said contractor's Labour Regulations.	
22.9.	The Contractors shall indemnify the BHEL against any payment to be made under and for observance of the regulation aforesaid without prejudice to his right to claim indemnity from these sub-contractors	
22.10.	**MODEL RULES FOR LABOUR WELFARE** The Contractor shall at his own expense comply with or cause to be complied with model Rules for Labour Welfare as appended to these conditions or rules framed by Government from time to time for the protection of health and for making sanitary arrangements for workers employed directly or indirectly on the works, In case the Contractors fails to make arrangements as aforesaid the Engineer-in-charge shall be entitled do so and recover the cost thereof from the contractor.	
23.	**SAFETY CODE**	
	RESPONSIBILITIES OF THE CONTRACTOR IN RESPECT OF SAFETY OF MEN, EQUIPMENT, MATERIAL AND ENVIRONMENT	
23.1.	Before commencing the work, contractor shall submit a "SAFETY PLAN" to the authorized BHEL Official. The 'SAFETY PLAN' shall indicate in detail the measure that would be taken by the contractor to ensure safety of men, equipment, material and environment during execution of the work. The plan shall take care to satisfy all requirements specified hereunder. The contractor shall submit Safety Plan along with his offer. During negotiations before placing of work order and during execution of the contract BHEL shall have right to review and suggest modification in the Safety Plan. Contractor shall abide by BHEL decision in this respect.	
23.2.	The contractor shall take all necessary safety precautions and arrange for appropriate appliances as per direction of BHEL or its authorized officials to prevent loss of human lives, injuries to personnel engaged, and damage to property and environment.	
23.3.	The contractor shall provide to its work force and ensure the use of the following personal protective equipment as found necessary and as directed by the authorized BHEL Officer: -Safety Helmets conforming to IS-2925: 1984. i. Safety Belts conforming to IS-3521: 1983. ii. Safety Shoes conforming to IS-1989: 1978. iii. Eye and Face protection devices conforming to IS-8520: 1977 and IS-8940: 1978. iv. Hand and body protection devices conforming to: IS-2573: 1975 IS-6994: 1973 IS-8807: 1978 IS-8519: 1977	
23.4.	In view of present pandemic situation, Bidders are mandatorily has to ensure all precautionary measures as per guidelines issued by State/Central government/District administration to prevent spread of COVID-19 like usage of Personal protective Equipment's and other norms like wearing masks, maintaining social distance and other instructions issued from time to time and also quote percentage including cost incurring due to prevent spread of COVID-19.	

23.5.	Successful bidder should take utmost care of their manpower deployed, considering the current outbreak due to COVID-19, Successful bidder should take precautionary measures as per guidelines issued by State/Central government/District administration to prevent spread of COVID-19.	
23.6.	All tools, tackles, lifting appliances, material handling equipment scaffolds, cradles, safety nets, ladders, equipment's etc. used by the contractor shall be of safe design and construction. These shall be tested and certificate of fitness obtained before putting them to use and from time to time as instructed by authorized BHEL Official who shall have the right to ban the use of any item.	
23.7.	All electrical equipment's, connections and wiring for constructions power, its distribution and use shall conform to the requirement of the Indian Electricity Act and Rules. Only electricians licensed by the appropriate statutory authority shall be employed by the contractor to carry out all types of electrical works. All electrical appliances including portable electric tools used by the contractor shall have safe plugging system to source of power and be appropriately earthed. The contractor shall not use any hand lamp energized by electric power with supply voltage of more than 24 volts. For work in confined space lighting shall be arranged with power sources of not more than 24 volts.	
23.8.	The Contractor shall adopt all fire safety measures as laid down in the "Code for fire Safety at Construction Sites" issued by the Safety Department of the Construction Management (HQ) of BHEL and as per directions of the authorized BHEL Official. A copy of the above referred "Code of Fire Safety at the Construction Sites" shall be made available by BHEL to the contractor for reference, on demand by the contractor, during tendering stage itself.	
23.9.	Where it becomes necessary to provide and/or store petroleum products, explosives, chemicals and liquid or gaseous fuel or any other substance that may cause fire or explosion, the contractor shall be responsible for carrying out such provisions and/or storage in accordance with the rules and regulations laid down in the relevant government acts, such as Petroleum Act, Explosives Act, Petroleum and Carbides of Calcium Manual of the Chief Controller of Explosives, Govt. of India. etc., prior approval to the authorized BHEL Official at the site shall also be taken by the contractor in all such matters.	
23.10.	The contractor shall arrange at his cost (wherever not specified) appropriate illumination at all work spots for safe working when natural daylight may not be adequate for clear visibility	
23.11.	The contractor shall be held responsible for any violation of statutory regulations local, state or central and BHEL instructions that may endanger safety of men, equipment, material and environment in his scope of work or another contractor or agencies. Cost of damages if any, to life and property arising out of such violation of statutory regulations and BHEL instructions shall be borne by the contractor.	
23.12.	In case of a fatal or disabling injury accident to any person at construction sites due to the lapses by the contractor, the victim and/or his/her dependents shall be compensated by the contractor as per statutory requirements. However, if considered necessary, BHEL shall have the right to impose appropriate financial penalty on the contractor and recover the same from payments due to the contractor for suitably compensating the victim and/or his/her dependents. Before imposing any such penalty, appropriate enquiry shall be held by BHEL giving opportunity to the contractor to present his case.	

23.13.	In case of any damage to property by the contractor, BHEL shall have the right to recover cost of such damages from payments from payments due to the contractor after holding an appropriate enquiry. In case of any delay in the completion of a job due to mishaps attributable to lapses buy the contractor; BHEL shall have to recover cost of such delay from payments due to the contractor, after notifying suitably and giving him opportunity to present his case.	
23.14.	If the contractor fails to improve the standards of safety in its operation to the satisfaction of BHEL after being given a reasonable opportunity to do so; and/or if the contractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carry out instructions regarding safety issued by the authorized BHEL Official, BHEL shall have the right to take corrective steps at the risk and cost of the contractor after giving a notice of not less than seven days indicating the steps that would be taken by BHEL.	
23.15.	The contractor shall submit report of all accidents, fires and property damage, dangerous occurrence to the authorized BHEL Official immediately after such occurrence, but in any case not later than twelve hours of the occurrence. Such reports shall be furnished in the manner prescribed by BHEL. In addition, the contractor to the authorized BHEL Official shall also submit periodic reports on safety from time to time as prescribed.	
23.16.	Before commencing the work, the contractor shall appoint/nominate a responsible officer to supervise implementation of all safety measures and liaison with his counterpart of BHEL.	
23.17.	If safety record of the contractor in execution of the awarded job is to the satisfaction of Safety Department of BHEL, issue of an appropriate certificate to recognize the safety performance of the contractor may be considered by BHEL after completion the job.	
24.	**CONCILIATION CLAUSE**	
24.1.	As per Annexure – XV.	
25.	**MAKE IN INDIA Clause**	
25.1.	For this procurement, Public Procurement (Preference to MAKE IN INDIA) Order 2017 Dated 15.06.2017, 28.05.2018, 29.05.2019, 04.06.2020 and subsequent orders issued by the respective Nodal Ministry shall be applicable. Even if issued after issue of this NIT but before finalization of contract WO against this NIT.	
25.2.	In the event of any Nodal Ministry prescribing higher or lower percentage of purchase preference and/ or local content in respect of this procurement same shall be applicable.	

26.	**ANNEXURES**	**Submitted / Not Submitted**
	Bidder to submit completely filled, signed and stamped copies of all the annexures / formats, as applicable.	
26.1.	ANEXURE I: DETAILED SCOPE OF WORK	
26.2.	ANNEXURE II: TECHNO-COMMERCIAL BID APPLICATION	
26.3.	ANNEXURE III: BIDDER INFORMATION	
26.4.	ANNEXURE IV: ELIGIBILITY CRITERIA	
26.5.	ANNEXURE V: BIDDER DECLARATION - I	
26.6.	ANNEXURE VI: BIDDER DECLARATION - II	
26.7.	ANNEXURE VII: DEVIATION SHEET	
26.8.	ANNEXURE VIII – UNPRICED BID	
26.9.	ANNEXURE IX - AGREEMENT BETWEEN BHEL- SBD AND CONTRACTOR	
26.10.	ANNEXURE X - THIRD PARTY NON-DISCLOSURE AGREEMENT	
26.11.	ANNEXURE XI – FORMAT FOR E-PAYMENT	
26.12.	ANNEXURE XII - PPP-MII FORMAT	
26.13.	ANNEXURE XIII - MODEL CONCILIATION CLAUSE FOR CONDUCT OF CONCILIATION UNDER THE BHEL CONCILIATION SCHEME, 2018ANNEXURE XIII - MODEL CONCILIATION CLAUSE FOR CONDUCT OF CONCILIATION UNDER THE BHEL CONCILIATION SCHEME, 2018	

ANEXURE I: DETAILED SCOPE OF WORK

As per PS-439- Rev. 00.

ANNEXURE II: TECHNO-COMMERCIAL BID APPLICATION

To,

Deputy Manager / Works Contracts Cell
Bharat Heavy Electricals Limited
Solar Business Division,
IISc Post, Malleswaram,
Bengaluru – 560 012

Dear Sir,

I / We hereby offer to carry out the work "**Operation and Maintenance works of 100 MW floating Solar PV Power Project at NTPC Ramagundam, Telangana**

I /We have carefully perused the all the clauses mentioned in NIT and agree to abide with the same.

1. Notice Inviting Tender – Part A
3. Price Bid Format - Part – B

I/ We further agree to execute all the works referred to in the said documents.

I declare that, there was never / is no litigation or charge under investigation / enquiry / trial against me / us, nor conviction in a court of law or suspended or blacklisted by any organization on any grounds.

Signature of Tenderer
Date:

ANNEXURE III: BIDDER INFORMATION

S. No.	DETAILS REQUIRED	Requirement fulfilled (Yes / No / NA/ Value)
1	Name of the Company	
2	Name of Authorized Signatory	
3	Name of Contact person for this tender	
4	Email-id of contact person	
5	Contact number	
6	Bank Account Details (Name of Bank, Branch and Account Number). Cancelled Cheque to be enclosed	
7	Details of Relatives employed in BHEL, Name Designation and Unit	
a	Relative 1	
b	Relative 2	
c	Relative 3	

ANNEXURE IV: ELIGIBILITY CRITERIA

S. No.	DETAILS REQUIRED	Requirement fulfilled (Yes / No / NA/ Value)	Whether proof / document enclosed (YES / NO)
1.	Firm of contractor/independent contractor (Proprietor) should be registered and having at least three years' existence in business consecutively for the past three financial years.		
2.	Average Annual Financial turnover during the last 3 years ending 31st March of the previous financial year.		
3.	Relevant Work Experience – 1		
4.	Relevant Work Experience – 2		
5.	Relevant Work Experience – 3		
6.	PAN No. - Clause 3.8		
7.	GST Registration Number		
8.	**MSEs / NSIC/Udyam Certificate to be enclosed (if applicable)**		
9.	EMD Details (DD No., Amount, Date & Bank)		
10.	PPP-MII Format to be enclosed		

ANNEXURE V: BIDDER DECLARATION - I

S. No.	DETAILS REQUIRED	Requirement fulfilled (Yes / No / NA/ Value)
1	I have completely understood the scope of work and submit my agreement to carry out the work as per mentioned in Tender document.	
2	I have quoted rates for the total scope of work mentioned in the tender document	
3	I have understood and accepted the payment terms of BHEL as indicated in this tender	
4	I am responsible for the safety of workmen deployed and agree to fulfil the requirements as per tender terms	
5	I have understood the penalty / LD clause mentioned in this tender and submit my agreement for the same.	
6	I agree to participate in the tender and carry out the work (if awarded) ethically and submit my agreement to various requirements in this contract.	
7	I have carefully read the Tender Terms and Conditions and I submit my agreement for the same.	

ANNEXURE VI: BIDDER DECLARATION - II

I, ----------, aged----------Years., S/o ----------,

Residing at ----------

Hereby declare as follows:

(i) That my nationality is _____.

(ii) That I am a major and eligible to enter into contract / my firm / my company is competent to enter into an agreement.

(iii) I shall employ only such personnel who have not been found unfit for employment in Organizations such as Central / state / Public undertaking by the Police Authorities.

(iv) I shall not employ persons against whom Criminal cases are pending or under investigation.

(v) I shall also not employ persons found guilty of offences involving moral turpitude for executing work in BHEL contracts.

(vi) That there are no Criminal cases/Civil/Labor pending or under investigation against me or my firm or company.

(vii) I have not been found guilty of offences involving moral turpitude nor any of the company directors / partners of my firm have been found guilty of offences involving moral turpitude.

(viii) Neither I nor my firm nor my company has been declared insolvent in the past.

(ix) I have taken due care and efforts to furnish only information which are true in the tender document.

(x) I shall employ labor who is more than 18 years of age and less than 58 years and having sound physical and mental health.

(xi) I shall keep Photograph / identity proof / residential proof of the laborers to be employed against this tender and arrange for police verification.

(xii) I shall employ and deploy suitable qualified personnel for supervision of the work in each shift and additionally as required for monitoring compliance to process requirements and compliance to contract terms & conditions.

[Signature with Name & seal of the Tenderer]

Date :
Place :

ANNEXURE VII: DEVIATION SHEET

Deviation not acceptable for this tender.

ANNEXURE VIII – UNPRICED BID

As per BOQ

ANNEXURE IX - AGREEMENT BETWEEN BHEL- SBD AND CONTRACTOR

This Agreement made on this _____ day of _____ Two Thousand and Nine between M/s / Shri _____ aged about _____ years S/O of Shri _____, residing at _____, hereinafter called the "Contractor" (which expression shall unless repugnant to the context or meaning thereof be deemed to mean and include its successors and permitted assigns) of the First part.

AND

BHARAT HEAVY ELECTRICALS LIMITED, SOLAR BUSINESS DIVISION, Prof. CNR Circle, P.B.1245, IISc Post, Malleswaram, BENGALURU-560012, a Company incorporated under the Companies Act 1956 and having its registered office at BHEL House, Siri Fort New Delhi - 110049, hereinafter called " BHEL-SBD " (which expression shall unless repugnant to the context or meaning thereof be deemed to mean and include its successors and permitted assigns) of the second part.

Whereas,

BHEL, SBD is desirous of entrusting to the said contractor to engage and carryout the contract job of ……. more specifically mentioned in the Annexure (hereinafter called the Contract work) to this Agreement.

The Contractor who is a specialized agency in the type of contract work in different establishments has agreed to undertake the said contract work on job contract basis.

NOW THEREFORE IT IS AGREED BETWEEN THE PARTIES:

The Terms and conditions of this agreement are as stipulated in:

Notice Inviting Tender
Scope of Work
Proforma for Offering Techno-Commercial Bid
Special Terms & Conditions of the Contract
General Terms and Conditions
Duties and Responsibilities of Contractor
Price Bid Format
Declaration by Contractor
Any minutes of the meeting & written understanding between BHEL & Contractor
Work Orders and Work Instructions issued to the Contractor
Agreement between Contractor and BHEL-SBD

Shall form part and parcel of this agreement.

IN WITNESS WHEREOF THE PARTIES HERETO through their authorized Representatives have signed these presents on the day, month and year mentioned above.

For and on behalf of M/s----------

[Authorized signatory]
Name & Designation

Witness : 1

Signature :

Designation :

Address :
For and on behalf of
Bharat Heavy Electricals Limited
Solar Business Division,
Bengaluru 560012.

[Authorized signatory]
Name & Designation

Witness : 2

Signature :

Designation :

Address :

ANNEXURE X - THIRD PARTY NON-DISCLOSURE AGREEMENT

I, _____on behalf of the _____ (Name of Company),

acknowledge that the information received or generated, directly or indirectly, while working with BHEL on contract is confidential and that the nature of the business of the BHEL is such that the following conditions are reasonable, and therefore:

I warrant and agree as follows:

I, or any other personnel employed or engaged by our company, agree not to disclose, directly or indirectly, any information related to the BHEL. Without restricting the generality of the foregoing,
it is agreed that we will not disclose such information consisting but not necessarily limited to:

•Technical information: Methods, drawings, processes, formulae, compositions, systems, techniques, inventions, computer programs/data/configuration and research projects.

•Business information: Customer lists, project schedules, pricing data, estimates, financial or marketing data,

On conclusion of contract, I, or any other personnel employed or engaged by our company shall return to BHEL all documents and property of BHEL, including but not necessarily limited to: drawings, blueprints, reports, manuals, computer programs/data/configuration, and all other materials and all copies thereof relating in any way to BHEL's business, or in any way obtained
by me during the course of contract. I further agree that I, or any others employed or engaged by our company shall not retain copies, notes or abstracts of the foregoing.

This obligation of confidence shall continue after the conclusion of the contract also.

I acknowledge that the aforesaid restrictions are necessary and fundamental to the business of the BHEL, and are reasonable given the nature of the business carried on by the BHEL. I agree that this agreement shall be governed by and construed in accordance with the laws of country.

I enter into this agreement totally voluntarily, with full knowledge of its meaning, and without duress.

Dated at……., this……. day of ……20.. .

Name

Company

Signature

ANNEXURE XI – FORMAT FOR E-PAYMENT

To:

AGM (Finance)
BHEL-SBD/ Bengaluru
Opp. Indian Institute of Science
Prof. CNR Rao Circle
Bengaluru – 560093

Subject: *E-payments vide RTGS/ NEFT.*

I/ We request and authorize you to effect E-payment vide any two modes to my/ our bank account as per the details given below:

Vendor Name	:	
Title/ Name of Account in the bank	:	
Account Type (Saving/ Current)	:	
Bank Account Number	:	☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐
Name and address of bank	:	
Bank/ Branch contact person name	:	
Bank. Branch phone numbers with STD code:		
Bank Branch MICR code	:	☐☐☐☐☐☐☐☐☐
Bank Branch RTGS IFSC code	:	☐☐☐☐☐☐☐☐☐☐☐☐☐
Bank Branch NEFT IFSC code	:	☐☐☐☐☐☐☐☐☐☐☐☐☐
Your E-mail address	:	
Name of the Authorized Signatory	:	
Contact person Name	:	

I/ We confirm that information provided above is correct & any consequences due to any mistake in above will be borne by us.

Thanking you,

For

(Authorized Signatory)

We confirm that we are enabled for receiving RTGS/ NEFT credits and we further confirm that he account number of (please mention here the name of account holder) _____, the signature of the Authorized Signatory and MICR and IFSC codes of our branch mentioned above are correct.

Bank's Verification
(Manager's/ Officer's signature under bank stamp)

Note: Please attach cancelled original cheque leaf.

ANNEXURE XII - PPP-MII FORMAT

FORMAT FOR VERIFICATION OF LOCAL CONTENT UNDER PREFERENCE TO MAKE IN INDIA ORDER
(To be submitted with the offer)
[Applicable for procurement value from Rs. 5.00 Lac to Rs. 10.00 Crore]
Self-certification giving the percentage of local content, in line with PPP-MII order, if applicable [to be submitted on the letter head of the issuer.]

Item Name: Operation and Maintenance works of 1.7 MW Solar Power Plant at BINA (MP) for a period of 12 months

Enquiry No.: WCC-ASR-202223-002
Project: Operation and Maintenance works of 100 MW floating Solar PV Power Project at NTPC Ramagundam, Telangana

Applicable percentage of Local Content……
(Bidder to indicate local content in percentage)
We have read and understood the provisions of "Public Procurement (Preference to Make in India) Order, 2017" dated 15/06/2017, its revision dated 28/05/2018 and any subsequent modifications/Amendments, if any [hereinafter, "PPP-MII Order"] issued by Department of Industrial Policy and Promotion (DIPP), Ministry of Commerce and Industry, Government of India.
In line with the provisions of the PPP-MII Order, We, M/s. …… [Enter the name of the Bidder] [hereinafter, "Local Supplier"] submits self-certification to M/s. Bharat Heavy Electricals Limited [hereinafter, BHEL] regarding Local Content in Goods/Services/Works to be supplied by the Local Supplier Operation and Maintenance works of 100 MW floating Solar PV Power Project at NTPC Ramagundam, Telangana for thirty-six (36) months (Enter the name of the Equipment/Item for Project), wherein we have agreed to abide by the terms and conditions of the PPP-MII Order.
Details of location at which local value addition will be made is as follows:

_____
_____
_____
_____

We also understand, false declarations will be in breach of the Code of Integrity under Rule 175(1)(i)(h) of the General Financial Rules for which a bidder or its successors can be debarred for up to two years as per Rule 151 (iii) of the General Financial Rules along with such other actions as may be permissible under law.

For and on behalf of,

Authorized Signatory
(With Company Seal & Signature)
Date:

Note: This is a guiding format. In case the bidder submits the certificate in a format different from the above, the same may be considered provided it meets the intent and purpose, as may be ascertained by BHEL.

ANNEXURE XIII - MODEL CONCILIATION CLAUSE FOR CONDUCT OF CONCILIATION UNDER THE BHEL CONCILIATION SCHEME, 2018

BRIEF PROCEDURE FOR CONDUCT OF CONCILIATION PROCEEDINGS

The proceedings of Conciliation shall broadly be governed by Part-III of the Arbitration and Conciliation Act 1996 or any statutory modification thereof and as provided herein:

1. The party desirous of resorting to Conciliation shall send an invitation/notice in writing to the other party to conciliate specifying all points of Disputes with details of the amount claimed. The party concerned shall not raise any new issue thereafter. Parties shall also not claim any interest on claims/counter- claims from the date of notice invoking Conciliation till the conclusion of the Conciliation proceedings. If BHEL is to initiate Conciliation, then, the invitation to Conciliate shall be extended to the concerned Stakeholder in Format 7 hereto. Where the stakeholder is to initiate the Conciliation, the notice for initiation of Conciliation shall be sent in Format-8 hereto.
2. The party receiving the invitation/notice for Conciliation shall within 30 days of receipt of the notice of Conciliation intimate its consent for Conciliation along with its counter-claims, if any.
3. The Conciliation in a matter involving claim or counter-claim (whichever is higher) up to Rs 5 crores shall be carried out by sole Conciliator nominated by BHEL while in a matter involving claim or counter-claim (whichever is higher) of more than Rs 5 crores Conciliation shall be carried out by 3 Conciliators nominated by BHEL. The appointment of Conciliator(s) shall be completed and communicated by the concerned Department/Group of BHEL Unit/Division/Region/Business Group to the other party and the Conciliator(s) within 30 days from the date of acceptance of the invitation to conciliate by the concerned party in the Format-9. The details of the Claim, and counter-claim, if any, shall be intimated to the Conciliator(s) simultaneously in Format-5.
4. The Parties shall be represented by only their duly authorized in-house executives/officers and neither Party shall be represented by a Lawyer.
5. The first meeting of the IEC shall be convened by the IEC by sending appropriate communication/notice to both the parties as soon as possible but not later than 30 days from the date of his/their appointment. The hearings in the Conciliation proceeding shall ordinarily be concluded within two (2) months and, in exceptional cases where parties have expressed willingness to settle the matter or there exists possibility of settlement in the matter, the proceedings may be extended by the IEC by a maximum of further 2 months with the consent of the Parties subject to cogent reasons being recorded in writing.
6. The IEC shall thereafter formulate recommendations for settlement of the Disputes supported by reasons at the earliest but in any case within 15 days from the date of conclusion of the last hearing. The recommendations so formulated along with the reasons shall be furnished by the IEC to both the Parties at the earliest but in any case within 1 month from the date of conclusion of the last hearing.
7. Response/modifications/suggestions of the Parties on the recommendations of the IEC are to be submitted to the IEC within time limit stipulated by the IEC but not more than 15 days from the date of receipt of the recommendations from the IEC.
8. In the event, upon consideration, further review of the recommendations is considered necessary, whether by BHEL or by the other Party, then, the matter can be remitted back to the IEC with request to reconsider the same in light of the issues projected by either/both the Parties and to submit its recommendations thereon within the following 15 days from the date of remitting of the case by either of the Parties.
9. Upon the recommendations by the Parties, with or without modifications, as considered necessary, the IEC shall be called upon to draw up the Draft Settlement Agreement in terms of the recommendations.
10. When a consensus can be arrived at between the parties only in regard to any one or some of the issues referred for Conciliation the draft Settlement Agreement shall be accordingly formulated in regard to the

said Issue(s), and the said Settlement Agreement, if signed, by the parties, shall be valid only for the said issues. As regards the balance issues not settled, the parties may seek to resolve them further as per terms and conditions provided in the contract.

11. In case no settlement can be reached between the parties, the IEC shall by a written declaration, pronounce that the Conciliation between the parties has failed and is accordingly terminated.
12. Unless the Conciliation proceedings are terminated in terms of para 22 (b), (c) & (d) herein below, the IEC shall forward his/its recommendations as to possible terms of settlement within one (1) month from the date of last hearing. The date of first hearing of Conciliation shall be the starting date for calculating the period of 2 months.
13. In case of 3 members IEC, 2 members of IEC present will constitute a valid quorum for IEC and meeting can take place to proceed in the matter after seeking consent from the member who is not available. If necessary, videoconferencing may be arranged for facilitating participation of the members. However, the IEC recommendations will be signed by all members. Where there is more than one (1) Conciliator, as a general rule they shall act jointly. In the event of differences between the Members of IEC, the decision/recommendations of the majority of the Members of IEC shall prevail and be construed as the recommendation of the IEC.
14. The Draft Settlement Agreement prepared by the IEC in terms of the consensus arrived at during the Conciliation proceedings between the Parties shall be given by the IEC to both the parties for putting up for approval of their respective Competent Authority.
15. Before submitting the draft settlement agreement to BHEL's Competent Authority viz. the Board Level Committee on Alternative Dispute Resolution (BLCADR) for approval, concurrence of the other party's Competent Authority to the draft settlement agreement shall be obtained by the other party and informed to BHEL within 15 days of receipt of the final draft settlement agreement by it. Upon approval by the Competent Authority, the Settlement Agreement would thereafter be signed by the authorized representatives of both the Parties and authenticated by the members of the IEC.
16. In case the Draft Settlement Agreement is rejected by the Competent Authority of BHEL or the other Party, the Conciliation proceedings would stand terminated.
17. A Settlement Agreement shall contain a statement to the effect that each of the person(s) signing thereto (i) is fully authorized by the respective Party(ies) he/she represents, (ii) has fully understood the contents of the same and (iii) is signing on the same out of complete freewill and consent, without any pressure, undue influence.
18. The Settlement Agreement shall thereafter have the same legal status and effect as an arbitration award on agreed terms on the substance of the dispute rendered by an arbitral tribunal passed under section 30 of the Arbitration and Conciliation Act, 1996.
19. Acceptance of the Draft Settlement Agreement/recommendations of the Conciliator and/or signing of the Settlement Agreement by BHEL shall however, be subject to withdrawal/closure of any arbitral and/or judicial proceedings initiated by the concerned Party in regard to such settled issues.
20. Unless otherwise provided for in the agreement, contract or the Memorandum of Understanding, as the case may be, in the event of likelihood of prolonged absence of the Conciliator or any member of IEC, for any reason/incapacity, the Competent Authority/Head of Unit/Division/Region/Business Group of BHEL may substitute the Conciliator or such member at any stage of the proceedings. Upon appointment of the substitute Conciliator(s), such reconstituted IEC may, with the consent of the Parties, proceed with further Conciliation into the matter either de-novo or from the stage already reached by the previous IEC before the substitution.
21. The proceedings of Conciliation under this Scheme may be terminated as follows:
    a. On the date of signing of the Settlement agreement by the Parties; or,
    b. By a written declaration of the IEC, after consultation with the parties, to the effect that further efforts at conciliation are no longer justified, on the date of the declaration; or,

c. By a written declaration of the Parties addressed to the IEC to the effect that the Conciliation proceedings are terminated, on the date of the declaration; or,
d. By a written declaration of a Party to the other Party and the IEC, if appointed, to the effect that the Conciliation proceedings are terminated, on the date of the declaration; or,
e. On rejection of the Draft Settlement Agreement by the Competent Authority of BHEL or the other Party.

22. The Conciliator(s) shall be entitled to following fees and facilities:

Sl No	Particulars	Amount
1	Sitting fees	Each Member shall be paid a Lump Sum fee of Rs 75,000/- for the whole case payable in terms of paragraph No. 27 herein below.
2	Towards drafting of settlement agreement	In cases involving claim and/or counter-claim of up to Rs 5crores. Rs 50,000/- (Sole Conciliator) In cases involving claim and/or counter-claim of exceeding Rs 5 crores but less than Rs 10 crores. Rs 75,000 (per Conciliator) In cases involving claim and/or counter-claim of more than Rs 10 crores. Rs 1,00,000/- (per Conciliator) Note: The aforesaid fees for the drafting of the Settlement Agreement shall be paid on the, Signing of the Settlement Agreement after approval of the Competent Authority or Rejection of the proposed Settlement Agreement by the Competent Authority of BHEL.
3	Secretarial expenses	Rs 10,000/- (one time) for the whole case for Conciliation by a Sole Member IEC. Where Conciliation is by multi member Conciliators –Rs 30,000/- (one time)- to be paid to the IEC
4	Travel and Transportation	As per entitlement of equivalent officer (pay scale wise) in BHEL
	Others	As per the extant entitlement of whole time Functional Directors in BHEL. Ordinarily, the IEC Member(s) would be entitled to travel by air Economy Class
5	Venue for meeting	Unless otherwise agreed in the agreement, contract or the Memorandum of Understanding, as the case may be, the venue/seat of proceedings shall be the location of the concerned Unit / Division / Region / Business Group of BHEL. Without prejudice to the seat/venue of the Conciliation being at the location of concerned BHEL Unit / Division / Region / Business Group, the IEC after consulting the Parties may decide to hold the proceedings at any other place/venue to facilitate the proceedings. Unless, Parties agree to conduct Conciliation at BHEL premises, the venue is to be arranged by either Party alternately.

23. The parties will bear their own costs including cost of presenting their cases/evidence/witness(es)/expert(s) on their behalf. The parties agree to rely upon documentary evidence in support of their claims and not to bring any oral evidence in IEC proceedings.
24. If any witness(es) or expert(s) is/are, with the consent of the parties, called upon to appear at the instance of the IEC in connection with the matter, then, the costs towards such witness(es)/expert(s) shall be

determined by the IEC with the consent of the Parties and the cost so determined shall be borne equally by the Parties.

25. The other expenditures/costs in connection with the Conciliation proceedings as well as the IEC's fees and expenses shall be shared by the Parties equally.
26. Out of the lump sum fees of Rs 75,000/- for Sitting Fees, 50% shall be payable after the first meeting of the IEC and the remaining 50% of the Sitting Fees shall be payable only after termination of the conciliation proceedings in terms of para 22 hereinabove.
27. The travelling, transportation and stay at outstation shall be arranged by concerned Unit as per entitlements as per Serial No. 4 of the Table at para 23 above, and in case such arrangements are not made by the BHEL Unit, the same shall be reimbursed to the IEC on actuals limited to their entitlement as per Serial No. 4 of the Table at Para 23 above against supporting documents. The IEC Member(s) shall submit necessary invoice for claiming the fees/reimbursements.
28. The Parties shall keep confidential all matters relating to the conciliation proceedings. Confidentiality shall extend also to the settlement agreement, except where its disclosure is necessary for purposes of its implementation and enforcement or as required by or under a law or as per directions of a Court/Governmental authority/ regulatory body, as the case may be.
29. The Parties shall not rely upon or introduce as evidence in any further arbitral or judicial proceedings, whether or not such proceedings relate to the Disputes that is the subject of the Conciliation proceedings:
    a. Views expressed or suggestions made by the other party in respect of a possible settlement of the Disputes;
    b. admissions made by the other party in the course of the Conciliator proceedings;
    c. proposals made by the Conciliator;
    d. The fact that the other Party had indicated his willingness to accept a proposal for settlement made by the Conciliator.
30. The Parties shall not present the Conciliator(s) as witness in any Alternative Dispute Resolution or Judicial proceedings in respect of a Disputes that is/was the subject of that particular Conciliation proceeding.
31. None of the Conciliators shall act as an arbitrator or as a representative or counsel of a Party in any arbitral or judicial proceeding in respect of a Disputes that is/was the subject of that particular Conciliation proceeding.
32. The Parties shall not initiate, during the Conciliation proceedings, any arbitral or judicial proceedings in respect of a Disputes that is the subject matter of the Conciliation proceedings except that a Party may initiate arbitral or judicial proceedings where, in his opinion, such proceedings are necessary for preserving his rights including for preventing expiry of period of limitation. Unless terminated as per the provisions of this Scheme, the Conciliation proceedings shall continue notwithstanding the commencement of the arbitral or judicial proceedings and the arbitral or judicial proceedings shall be primarily for the purpose of preserving rights including preventing expiry of period of limitation.
33. The official language of Conciliation proceedings under this Scheme shall be English unless the Parties agree to some other language.

BHEL Conciliation Scheme, 2018
STATEMENT OF CLAIMS/COUNTER CLAIMS TO BE SUBMITTED TO THE IEC BY BOTH THE PARTIES

1. Chronology of the Disputes
2. Brief of the Contract/MoU/Agreement/LOI/LOA
3. Brief history of the Disputes:
4. Issues:
5. Details of Clam(s)/Counter Claim(s):

SI. No.	Description of claim(s)/Counter Claim	Amount (in INR) Or currency applicable in the contract	Relevant contract clause

6. Basis/Ground of claim(s)/counter claim(s) (along with relevant clause of contract)

Note– The Statement of Claims/Counter Claims may ideally be restricted to maximum limit of 20 pages. Relevant documents may be compiled and submitted along with the statement of Claims/Counter Claims. The statement of Claims/Counter Claims is to be submitted to all IEC members and to the other party by post as well as by email.

FORMAT FOR NOTICE INVOKING CONCILIATION CLAUSE BY BHEL FOR REFERRING THE DISPUTES TO CONCILIATION THROUGH IEC

To,

M/s. (Stakeholder's name)

Subject: NOTICE FOR INVOCATION OF THE CONCILIATION CLAUSE OF THE CONTRACT BY BHEL

Ref: Contract No/MoU/Agreement/LOI/LOA & date_____.

Dear Sir/Madam,

As you are aware, with reference to above referred Contract/MoU/Agreement/LOI/LOA, certain disputes have arisen, which, in-spite of several rounds of mutual discussions and various correspondences have remained unresolved. The brief particulars of our claims which arise out of the above- referred Contract/MoU/Agreement/LOI/LOA are reproduced hereunder:

Sl. No.	Claim description	Amount involved

As you are aware, there is a provision in the captioned Contract/MoU/Agreement/LOI/ LOA for referring disputes to conciliation.

In terms of Clause ---------of Procedure i.e., Annexure ------ to the Contract/MoU/Agreement / LOI / LOA, we hereby seek your consent to refer the matter to Conciliation by Independent Experts Committee to be appointed by BHEL. You are invited to provide your consent in writing to proceed with conciliation into the above mentioned disputes within a period of 30 days from the date of this letter along with details of counter-claims, if any, which you might have with regard to the subject Contract/ MoU/ Agreement/ LOI/ LOA.

Please note that upon receipt of your consent in writing within 30 days of the date of receipt of this letter by you, BHEL shall appoint suitable person(s) from the BHEL Panel of Conciliators.
This letter is being issued without prejudice to our rights and contentions available under the contract and law.

Thanking you Yours faithfully
Representative of BHEL

Note: The Format may be suitably modified, as required, based on facts and circumstances of the case.

FORMAT FOR NOTICE INVOKING CONCILIATION CLAUSE BY A STAKEHOLDER FOR REFERRING THE DISPUTES TO CONCILIATION THROUGH IEC

To,
BHEL (Head of the Unit/Division/Region/Business Group)

Subject: NOTICE FOR INVOCATION OF THE CONCILIATION CLAUSE OF THE CONTRACT BY A STAKEHOLDER

Ref: Contract No/MoU/Agreement/LOI/LOA& date_____.
Dear Sir/Madam,
As you are aware, with reference to above referred Contract/MoU/Agreement/LOI/LOA, certain disputes have arisen, which, in-spite of several rounds of mutual discussions and various correspondences have remained unresolved. The brief particulars of our claims which have arisen out of the above- referred Contract/MoU/Agreement/LOI/LOA are enumerated hereunder:

Sl. No.	Claim description	Amount involved

As you are aware, there is a provision in the captioned Contract/MoU/Agreement/LOI/ LOA for referring inter-se disputes of the Parties to conciliation.

We wish to refer the above-said disputes to Conciliation as per the said Clause of the captioned Contract/MoU/Agreement/LOI/ LOA. In terms of Clause ---------of Procedure i.e., Annexure ------ to the Contract/MoU /Agreement / LOI / LOA, we hereby invite BHEL to provide its consent in writing to proceed with conciliation into the above mentioned disputes within a period of 30 days from the date of this letter along with details of counter-claims, if any, which it might have with regard to the subject Contract/ MoU/ Agreement/ LOI/ LOA and to appoint suitable person(s) as Conciliator(s) from the BHEL Panel of Conciliators.
This letter is being issued without prejudice to our rights and contentions available under the contract and law.

Thanking you
Yours faithfully

Representative of the Stakeholder

Note: The Format may be suitably modified, as required, based on facts and circumstances of the case.

FORMAT FOR INTIMATION TO THE STAKEHOLDER ABOUT APPOINTMENT OF CONCILIATOR/IEC

To,

M/s. (Stakeholder's name)

Subject: INTIMATION BY BHEL TO THE STAKEHOLDER AND CONCILIATOR(S) ABOUT APPOINTMENT OF CONCILIATOR/IEC

Ref: Contract No/MoU/Agreement/LOI/LOA& date_____. Sir,
This is with reference to letter dated ---------- regarding reference of the disputes arising in connection with the subject Contract No /MoU/Agreement/LOI/LOA to conciliation and appointment of Conciliator(s).
In pursuance of the said letter, the said disputes are assigned to conciliation and the following persons are nominated as Conciliator(s) for conciliating and assisting the Parties to amicably resolve the disputes in terms of the Arbitration & Conciliation Act, 1996 and the Procedure ---- to the subject Contract ...../MoU/Agreement/LOI/LOA, if possible. Name and contact details of Conciliator(s)

a) .....
b) .....
c) .....

You are requested to submit the Statement of Claims or Counter-Claims (strike off whichever is inapplicable) before the Conciliator(s) in Format 5 (enclosed herewith) as per the time limit as prescribed by the Conciliator(s).

Yours faithfully,

Representative of BHEL
CC: To Conciliator(s)… for Kind Information please. Encl: As above

Note: The Format may be suitably modified, as required, based on facts and circumstances of the case.

End of

PART – A

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It must not be used directly or indirectly in anyway detrimental to the interest to the company.

TECHNICAL SPECIFICATION FOR

OPERATION & MAINTENANCE FOR 3 YEARS

OF

100 MW (AC) FLOATING SOLAR PHOTOVOLTAIC GRID-CONNECTED POWER PLANT
AT
NTPC RAMAGUNDAM (TELANGANA)

Revision details: 00	***Prepared*** ***VKC***	***Approved:*** ***MS***	***Date:*** ***20.10.2021***

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1.0 INTRODUCTION:

1.1 OVERALL PROJECT OUTLINE OF 100 MW FLOATING SOLAR PHOTOVOLTAIC POWER PLANT:

Bharat Heavy Electricals Limited (BHEL), Solar Business Division, Bangalore is setting up a 100MW (AC) Floating solar photovoltaic (SPV) power plant for NTPC at Ramagundam (Telangana).

The 100MW FSPV Project is divided into 40 discrete Array Blocks of 2.5MW-AC each. These 40 Arrays are spread on approx. 650 acres of the raw water reservoir area of the thermal plant. Each 2.5MW-AC Array has approx. 11200 PV Modules. Of the 40 blocks, 36 Array Blocks are made of M/s Prabh Dayal make of HDPE Floats and balance 4 Array blocks are made of M/s Adtech make. The shape of Array blocks of both makes are different and details of these Blocks are attached as Annexures. Each 2.5MW Floating Array has a corresponding floating equipment platform placed at an approx. distance of 10mts from the Array. Detail of the complete layout is attached in the Annexure.

After forming floating solar PV Island, the DC power cables from SCBs are routed through floaters upto PCU placed on an independent floating equipment platform. The output power from PCU is fed to a 2.7MVA hermetically sealed KNAN transformer. A stand-alone 33KV HT breaker shall be placed near to the transformer. 2.5MW(AC) power at 33KV level is combined at Local Pooling Switchgear Floating Platform (LPSFP) to 25MW power, where 10 in 1 out breaker panels are mounted. Total 4 nos of 25MW (AC) LPSFP shall be available in entire 100MW(AC) floating project. 3 Runs of 1CX630 sq.mm XLPE Al cable shall be routed from each LPFSP through independent cable floaters upto the reservoir embankment on the north side and through underground up to the final evacuation point. 4 Nos of outdoor IC-OG HT switchgear panels along with metering cubicles shall be placed on a platform near to NTPC's switchgear room. The output power from each 2 nos. of IC-OG panels are connected to 1 No.(50MW) indoor HT switchgear panel at bus section A and bus section F respectively.

Inverter (PCU): 40 Nos of 2.5MW containarized PCUs of M/s TBEA make with 5 years warranty and 10 years AMC (inclusive of warranty period).

Transformer: 2.7MVA hermetically sealed natural ester oil based inverter transformer- 40 Nos with 5 years warranty.

HT panel: 33KV IP65 rated M/s BHEL make HT panels - 92 Nos (80 nos on water and 12 on land) AC & DC SLDs also attached.

The plant is provided with infrastructural support systems such as weather monitoring system, plant illumination system, fire alarm system, Water washing system, Lightning arrestor system etc.

1.2 ENCLOSURES TO THIS TENDER SPECIFICATION (TENDER PURPOSE ONLY)

1	Tentative AC single line diagram of overall Solar PV power plant
2	Tentative floating SPV plant layout on water reservoir
3	Tentative layout of main control room
4	Tentative route of underground transmission line and switchyard

2.0 LOCATION/ ADDRESS OF POWER PLANT:

District Peddapalli, Telangana

Nearest Highway NH-63 (10KM)

Nearest Railway Station Ramagundam (05 Km)

Nearest Commercial Airport Hyderabad (260 Km)

3.0 BRIEF SCOPE OF WORK:

The scope of work includes operation and maintenance of 100 MW Floating solar power plant for 36 months' period. The scope includes O & M for entire plant covers the floating solar array on Reservoir, Main Control Room (CMCS), Floating equipment platforms for Inverters and Transformers, 33KV power cables laid on floaters from Floating equipment Inverter stations and terminated at Ramagundam TPP switchyard and final termination at Switchyard Control room and Main Control room close to switch yard. The scope includes O & M for all floating system, electrical, civil and mechanical installations. The brief scope of works is listed below:

3.1 Ensuring successful operation of SPV Plant for optimum energy generation.

3.2 Ensuring Breakdown maintenance, Preventive maintenance overhauls, arranging visit of O&M experts (when required) to maximize the availability of the solar plant. Follow-up with OEM for fault rectification is bidder scope.

3.3 Daily work of the operators involves logging the voltage, current, power factor, power and energy output of the SPV plant, temperature, logging down individual array output data once a day.

3.4 Monitoring and controlling, troubleshooting, maintaining of records, registers.

3.5 The operator shall record monthly energy output of each array and transformer and reports shall be prepared on performance of SPV plant.

3.6 Submission of periodical reports to the owner on the energy generation & operating conditions of the SPV plant. Further forwarding of the Operation/generation reports to the Statutory authority in designated format and routine on behalf of the owner as required through SCADA and communication system.

3.7 Ensuring Safety and protection of the plant by deputing sufficient security personnel to cover the CMCS, 40 nos. Inverter Floating Platforms and service boats and equipment at Reservoir jetty.

3.8 Maintain and carry out inventory management of all type of maintenance spares, consumables and fixing / application of the same. In order to meet the emergency requirements, contractor, with the permission of Employer can utilize the mandatory spares being supplied under the contract to customer NTPC with due notice. However, the used spares shall be identified well in advance by the contractor and informed to BHEL within reasonable time to enable its replenishing from OEMs. Also vendor shall follow up with OEMs for such spare items of matching quantity and quality and rating on behalf of BHEL to ensure timely receipt, storage and safe keeping of the replenished or replaced spare items.

3.9 Cleaning of the plant including floating solar array, CMCS building and Inverter cum transformer

platforms, ICOG platform on regular basis and as and when required.

3.10 Module washing as per approved schedule.

3.11 The contractor shall at his own expense provide all amenities to his workmen as per applicable laws and rules.

3.12 The Contractor shall ensure that all safety measures are taken at the site to avoid accidents to his employees or his Co-contractor's employees

3.13 The Contractor shall immediately report the accidents, if any, to the Engineer in charge & to all the concerned authorities as per prevailing laws of the state.

3.14 In order to ensure longevity, safety of the core equipment and optimum performance of the system the contractor should use only genuine spares of high-quality standards wherever his supplied are involved.

3.15 Deployment of Plant in Charge, adequate number of technical support staff and other supporting personnel and sufficient security personnel during the O&M period. All O&M electrical personnel shall possess NTPC (CISF issued) Gate pass for entry to Switchyard work area, Panel room.

3.16 The Contractor shall arrange for a vehicle throughout the tenure of the O&M contract for daily movement of the O&M staff along with BHEL personnel from reservoir area to Switchyard area, CMCS, Main Control room and around the bund roads for necessary checks. The vehicle shall be a car/jeep with all requisite valid fitness and registration documents, permits, licensed driver and compulsorily have the NTPC-CISF Gate permit for entry to switchyard and NTPC EMD office and other offices inside the Thermal plant.

3.17 At the time handing over of the plant by the contractor to NTPC through BHEL, the contractor shall handover equipment and spares in healthy condition.

4.0 DETAILED OPERATIONS AND MAINTENANCE SCOPE:

4.1 DATE OF COMMENCEMENT:

Date of commencement (Zero date) for O & M shall be the 15 days from the date of work Order OR date of handover by joint Minutes of Meeting date made at site whichever is later. Date shall be decided by BHEL, considering the site requirements.

4.2 O & M PERSONNEL REQUIREMENT:

Contractor shall deploy following minimum personnel:

4.2.1 Technical / administrative / office personnel:

I. One (1) Engineer (B. Tech in Electrical Engg.) with 33 kV Power station/switchyard working experience to be appointed who will be the overall O & M in-charge of the plant. Engineer shall have minimum 3 years of experience in operation of 33 KV or higher electrical substation and SCADA operation. The in-charge shall have competence to handle technical and operational / problems with overall responsibility for running complete plant operations. Necessary credential shall be

submitted along with technical bid.

II. Minimum 3 (three) technicians (with Diploma in Electrical with 3 years of experience) and Minimum 8 (Eight) electricians with field experience in solar plant to be deployed. They should have necessary skills in operating electrical / electronic / mechanical equipment, taking measurements, data logging / maintaining registers, preparation of reports in computer.

III. Minimum 4 technicians (Diploma/ITI) and minimum 4 Labour to be allocated for Carrying out Preventive and Breakdown maintenance as per O & M schedule / OEM guidelines / maintenance manual.

IV. The Plant shall be staffed in three 8 hour shifts. The shift wise deployment of persons shall be as per BHEL O & M team requirement.

Note: At least one among the technical personnel deployed at site shall essentially be a certified / licensed person for HT operations (33KV minimum) with valid licence for the state of Telangana. This is a mandatory requirement.

V. One person for regular house-keeping (cleaning / mopping etc.)

VI. Required man-power **(Minimum 80 Nos. for completing 3 washing cycles in a month) and 2 supervisors** for washing of SPV modules fitted on floater. Each 2.5 MW block contain 11200 PV module. Each PV modules must be cleaned at least thrice in a month by using water and Wiper. Use of wiper/mop is must. Cleaning of floater and pathways also need to be attended as and when required. Three cycles of cleaning by wiping of entire solar modules has to be completed in a month by the vendor, as directed by BHEL. Vendor to depute minimum manpower indicated above per cycle basis as per requirement of BHEL.

VII. One persons for Regular Grass cutting at ICOG and CMCS surrounding area, switchyard, and for clearing vegetation which may foul with Ropes and wires of the floater system from the bund area.

VIII. Boat operation shall be done by person having requisite boat driving experience and permit/license.

IX. Minimum 4 (Four) Persons required for maintenance of PV Floater Islands. Periodic maintenance shall be carried out for checking the floater condition, sign of crack/ damage, tightening of mooring ropes and any other maintenance needed to maintain healthiness of floating island. This includes replacement of faulty PV Modules, floaters used for PV modules etc.

X. Minimum 4 (Four) Persons required for maintenance of 40 nos. Ferrocement Floating Platforms for electrical equipment. Periodic maintenance shall be carried out for checking the floater condition, sign of crack/ damage, tightening of mooring ropes and any other maintenance needed to maintain healthiness of Ferrocement Floating Platforms as per OEM's O & M Manual. This includes De-watering of platform through Manhole, checking for leakage in platforms periodically etc.

XI. Other Manpower requirement as per the scope of work given shall be arranged by contractor as per requirement.

The manpower requirement mentioned above is minimum required and indicative only. Contractor shall depute additional manpower for attending the O & M activities as and when required basis. Contractor need to furnish attendance of persons deployed for the purpose of HR and statutory documentation purpose like payment of wages, insurance, provident fund etc.

4.2.2 Security personnel:

Minimum Twelve (12) security guards (all unarmed) to be deployed in three shifts with competence to handle tough situations and safeguard the plant from miscreants. Shift wise deputation of Security staff will be as per decision of BHEL site in-charge during O & M. Security shall deployed round the clock and 365 days a year. Considering the large area to be patrolled around the floating solar array inside the reservoir premises, the security personnel shall undertake regular Beat duty on motorbikes for area patrolling to provide quick response in case of any theft/incidents. Security shall be trained in firefighting also. Security persons should carry Day and night vision Binocular with good range to keep watch in plant area during day and night.

At least 1 number of Porta cabin shall be provided for running Security operations and at least 3 Portable Watch cabins/Tents shall be supplied and located at observation points around the reservoir for stationing Security guards during and day and night duty shifts. Security staff shall have Mobile or other communication system for conveying security alerts among themselves and to the supervisor.
One motorized rubber inflatable dinghy suitable for two security personnel shall be kept for patrolling in water. Security personnel doing patrolling in boat shall wear life vests.

In case, any of the above O & M personnel is on leave, reliever shall be arranged by the Contractor so that there is no effect on O & M activity.

4.2.3 O & M personnel shall be provided with Life jackets, raincoats, toolsets, earthing rods, safety gloves, safety goggles, gumboots, helmets, face masks and all other personal protective equipment (PPE) that will be relevant to ensure human safety while working in the reservoir.

4.2.4 COVID protocol shall be strictly followed by all O&M and security personnel employed by the vendor.

4.2.5 Names, qualification, work responsibility of personnel shall be listed on a display board within control room.

4.2.6 Attendance register shall be maintained.

4.2.7 Contractor shall ensure statutory requirements such as ESI, PF and labour license for their O & M personnel posted at site.

4.2.8 BHEL shall have right to disallow any O & M employee, if found unfit to perform. BHEL instructions issued in writing shall be binding on Contractor who shall replace the person.

4.2.9 O & M personnel at site shall conform to general regulations in force at site and to any special instructions from local administration/NTPC /BHEL.

4.2.10 O & M personnel at site shall be deemed to be aware of damages and risks incidental to conditions of the reservoir and works from time to time and BHEL shall not be responsible for any injury to personnel arising there from.

4.2.11 Training to O & M personnel:

It is the absolute responsibility of Contractor to ensure imparting of necessary training to their O & M personnel to get them acquainted with the operations of various electrical and mechanical equipment of the power plant and maintain Safety practices and protocol at all work places.

4.2.12 Availability of O & M personnel at power plant:

Contractor shall ensure that operating staff are present in the power plant round the clock. Contractor shall ensure that certain minimum operating staffs are present at the power plant even on festivals, public holidays and any other unique occasions so that the plant is run under competent supervision on all days.

4.2.13 Security guards shall be available at the power plant on round the clock basis and on all the days. In case of any break in duty of security guard(s), replacement with alternate guard(s) shall be ensured during the break time.

4.2.14 O & M personnel shall, strictly, not use any part of the power plant for their personal / residential purposes. Their presence at the plant shall, strictly, be meant only for the purpose of operation and maintenance of plant. Separate porta cabin office with power supply facility shall be provided by the vendor for his O&M team close to the CMCS building.

4.2.15 In case of Maintenance activity / failure or damage/accident / replacement activity/ repair required for equipment as Solar modules, VCB, CT and PT, Auxiliary, Main transformers, Battery bank / charger etc, all site related activities e.g. unloading, erection, installation, charging, co-ordination with agencies involved, etc., shall be in O & M contractor's scope. Arrangement of JCB/ crane / hydra / additional labour hiring / Ladder, etc., for O & M works will be in the scope of the Contractor. Supply of replacement material will be in BHEL scope except for tool kits and Measuring instruments. Tool kits and Measuring instruments will be supplied by BHEL at start of O & M (as listed in clause 4.7) and shall be maintained by O & M contractor. On damage of tools or instruments, replacement items shall be by O & M contractor.

4.2.16 Safety gadgets, first aid box items will be supplied and maintained by O & M contractor for all personnel.

4.2.17 Contractor shall designate one of the technicians as safety supervisor for supervising safety of various O&M Activities. Contractor shall prepare Job Safety Assessment for the works involved and train O & M staff accordingly.

4.3 PROVIDING SERVICE BOAT:

Contractor has to procure **two small passenger boat** having capacity of 5 persons including driver of each boat for maintenance works purpose. Boat shall be with FRP body construction, having roof canopy for shade and 6-8 HP outboard diesel/petrol engine motor (reputed make like Suzuki/Yamaha/equivalent). Boat shall be certified for water worthiness by concerned agency like IROS (Indian register of shipping/MMD/SOLAS/Govt. Department as applicable). Each Boat shall come equipped with 5 life jackets and shall have Nylon ropes for towing, anchoring, mooring and Air tubes (3 Nos.) for functioning in rescue work. The boat shall have sufficient stowage space at rear to carry electrical tools upto the floating platforms. All the expenses like fuel and routine maintenance of the boat and any additional dinghy/Security boat shall be met by contractor to make it ready always for any maintenance work.

In addition to that, contractor has to bear the expenditure to ensure Fuel for the running of boat supplied by BHEL at the site and routine mechanical servicing required for running the same. This boat will act as a rescue boat in case of need.

4.4 O&M ACTIVITIES – WEEKLY BASIS:

4.4.1 Removal of garbage from solar array in pond, switchyard, roads, drains, pathways, sand buckets; logging in registers with signatures of operating persons and in-charge.

4.4.2 Monitoring and logging of fire extinguisher levels / pressures as per BHEL formats.

4.4.3 Measurement of string currents using clamp meter at the cable entry point to SCB without opening SCB.

4.4.4 Preventive checks and rectification for HT cable on floaters like tightness of cable clamp, avoiding stress on cable due to unnecessary bends, dipping in water etc.

4.5 O&M ACTIVITIES – MONTHLY BASIS:

4.5.1 Inspection of fire extinguishers (weight, pressure indication, physical status etc) followed by refilling actions, if necessary, based on indications. Report to be submitted as per BHEL approved recording formats. The details of fire extinguishers are as follows:

Project: 100MW(AC) Floating Solar PV for NTPC at Ramagundam Telangana

BOM for Fire Extinguisher as per (As per Clause 2.1)

Fire Extinguisher	Make	MODEL	Qty	Unit
DCP-ABC	Vintex	VFPA 9	84	Nos
CO2 TYPE	Vintex	VFP C02 9	84	Nos.
FOAM TYPE	Vintex	VFPSM 9	41	Nos
HAND PORTABLE	Vintex	VFPSW 9	1	Nos
SAND BUCKET	Reputed	9 Ltr	42	Nos.

4.5.2 Earth resistance measurements (individual and in grid) for solar array structures, control room equipment, ICOG equipment, lightning arrestors (ESE): measured values shall be recorded in registers and reported to BHEL as per BHEL approved recording formats.

4.5.3 Submission of values / status of plant parameters and events for the corresponding month, as below, as per BHEL approved formats:

a. Daily values of solar array strings (SCB parameters)

b. Daily values of weather parameters (solar energy, wind speed, ambient temperature)

c. Daily energy generation

d. Events (with date, time) of faults / tripping / breakdown of equipment

e. Events (with date, time) of grid outage

f. Events (with date, time) of equipment damages, accidents and thefts

g. Activities of module cleaning

4.5.4 Monthly reports shall be submitted to BHEL for all the above data.

4.5.5 Energy generation / meter reading report to be prepared and submitted to the concerned department of NTPC. Signatures from BHEL's customer and substation representatives shall be obtained wherever required.

4.5.6 Co-ordination with STU/SLDC/other statutory organizations as per the requirement on behalf of Employer for Joint Metering Report (JMR), furnishing generations schedules as per requirement, revising schedules as necessary and complying with grid requirements.

4.5.7 Check the tightness of connections inside the SCB.

4.6 O&M ACTIVITIES – QUARTERLY BASIS:

4.6.1 Cleaning of PCUs, VCB panels, ACBD, IRDB, FCBC, battery banks etc. to remove accumulated dust at plant and substation end.

4.6.2 Monitoring and status review, followed by rectification / calibration / replenishment / replacement actions as necessary and applicable for following:

(a) Spare items of all electrical equipment

(b) First aid box items - medicines and accessories

(c) Safety gadgets

(d) Tool kits and measuring instruments

(e) Yard lights

(f) Pumps, starters

(g) Control room appliances: air conditioners, lights, fans, exhaust fans, switch boards etc.

Note: Except for tool kits and Measuring instruments, consumable and minor spares, all other items required for replacement during O & M period will be supplied by BHEL except wherever specified otherwise. Tool kits and Measuring instruments will be maintained by O & M contractor. On failure/damage of tools or instruments, replacement items will be supplied by O & M contractor. Safety gadgets, First aid box items will be supplied and maintained by O & M contractor.

4.6.3 Following measuring instruments will be supplied by BHEL at start of O & M at site:

1	Insulation tester	Reputed make	1 No
4	Digital multi-meter	Reputed make	2 No
5	Clamp meter DC & AC	Reputed make	2 No

On failure/damage of tools or instruments, replacement items will be supplied by O & M contractor.

Note: Any other tools or instruments required for purpose of O & M, replacement of PV modules from floating pontoon etc., will be supplied and maintained by O & M contractor. Any tools required for the efficient running and maintenance of PV module cleaning system shall be provided by the vendor. This shall include tools to replace submersible pump-motors, repair pressurized water pipe lines and supply cable connections.

The vendor shall assemble and supply light weight step ladder frames for accessing the second and third row of PV modules for purpose of maintenance such as replacement, cables reconnection, earthing etc. Total of 20 nos. of ladder frames shall be supplied for the 40 Blocks of 2.5 MW. Same shall be made of aluminium, FRP or pre-galvanized light weight sections. It shall be capable of providing support for the O&M technician over the floaters and without damaging any PV modules or floaters. Vendor shall obtain prior approval of BHEL before supply of these ladders.

The PV floaters and assembly parts if any required to be supplied as replacements shall be made available by BHEL from the Floater OEM.

4.6.4 Pest control (rats, snakes etc.) – sprays, chemicals, medicines etc. to be applied wherever required.

4.6.5 Submission of quarterly report on above activities to BHEL.

4.6.6 Cleaning of water storage tanks

4.7 O & M ACTIVITIES – YEARLY BASIS:

4.7.1 BDV and PPM and GA measurements for oil samples from all the transformers and submission of report to BHEL.

4.7.2 Calibration of Weather Monitoring Station equipment whenever falls due

4.7.3 Filtration of oil to be arranged, if required, based on BDV measurement report. Machinery/ Testing Equipment, DG set, Oil sample bottles (of aluminium material) as per requirement will be arranged by O & M contractor. Tightness of cables, earthing and hardware, replacement of gasket, paint touch-up, arresting oil leakages and oil top-up of all transformers and other related electrical works.

4.7.4 Testing and calibration of VCBs, relays, CTs, PTs, LA etc

4.7.5 Cleaning of sewerage lines, septic tanks (if found necessary)

4.7.6 Painting of CMCS gate and fencing, ICOG canopy structure, earthing chambers, other steel structures if required based on conditions of rusting etc.

4.7.7 Checking tightness of hardware in solar array structures, floaters and tightening wherever required.

4.7.8 Checking tightness of power cable terminations in SPV modules (MC4), SCBs, electrical panels of control room, Inverter room, Transformer yards

4.7.9 Hot-spot detection of Solar panels by using thermal imaging camera to be carried out as per

schedule and report shall be submitted indicating PV modules number wise.

4.8 O & M ACTIVITIES –ONCE IN 3 YEARS

Painting of Main Control room building and inverter room buildings using weather proof cement based acrylic emulsion paint (Exterior grade) for outside and oil bound distemper paint for inside the building.

4.9 O & M ACTIVITIES - AS AND WHEN REQUIRED:

4.9.1 Contractor shall do the periodic maintenance of all equipment's in order to maintain higher performance ratio (PR) and generation target as mentioned in plant performance warranty.

4.9.2 Regular checking by 'Walk Down' checks to internal condition of equipment such as- Module, SCB, Array Junction Box, WMS, all type of Cables, Electrical connection, Earth Strips, Conduit, Communication system etc.

4.9.3 Module Hotspot detection as per O & M schedule of OEM.

4.9.4 Schedule Junction box servicing as per O & M schedule of OEM.

4.9.5 Schedule Inverter servicing as per O & M schedule of OEM.

4.9.6 Schedule Check of Cabling connections

4.9.7 Readiness of boat.

4.9.8 Schedule Checking of Earthing Protection

4.9.9 Schedule Checking of Lightening Protection

4.9.10 Maintenance of the anchoring arrangements, mooring arrangements etc. where schedule of checking, maintenance etc shall be done as per OEM maintenance Manual.

4.9.11 Cleaning of the vegetation from water surfaces of monthly basis from Module and HDPE Pontoons, Mooring ropes.

4.9.12 Monthly cleaning of the surface drains, road etc. at transformer yard, MCR in and around and switchyard area.

4.9.13 Monitoring and operation of plant electrical equipment as and when required:

4.9.14 VCB on/off: local operations from outdoor HT panel and remote operations

4.9.15 Settings of numerical relays in HT panels: review and revision in consultation with BHEL.

4.9.16 ACB on/off operations on LT side.

4.9.17 PCU operations: emergency close, LCD displays (selection of settings, monitoring the DC/AC/event/fault status parameters), operation of duct fans.

4.9.18 Battery and UPS operations.

4.9.19 Coordinating and liasoning on behalf of BHEL for obtaining renewal of statutory licenses, clearances and approvals from state or central agencies and or departments.

4.9.20 Maintenance of all electrical/mechanical/civil installations with urgent action plans and

implementation, when the items are found non-working / damaged. The same shall be reported to BHEL within 12 hours from time of observation.

4.9.21 All the equipment required for O & M for the healthy operation of the Plant must be calibrated, time to time, from the NABL accredited labs and the certificate of calibration must be provided prior to its deployment.

4.9.22 Reporting, on an immediate basis (within max 2 hours) of functional problems / damages in BHEL supplied items to facilitate repair / replacement by BHEL. Further, Contractor shall correspond / coordinate with respective equipment Contractors / service centers, on behalf of BHEL, for getting the service engineers to the site. Later, coordinating with the service engineers during their visit to site, and assisting them in the trouble shooting process until the problem is resolved. Contractor shall report to BHEL (within max 2 hours) immediately after the problem is resolved.

4.9.23 Contractor shall keep updating the spares inventory at the site every time there is consumption of spare items towards replacement. In case of shortage of spares, the same shall be reported on an urgent basis (with max 2 hours) to BHEL.

4.9.24 Coordinating with authorities upon failures at Upstream O & M contractor, sub-station bay, grid failures, line problems etc and implementing the needful steps to restore the plant to normal operation.

4.9.25 The charges for the broadband internet, telephone and data charges, if any, of the SPV plant during the entire period will be in scope of the Contractor

4.9.26 Theft incidents: immediate reporting to BHEL, filing FIRs with police stations on behalf of BHEL, coordination for site inspection by insurance companies and clearance of insurance claims, logging of events (date, time) and maintaining records for entire plant.

4.9.27 Accidents: immediate reporting to BHEL, coordinating with hospitals, logging of events (data, time) and maintaining records.

4.9.28 Grass cutting – Sufficient number of Grass cutting machines, quantity as required, will be supplied and maintained at site by O & M contractor for grass cutting activity at ICOG and CMCS locations. Arrangement for electrical supply or fuel, as applicable, will be made by O & M contractor. Contractor shall attend grass cutting activity on continuous basis or when the grass start growing. Weeds and water plants around the floating equipment platforms, mooring ropes and wires attaching the floating system to the anchors shall be removed time to time as per its growth.

4.10 O & M OF HDPE FLOATING PLATFORMS BLOCK:

There are 40 nos. of Floating Platform Blocks in the project as given in overall layout. Each Block contain PV modules of 2.5 MW (AC) capacity. The floating blocks are made of HDPE material. O

& M of floating platform blocks shall be as per schedule of Floater OEM's attached with tender enquiry. The suitable no. of manpower (Minimum 8) is arranged by the contractor as per requirement for O & M requirement of floater blocks.

4.11 O & M OF FERROCEMNT FLOATING PLATFORMS FOR ELECTRICAL EQUIPMENT:

4.11.1 There are two types of floating platforms for Electrical Equipment in the project as given in overall layout. One is called Inverter Floater Platform (IFP) and other is local pooling switchgear Floater Platform (LPSFP). LPSFP having two parts- LPSFP-IFP and LPSFP. The quantities are as follows:

Sr. No.	Description of Floatation Platforms	No. of Platforms
1	Inverter floater Platform (IFP)	36
2	Local pooling switchgear Floater Platform (LPSFP)	04

4.11.2 PCU's, HT panels, and Transformers are the major equipment which was placed on these floating platforms. Further, it has provisions of easy passage of O&M persons and cable entry/exit, as required. The equipment layout of both the floating platform is attached.

4.11.3 The floating platform is made of Ferrocement. Ferrocement is a form of reinforced concrete using closely spaced multiple layers of mesh and /small diameter of rods completely infiltrated with, or encapsulated in mortar. The most common type of reinforcement is steel mash. The platform is constructed with 10 separate compartments having manhole for maintenance purpose.

4.11.4 Handrails of Stainless steel (SS304) of 1 M height has been provided all around the floating platform. Step ladder for access from boat or land with handrail to the platform has also been provided.

4.11.5 Periodic maintenance shall be carried out for checking the floater condition, sign of crack/ damage, tightening of mooring ropes and any other maintenance needed to maintain healthiness of Ferrocement Floating Platforms as per OEM's O & M Manual. This includes De-watering of platform through Manhole, checking for leakage in platforms periodically etc.

4.11.6 Weekly checking of freeboard and tilt of the platforms and record to be maintained in register.

4.11.7 In case of reduced free board in any platform, removal of condensate water inside Manhole and putting silicon sealant for manhole covers.

4.11.8 Cleaning of platform surface to allow easy water run-off and checking air tightness of Manhole covers.

4.11.9 Conduct visual inspection daily and report on any damage due to boat hits, cracks and any other abnormalities to BHEL.

4.11.10 One no. Dewatering pump diesel/petrol operated shall be required at each LPSFP (i.e. total 4) for dewatering of platforms in case of leakage/spill over due to wave. Each pump will cater dewatering requirement of all 10 IFP's of that LPSFP. The pump shall be portable type and easy to handle. Suggested make and model shall be Honda 2.9 Kw Portable Dewatering Pump, Model Name/Number: WB30X.

4.11.11 Contractor has to ensure that there is the tilt of Ferro cement platforms shall not be more than the acceptable limit marked on platform due to water entry in platforms. For this, a surface level sensor to be installed on each Floating platform for providing information on excess tilt due to water entry.

4.12 DRONE INSPECTION WITH THERMAL IMAGING OF FLOATING SOLAR PLANT AS PART OF O&M:

a. Thermography of PV panels in the reservoir shall be carried out using RPA/UAV/drone mounted thermal/IR camera having minimum resolution of 640 x 512. The brief scope of bidder includes
b. Identification of low performing strings.
c. Identification of reasons of low performance like hot spots on the cells/panels, diode failures, cracked cells or glass cracks, loose contacts and wiring faults, penetration of moisture and/or dirt, failed or disconnected modules, junction box heating or any other.
d. Identification of hot spots in other equipment like SCBs, Y connectors, DC cables, Switchyard.
e. Preparation and submission of detailed report covering physical panel location of each anomaly, summary of defect types and number of defects indicating the priority which arrays need immediate attention etc. The report should be provided in soft (pdf, images in jpeg) as well as hardcopy.
f. Recommendation on root cause of the problems.
g. Frequency of drone survey for thermography shall be weekly per block during the PG test period of the plant for period of three to four months and thereafter shall be monthly once per block during the regular O&M period or as and when required by BHEL. Experienced operator shall be made available for operating and conducting the regular Drone survey of the system as above till end of the O&M period. Maintaining and upkeep of the Drone with accessories such as Thermal Camera, software and hardware for obtaining and analysing the survey inputs for O&M purpose shall be under scope of the O&M vendor. Necessary approvals shall be obtained from Owner (NTPC) for movement of the drone over the reservoir.

4.13 SCHEDULE OF REPORTS:

Sl. No.	Description	Frequency (At least)
(1)	Previous day Plant wise Insolation vs Generation vs Schedule Generation and next day schedule	Daily
(2)	Net Meter sent out generation of the PV plant and for total power station.	
(3)	Performance Ratio & Plant Utilisation Factor	
(4)	Details Maintenance Schedule program	
(5)	Main incident recorded including grid outage	
(6)	Actual generation Vs Guaranteed	Monthly / Quarterly / Bi-Annual / Yearly
(7)	Actual Performance Ratio vs Guaranteed	
(8)	O & M preventive and corrective maintenance services during the current month and expected for the following month.	
(9)	Main incidents recorded, incidents handling and resolution times.	
(10)	Analysis of all performance data of the plants to ensure optimal performance and detect any areas for improvement.	

4.14 SERVICE SCHEDULE:

Maintenance register/log book must be maintained at site. Vendor shall provide the Services activities described below at the frequency indicated in table:

Sl. No.	Description	Frequency (At least)
	PREVENTIVE MAINTENANCE	
1	For monitoring of plant performance by walking between module rows for random checking of Floater/modules / cables / SCBs both at SCADA and Physically. (Including Drone survey as per schedule for PG test period and regular O&M period for finding faulty strings and modules)	Daily
2	Random inspection of output of Floater/modules / strings at SCADA.	
3	Checking that all inverters are producing generation as per expected generation values and Checking for received alarm and failure warnings(if any)	
4	Array inspection: Walk through each row of the PV array and check the PV modules for any damage. Report any damage to rack and damaged modules for warranty replacement. Note location and serial number of doubtful modules.	
5	Washing of all panels with water with no chemicals in a method approved by the Purchaser.	Twice/Thrice in a Month
6	Remove any sprouting seeds or vegetation, bird nests, leaves or debris, etc. from Solar panel, Modules, SCB, walkways etc. It is to be ensured that above debris shall not be discharged into the reservoir.	Monthly
7	Floater and MMS integrity	Monthly
8	Inspect electrical boxes for corrosion or intrusion of water or insects. Seal boxes if required.	Half yearly
9	Exercise operation of all protection devices.	Half yearly
10	HT Switchgear cleaning and tightness of Bus, Contact resistance, IR etc.	Yearly

Sl. No.	Description	Frequency (At least)
11	HT Switchgear: Preventive maintenance of VCB, CT, PT, Relays etc with IR, Primary injection, secondary injection, Contact resistance, Closing and opening time, Interlock checking etc.	
12	SWITCHYARD: Checking, cleaning, tightness. thermo-graphic of CT, PT, VCB, CR panel, LA, Isolators etc. at Switchyard.	Every three month Yearly
13	Oil filled Transformer: Oil level, Wdg temp, Oil temp reading.	Daily
	Transformer Oil: BDV and PPM and DGA as required	Yearly
14	UPS and UPS Battery: Cleaning and voltage as per OEM schedule.	Twice in a month
15	Grounding inspection : Continuity and Earth resistance test (below 1 ohm) system grounding for a) Electrical all earthing at Control room & Switchyard, b) Electronic earthing at Control room, c) Array earthing.	Half yearly
16	Inspect cabling for signs of cracks, defects, pulling out of connections; overheating, arcing, short or open circuits, and ground faults.	Monthly
17	LT panels: ACDB, DCDB, Aux. DB, Utility DB and other LT panels	Half yearly
18	Inverter inspection: Observe instantaneous operational indicators on the faceplate of the inverter to ensure that the amount of power being generated is typical of the conditions. Compare current readings with diagnostic benchmark. Inspect inverter housing or shelter for physical maintenance required if present.	According to OEM's O&M schedule.
19	String inspection: Test open-circuit voltage of series strings of modules.	According to OEM's O&M schedule.
20	Ni-Cd battery sets : As per OEM standard.	Monthly
21	UPS checks – As per OEM standard	Monthly
22	Corrosion inspection: Check all hardware for signs of corrosion, and remove rust and re-paint if necessary.	Half yearly
23	Mounting system inspection: Inspect ballasted, non-penetrating mounting system for abnormal movement	Half yearly
24	Motor boats shall be operable all the time	Daily
25	Mooring arrangements checking and taking preventive action	Monthly
26	Cleaning of the vegetation from water surfaces (If anything comes over the plant that has be cleaned for smooth O & M activity and sustained generation.)	Monthly
27	Cleaning of Surface drains, road (In and around CMCS building, ICOG and switchyard area	Monthly
28	Visual inspection and correction of Solar Facility for loose electrical connections and ground connections.	Half yearly
29	Infrared scans on all combiner and re-combiner boxes; tighten connections to manufacturer's torque specification; report broken terminal blocks. (Employ Drone survey with thermal scanner as per schedule)	According to OEM O & M schedule.
30	Clean inverter cabinet air vents.	Quarterly
31	Clean and change inverter air filters, if present, per manufacturer's warranty requirements.	Quarterly
32	Clean/remove dust from inverter heat sinks per manufacturer's warranty requirements.	Half yearly

Sl. No.	Description	Frequency (At least)
33	Check torque marks and re-tightening appropriate wiring connections to design specification torque force per manufacturer's guidelines.	Half yearly
34	Perform infrared scan of 100% of modules for two types of circuitry connections: cells on the front and junction boxes on the back. (Employ Drone survey with thermal scanner as per schedule)	According to OEM O & M schedule.
35	Document details of preventive maintenance work, such as condition observations, work performed, meter readings, thermal images, and system testing results.	Monthly
36	Vendor will make available a 24x7x365 Technical Support	Ongoing

5.0 GENERAL CONDITIONS APPLICABLE DURING O & M:

O & M contractor shall ensure that technically qualified people shall be provided employment during O & M.

1	Vendor shall make their own arrangements for necessary food, drinking water and accommodation for their labour and employees posted at the site. Similarly, food and drinking water required at the site, during the operations, shall also be in scope of vendor.
2	Vendor shall organize all necessary steps to meet statutory requirements such as labour license, PF, ESI etc and also ensure compliance with **relevant acts** such as minimum wages act, income tax act, employee insurance act etc for their labour deployed at site.
3	Vendor shall maintain updated labour register, with name, age, qualification, salary, attendance details etc. at the site.
4	Vendor shall use danger boards, wherever required, to ensure safety of the persons.
5	Vendor shall adhere to all necessary safety norms such as use of lifejackets, floating devices, helmet, goggles, hand gloves, gumboots, aprons, safety harnesses etc. It is the ultimate responsibility of the vendor in all respect to prevent accidents at the site and safeguard their labour from accidents.
6	Vendor shall, at the completion of every work, clear off the debris, which resulted out of the work. In case of excavation work such as cable trench etc, vendor shall finish the land neatly with necessary leveling, rolling etc.
7	Vendor shall carry out the work without causing inconvenience to other contract groups at the site. In case of conflicts with other groups, vendor shall ensure that the matter is resolved at once amicably so that the progress of work is not affected.
8	Any damages on the building, structures etc. attributable to the acts of labour / employees of vendor shall be rectified and made good by the vendor at their own cost.
9	No child labour shall be employed for execution of the present contract.
10	Vendor shall submit periodic status report, on daily as well as weekly consolidated basis, to BHEL on the progress of the contract.
11	General Guidelines Any civil or electrical work which is not mentioned or included in this tender document but necessary for functional requirements of the plant shall be carried out by vendor. All work shall be carried out in accordance with the latest edition of the Indian Electricity Act and rules formed thereunder and as amended from time to time.
12	The Contractor shall comply with the provision of all relevant Acts of Central or State Governments including payment of Wages Act 1936, Minimum Wages Act 1948, Employer's Liability Act 1938, Workmen's Compensation Act 1923, Industrial Dispute Act 1947, Maturity Benefit Act 1961, Employees State Insurance Act 1948, Contract Labor

	(Regulations & Abolishment) Act 1970 or any modification thereof or any other law relating whereto and rules made there under from time to time.'

6.0 HANDING OVER OF THE PLANT:

6.1 At the end of the contract period, the contractor shall hand over the plant and equipment back to the owner (NTPC) jointly with BHEL in completely safe and healthy condition and without any pending defect.

6.2 The items supplied by NTPC/BHEL on returnable basis, such as spares parts (from mandatory spares or through procurement), consumables, tools and plants, documents etc. shall be returned back to NTPC/BHEL. Else suitable recoveries shall be made from the Contractor's bills.

6.3 After O&M period, BHEL may at its discretion decide to extend the existing O&M contract on mutually acceptable terms & conditions.

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BOQ of O&M works for 100 MW Floating Solar PV Power Plant at NTPC, Ramagundam for a period of 36 months

Sl. No.	Item / Activity description	Unit	Qty	Details	Minimum Manpower	Type of Manpower
OPERATION & MAINTENANCE FOR 36 MONTHS						
1	Management of complete O & M activities by O&M incharge. I. One (1) Engineer (B. Tech in Electrical Engg.) with 33 kV Power station/switchyard working experience to be appointed who will be the overall O & M in-charge of the plant.	Man Months	36	Major responsibilities of O&M incharge : (i) Allotment of work to all the O&M staff and supervision of O&M works as per schedule approved by BHEL. (ii) Sending Daily, weekly and Monthly report to BHEL by mail. (iii) Interaction with customer / NTPC / SLDC etc. iv) Co-ordinating and liasioning with SRLDC for declaring forecast and DSM data on daily basis as per grid protocol. (v) Coordinating with sub-station upon grid failures /cable faults and implementing the needful steps to restore the plant to normal operation. (vi) Monthly downloading of data from ABT meter using CMRI / as instructed by NTPC. (vii) Maintaining plant records and log books, stock register and reporting to BHEL. (viii) Trouble-shooting and Updation of SCADA system if required as instructed by BHEL. (ix) Theft incidents: immediate reporting to BHEL, filing FIRs at police stations on BHEL behalf, coordination for site inspection by insurance companies and clearance of insurance claims, logging of events (date, time) and maintaining records. (x) Accidents: immediate reporting to BHEL, coordinating with hospitals, logging of events (data, time) and maintaining records. Payment for Services of O & M in Charge shall be as per attendance records maintained and deductions will be passed in case of non-availability (**Proportional basis)**.	1	Engineering Graduate
2	Plant Operation works such as (i) Logging of DC, AC, grid parameters (current, voltage, power, energy) at PCUs, HT panels, transformer temperatures, equipment tripping/ breakdown, grid outage, SCB string currents as per BHEL formats. (ii) SCADA data station / HMI PC operations/ operation for daily monitoring of weather parameters, trend graphs and urgent reporting to BHEL in case of any problems / anomalies observed with any of the parameters, resolving communication issues between SCADA and other equipment, healthiness of all equipment. (iii) Supervision of electricians deployed per shift.	Man Months	126	Minimum 3 (Three) technicians (with Diploma in Electrical with 3 years of experience). They should have necessary skills in operating electrical / electronic / mechanical equipment, taking measurements, data logging / maintaining registers, preparation of reports in computer. The O&M works mentioned are indicative. All the activities required for O&M shall be carried out by technicians as instructed by BHEL. Monthly reports to be prepared and submitted by mail to BHEL for the various parameters including Earth resistance, String current, Energy exported etc. as per report formats finalized by BHEL. Diploma technician must be certified for operating installations of 33KV and above. Certificate / license copy to be submitted to BHEL before commencement of O&M works. One technician to be posted in Night shift operation. Measurement of above activities shall be done as per O&M Log book records maintained. Deductions shall be passed in O&M Contractor Bills for any activities not completed.	3	Highly Skilled
3	Electrical operation works (i) Logging of plant operation data as instruction of technicians. (ii) Attending faults in electrical systems and reporting	Man Months	336	Minimum 8 (Eight) electricians with field experience in solar plant to be deployed to cover 40 nos. Inverter Floating Platforms, 4 no. floating polling stations, one CMCS Building (At Reservoir area), One ICOG Platform and 2 nos. panel rooms at NTPC Switchyard (6 KM away from Reservoir). They should have necessary skills in attending faults in DC/AC systems under supervision of technicians. The O&M works mentioned are indicative. Two electrician to be posted in Night shift operation. Measurement of above activities shall be done as per O&M Log book records maintained. Deductions shall be passed in O&M Contractor Bills for any activities not completed.	8	Skilled

4	Carrying out Preventive and Breakdown maintenance as per O & M schedule / OEM guidelines / maintenance manual such as a) Cleaning, tightness checks, lubrication and other maintenance of equipment -PCUs, HT panels, Inverter transformers, Auxiliary transformers, ACDB, UPS, Battery banks, SCBs, SCADA, WMS, Fire Alarm, ESE Lightning arresters, earthing, light fitting -indoor and outdoor etc. b) Replacement of gaskets, Rectification of Oil leakages in all transformers. c) Repair/ replacement of failed 33KV cable inside plant including underground transmission till evacuation point at NTPC, replacement of failed 33 kV termination/ jointing kits (Including supply of repair materials). d) Trouble-shooting of solar array problems as DC earth fault, OFC/ communication cable faults, replacement of damaged PV modules, SCB components etc. (e) Monthly earth resistance measurement and recording value on the Earth chambers and checking of underwater earthing (f) Watering of earth pits for CMCS, ICOG platform	Man Months	288	Minimum 4 technicians (Diploma/ITI) and minimum 4 Labour to be allocated for this activity. (i) List of equipments is indicative. Maintenance of all the equipments installed in plant is in vendor's scope. (ii) Periodic maintenance shall be preferably carried out during early morning or evening to avoid generation loss. (iii) Whenever a fault has occurred, the contractor has to attend to rectify the fault & the fault must be rectified within 48 hours from the time of occurrence of fault. (iv) Major spares such as complete equipment failures of CT, PT, LA, Breaker, Isolator, SCB, PCU, transformer, cables, HT termination and jointing kits etc. if any will be supplied by BHEL. (v) **Minor spares and consumables such as MCBs, all type of Fuses (for SMB, PCU and for all other equipments), Lights in PV area, switch yard & buildings , fans, indication lamps, gaskets, silica gel, transformer oil for top-up. Acid for battery, Fastners, termination kits, cable lugs, glands and heat shrinkable sleeves of all required sizes, MC4 connectors, PCU dust filter, sanitary fittings. if required shall be supplied by vendor.** vi) In case of Maintenance activity / failure / damage / accident / replacement / repair required for any of the plant equipment such as Solar modules, HT panels, all transformers etc. or for any other site related activities, unloading, erection, installation, charging, co-ordination with agencies involved, etc., shall be in O & M vendor's scope. Arrangement of Crane / hydra / JCB/ additional labour hiring / Ladder, etc., for arranging replacement of failed equipment shall also be in the scope of O&M vendor. (vii) All tools and tackles, measuring instruments, testing equipment required for maintenance activities shall be arranged by O&M vendor. Measurement of above activities shall be done as per O&M Log book records maintained. Deductions shall be passed in O&M Contractor Bills for any activities not completed.	8	4 Skilled+ 4 Unskilled
5	Operation & Maintenance of Module washing System installed by BHEL. Washing of SPV modules fitted on floater – Each 2.5 MW-AC Array has approx. 11200 PV Modules. Each PV modules must be cleaned at least **thrice in a month** by using water and Wiper, as per requirement of BHEL. Use of wiper/mop is must. Cleaning of modules shall be carried out block wise. All type of tools & tackles required for maintenance of module washing system shall be arranged by contractor. Cleaning of floater and pathways also need to be attended as and when required. Bidder shall supply minimum 130 number of life jacket and maintain the same throught O & M period. Personnel entering the pond and pond embankment area must wear the same all the time. in case of faliure to wear, bidder are liable for fine imposed by BHEL/NTPC.	Washing Cycles	108	(i) Required labourers **(Minimum 80 Nos. for completing 3 washing cycles in a month) and 2 supervisors** to be deployed to complete this activity within the schedules time period. (ii) Reservoir Water shall be used for the modules cleaning. (iv) All the consumables for cleaning of modules such as cleaning brushes, mopping sticks etc. shall be arranged by vendor. Detergent/any other chemical shall not be used for module cleaning without written permission from BHEL/NTPC. (v) In case of natural cleaning of solar modules by rains and cleaning not carried out, no payment will be done for that cycle within the month. (vi) **Three cycles** of cleaning by wiping of entire solar modules has to be completed in a month by the vendor, as directed by BHEL. Vendor to depute minimum manpower indicated above. In case, lesser quantity of solar modules are cleaned, proportionate payment will be made for quantity of solar modules cleaned up to last day of each month. (vii) Each solar module is of 2m x 1m size and mounted on each Pontoon. (viii) The module washing system installed by BHEL comprising submersible/open well pumps, HDPE pipe network, Valves, hose pipes etc. O & M of the complete system shall be in contractor's scope. All type of tools and tackles required for maintenance of MWS shall be arranged by contractor. Measurement of above activity shall be done as per washing cycle basis of complete plant. Deductions shall be passed in O & M Contractor Bills for any incomplete work.	80	Unskilled

6	Deployment of 12 (Twelve) Unarmed Security Guards 24x7 including national holidays for the entire plant including pond side and at switchyard to be deployed as per requirement of site. At least 1 number of Porta cabin shall be provided for running Security operations and at least 3 Portable Watch cabins/Tents shall be supplied and located at observation points around the reservoir for stationing Security guards during and day and night duty shifts. Security staff shall have Mobile or other communication system for conveying security alerts among themselves and to the supervisor. One motorized rubber inflatable dinghy suitable for two security personnel shall be kept for patrolling in water. Security personnel doing patrolling in boat shall wear life vests.	Months	36	(i) Securing entire plant area- 700 Acres reservoir area along periphery. (ii) In case of theft, FIR to be lodged by O&M vendor. **(iil) If theft incidents are due to negligence of O&M vendor such as shortage of security, the loss recovery shall be done from vendor.** Considering the large area to be patrolled around the floating solar array inside the reservoir premises, the security personnel shall undertake regular Beat duty on motorbikes for area patrolling to provide quick response in case of any theft/incidents. Security shall be trained in firefighting also. Security persons should carry Day and night vision Binocular with good range to keep watch in plant area during day and night. At least 1 number of Porta cabin shall be provided for running Security operations and at least 3 Portable Watch cabins/Tents shall be supplied and located at observation points around the reservoir for stationing Security guards during and day and night duty shifts. Security staff shall have Mobile or other communication system for conveying security alerts among themselves and to the supervisor. One motorized rubber inflatable dinghy suitable for two security personnel shall be kept for patrolling in water. Security personnel doing patrolling in boat shall wear life vests. Measurement of Services of Security guards shall be as per attendance records maintained and deductions will be passed in O&M Contractor Bills in case of non-availability at site.	12	Security (Without Arm)
7	General maintenance works such as Daily housekeeping activity for Main Control room and ICOG Platform including toilets, Garbage removal from solar array area, grass cutting at switchyard, and for clearing vegetation which may foul with Ropes and wires of the floater system from the bund area, repair of plumbing works, Sintex tanks, cleaning of sewerage lines, septic tanks, soak pits if required, minor civil repair works such as leakages, doors, windows, rolling shutters, ventilators, floor/ tiles/ wall cracks, cleaning of drains etc.	Months	36	(i) Required labourers (Minimum 1 for general Housekeeping and 1 nos. for grass cutting and specific housekeeping work) to be allocated for this activity. (ii) All the buildings - Main Control room and ICOG Platform to be mopped daily and surroundings to be kept clean. (iii) All toilets to be cleaned daily. (iv) Regular Grass cutting at ICOG and CMCS surrounding area, switchyard, and for clearing vegetation which may foul with Ropes and wires of the floater system from the bund area. (v) All tools & consumables required for this activity shall be in vendor's scope. Measurement of above activities shall be done as per O & M Log book records maintained. Deductions shall be passed in O & M Contractor Bills for any activities not completed.	2	Unskilled
8	Floater and Floater Pathways maintenance : Periodic maintenance shall be carried out for checking the floater condition, sign of crack/ damage, Tightening of mooring ropes and any other maintenance needed to maintain healthiness of floating island as per OEM's O & M Manual. This includes replacement of faulty PV Modules, floaters used for PV modules, nut, connections between floaters etc. Spares required for Floater maintenance shall be provided by BHEL.	Months	36	O & M of floating platform blocks shall be as per schedule of Floater OEM's attached with tender enquiry. Minimum 4 nos. manpower is required for Floater Maintenance works like checking and tightening of HDPE nuts for floater connection and PV module Fasteners, cap fittings, cable tie locks etc. as per O&M manual of OEM. In case of any abnormalities observed in floating platform, the same to be informed immediately to OEM.	4	Unskilled

9	Ferrocement Floating Platforms for electrical equipment Maintenance: Periodic maintenance shall be carried out for checking the floater condition both inside and outside, sign of crack/ damage, tightening of mooring ropes and any other maintenance needed to maintain healthiness of Ferrocemnt Floating Platforms as per OEM's O & M Manual.	Months	36	1. Weekly checking of freeboard and tilt of the platforms and record to be maintained in register. 2. In case of reduced free board in any platform, removal of condensate water inside Manhole and putting silicon sealant for manhole covers. 3. Cleaning of platform surface to allow easy water run-off and checking air tightness of Manhole covers. 4. Conduct visual inspection daily and report on any damage due to boat hits, cracks and any other abnormalities to BHEL. 5. One no. Dewatering pump diesel/petrol operated shall be required at each LPSFP (i.e. total 4) for dewatering of platforms in case of leakage/spill over due to wave. Each pump will cater dewatering requirement of all 10 IFP's of that LPSFP. The pump shall be portable type and easy to handle. Suggested make and model shall be Honda 2.9 Kw Portable Dewatering Pump, Model Name/Number: WB30X 6. Contractor has to ensure that there is the tilt of Ferrocement platforms shall not be more than the acceptable limit marked on platform due to water entry in platforms. For this, a surface level sensor to be installed on each Floating platform for providing information on excess tilt due to water entry.	4	Unskilled
10	DRONE INSPECTION WITH THERMAL IMAGING OF FLOATING SOLAR PLANT	Months	36	Frequency of drone survey for thermography shall be weekly per block during the PG test period of the plant for period of three to four months and thereafter shall be monthly once per block during the regular O&M period. Experienced operator shall be made available for operating and conducting the regular Drone survey of the system as above till end of the O&M period. Maintaining and upkeep of the Drone with accessories such as Thermal Camera, software and hardware for obtaining and analyzing the survey inputs for O&M purpose shall be under scope of the O&M vendor. Necessary approvals shall be obtained from Owner (NTPC) for movement of the drone over the reservoir.	As per Requirement	As per Requirement
11	Annual maintenance of all transformers with respect to BDV measurement, PPM measurement and Oil filtering as required, DGA test, tightness of cables, earthing and hardwares, replacement of gasket, paint touchup, arresting oil leakages and **oil top-up** work, as applicable of all transformers (33KV and aux transformers) and other related electrical works.	AU	3	Through OEM / competent testing agencies as approved by BHEL. All required tools, tackles, testing and measuring instruments, Oil filtration kit, DG set, welding machines and **transformer oil for top-up e**tc. to be arranged by vendor. The Annual Maintenance activities shall be carried out as per OEM schedule and will be measured only when all activities listed are completed. Payment for any Maintenance not carried out shall be deducted from O&M Contractor Bills.	As per Requirement	As per Requirement
12	Annual testing and calibration of 33 kV HT panel equipment such as VCBs, CTs, PTs, Numerical relays, electromechanical relays, MFMs, Energy meters, including the switchyard equipemnts installed near NTPC Simhadri sub-station and for metering equipment installed in Panel Room.	AU	3	Through OEM / competent testing agencies as approved by BHEL. All required tools, tackles, testing and measuring instruments, DG set etc. to be arranged by vendor. This shall be as per the schedule mentioned in O & M schedule.	As per Requirement	As per Requirement
13	Calibration of Weather Monitoring Station equipment	AU	2	Weather monitoring station equipment to be calibrated at IMD or OEM recommended labs as per calibration period of individual equipment as recommended by OEM.	As per Requirement	As per Requirement
14	Checking and re-filling of Fire extinguishers and sand buckets as required	AU	3	All the fire extinguishers to be checked for healthiness and re-filling to be carried out as and when required as per validity of fire safety.	As per Requirement	As per Requirement
15	Maintenance and Servicing of Airconditioners, Furniture, Water purifier, fans etc.	Months	36	Complete maintenance and servicing of equipment as and when required to be carried out by vendor.	As per Requirement	As per Requirement
16	Painting/Zinc Spray of all metal structures at Floating Platforms, rolling shutters, switchyard and gates etc. For Galvanised structures shall be Zinc Sprayed where as Non-Galvanised Structures shall be painted.	AU	3	All Inverter Floating Platforms have metal Structures for cable Entry Exit. Painting of all metal structures shall be carried out once in every year. The metal structures in water to be painted with two coat of zinc primer and 2 coat of Aluminum paint, as applicable. All Gavanised Structure will be Zinc Sprayed.	As per Requirement	As per Requirement

17	Painting of Main Control room building using weather proof cement based acrylic emulsion paint (Exterior grade) for outside and oil bound distemper paint for inside the building	AU	1	Painting of Control room building shall be carried out once in 3 years.	As per Requirement	As per Requirement
18	Providing internet leased line connection of min. 1 MBPS speed including required hardware for 24 hours internet facility	Months	36	Internet connection to be taken in the name of NTPC. Monthly charges to be paid by Contractor.	NA	NA
19	Coordination and liasoning with CEA for renewal of CEA approval and other statutory bodies as applicable.	AU	2	Vendor shall coordinate and liason with CEA for renewal of complete plant approval including 33KV Transmission line/ cable and NTPC side substation bays. Official charges if any to CEA will be paid by Contractor. BHEL will re-imburse the same as extra than BOQ rate.	As per Requirement	As per Requirement
20	Arrangement of one scuba diver at site for any type of works under water as and when required.	Man days	36	Periodic underwater Inspection of anchroing ropes and mooring arrangements shall be done as per requirement of site.	As per Requirement	As per Requirement
21	Operation & Maintenance of contractor's supplied Boat and BHEL supplied motorised boat	Months	36	Contractor has to supply **two small passenger boat** having capacity of 5 persons including driver of each boat for maintenance purpose. Boat shall be with FRP body construction and 6-8 HP outboard diesel/petrol engine motor (reputed make like Suzuki/Yamaha/equivalent). Boat shall be certified for water worthiness by concerned agency like IROS (Indian register of shipping/MMD/SOLAS/Govt. Department as applicable). Each boat shall come equipped with 5 life jackets and shall have Nylon ropes for towing, anchoring, mooring and Air tubes (3 Nos.) for functioning in rescue work. All the expenses like fuel and routine maintenance of the boat shall be done by contractor to make it ready always for any maintenance work. In addition to that, contractor has to bear the expenditure to ensure Fuel for the running of boat supplied by BHEL at the site and routine mechanical servicing required for running the same. This boat will act as a rescue boat in case of need. Contractor has to bear the expenditure to ensure Fuel for the running of boat supplied by BHEL at the site and routine mechanical servicing required for running the same. Boat operation shall be done by person having requisite boat driving experience and permit.	As per Requirement	As per Requirement
22	Inspection Cum Mobile Office Boat used by BHEL/NTPC/Statutory Authority Officials and Inspectors		36	Contractor has to arrange a Inspection Cum Mobile Office Boat Having provision of Canopy on top, 4 chairs, one center Tables, Handrails, fan for working as a mobile office in reservoir area. Boat shall come equipped with 5 life jackets and shall have Nylon ropes for towing, anchoring, mooring and Air tubes (3 Nos.) for functioning in rescue work. All the expenses like fuel and routine maintenance of the boat shall be done by contractor to make it ready always for any inspection work. Boat operation shall be done by person having requisite boat driving experience and permit.		
23	Arrangement of Jeep/car for for daily movement of the O&M staff along with BHEL personnel from reservoir area to Switchyard area and around the bund roads for necessary checks	Months	36	The Contractor shall arrange for a vehicle throughout the tenure of the O&M contract for daily movement of the O&M staff along with BHEL personnel from reservoir area to Switchyard area and around the bund roads for necessary checks. The vehicle shall be a car/jeep with all requisite valid fitness and registration documents, permits, licensed driver and compulsorily have the NTPC-CISF Gate permit for entry to switchyard and NTPC EMD and other offices inside the Thermal plant.	As per Requirement	As per Requirement
24	Arrangement of Drinking water for O & M Staff in Control room	Months	36	i. Arrangement of Bottled Water Dispenser (Voltas/Any reputed make) with heating, normal and cooling mode. Operation, maintenance and upkeep of the equipment shall be in Contractor's scope. ii. Daily arrangement of Bottled water for drinking purpose.	NA	NA
25	Monthly recharge of SIM cards (3 nos.)	Months	36	Recharge for SIM Card Installed in mini RTU (2 no's) and one Sim Card for SLDC communication	NA	NA

26	Maintenance of Roads and drains such as: I. Crack repairing of the road surface. II. Pot-holes over the top road surface to be rectify. III. Maintenance of shoulders for the rain cuts or damage due to some external reasons. IV. Before and after the monsoon season the storm water drainage shall be maintained & cleaned for smoother flow of storm water.	AU	3	Maintenance of roads and drains shall be carried out once in every year. The details of road to be maintained as follows: 1. Control Room approach concrete road is 150 Meter. Width: 3 M 2. Jetty-1 WBM road approximately approx. 1 KM, Width: 3 M 3. Launching Pad WBM Road approx. 1 KM, Width: 3 M 4. Jetty-2 Earthen Road approx.: 1.5 KM, Width: 3 M		
27	Construction & Maintenance of a Permanent Jetty of approximate dimensions of 12 m x 5 m at edge of reservoir at location given by BHEL to enable maintenance of heavy electrical equipment from land onto Floating equipment platforms. Platform shall be of RCC construction with ramp on land side for enabling movement of cranes onto platform.	AU	3	Annual Strengthening of Columns and slabs, Welding, concreting to be done annualiy for use of jetty for maintenance of Heavy Equipment. The jetty will be RCC precast/cast insitu/ steel type at least 2m height above water level with hand rail towards water side. Minimum 2m clear water depth is mandatory at jetty location to reservoir (in boat driving path of minimum 15 m width). Length of the jetty will be minimum 16m wide to park at least single IFP in length wise for repair of equipment. Jetty should be capable for the movement of 50T mobile crane till water end for shifting of electrical equipment from floating platforms.		

MWS CONTRATOR		EPC CONTRATOR
EXACT PIPES & MOULDS PVT LTD	SCHEME OF MODULE WASHING SYSTEM AT FSPV 100 MW AT NTPC RAMAGUNDAM T.S	END CUSTOMER

1.0 INTRODUCTION

The performance of a solar PV power plant depends on several parameters such as global horizontal Irradiance, ambient temperature etc. which are site specific conditions and are beyond human control. In addition to these several losses are encountered, one of which is soiling loss (due to dust settling, bird droppings etc). Soiling loss can be reduced by maintaining a proper cleaning schedule for solar modules.

2.0 SCOPE

This report provides information for the scheme of module washing system at FSPV 100MW NTPC Ramagundam project.

3.0 OBJECTIVE

To safeguard and maintain a permanent arrangement for module washing in the 100 MW Floating Solar PV Plant at NTPC RAMAGUNDAM project by installing Floating module washing system with Open Well pump(s) and lying network of HDPE pipe. Floating Module washing system including plant side open well pump and HDPE pipe line network of suitable for washing all modules in 2 cycles (15 days once) and 4 liters of water per module.

4.0 SCHEME OF MODULE WASHING SYSTEM

4.1 Water Source:

The reservoir water shall be used for module cleaning as it is suitable for Module Cleaning. The water test report of pond water and PV module Manufacturer recommendations is attached for reference. It is evident that the parameters of reservoir water are lesser that the recommended values by PV Module Manufacturer.

4.2 Design inputs consideration:

As per the project Array layout there are 40 Blocks of 2.5 MW-AC each.

Total number of module in 100 MW Solar PV plant	441600
Quantity of water required per module	4 liters.
Number of cleaning cycles in a month	2

Number of days for One cleaning cycle	13 days
Minimum pressure at the 50 m length hose pipe outlet	2 bar

4.3 Piping Network of Module washing system:

For pipe network in the project we have chosen open loop pipe network having following benefits over closed loop networking of pipes in floating solar plants:

I. The loop network is a good option for land based MCS Systems for equalization of each washing point in case any case more than 4 no's of cleaning points are working simultaneously. But here in the case of floating Solar modules, the major challenges are waves of the water. To maintain the pressure of waves inside the water which could damage the joints. We better know that joints are normally weak in any system when water is running inside. As per the tested value, normal flow of the water creates the pressure of 28 Kg/cm2 but at the joints, it can bear the pressure of 16 kg/cm2.

II. HDPE pipes create vacuum automatically and after that we start the cleaning, then at specific intervals vacuum is reducing pressure or different location blocks of water flow. If our pump is working properly it's normally called Air Lack. Under the floating plants, making the joints additionally on different blocks will make it weaker to bear the pressure.

III. In our system, we have used a customized pipe which has been manufactured in single length specially to maintain the hassle free pressure of water in the pipes for each line across. One unit of air vent has been installed in each block to release the air vacuum inside the HDPE pipes. To maintain the equal pressure across, we have proposed Automatic pressure releasing valves (APRV)

IV. One non returning valve has been also used in our system which will prevent the returning water in case of overflowing of the water in any circumstances.

In view of above, BHEL proposed open loop piping network for module washing system in this project which will be long lasting and maintenance free. However, desired pressure at each point shall be maintained as shown in design calculations.

4.4 Scheme of Module washing system:

V. Open well pump install under the water below 0.75 meter with full protection for each Invertor Room. Each Pump system will cover each Blocks of 2.5 MW.

VI. Pump systems will be installed near Floating Invertor Station at the initial point of walkway.

VII. For the stability of the walkway on floater, it has been tightly tide by the Moring rope on outside Block to exert pressure on rope and it will balance the weight of open well pump accurately. For the safety of the pump and pipeline, strainer shall be installed to stop infiltration of Algae and other unwanted materials inside the pump. To maintain the level of water inside the pipeline, a vertical non return valve shall be installed on the top of the pump. A Automatic pressure releasing valve should be installed above the non-returning valve for the safety of the pipeline.

VIII. The Buoyancy Calculation for suspension of pump with floaters is attached.

IX. A gate valve shall be installed on Near the side of pressure releasing valve (Ref. to technical configuration drawing-pump arrangement).

X. HDPE pipes float above the water and shall be installed between the floater and

module and it will be clamped with walkway through stainless still rope.

XI. Open well Pump OWP-1, OWP-n used for pumping water from Reservoir of NTPC to clean respective Floating module during Morning and Evening time.

XII. Both, main header and sub header pipes will be HDPE with 40 mm diameter.

XIII. A single customized HDPE Pipe with Max Length 250 Mtr will be used in every row.

XIV. cleaning points in equal distance shall be installed in one row. (For more detail, refer the MCS module drawing)

XV. Pipe lines are sized with reference to (HDPE Pipe Conforming) IS:4984-2016 Part-1 standard. (Loss Calculation attached as per IS 2951-Part-1).

XVI. Each tap-off point provides with an automatic isolation/ball valve & provision to connect to hose pipe (Nominal Bore, NB – 15 mm; Length – 50 m) carried manually to clean the nearby modules/adjacent rows of Floater.

XVII. At any point of time, only One numbers of tap-offs can be opened to clean the modules in each cleaning area.

XVIII. Cleaning operation shall be done daily only after plant shut down, during evening hours & early morning hours before plant starts, cleaning cycle will be repeat after 15 days.

XIX. Cleaning operation shall be done daily with Help of 2 Number of Manpower in each Block total 80 Nos of Manpower also each 20 Block 2 Nos Supervisor and Total 40 Block for One Number Manager Required for each Cleaning Cycle. 2 Nos Boat Driver and 1 Nos Maintenance Engineer.

XX. Detailed BOM for piping & pumps & all accessories for module cleaning system listed in the drawings.

XXI. Pumps are sized for operating One (Maximum three Tap Offs Load Beaqr By Pump) outlets/ tap offs at a time in cleaning area.

XXII. Starter Panel will be installed/Mount at outside/inside of AC DB.

4.5 Pump Operation Scheme:

Zone-1	**OWp-1** →	Block Cleaning (Block -1)
Zone-2	**OWp-1** →	Block Cleaning (Block -2)
Zone-3	**OWp-1** →	Block Cleaning (Block -n)

Please Refer- 1) P&ID AND SLD of module cleaning system

Note: Daily cleaning of modules shall be done by one numbers of tap-offs each Pump Section. Total 40 Number of Pump Section will complete the cleaning in 6 hrs. (3 hour mornings and 3-hour evening) every day.

****

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN mm

DRAWING NO. 3 679 05 00956

VARIANT 1

Figure legends & BOQ

PV panel: 11000 Pcs

Washing point: 18 Nos

Flexible Pipe : 1+1+1 W+S+store

Electrical Cable with

Flexible HDPE Conduct: 1 lot

MCS Pump : 1 Nos.

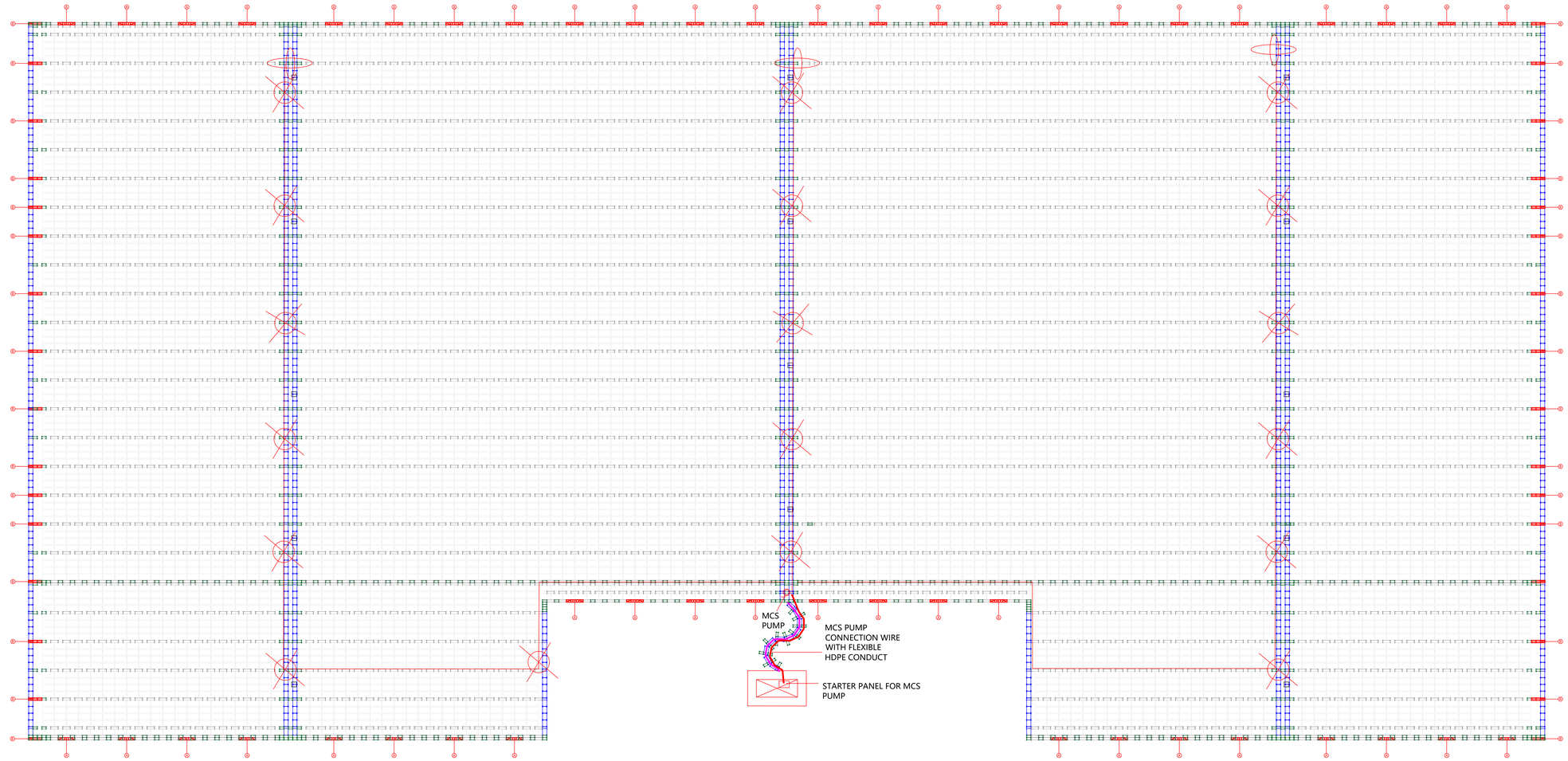
Air vent : 3 Nos.

Starter Panel: 1 Nos

HDPE PIPE 40 MM : 400 MTR

Notes

1.Unit in meter.
2.This array of module is 11000 pieces,the panel slope angle is 5 degs.
3.Using SPV MODULE-L24315P ,325Wp, which of 1966 mm in length and 986 mm in width.
3.The width of main maintenance walkway is 440mm .



MWS LAYOUT

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REV.	DATE	ALTERED / CHECKED / APPROVED

	NAME	SIGN	DATE
DRAWN	SAN		270821
CHECKED	VCP		270821
APPROVED			

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PROJECT : NTPC RAMAGUNDAM 100MW FSPV
CUSTOMER : NTPC LIMITED

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

TITLE: MWS P & ID LAYOUT– VARIANT 1

No. OF SHEETS 01
SHEET 01
REV 01

BHEL DRG. No. 5747–004–PVE–U–014

A1 SIZE

Figure legends & BOQ

PV panel: 11000 Pcs

Washing point: 18 Nos

60 mtr

Flexible Pipe : 1+1+1 W+S+store

Electrical Cable with

Flexible HDPE Conduct: 1 lot

MCS Pump : 1 Nos.

Air vent : 3 Nos.

Starter Panel: 1 Nos

HDPE PIPE 40 MM : 400 MTR

Notes

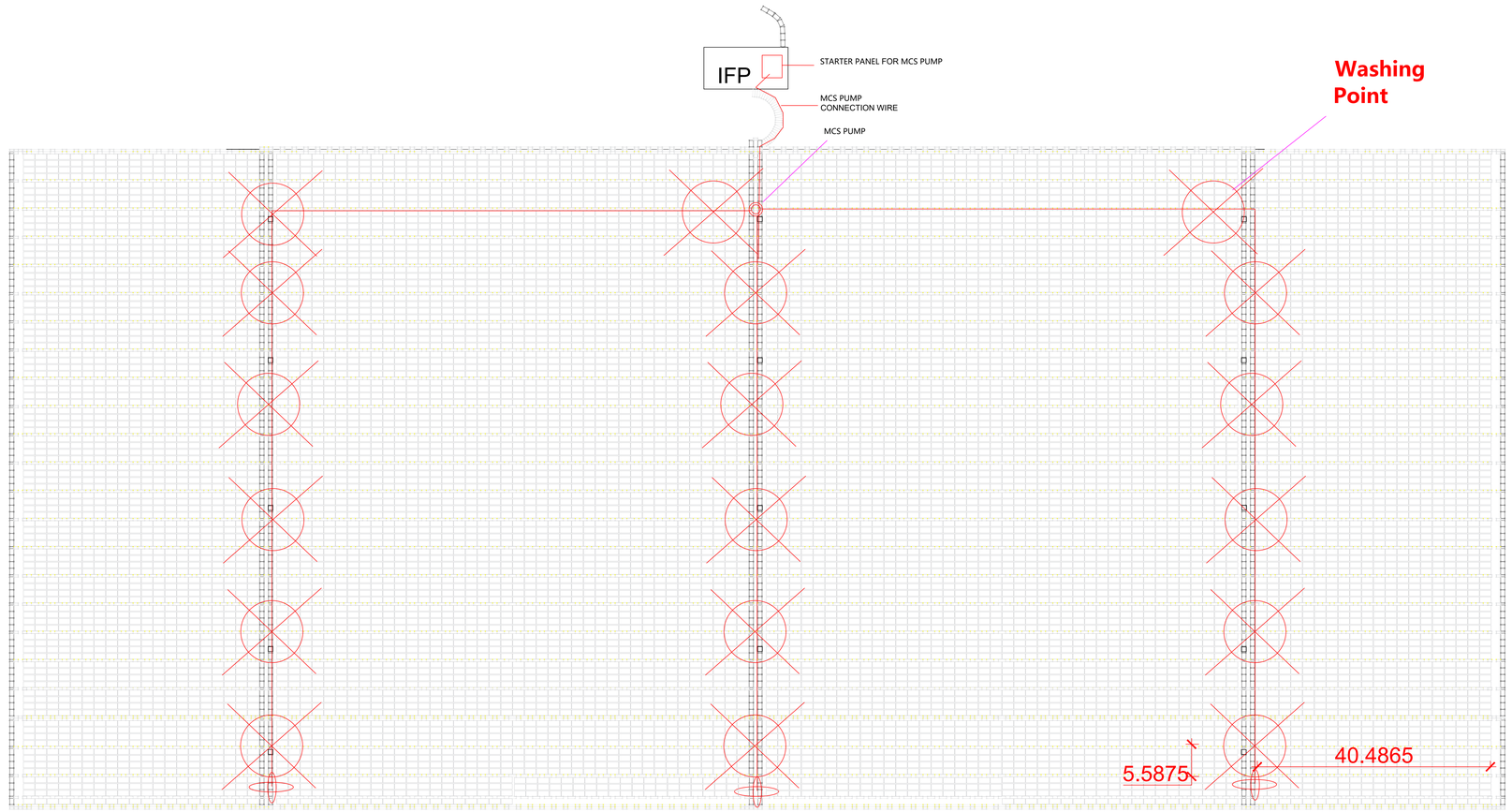
1.Unit in meter.
2.This array of module is 11000 pieces,the panel slope angle is 5 degs.
3.Using SPV MODULE-L24315P ,325Wp, which of 1966 mm in length and 986 mm in width.
3.The width of main maintenance walkway is 440mm .

FIRST ANGLE PROJECTION

DRAWING NO. 3 679 05 009S6

ALL DIMENSIONS ARE IN mm

VARIANT 2



MWS LAYOUT

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REV.	DATE	ALTERED / CHECKED / APPROVED

	NAME	SIGN	DATE
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CHECKED	VJ		160821
APPROVED			

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DEPT. SC&PV | CODE 439

BHEL ORG. No.

PROJECT : NTPC RAMAGUNDAM 100MW FSPV
CUSTOMER : NTPC LIMITED

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

TITLE: MWS LAYOUT– VARIANT 2

No. OF SHEETS 01 | SHEET No. 02 | REV 00

5747–004–PVE–U–014

A1 SIZE

FIRST ANGLE PROJECTION
DRAWING NO. 3 679 05 00956
ALL DIMENSIONS ARE IN mm

VARIANT 3

Figure legends & BOQ

PV panel: 11000 Pcs

Washing point: 18 Nos

60 mtr — Flexible Pipe : 1+1+1 W+S+store

Electrical Cable with
Flexible HDPE Conduct: 1 lot

MCS Pump : 1 Nos.

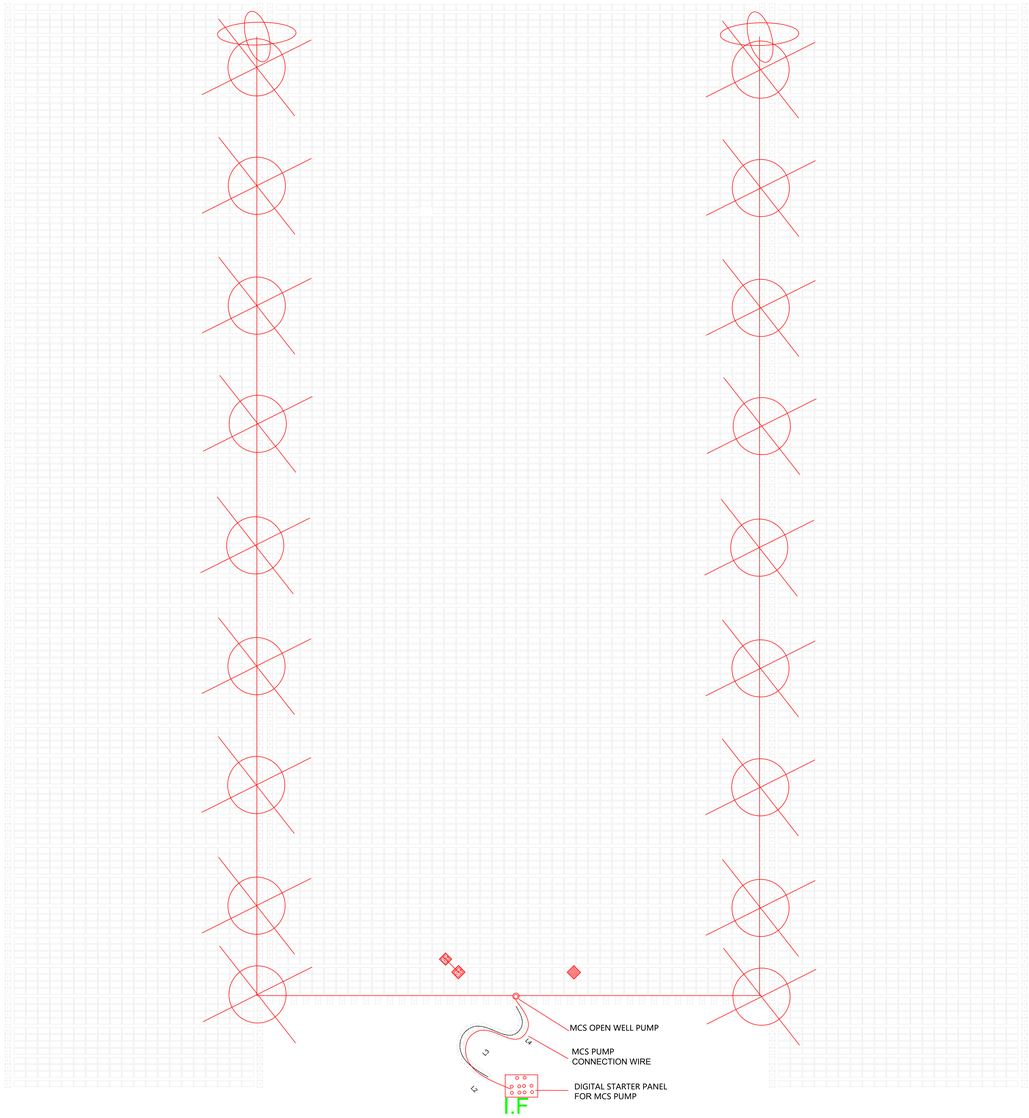
Air vent : 2 Nos.

Starter Panel: 1 Nos

HDPE PIPE 40 MM : 400 MTR

Notes

1.Unit in meter.
2.This array of module is 11000 pieces,the panel slope angle is 5 degs.
3.Using SPV MODULE-L24315P ,325Wp, which of 1966 mm in length and 986 mm in width.
3.The width of main maintenance walkway is 440mm .



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APPROVED			
DISTRIBUTION OF PRINTS			

DEPT.	CODE
SC&PV	439

PROJECT : NTPC RAMAGUNDAM 100MW FSPV
CUSTOMER : NTPC LIMITED

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

TITLE: MWS P & ID LAYOUT– VARIANT 4

No. OF SHEETS	01
SHEET No.	01
REV	00

BHEL DRG. No. 5747–004–PVE–U–014

A1 SIZE

FIRST ANGLE PROJECTION
DRAWING NO. 3 679 05 00956
ALL DIMENSIONS ARE IN mm
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VARIANT 4

Figure legends & BOQ

PV panel: 11000 Pcs

Washing point: 18 Nos

60 mtr

Flexible Pipe : 1+1+1 W+S+store

Electrical Cable with
Flexible HDPE Conduct: 1 lot

MCS Pump : 1 Nos.

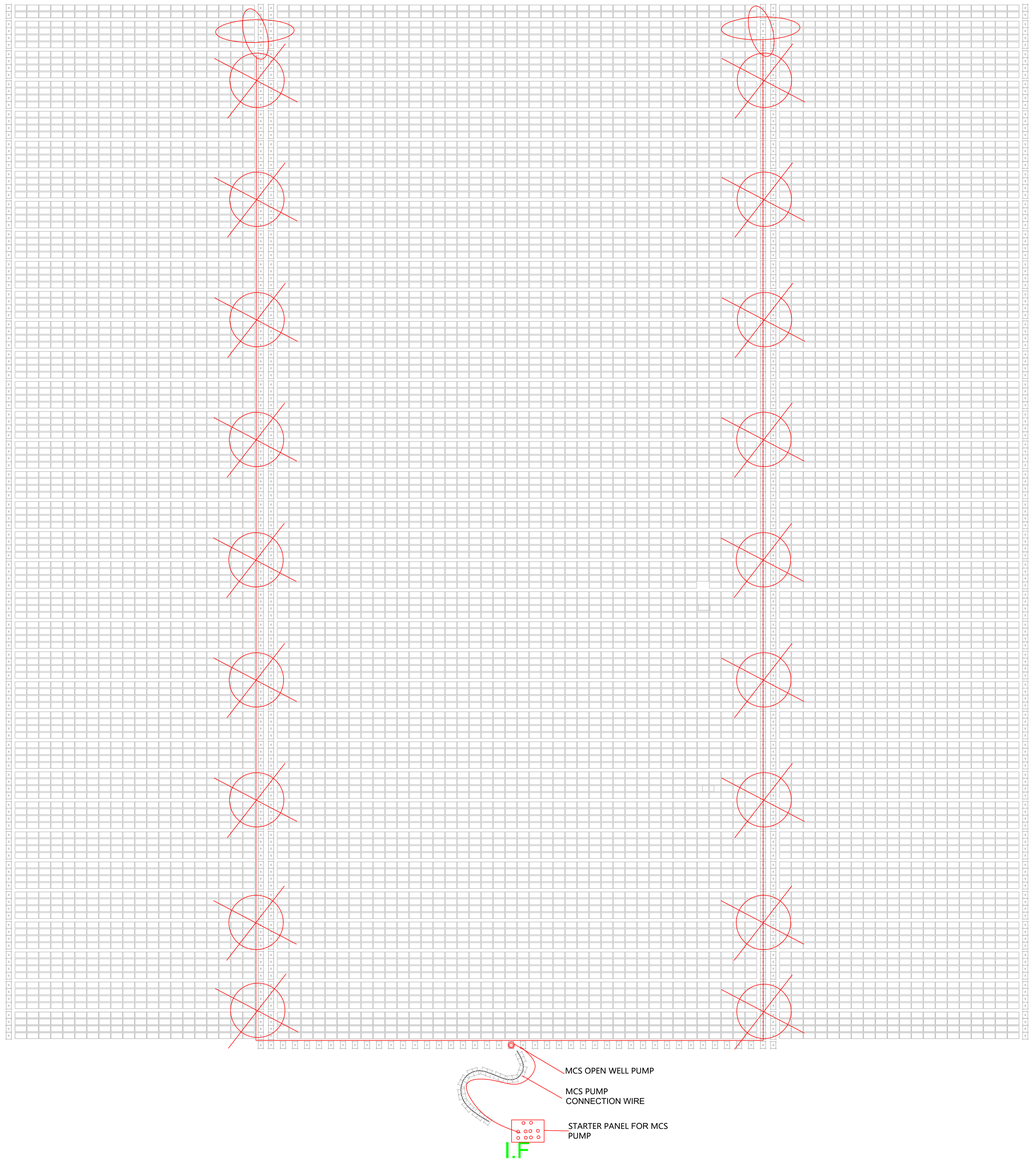
Air vent : 2 Nos.

Starter Panel: 1 Nos

HDPE PIPE 40 MM : 400 MTR

Notes

1.Unit in meter.
2.This array of module is 11000 pieces,the panel slope angle is 5 degs.
3.Using SPV MODULE-L24315P ,325Wp, which of 1966 mm in length and 986 mm in width.
3.The width of main maintenance walkway is 440mm .



MCS LAYOUT

REV.	DATE	ALTERED / CHECKED / APPROVED
01		FIRST ISSUE

	NAME	SIGN	DATE
DRAWN	SAN		270821
CHECKED	VCP		270821
APPROVED			

DISTRIBUTION OF PRINTS

DEPT.	CODE
SDPV	439

PROJECT : NTPC RAMAGUNDAM 100MW FSPV
CUSTOMER : NTPC LIMITED

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

TITLE: MWS P & ID LAYOUT– VARIANT 4

No. OF SHEETS	01
SHEET No.	01
REV	01

BHEL DRG. No. 5747–004–PVE–U–014

A1 SIZE

SIGN & DATE | NEXT DRG.NO. | INVENTORY NO.

Purshotam Profiles Pvt Ltd

Operation and Maintenance

Manual for Floats and Anchoring System

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FOREWARD

This manual contains background information and guidelines concerning the operation and maintenance of Floating Solar Array. This includes operation and maintenance of floats, mooring lines and anchors.

The materials and procedures detailed herein have been prepared to assist the user in establishing and sustain an effective floating solar plant. Although it is not mandatory that the plant follows the recommended procedure, they have been developed from the best technical sources available to PL and many views expertise in the field.

As with the O&M of any type of PV system, the aim is to maximize the electricity generation yield through the system's efficient operation while minimizing the costs through careful system maintenance that ensures the longevity of its components. Maintenance also ensures a safe working environment for O&M personnel.

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2) Operation and Maintenance for Floats
3) Biofouling
4) How to prevent biofouling?
5) Floater O&M
6) Anchoring & Mooring O&M
7) List of Spares for FPV System
8) Module Cleaning Guide for FPV System

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Preventive Maintenance

Preventive maintenance (or preventative maintenance) is maintenance that is regularly performed on a piece of equipment to lessen the likelihood of it failing. It is performed while the equipment is still working so that it does not break down unexpectedly

Elements include:

- General Site maintenance
- Cleaning of PV modules
- Cleaning of floating pontoons
- Inspection and management of biofouling (mostly from bird droppings)
- Inspection of Buoyancy
- Inspection of Anchoring Lines
- Inspection of Anchors

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Operation and Maintenance of Floats

- **Biofouling**

The design and climate at the installation site play an important role in influencing the degree of biofouling. General cleaning of the float surface—removing accumulated dirt, algae growth, bird droppings, and midge/mosquito egg masses—should take place at appropriate intervals depending on site conditions. Open areas of each float (if applicable) that are not covered by PV panels (most often along the perimeter of a floating island) create stagnant water pockets that can become breeding grounds for midges and mosquitoes.

Floats upon which PV modules are mounted are observed to be less susceptible to this problem. Algae growing on the submerged structures or floats provide a suitable habitat for insect larvae and proliferating insects; larvae also constitute a food source for birds.

How to prevent biofouling?

- Regular Cleaning of accumulated dirt, algae growth, bird droppings etc.
- Install floats without any open areas at the perimeter of the floating island.
- Install water pumps/rotors to prevent water from stagnating in pockets.

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Sno	Item	What to check?	What to do?	How to Resolve?
1	Cap	1) Loose Cap	Check if the cap is loose	Tighten with Torque wrench as per manual.
		2) Missing Cap	Check if the cap is missing/broken	Install new cap as per OEM instructions.
2	Floater Immersed In Water	1) Cap	Check if the cap is missing/broken	If yes, change with a spare cap as per OEM Instructions
		2) Punctured Floater	Check the surface of floater for holes/puncture	If yes, change with a spare floater as per OEM Instructions
		3) Floater Pad Eye	Check if the floater pad eye is damaged	If yes, change with a spare floater as per OEM Instructions
3	Connections	1) Tightness of Nut	Check if the nut is properly tightened	If not, tighten with torque wrench as per OEM instructions
		2) Cable tie	Check if cable ties are installed to hold the nut	If not, install as per OEM instructions
		3) Missing /Broken Nut	Check if the nut is broken/missing, identify cause and report to OEM	If yes, change with a spare nut as per OEM Instructions
4	Spreader Bar	1) Connection of D shackles	Check if the shackle is properly connected	If not, connect as per OEM instructions
		2) Spreader fitment with floater	Check if the spreader bar is fitted properly and the legs are going through pad eye	If not, connect as per OEM instructions

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		3) Spreader Bar Floater	Check the floater visually and check for any signs for damage due to load	If , damaged with a spare floater as per OEM Instructions
		4) Floater Pad eye	Check Floater pad eye	If damaged, change with a spare floater as per OEM Instructions
		Corrosion	Check for Corrosion	Clean and apply protective paint as per OEM instructions
5	Clamps	1) Missing Clamp	Check if clamp is missing	If yes, change with a spare clamp as per OEM Instructions
		2) Broken Clamp	Check if clamp is broken, identify cause and report to OEM	If yes, change with a spare clamp per OEM Instructions
		3) Fitment	Check alignment	if not, align as per OEM instructions
6	Fasteners	1) Missing Fastener	Check if fastener is missing	If yes, change with a spare fastener as per OEM Instructions
		2) Broken Fastener	Check if fastener is broken, identify cause and report to OEM	If yes, change with a spare fastener per OEM Instructions
		3) Fitment	Check alignment	if not, align as per OEM instructions

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Operation and Maintenance for Anchoring System

- **Mooring lines and Anchoring systems**

The failure of the mooring and anchoring system can have a catastrophic impact. It is important to verify every component of an anchoring system, including the wire or mooring chain, shackle, and anchor. The inspection and verification of the system components that are close to the surface can be accomplished with less effort from the floating platform.

For the components near the surface (like the shackles, chain, and cable), a visual inspection may be done from the floating platform by pulling the rope/ wire a few centimetres above the water. Mooring lines should be inspected for marine growth and general fouling, which add weight and contribute to further corrosion and degradation. A visual inspection of the chain links and contact points is also important. It is advisable to look for broken wires, loose strands, corrosion, and frayed crimp points.

For the submerged components like anchors, underwater shackles, and mooring ropes/cables, it is recommended to divers for inspection. A inspection of the anchor and measurement of tension of mooring line can be done as part of the preventive maintenance routine

Action

- Inform OEM about any failure in component of anchoring and mooring, which includes mooring ring, d shackles, thimbles, pad eye and anchoring ropes
- All mooring components should be checked for corrosion, damage/broken/missing. In case of corrosion, apply protective paint and if the components are missing/damaged/broken the component must be replaced as per OEM instructions.

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Underwater Inspection

The purpose of mooring underwater inspection is to determine the general conditions of mooring lines, chains and anchors and to verify and update existing as-built drawings and maintenance record. Each Array's Mooring line should be inspected by divers every 6 months Divers assigned for each inspection will inspect only a portion of submerged mooring line in order to compile a general description of the mooring's condition.

Inspection of Mooring Ropes

The visual inspection of synthetic rope before continued use is critical. The residual strength of a rope, the prime indicator of its useful and safe remaining working life, must be assured before committing the rope to continued use.

- **Cut Strands**
  - **What**

- Two or more cut strands in proximity
  - **Cause**

- Abrasion
- Cyclic tension wear
  - **Corrective Action**
    - Remove affected section and re-splice with a stranded end for end splice

- **Compression**
  - **What**
    - Visible Sheen
    - Stiffness reduced by flexing the rope
  - **Cause**
    - Fibre moulding itself to the contact surface under a radial load
  - **Corrective Action** ○ **Abrasion**
  - **What**
    - Broken filaments and yarns
  - **Cause**
    - Abrasion
  - **Corrective Action**
    - Visually inspect the abrasion and evaluate rope based on its most damaged section. Either repair or retire.

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Inspection of Anchor Pile

- Anchor inspections consist of periodic and emergency inspections.
- Check Pad Eye of Pile for corrosion (If corrosion is present, clean and apply protective paint as per OEM instructions
- Check Pad Eye Alignment
-

Biennial Maintenance Schedule

- Visual Inspection for marine growth, corrosion, and degradation
- Visual Inspection for broken wires, loose strands, and corrosion
- Verify Mooring Line Tensions

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List of Spares for FPV Systems

A spare parts inventory in the event of equipment failure is essential. It minimizes downtime during corrective maintenance. It is recommended that spare parts be kept on site in a permanent storage area or in a nearby warehouse. Some original parts may no longer be available within a few years of manufacture (or might require an upgrade). Adequate supplies of the following essential components should be maintained for FPV systems. We recommend to keep at least **.05% of the BOM** as spares for floaters and mooring lines

- Floats—loss of buoyancy could require replacement floats during the lifetime of the project.
- Fasteners—all fasteners exposed to water might require replacement owing to corrosion/oxidation or accidental submersion.
- Modules, in case of damage.
- Additional Mooring Lines
- Spare string inverters (if these are being used).

It is important that spares stock levels are maintained. Therefore, when the O&M contractor uses components from the spares inventory, the contractor should be responsible for replenishing the stocks as soon as is feasible. This arrangement will reduce the time gap between the identification of the fault and replacement of the non-operational component. This can be of particular importance for remote locations where poor accessibility or adverse weather conditions can delay the delivery of components to the site.

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Module Cleaning Guide for FPV Systems

Module cleaning is a simple but important task. It can produce significant and immediate benefits in terms of energy yield. The frequency of module cleaning will depend on local site conditions and the time of year. The frequency to clean modules will be dictated by factors such as site and surrounding area ground covering and local rainfall patterns

When scheduling module cleaning, consideration should
be given to the following:

- Environmental and human factors
- Weather patterns: cleaning during rainy periods is less likely to be required.
- Dust carried from deserts by wind that may also appear following rain.
- Site accessibility based upon weather predictions.

If the system efficiency is found to be below the expected level, then the cleanliness of the modules should be checked and cleaning conducted as necessary.

Module cleaning can be performed manually through dust broom as shown in image below. The personnel should make sure that he/she is adequately equipped with approved life jacket, Safety Shoes, and Safety Helmet as per IS Code

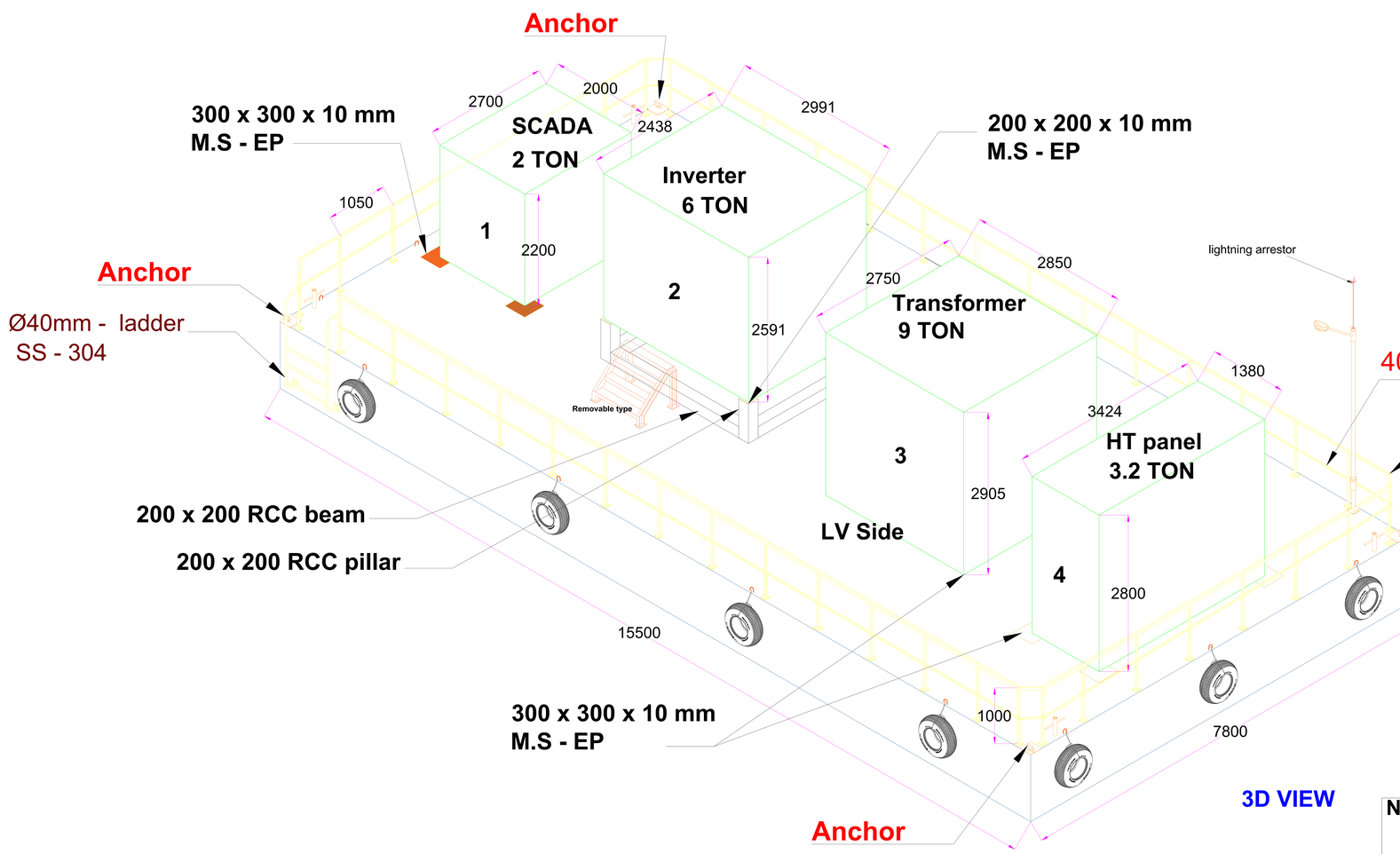


Module cleaning can also be performed through automated or motorized cleaning tools. These tools are easily available in the open market. The automated cleaning system has significant advantage over manual cleaning. It ensures proper cleaning and also minimizes safety issues

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wall thickness of
Top = 40 mm
Bottom and sides = 30mm
All internal bulk heads = 25mm

BHEL-IFP- 02 - 3D ASSEMBLY VIEW



3D VIEW

Load note:

1.Platform weight = 40 ton
2.Total foundation weight = 2 ton
3.Inverter panel weight = 6 ton
4.Transformer weight = 9 ton
5.HT panel weight = 3.2 ton
6.SCADA weight = 2 ton
7.Total handrail weight = 3 ton
8.Live Load = 1 ton

Over All Weight = 66.2 ton.

Note:

1. All dimension are in mm.
2.Drawing in 1:100 scale.

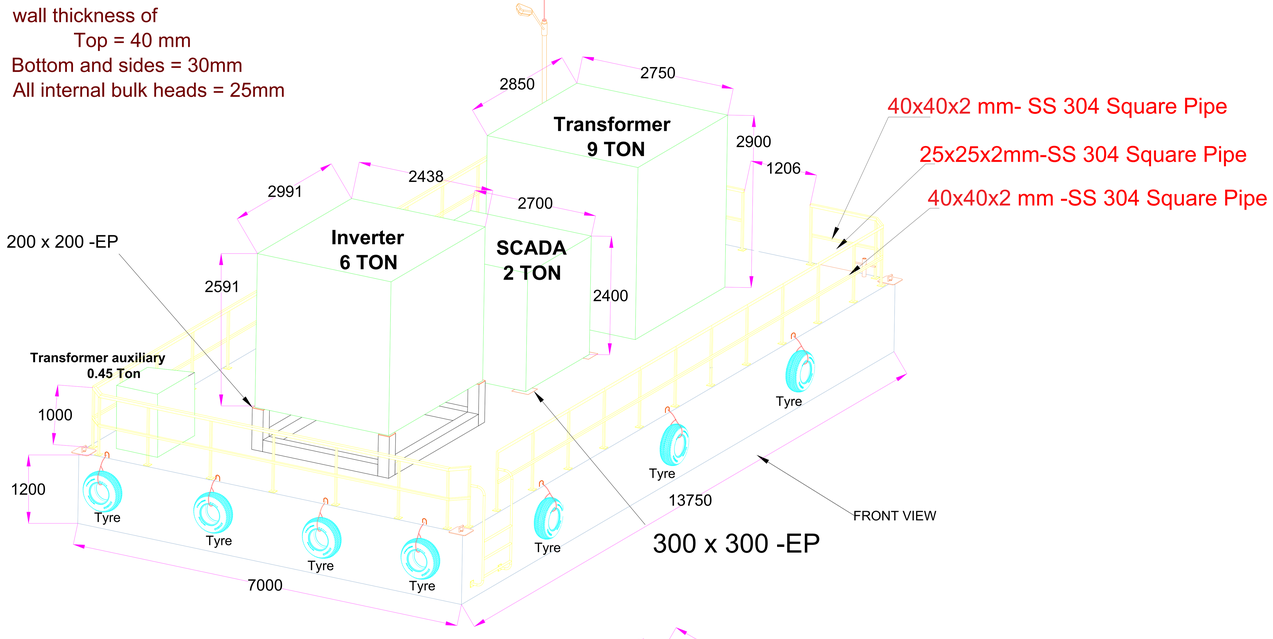
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Vendor Code:	**-**	**Client:**	
Rev:	**Project:**		
	Qty:	**36 Nos**	**NTPC-Ramagundam.**

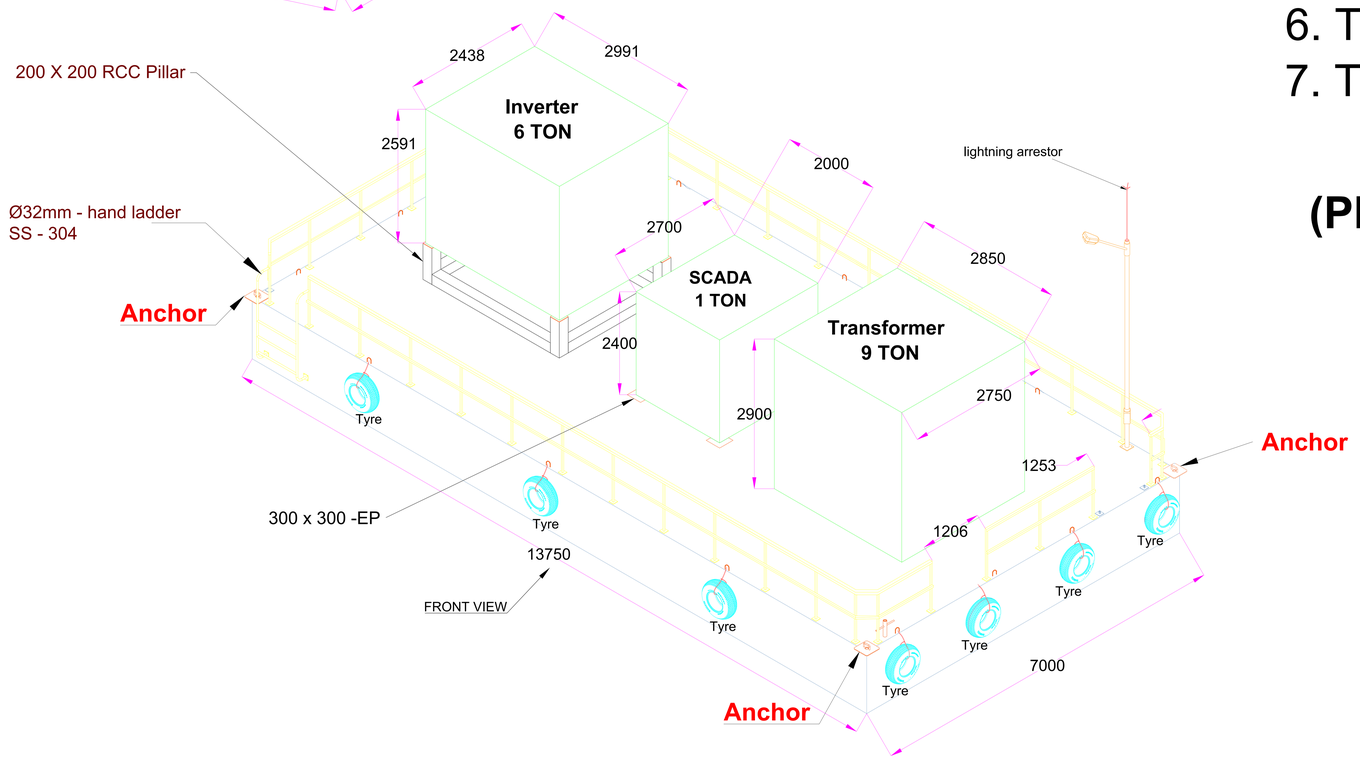
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ADTECH SYSTEMS LIMITED	**Title:**	**BHEL-IFP-01-PLATFORM**		
	Pro.no:	**ADT-P1**	**Drw.no**	**IFP-02**
Dgn.by: JFF	**T.weight:**	**66.2 TON**	**Date:**	**04.05.2021**
Chd.by: BC	**Material:**	**FCC**	**A4**	
Apd.by: KN	**Scale:**	**1:1**		

BHEL - LPSFP- IFP - 02 - 3D ASSEMBLY VIEW

wall thickness of
Top = 40 mm
Bottom and sides = 30mm
All internal bulk heads = 25mm





Platform -I - Load note:

1.platform weight = 35 ton
2.Total foundation weight = 2 ton
3. Inverter panel weight = 6 ton
4.Transformer weight = 9 ton
5. SCADA Weight = 2 ton
6. Total handrail weight = 1.2 ton
7. Transformer auxiliary = 0.45 ton

(Platform -I) Over All Weight = 56 ton.

Note:
1. All dimension are in mm.
2.Drawing in 1:100 scale.

Project Name:	100MW SITE - NTPC - Ramagundam.		
Vendor Code:	-	**Client:**	
Rev:	**Project:**		
	Qty:	4 Nos	NTPC-Ramagundam.

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ADTECH SYSTEMS LIMITED	**Title:**	BHEL-LPSFP-IFP-02-PLATFORM		
	Pro.no:	ADT-P2	**Drw.no**	LPSFP-IFP-02
Dgn.by: JFF	**T.weight:**	56 TON	**Date:**	04.05.2021
Chd.by: BC	**Material:**	FCC	**A4**	
Apd.by: KN	**Scale:**	1:1		

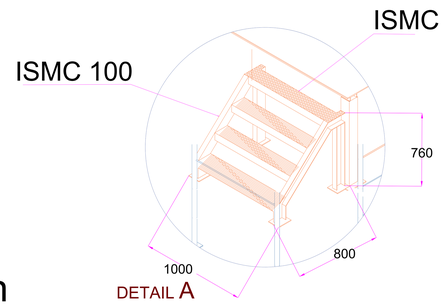
BHEL - LPSFP- 03 - 3D ASSEMBLY VIEW

wall thickness of
Top = 40 mm
Bottom and sides = 30mm
All internal bulk heads = 25mm

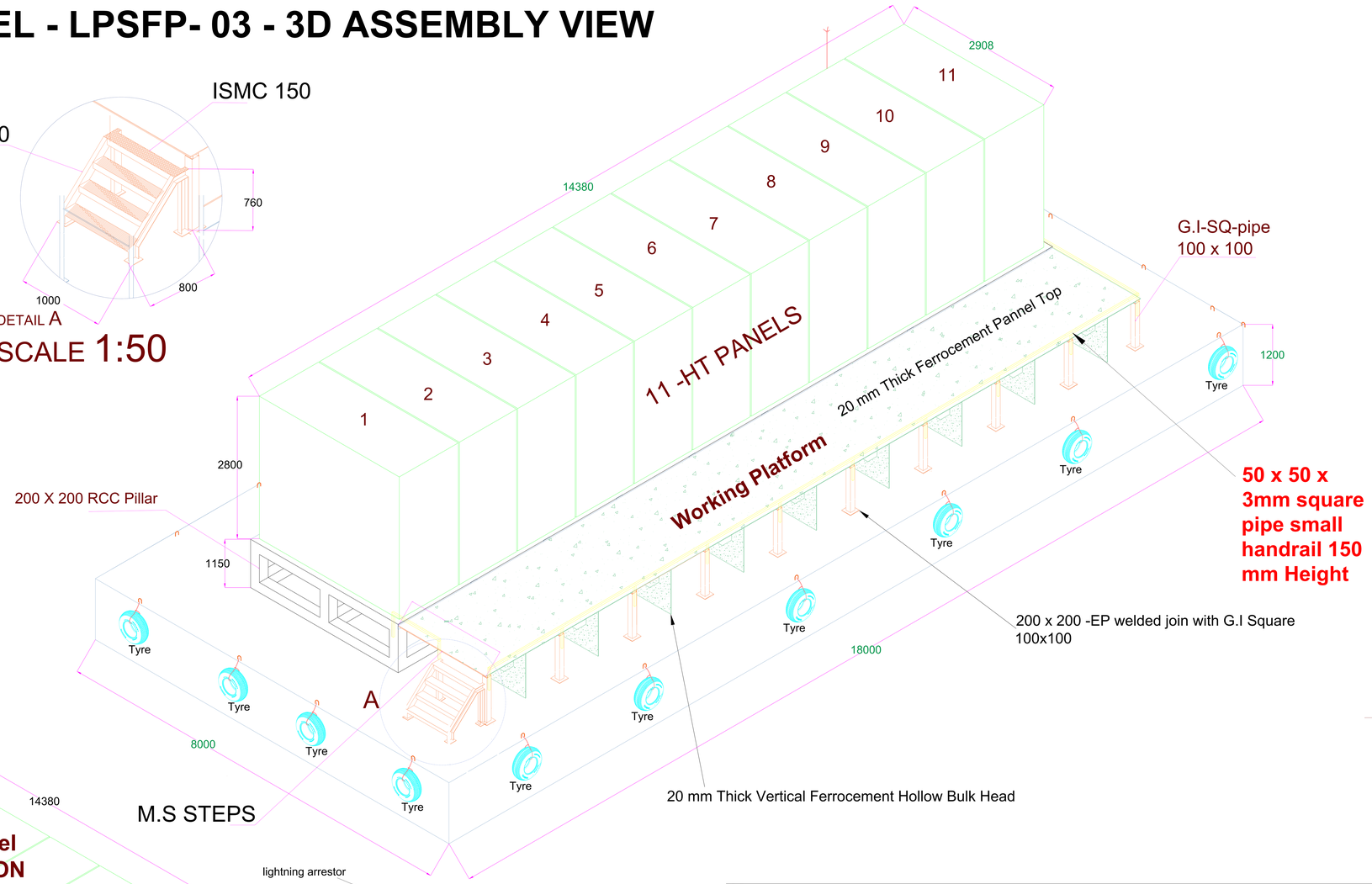
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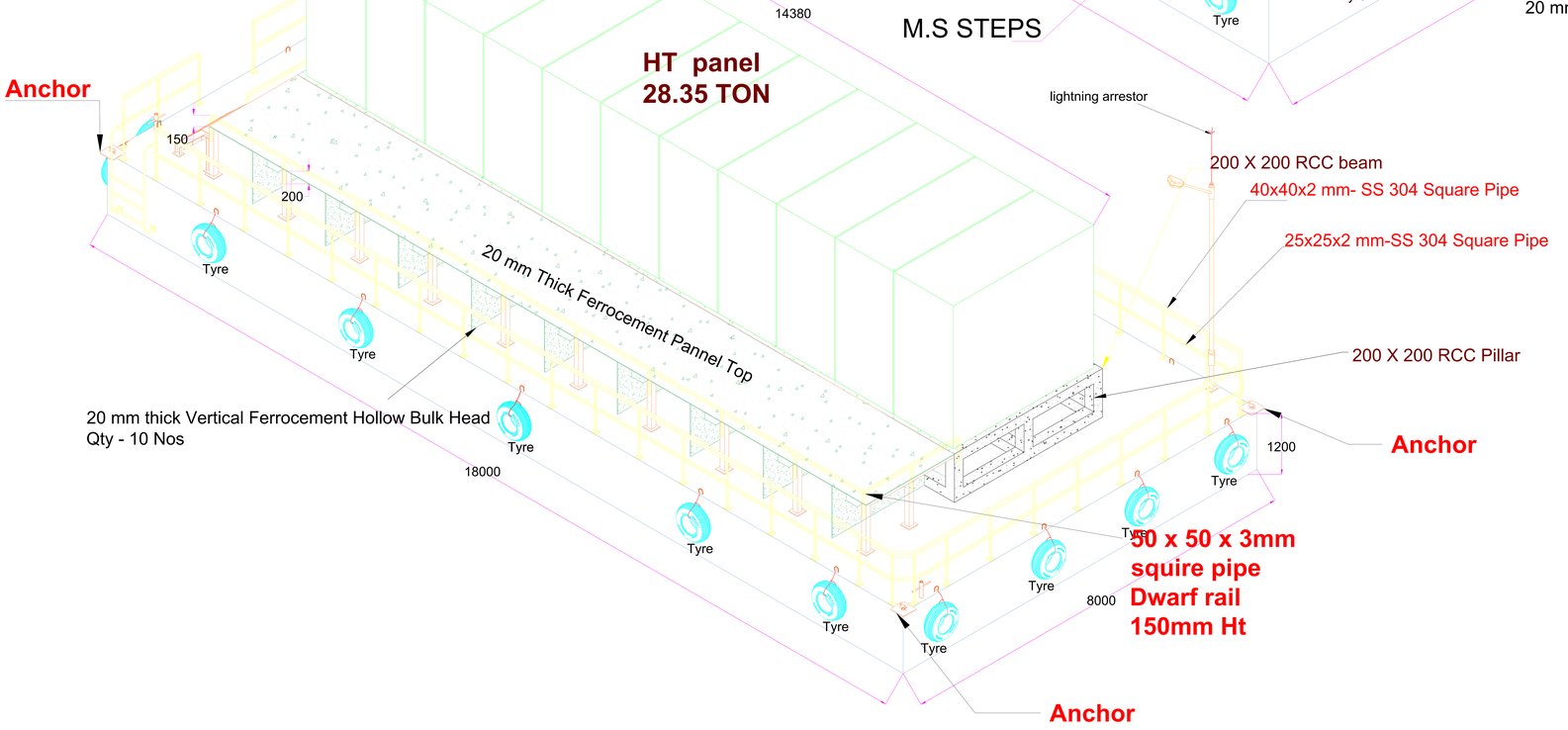
1.platform weight = 45 ton
2.Total foundation weight = 13.5 ton
3. Total HT panel weight = 28.35 ton
4. Total handrail weight = 1.5 ton
5. Working platform weight = 2.5 ton
6. Live load = 1 ton
7.Misc load = 1 ton

Over All Weight = 93 ton.



DETAIL A
SCALE 1:50





Note:

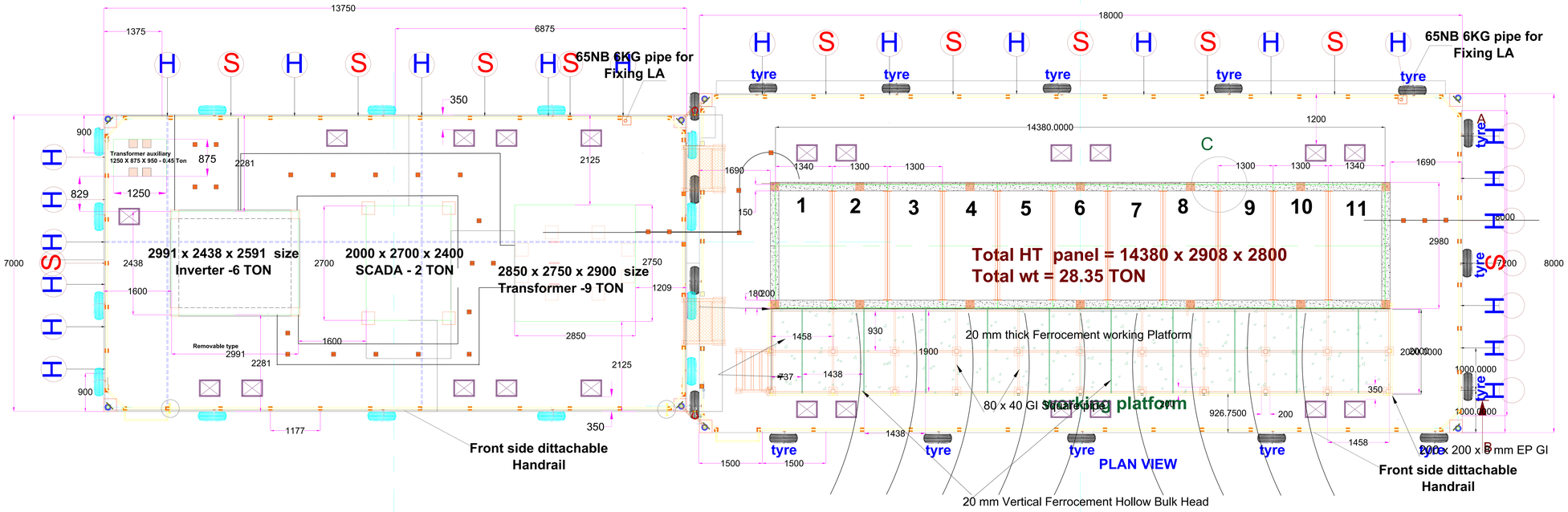
1. All dimension are in mm.
2.Drawing in 1:100 scale.

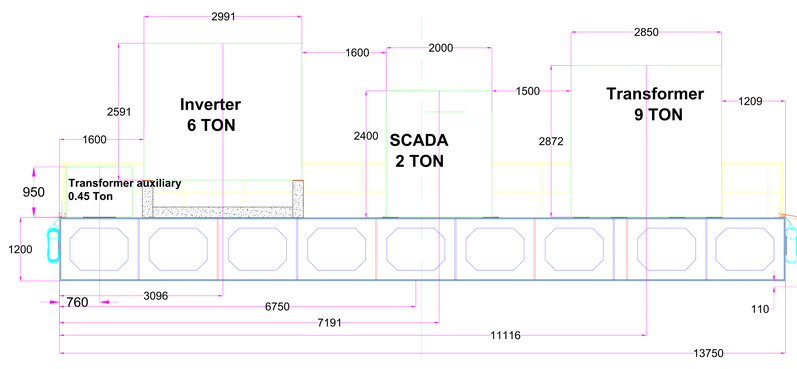
Project Name:	**100MW SITE - NTPC - Ramagundam.**		
Vendor Code:	**-**	**Client:**	
Rev:	**Project:**		
	Qty:	**4 Nos**	**NTPC-Ramagundam.**

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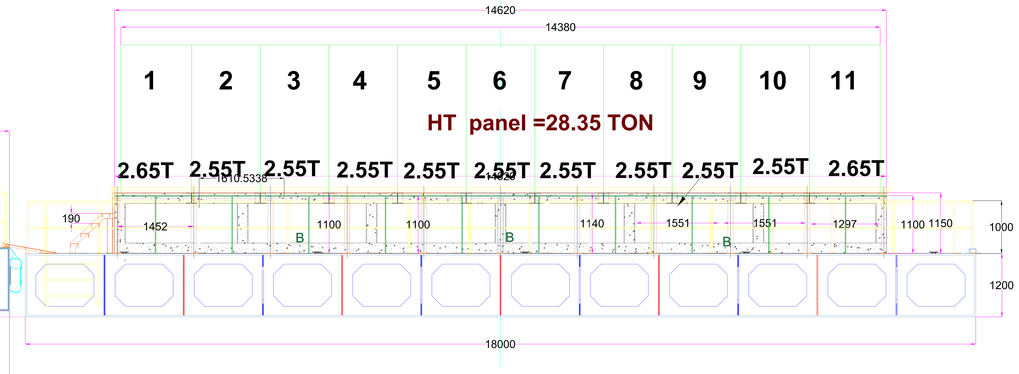
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Dgn.by: JFF	**T.weight:**	**93 TON**	**Date:**	**04.05.2021**
Chd.by: BC	**Material:**	**FCC**	**A4**	
Apd.by: KN	**Scale:**	**1:1**		

BHEL - LPSFP-IFP and LPSFP - JOIN PLATFORM DRAWING

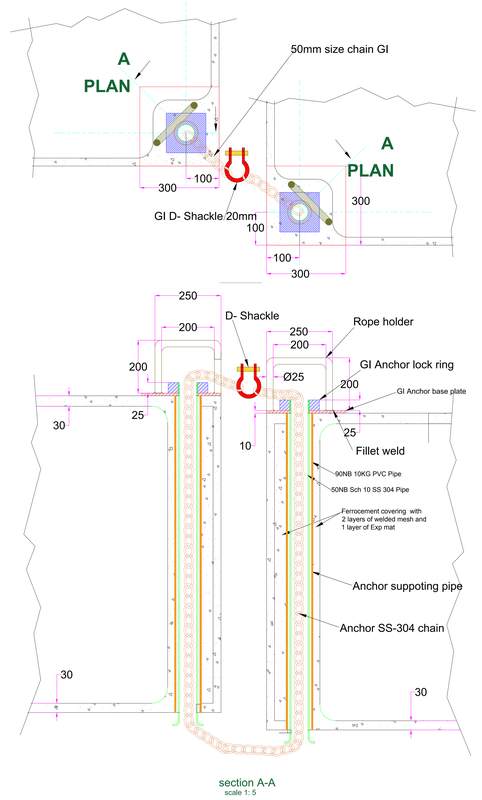




(Platform - II) Total Weight = 56 ton



(Platform - I) Total Weight = 93 ton



JAIN CONNECTION DETAIL DRAWING

DEVELOPMENT OF 100 MW (AC) FLOATING SOLAR PHOTOVOLTAIC PLANT AT NTPC RAMAGUNDAM SUPER THERMAL POWER PLANT

TITLE OF THE DRAWING:	**AC Cable layout including laying details**
DOCUMENT NO:	**5747-004-PVE-F-003**

SL.NO	CONTENTS
1	Compliance sheet
2	AC Cable layout including laying details (From Embankment to Final evacuation point)
3	STAD analysis report in PDF

Note: HT cable routing on water will be submitted seperately.

Signature Not Verified
Digitally signed by P RAJKUMAR
Date: 2021.01.19 15:22:59 IST
Reason: CAT I
Location: NTPCEOC

REV NO.	DATE	STATUS	INITIALS	INITIALS	INITIALS
4	16.01.2021	FOR APPROVAL	KRISHN		M SREENATH
3	02.01.2021	FOR APPROVAL	KRISHN		M SREENATH
2	11.12.2020	FOR APPROVAL	KRISHN		M SREENATH
1	19.10.2020	FOR APPROVAL	KRISHN		M SREENATH
0	21.09.2020	FOR APPROVAL	KRISHNA J	VIPIN	M SREENATH
PROJECT:			PREPARED BY	CHECKED BY	APPROVED BY
DEVELOPMENT OF 100 MW (AC) FLOATING SPV PLANT AT NTPC RAMAGUNDAM SUPER THERMAL POWER PLANT			5747-004-PVE-F-003		16.01.2021
					PAGE - 1

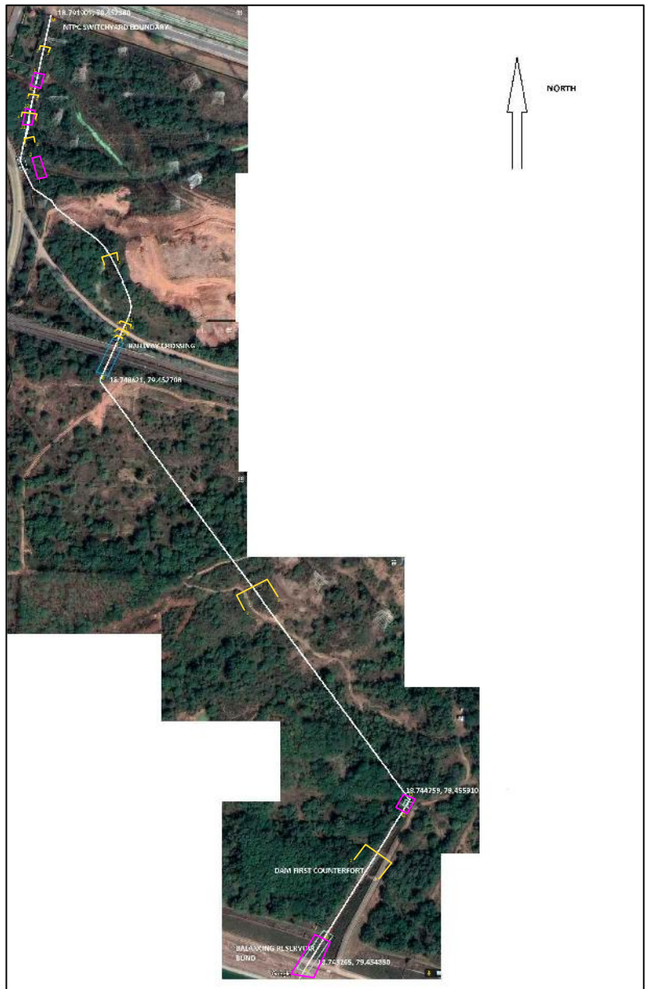
CRS for 33KV cable route & cable laying methodology		
	CUSTOMER-	**NTPC**
	TITLE-	**5747-004-PVE-F-003-02(REV-03)**
	PROJECT-	**100MW FSPV For NTPC At Ramagundam**
S.NO	**NTPC COMMENT**	**UT/BHEL Reply dtd 12-01-2021**
1	Detail of end block	Updated in revised drawing.
2	16 dia rod to be encased in concrete	Complied. Updated in revised drawing.
3	include complete backfilling note	Included in revised drawing.(Pls Refer P.N.4 in Note No. 4 of Document.)
4	Pl. Check if it is applicable?	Not Applicable.

CRS for 33KV cable route & cable laying methodology		
	CUSTOMER-	**NTPC**
	TITLE-	**5747-004-PVE-F-003-02**
	PROJECT-	**100Mw FSPV For NTPC At Ramagundam**
S.NO	**NTPC COMMENT**	**BHEL Reply**
1	INDICATE is codes for cable laying	Applicable code is IS-1255-1983
2	indicate type of support below pipes(e.g. PCC or earth)	Indicated in revised document (Labelled 75MM Gravels)
3	where it will be applied	As per Site Requirement after Fabrication, at all the Cable Tray Support Structures.
4	Include note for structural steel i.e grade, IS codes etc	IS-2062 E250 A, 2011 RA 2016,Make-SAIL,ESSAR,JINDAL & TATA
5	Indicate fixing detail of angle with base plate	Indicated in revised Layout
6	Any damage to the existing NTPC structure during construction while taking support the same shall be done good by solar epc contractor	Confirmed
7	detail	Laid Underground
8	what is this block- pcc or rcc	Existing Bridge RCC
9	include note for backfilling and compaction	Noted
10	WHERE IS THIS SECTION IS APPLICABLE	Modified in the revised drawing. It is applicable to C2. Column height and distance between columns is already available
11	INDICATE VALUES	
12	indicate detail	Indicated in revised Layout
13	add wing load also	Considered and revised document is attached

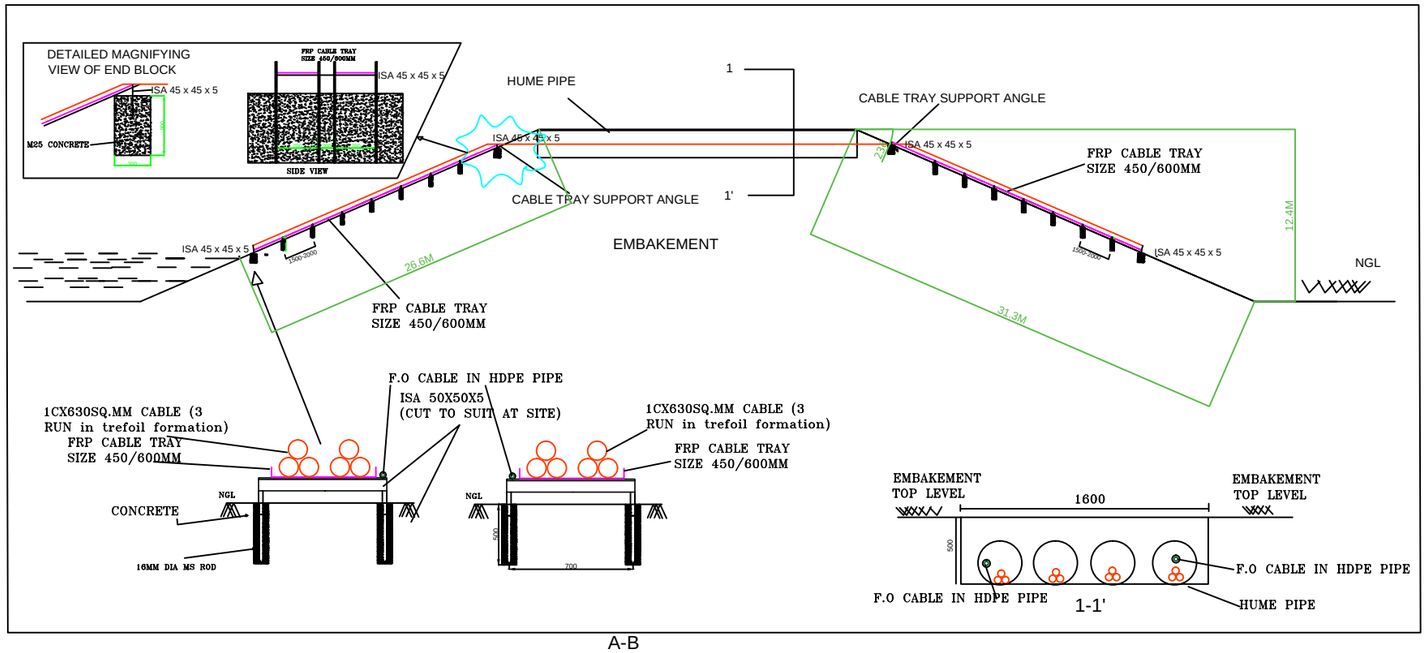
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

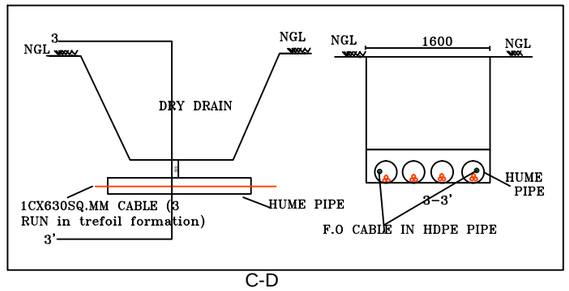
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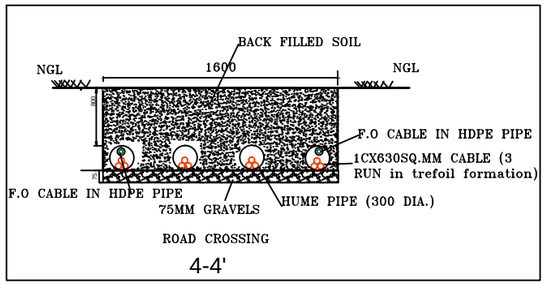
JUNGLE CLEARANCE ROUTE FROM NTPC BALANCING RESERVOIR TO NTPC SWITCHYARD BOUNDARY FOR 33KV HT CABLE ROUTING



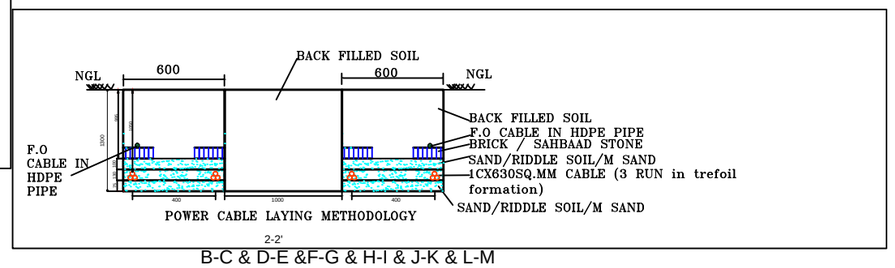
A-B



C-D



G-H & J1-J2



B-C & D-E &F-G & H-I & J-K & L-M

NOMENCLATURE FOR CABLE LAYING

LOCATION	DESCRIPTION
A–B	EMBAKEMENT
B–C	UNDER GROUND
C–D	HUME PIPE (DRY–DRAIN)
D–E	UNDER GROUND
E–F	RAILWAY CROSSING (DOCUMENT SUBMITTED TO RAILWAY DEPARTMENT)
F–G	UNDER GROUND
G–H	HUME PIPE (ROAD CROSSING)
H–I	UNDER GROUND
I–J	CABLE TRAY ON DRAIN IS FIX ON PROPOSED CULVERT CUNSTRUCT BY NTPC.
J1–J2	HUME PIPE (ROAD CROSSING UNDER PROPOSED ROAD CONSTRUCT BY NTPC)
J–K	UNDER GROUND
K–L	CABLE TRAY (DRAIN) DETAIL SHOWS IN DRAWING
L–M	UNDER GROUND
M	BOUNDARY WALL

NOTES:

1) ALL DIMENTIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2) THIS IS TENTATIVE DRAWING WHICH IS DRAWN AS PER SURVEY OF ROUTE, IF ANY CHANGES / ISSUES COMES DURING EXECUTION THEN IT WILL SHORT OUT BY DISCUSS WITH BHEL/NTPC REPRESENTATIVE
3) 2 COAT PRIMER,2 COAT ENAMEL ALUMINIUM PAINT

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: NTPC 100MW AC FLOATING SOLAR PROJECT RAMAGUNDAM (T.S)	TITLE: 33KV CABLE LAYING METHODOLGY	REV-03	EPC– BHEL EDN BANGALORE UNIVERSAL TRANSFORMER BHOPAL		NAME	SIGN	DATE	APPD	SHT.No. 1 of 4 NO. OF SHT. 4	
				DRN	MANISH		08.10.20			
				CKD	PRASHANT					

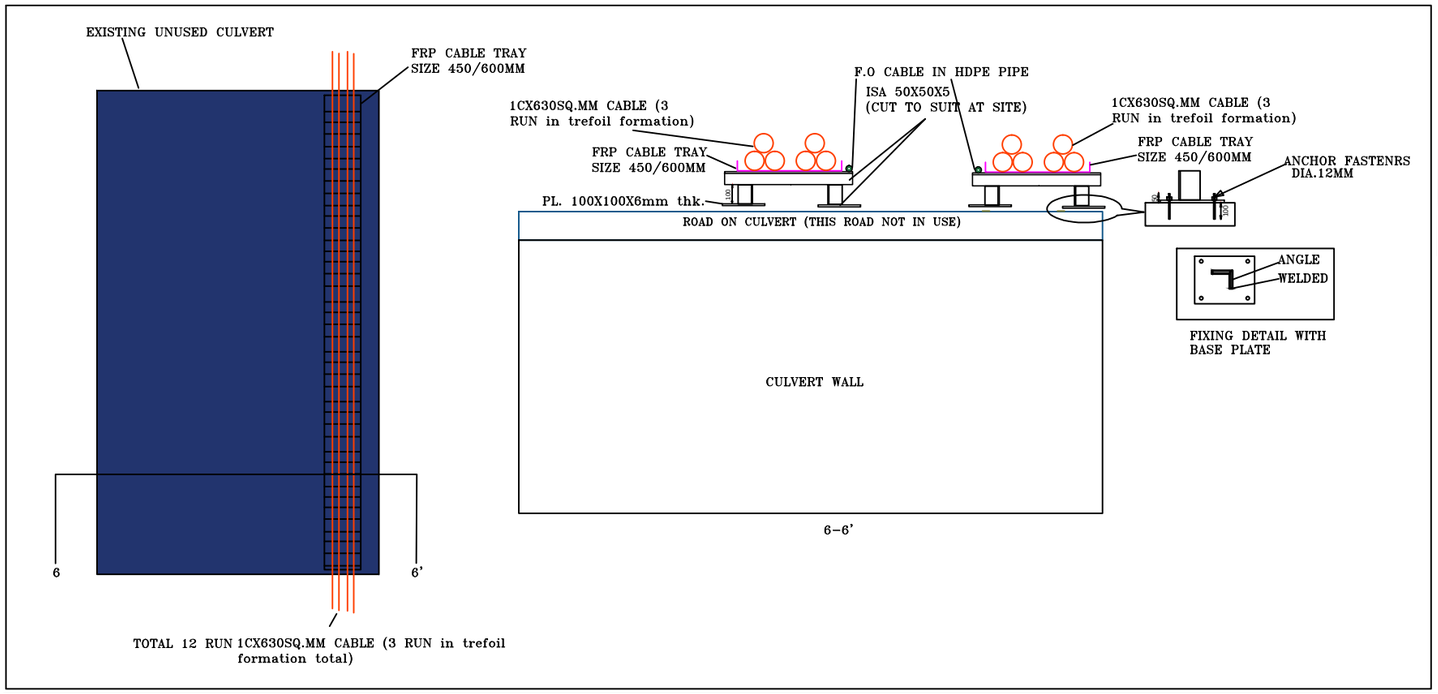
INVENTORY NO. | SIGN. & DATE | REF. DRG. NO.

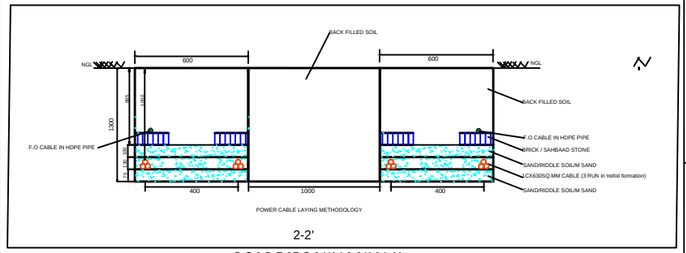
A1

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FIRST ANGLE PROJECTION

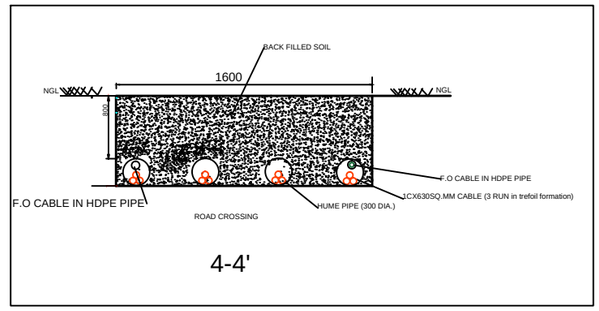
(ALL DIMENSIONS ARE IN mm)





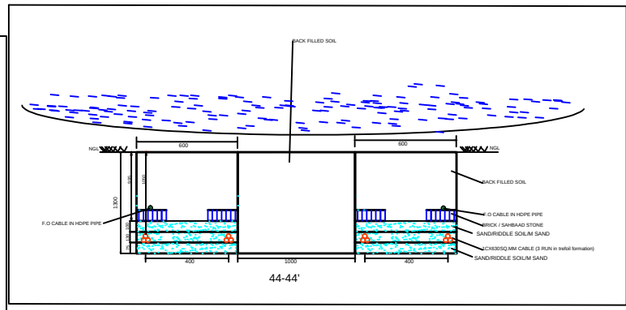
2-2'

B-C & D-E &F-G & H1-I & J-K & L-M



4-4'

G-H & J1-J2



44-44'

H-H'

K-L

NOMENCLATURE FOR CABLE LAYING

LOCATION	DESCRIPTION
A–B	EMBAKEMENT
B–C	UNDER GROUND
C–D	HUME PIPE (DRY–DRAIN)
D–E	UNDER GROUND
E–F	RAILWAY CROSSING (DOCUMENT SUBMITTED TO RAILWAY DEPARTMENT)
F–G	UNDER GROUND
G–H	HUME PIPE (ROAD CROSSING)
H–H1	UNDER GROUND (NAALAH)
H1–I	UNDER GROUND
I–J	CABLE TRAY ON DRAIN IS FIX ON PROPOSED CULVERT CUNSTRUCT BY NTPC.
J1–J2	HUME PIPE (ROAD CROSSING UNDER PROPOSED ROAD CONSTRUCT BY NTPC)
J–K	UNDER GROUND
K–L	CABLE TRAY (DRAIN) DETAIL SHOWS IN DRAWING
L–M	UNDER GROUND
M	BOUNDARY WALL

NOTES:

1) ALL DIMENTIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2) THIS IS TENTATIVE DRAWING WHICH IS DRAWN AS PER SURVEY OF ROUTE, IF ANY CHANGES / ISSUES COMES DURING EXECUTION THEN IT WILL SHORT OUT BY DISCUSS WITH BHEL/NTPC REPRESENTATIVE
3) 2 COAT PRIMER,2 COAT ENAMEL ALUMINIUM PAINT
4) "Back filling material to be placed over buried cables shall be free from stones and harmful mixtures. Back filling shall be placed in layers of 150 mm".
5) STRUCTURAL STEEL IS–2062 E250 A, 2011 RA 2016,Make–SAIL,ESSAR,JINDAL & TATA

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT NTPC 100MW AC FLOATING SOLAR PROJECTI RAMAGUNDAM (T.S)	**TITLE** 33KV CABLE LAYING METHODOLGY	REV-03	EPC– BHEL EDN BANGALORE		NAME	SIGN	DATE	APPD	SHT.No.	2 of 4
			UNIVERSAL TRANSFORMER BHOPAL	DRN	MANISH		08.10.20		NO. OF SHT.	4
				CKD	PRASHANT					

REF. DRG. NO. | SIGN. & DATE | INVENTORY NO.

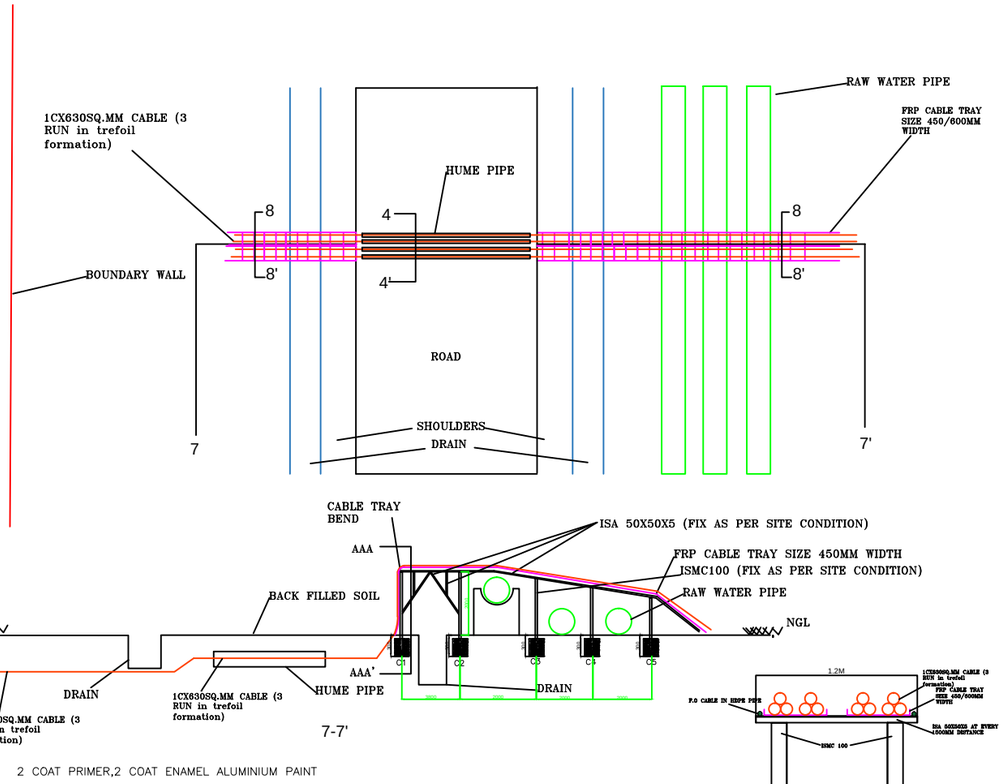
A3

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FIRST ANGLE PROJECTION

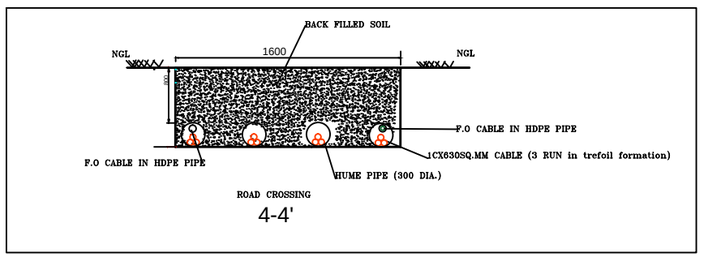
(ALL DIMENSIONS ARE IN mm)



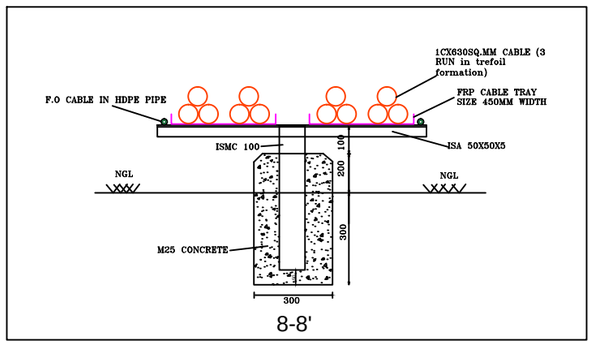


2 COAT PRIMER,2 COAT ENAMEL ALUMINIUM PAINT

N-O



N-O & P-Q & R-S



M-N & OP & Q-R & S-T & T-U & U-V

NOTES:

1) ALL DIMENTIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2) THIS IS TENTATIVE DRAWING WHICH IS DRAWN AS PER SURVEY OF ROUTE,
   IF ANY CHANGES / ISSUES COMES DURING EXECUTION THEN IT WILL SHORT OUT BY DISCUSS WITH BHEL/NTPC REPRESENTATIVE
3) 2 COAT PRIMER,2 COAT ENAMEL ALUMINIUM PAINT

NOMENCLATURE FOR CABLE LAYING

LOCATION	DESCRIPTION
M–N	CABLE TRAY
N–O	HUME PIPE (ROAD CROSSING)
O–P	CABLE TRAY
P–Q	HUME PIPE (ROAD CROSSING)
Q–R	CABLE TRAY
R–S	HUME PIPE (ROAD CROSSING)
S–T	CABLE TRAY
T–U	CABLE TRAY
U–V	CABLE TRAY

INVENTORY NO. | SIGN. & DATE | REF. DRG. NO.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT NTPC 100MW AC FLOATING SOLAR PROJECTI RAMAGUNDAM (T.S)	**TITLE** 33KV CABLE LAYING METHODOLGY	REV-03	EPC– BHEL EDN BANGALORE		NAME	SIGN	DATE	APPD	SHT.No.	3 of 4	
			UNIVERSAL TRANSFORMER BHOPAL	DRN	MANISH		08.10.20		NO. OF SHT.	4	
				CKD	PRASHANT						

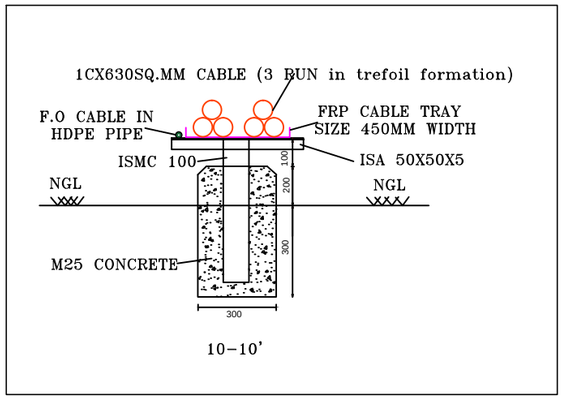
A3

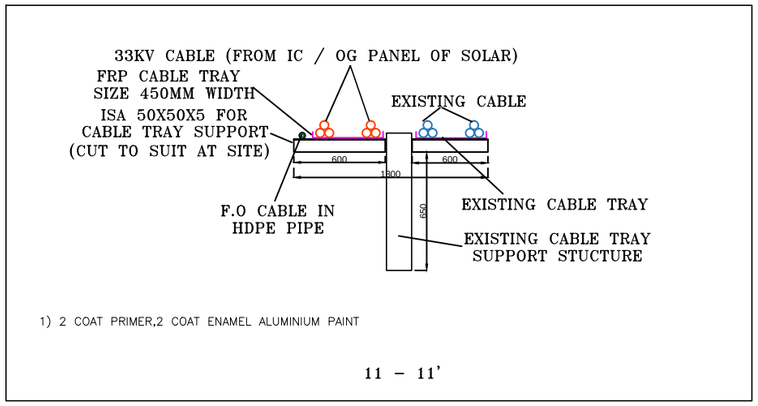
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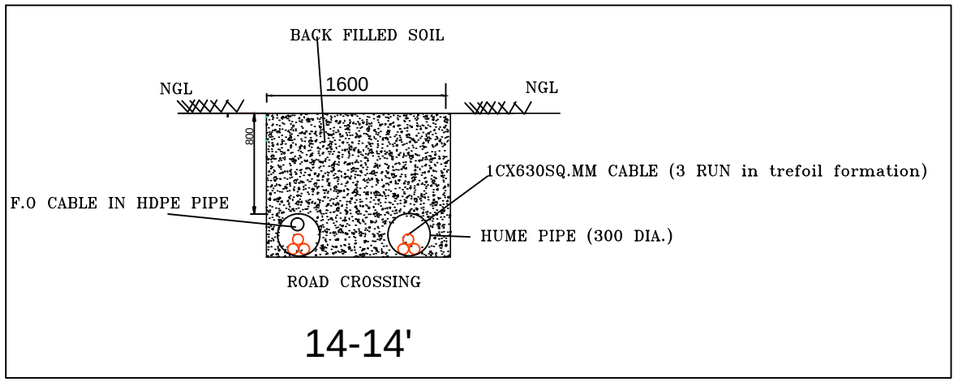
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)









Z1-Z2

NOTES:

1) ALL DIMENTIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2) THIS IS TENTATIVE DRAWING WHICH IS DRAWN AS PER SURVEY OF ROUTE, IF ANY CHANGES / ISSUES COMES DURING EXECUTION THEN IT WILL SHORT OUT BY DISCUSS WITH BHEL/NTPC REPRESENTATIVE
3) CABLE TRAY SUPPORT STRUCTURE SHALL BE FIX IN 1.5M CENTER TO CENTER.
4) 2 COAT PRIMER,2 COAT ENAMEL ALUMINIUM PAINT

NOMENCLATURE FOR CABLE LAYING

LOCATION	DESCRIPTION
V-W & V-W1	CABLE TRAY
W-X	EXISTING CABLE TRENCH
W1-X1 & X1-Y1	EXISTING CABLE TRAY (DETAILS SHOWN IN SECTION 11-11')
Y1-Z1	CABLE TRAY
Z1- Z2	ROAD CROSSING
Z2-Z3	EXISTING CABLE TRENCH

INVENTORY NO. | SIGN. & DATE | REF. DRG. NO.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT NTPC 100MW AC FLOATING SOLAR PROJECTI RAMAGUNDAM (T.S)	**TITLE** 33KV CABLE LAYING METHODOLGY	REV-02	EPC- BHEL EDN BANGALORE UNIVERSAL TRANSFORMER BHOPAL		NAME	SIGN	DATE	APPD	SHT.No. 4 OF 4
				DRN	MANISH		08.10.20		NO. OF SHT. 4
				CKD	PRASHANT				

1 2 3 4 5 6 7 8 — A B C D E F — A3

Attached STAAD file (for reference)

STAAD INPUT FILE

STAAD SPACE
START JOB INFORMATION
ENGINEER DATE 08-Dec-20
END JOB INFORMATION
INPUT WIDTH 79
UNIT METER KN
JOINT COORDINATES
1 0 0 0; 2 0 0 -0.85; 3 0 2 0; 4 0 2 -0.85; 5 3.8 0 -0.85; 6 3.8 2 -0.85;
7 3.8 0 0; 8 3.8 2 0; 9 5.8 0 -0.85; 10 5.8 2 -0.85; 11 5.8 0 0; 12 5.8 2 0;
13 9.8 0 0; 14 9.8 0 -0.85; 15 9.8 1.17 0; 16 9.8 1.17 -0.85; 17 7.8 1.585 0;
18 7.8 1.585 -0.85; 19 7.8 0 0; 20 7.8 0 -0.85; 21 4.8 2 0; 22 6.8 1.7925 0;
23 4.8 2 -0.85; 24 6.8 1.7925 -0.85; 25 8.8 1.3775 0; 26 8.8 1.3775 -0.85;
27 1.9 2 0; 28 1.9 2 -0.85; 29 0 1 -0.85; 30 0 1 0; 31 3.8 1 -0.85; 32 3.8 1 0;
33 0.95 2 0; 34 0.95 2 -0.85; 35 2.85 2 0; 36 2.85 2 -0.85; 37 0.95 1.5 0;
38 2.85 1.5 0; 39 0.95 1.5 -0.85; 40 2.85 1.5 -0.85;
MEMBER INCIDENCES
1 2 29; 2 1 30; 3 5 31; 4 7 32; 5 9 10; 6 11 12; 7 13 15; 8 14 16; 9 3 33;
10 8 21; 11 12 22; 12 4 34; 13 6 23; 14 10 24; 15 3 4; 16 8 6; 17 12 10;
18 17 25; 19 18 26; 20 19 17; 21 20 18; 22 15 16; 23 21 12; 24 22 17; 25 23 10;
26 24 18; 27 25 15; 28 26 16; 29 21 23; 30 22 24; 31 25 26; 32 27 35; 33 28 36;
34 29 4; 35 30 3; 36 31 6; 37 32 8; 38 30 37; 39 32 38; 40 29 39; 41 31 40;
42 27 28; 43 17 18; 44 33 27; 45 34 28; 46 35 8; 47 36 6; 48 37 27; 49 38 27;
50 39 28; 51 40 28; 52 33 37; 53 35 38; 54 36 40; 55 34 39;
DEFINE MATERIAL START
ISOTROPIC STEEL
E 2.05e+008
POISSON 0.3
DENSITY 76.8195
ALPHA 1.2e-005
DAMP 0.03
TYPE STEEL
STRENGTH FY 253200 FU 407800 RY 1.5 RT 1.2
END DEFINE MATERIAL
MEMBER PROPERTY INDIAN
1 TO 8 20 21 34 TO 37 TABLE ST ISMC100
9 TO 19 22 TO 33 38 TO 55 TABLE ST ISA50X50X5
CONSTANTS
BETA 90 MEMB 1 TO 8 20 21 34 TO 37
BETA 45 MEMB 9 TO 11 15 TO 18 22 TO 24 27 29 TO 32 38 TO 44 46 48 TO 53
BETA 315 MEMB 12 TO 14 19 25 26 28 33 45 47 54 55
MATERIAL STEEL ALL
SUPPORTS
1 2 5 7 9 11 13 14 19 20 FIXED
MEMBER TRUSS
38 TO 41 48 TO 51
LOAD 1 LOADTYPE Dead TITLE DEAD LOAD
SELFWEIGHT Y -1
MEMBER LOAD
15 16 42 UNIFGY -0.725
16 17 29 UNIFGY -0.382

17 30 43 UNI GY -0.382
22 31 43 UNI GY -0.382
LOAD 3 LOADTYPE Wind TITLE WIND LOAD +X
MEMBER LOAD
1 TO 6 34 TO 37 UNI GX 0.093
20 21 UNI GX 0.088
7 8 UNI GX 0.082
52 TO 55 UNI GX 0.093
38 TO 41 48 TO 51 UNI GX 0.107
LOAD 4 LOADTYPE Wind TITLE WIND LOAD -X
MEMBER LOAD
1 TO 6 34 TO 37 UNI GX -0.106
20 21 UNI GX -0.1
7 8 UNI GX -0.093
52 TO 55 UNI GX -0.093
38 TO 41 48 TO 51 UNI GX -0.107
LOAD 5 LOADTYPE Wind TITLE WIND LOAD +Z
MEMBER LOAD
1 TO 6 34 TO 37 UNI GZ 0.033
7 8 20 21 UNI GY 0.032
9 TO 11 18 23 24 27 32 44 46 UNI GZ 0.128
12 TO 14 19 25 26 28 33 45 47 UNI GZ 0.134
38 TO 41 48 TO 51 UNI GZ 0.113
LOAD 6 LOADTYPE Wind TITLE WIND LOAD -Z
MEMBER LOAD
1 TO 6 34 TO 37 UNI GZ -0.031
7 8 20 21 UNI GY -0.032
9 TO 11 18 23 24 27 32 44 46 UNI GZ -0.134
12 TO 14 19 25 26 28 33 45 47 UNI GZ -0.128
38 TO 41 48 TO 51 UNI GZ -0.118
LOAD COMB 2 DL + WL +X
1 1.127 3 1.127
LOAD COMB 7 DL + WL -X
1 1.127 4 1.127
LOAD COMB 8 DL + WL +Z
1 1.127 5 1.127
LOAD COMB 9 DL + WL -Z
1 1.127 6 1.127
PERFORM ANALYSIS PRINT ALL
LOAD LIST 2 7 8 9
PARAMETER 1
CODE INDIAN
BEAM 1 MEMB 1 TO 51
FYLD 250000 ALL
RATIO 1 ALL
TRACK 2 ALL
CHECK CODE ALL
STEEL MEMBER TAKE OFF ALL
PERFORM ANALYSIS
FINISH

Design Paramaters		
Weight	UOM	
48	Kg/m	630 sq. mm
3.5	Kg/m	Cable Tray
1	kg/m	HDPE
52.5	Kg/m	Total
C1-C2		
3.8	m	Length
199.5	Kg	Weight
1955.1	N	
3	No	Space
651.7	N	Load/Space
0.9	m	Cable Tray Width
724.1111	N/m	UDL
C2-C3		
2	m	Length
105	Kg	Weight
1029	N	
3	No	Space
343	N	Load/Space
0.9	m	Cable Tray Width
381.1111	N/m	UDL
C3-C4		
2	m	Length
105	Kg	Weight
1029	N	
3	No	Space
343	N	Load/Space
0.9	m	Cable Tray Width
381.1111	N/m	UDL
C4-C5		
2	m	Length
105	Kg	Weight
1029	N	
3	No	Space
343	N	Load/Space
0.9	m	Cable Tray Width
381.1111	N/m	UDL

C. Wind Load			
Basic Wind speed (Vb)	158.4	kmph	Page- 6 , Fig:1
	44	m/s	
Probability factor (risk coefficent) (k1)	1.00		Page-7 Table-1
Terrain roughness and height Factor (k2) (Category-1, Height <10m)	1.05		Page-8 Table-2
Topography Factor (k3) (Slope is less than 3 °)	1.00		Page -8 Clause 6.3.3.1
Importance Factor (k4) (for other structures)	1.00		Clause 6.3.4
Design Wind Speed (Vz) = Vb* k1* k2* k3* k4	46	m/s	Formula Page-5
Design wind pressure (Pd) = 0.6x Vz xVz	1.281	KN/m2	Clause 7.2 PAGE-9

2. Wind Load due to wind in +X direction

Note: l is length of element and b is the width of member across the direction of wind

Element	Pressure Coeff. (Page: 41 Table-29)	l/b	Reduction factor (Page:40 Table-28 and extrapolated)	UDL (Cfn x pd x K x b)		
Longer Columns	1.8	20.000	0.810	0.093	KN/m	l= 2000 mm, b= 100 mm (ISMC100)
Medium Columns	1.8	15.850	0.760	0.088	KN/m	l= 1585 mm, b= 100 mm (ISMC100)
Smaller Columns	1.8	11.700	0.710	0.082	KN/m	l= 1170 mm, b= 100 mm (ISMC100)
Horizontal Angles (Z axis)	2.1	0.059	0.000	0.000	KN/m	l= 50 mm, b= 850 mm
Vertical Angles	2.1	10.000	0.690	0.093	KN/m	l= 500 mm, b= 50 mm
Tilt Angles	1.9	42.940	0.879	0.107	KN/m	l= 2147 mm, b= 50 mm

Negligible on other members due to wind parallel to members

3. Wind Load due to wind in -X direction

Note: l is length of element and b is the width of member across the direction of wind

Element	Pressure Coeff. (Page: 41 Table-29)	l/b	Reduction factor (Page:40 Table-28 and extrapolated)	UDL (Cfn x pd x K x b)		
Longer Columns	2.05	20.000	0.810	0.106	KN/m	l= 2000 mm, b= 100 mm (ISMC100)
Medium Columns	2.05	15.850	0.760	0.100	KN/m	l= 1585 mm, b= 100 mm (ISMC100)
Smaller Columns	2.05	11.700	0.710	0.093	KN/m	l= 1170 mm, b= 100 mm (ISMC100)
Horizontal Angles (Z axis)	2	0.059	0.000	0.000	KN/m	l= 50 mm, b= 850 mm

Vertical Angles	2	10.000	0.690	0.088	KN/m	l= 500 mm, b= 50 mm
Tilt Angles	1.9	42.940	0.879	0.107	KN/m	l= 2147 mm, b= 50 mm

Negligible on other members due to wind parallel to members

4. Wind Load due to wind in +Z direction

Element	Pressure Coeff.	l/b	Reduction factor	UDL		
Longer Columns	0.6	40.000	0.870	0.033	KN/m	l= 2000 mm, b= 50 mm (ISMC100)
Medium Columns	0.6	31.700	0.845	0.032	KN/m	l= 1585 mm, b= 50 mm (ISMC100)
Smaller Columns	0.6	23.400	0.820	0.032	KN/m	l= 1170 mm, b= 50 mm (ISMC100)
Horizontal Angles (X axis) Front Side	2	197.720	1.000	0.128	KN/m	l= 9886 mm, b= 50 mm
Horizontal Angles (X axis) Back Side	2.1	197.720	1.000	0.134	KN/m	l= 9886 mm, b= 50 mm
Tilt Angles	2	42.940	0.879	0.113	KN/m	l= 2147 mm, b= 50 mm

Negligible on other members

5. Wind Load due to wind in -Z direction

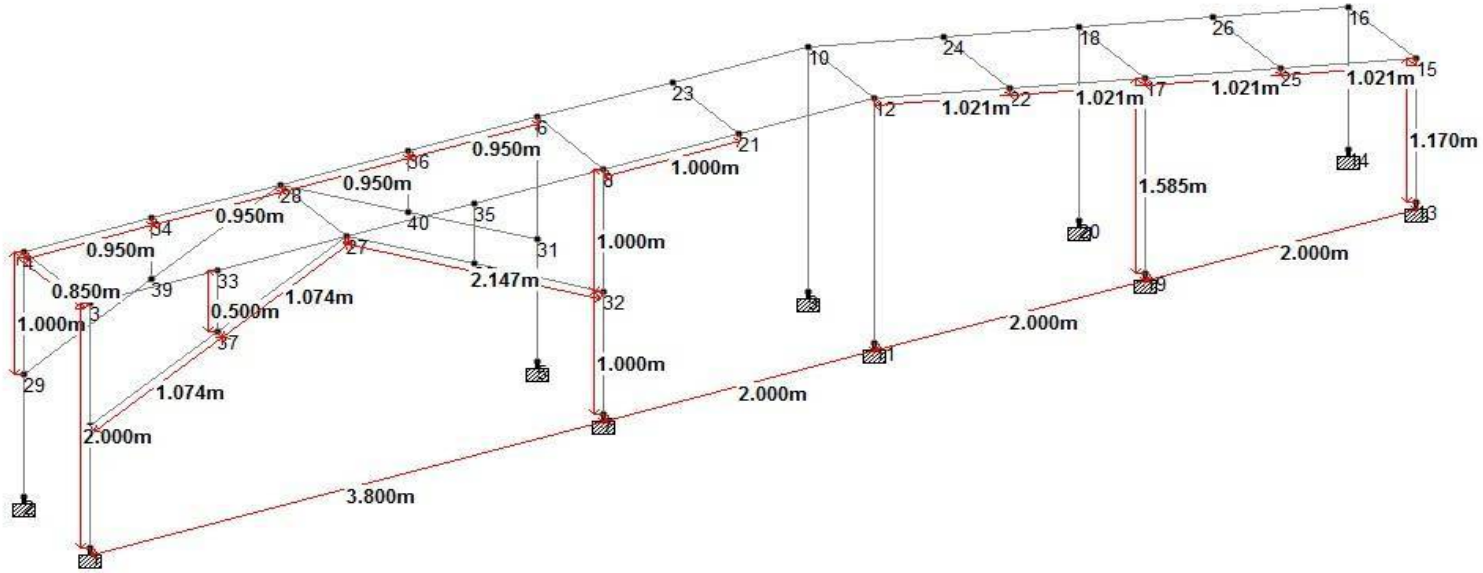
Element	Pressure Coeff.	l/b	Reduction factor	UDL		
Longer Columns	0.6	40.000	0.810	0.031	KN/m	l= 2000 mm, b= 50 mm (ISMC100)
Medium Columns	0.6	31.700	0.845	0.032	KN/m	l= 1585 mm, b= 50 mm (ISMC100)
Smaller Columns	0.6	23.400	0.820	0.032	KN/m	l= 1170 mm, b= 50 mm (ISMC100)
Horizontal Angles (X axis) Front Side	2.1	197.720	1.000	0.134	KN/m	l= 9886 mm, b= 50 mm
Horizontal Angles (X axis) Back Side	2	197.720	1.000	0.128	KN/m	l= 9886 mm, b= 50 mm
Tilt Angles	2.1	42.940	0.879	0.118	KN/m	l= 2147 mm, b= 50 mm

Negligible on other members

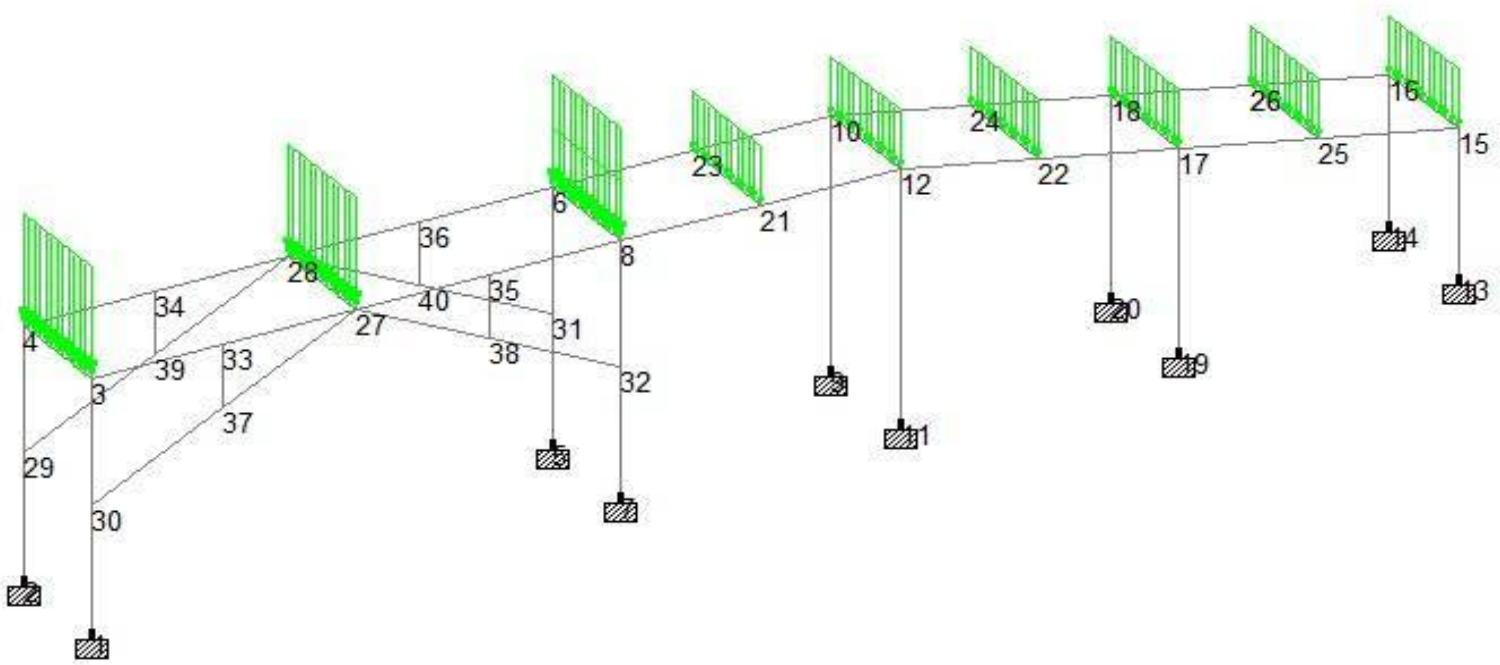
6. Combinations

1) 1.127 DL + 1.127 WL (+X)
2) 1.127 DL + 1.127 WL (-X)
3) 1.127 DL + 1.127 WL (+Z)
4) 1.127 DL + 1.127 WL (-Z)

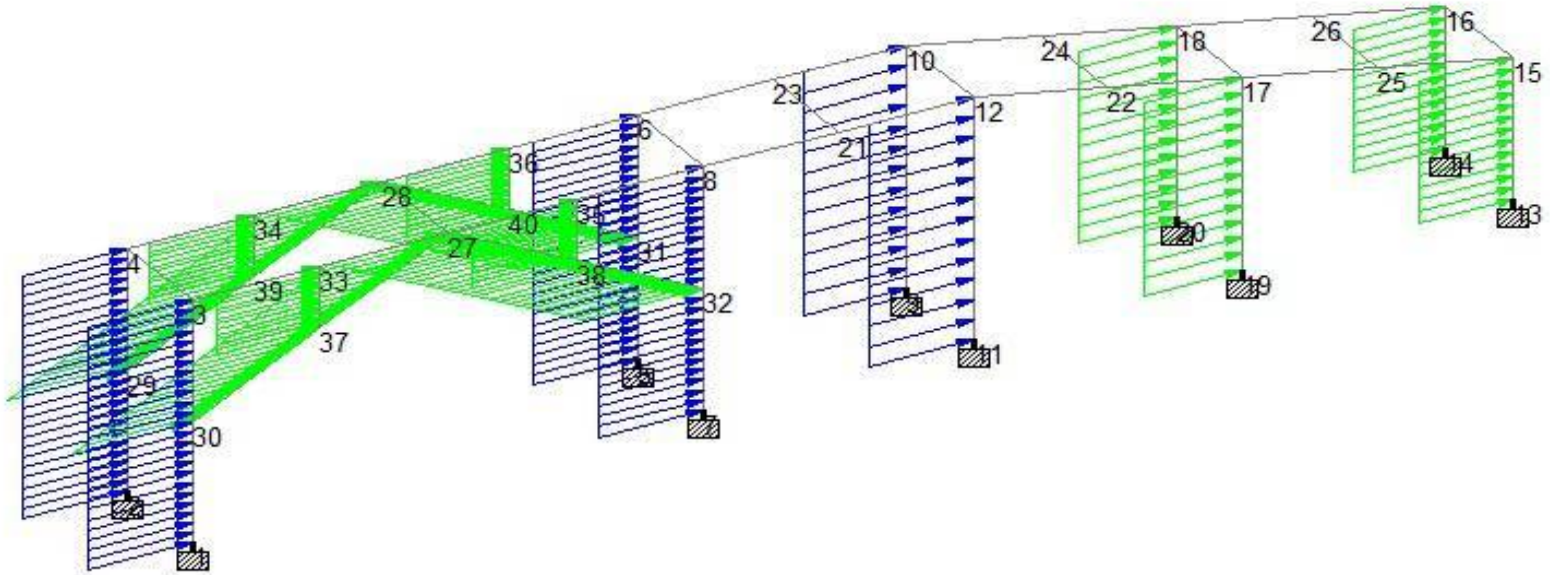
GEOM ETRY


0.950m
0.950m
0.950m
0.950m
0.850m
1.000m
1.074m
0.500m
2.147m
1.000m
1.000m
1.074m
2.000m
3.800m
2.000m
1.000m
1.021m
1.021m
1.021m
1.021m
1.585m
1.170m
2.000m
2.000m

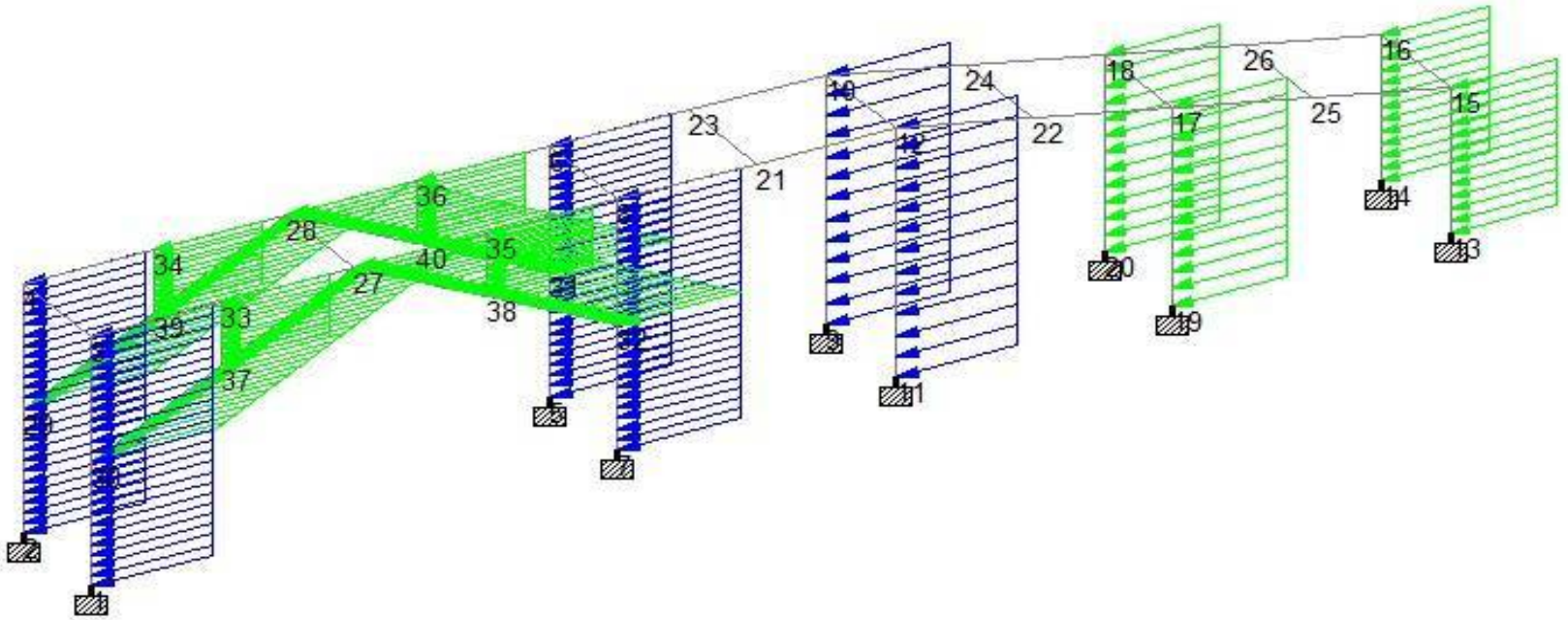
DEAD LOADS


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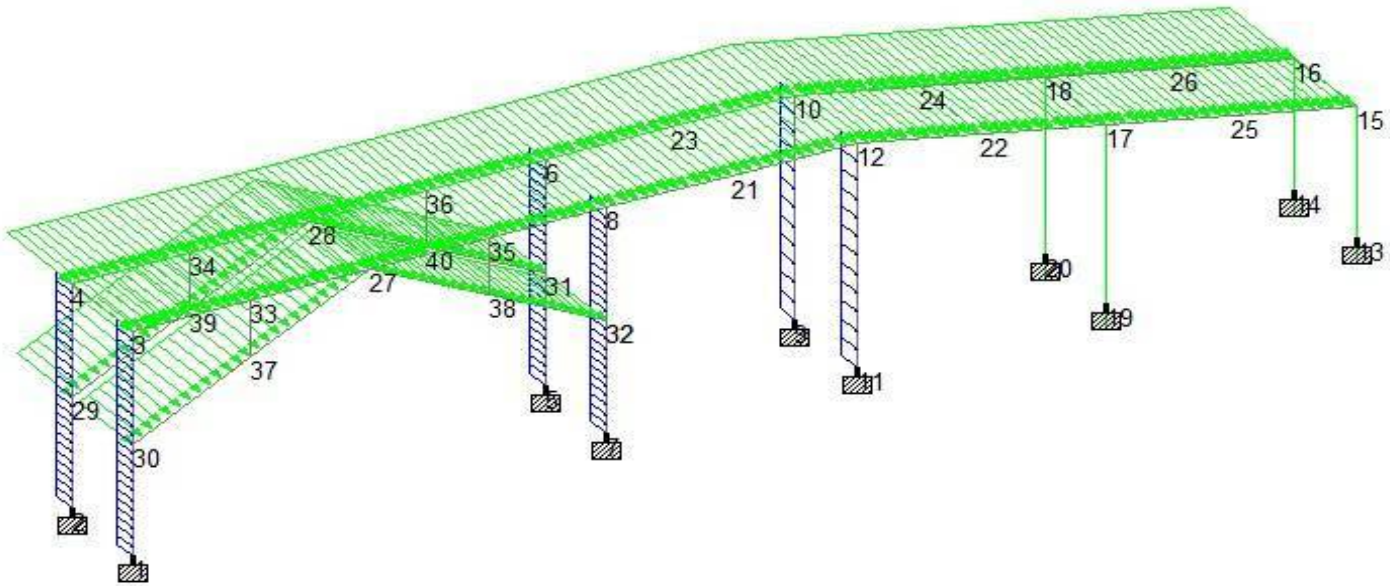
WIND LOAD +X


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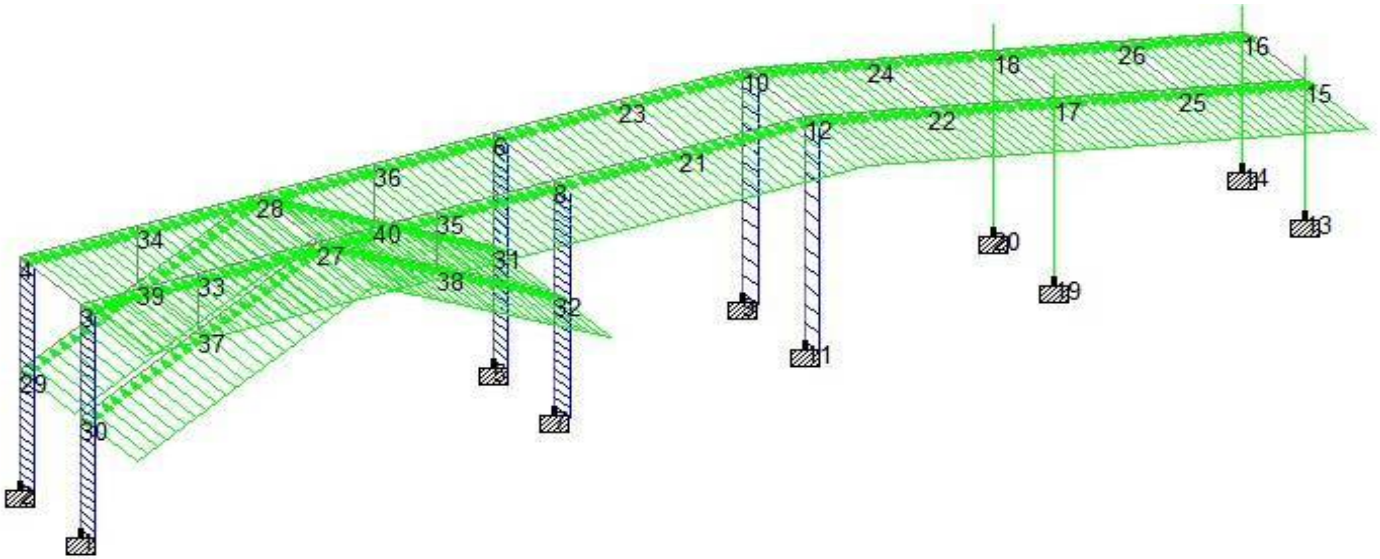
WIND LOAD -X



WIND LOAD +Z


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WIND LOAD -Z


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**************************************************
*                                                *
*           STAAD.Pro V8i SELECTseries5           *
*           Version  20.07.10.66                 *
*           Proprietary Program of               *
*           Bentley Systems, Inc.                *
*           Date=    JAN  2, 2021                *
*           Time=    13:28:14                    *
*                                                *
*      USER ID: BHEL                             *
**************************************************
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```
     1. STAAD SPACE
INPUT FILE: Ramagundam.STD
     2. START JOB INFORMATION
     3. ENGINEER DATE 08-DEC-20
     4. END JOB INFORMATION
     5. INPUT WIDTH 79
     6. UNIT METER KN
     7. JOINT COORDINATES
     8. 1 0 0 0; 2 0 0 -0.85; 3 0 2 0; 4 0 2 -0.85; 5 3.8 0 -0.85; 6 3.8 2 -0.85
     9. 7 3.8 0 0; 8 3.8 2 0; 9 5.8 0 -0.85; 10 5.8 2 -0.85; 11 5.8 0 0; 12 5.8 2 0
    10. 13 9.8 0 0; 14 9.8 0 -0.85; 15 9.8 1.17 0; 16 9.8 1.17 -0.85; 17 7.8 1.585 0
    11. 18 7.8 1.585 -0.85; 19 7.8 0 0; 20 7.8 0 -0.85; 21 4.8 2 0; 22 6.8 1.7925 0
    12. 23 4.8 2 -0.85; 24 6.8 1.7925 -0.85; 25 8.8 1.3775 0; 26 8.8 1.3775 -0.85
    13. 27 1.9 2 0; 28 1.9 2 -0.85; 29 0 1 -0.85; 30 0 1 0; 31 3.8 1 -0.85; 32 3.8 1 0
    14. 33 0.95 2 0; 34 0.95 2 -0.85; 35 2.85 2 0; 36 2.85 2 -0.85; 37 0.95 1.5 0
    15. 38 2.85 1.5 0; 39 0.95 1.5 -0.85; 40 2.85 1.5 -0.85
    16. MEMBER INCIDENCES
    17. 1 2 29; 2 1 30; 3 5 31; 4 7 32; 5 9 10; 6 11 12; 7 13 15; 8 14 16; 9 3 33
    18. 10 8 21; 11 12 22; 12 4 34; 13 6 23; 14 10 24; 15 3 4; 16 8 6; 17 12 10
    19. 18 17 25; 19 18 26; 20 19 17; 21 20 18; 22 15 16; 23 21 12; 24 22 17; 25 23 10
    20. 26 24 18; 27 25 15; 28 26 16; 29 21 23; 30 22 24; 31 25 26; 32 27 35; 33 28 36
    21. 34 29 4; 35 30 3; 36 31 6; 37 32 8; 38 30 37; 39 32 38; 40 29 39; 41 31 40
    22. 42 27 28; 43 17 18; 44 33 27; 45 34 28; 46 35 8; 47 36 6; 48 37 27; 49 38 27
    23. 50 39 28; 51 40 28; 52 33 37; 53 35 38; 54 36 40; 55 34 39
    24. DEFINE MATERIAL START
    25. ISOTROPIC STEEL
    26. E 2.05E+008
    27. POISSON 0.3
    28. DENSITY 76.8195
    29. ALPHA 1.2E-005
    30. DAMP 0.03
    31. TYPE STEEL
    32. STRENGTH FY 253200 FU 407800 RY 1.5 RT 1.2
    33. END DEFINE MATERIAL
    34. MEMBER PROPERTY INDIAN
    35. 1 TO 8 20 21 34 TO 37 TABLE ST ISMC100
    36. 9 TO 19 22 TO 33 38 TO 55 TABLE ST ISA50X50X5
    37. CONSTANTS
    38. BETA 90 MEMB 1 TO 8 20 21 34 TO 37
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39. BETA 45 MEMB 9 TO 11 15 TO 18 22 TO 24 27 29 TO 32 38 TO 44 46 48 TO 53
40. BETA 315 MEMB 12 TO 14 19 25 26 28 33 45 47 54 55
41. MATERIAL STEEL ALL
42. SUPPORTS
43. 1 2 5 7 9 11 13 14 19 20 FIXED
44. MEMBER TRUSS
45. 38 TO 41 48 TO 51
46. LOAD 1 LOADTYPE DEAD  TITLE DEAD LOAD
47. SELFWEIGHT Y -1
48. MEMBER LOAD
49. 15 16 42 UNI GY -0.725
50. 16 17 29 UNI GY -0.382
51. 17 30 43 UNI GY -0.382
52. 22 31 43 UNI GY -0.382
53. LOAD 3 LOADTYPE WIND  TITLE WIND LOAD +X
54. MEMBER LOAD
55. 1 TO 6 34 TO 37 UNI GX 0.093
56. 20 21 UNI GX 0.088
57. 7 8 UNI GX 0.082
58. 52 TO 55 UNI GX 0.093
59. 38 TO 41 48 TO 51 UNI GX 0.107
60. LOAD 4 LOADTYPE WIND  TITLE WIND LOAD -X
61. MEMBER LOAD
62. 1 TO 6 34 TO 37 UNI GX -0.106
63. 20 21 UNI GX -0.1
64. 7 8 UNI GX -0.093
65. 52 TO 55 UNI GX -0.093
66. 38 TO 41 48 TO 51 UNI GX -0.107
67. LOAD 5 LOADTYPE WIND  TITLE WIND LOAD +Z
68. MEMBER LOAD
69. 1 TO 6 34 TO 37 UNI GZ 0.033
70. 7 8 20 21 UNI GY 0.032
71. 9 TO 11 18 23 24 27 32 44 46 UNI GZ 0.128
72. 12 TO 14 19 25 26 28 33 45 47 UNI GZ 0.134
73. 38 TO 41 48 TO 51 UNI GZ 0.113
74. LOAD 6 LOADTYPE WIND  TITLE WIND LOAD -Z
75. MEMBER LOAD
76. 1 TO 6 34 TO 37 UNI GZ -0.031
77. 7 8 20 21 UNI GY -0.032
78. 9 TO 11 18 23 24 27 32 44 46 UNI GZ -0.134
79. 12 TO 14 19 25 26 28 33 45 47 UNI GZ -0.128
80. 38 TO 41 48 TO 51 UNI GZ -0.118
81. LOAD COMB 2 DL + WL +X
82. 1 1.127 3 1.127
83. LOAD COMB 7 DL + WL -X
84. 1 1.127 4 1.127
85. LOAD COMB 8 DL + WL +Z
86. 1 1.127 5 1.127
87. LOAD COMB 9 DL + WL -Z
88. 1 1.127 6 1.127
89. PERFORM ANALYSIS PRINT ALL
```

P R O B L E M S T A T I S T I C S

NUMBER OF JOINTS 40 NUMBER OF MEMBERS 55
NUMBER OF PLATES 0 NUMBER OF SOLIDS 0
NUMBER OF SURFACES 0 NUMBER OF SUPPORTS 10

SOLVER USED IS THE OUT-OF-CORE BASIC SOLVER

ORIGINAL/FINAL BAND-WIDTH= 30/ 6/ 36 DOF
TOTAL PRIMARY LOAD CASES = 5, TOTAL DEGREES OF FREEDOM = 180
TOTAL LOAD COMBINATION CASES = 4 SO FAR.
SIZE OF STIFFNESS MATRIX = 7 DOUBLE KILO-WORDS
REQRD/AVAIL. DISK SPACE = 12.2/ 24885.9 MB

LOADING 1 LOADTYPE DEAD TITLE DEAD LOAD

SELFWEIGHT Y -1.000

ACTUAL WEIGHT OF THE STRUCTURE = 3.040 KN

MEMBER LOAD - UNIT KN METE

MEMBER	UDL	L1	L2	CON	L	LIN1	LIN2
15	-0.7250 GY	0.00	0.85				
16	-0.7250 GY	0.00	0.85				
42	-0.7250 GY	0.00	0.85				
16	-0.3820 GY	0.00	0.85				
17	-0.3820 GY	0.00	0.85				
29	-0.3820 GY	0.00	0.85				
17	-0.3820 GY	0.00	0.85				
30	-0.3820 GY	0.00	0.85				
43	-0.3820 GY	0.00	0.85				
22	-0.3820 GY	0.00	0.85				
31	-0.3820 GY	0.00	0.85				
43	-0.3820 GY	0.00	0.85				

LOADING 3 LOADTYPE WIND TITLE WIND LOAD +X

MEMBER LOAD - UNIT KN METE

MEMBER	UDL	L1	L2	CON	L	LIN1	LIN2
1	0.0930 GX	0.00	1.00				
2	0.0930 GX	0.00	1.00				
3	0.0930 GX	0.00	1.00				
4	0.0930 GX	0.00	1.00				
5	0.0930 GX	0.00	2.00				
6	0.0930 GX	0.00	2.00				
34	0.0930 GX	0.00	1.00				
35	0.0930 GX	0.00	1.00				
36	0.0930 GX	0.00	1.00				
37	0.0930 GX	0.00	1.00				
20	0.0880 GX	0.00	1.59				
21	0.0880 GX	0.00	1.59				
7	0.0820 GX	0.00	1.17				
8	0.0820 GX	0.00	1.17				
52	0.0930 GX	0.00	0.50				
53	0.0930 GX	0.00	0.50				
54	0.0930 GX	0.00	0.50				
55	0.0930 GX	0.00	0.50				
38	0.1070 GX	0.00	1.07				
39	0.1070 GX	0.00	1.07				

40	0.1070	GX	0.00	1.07
41	0.1070	GX	0.00	1.07
48	0.1070	GX	0.00	1.07
49	0.1070	GX	0.00	1.07
50	0.1070	GX	0.00	1.07
51	0.1070	GX	0.00	1.07

LOADING 4 LOADTYPE WIND TITLE WIND LOAD -X

MEMBER LOAD - UNIT KN METE

MEMBER	UDL		L1	L2	CON	L	LIN1	LIN2
1	-0.1060	GX	0.00	1.00				
2	-0.1060	GX	0.00	1.00				
3	-0.1060	GX	0.00	1.00				
4	-0.1060	GX	0.00	1.00				
5	-0.1060	GX	0.00	2.00				
6	-0.1060	GX	0.00	2.00				
34	-0.1060	GX	0.00	1.00				
35	-0.1060	GX	0.00	1.00				
36	-0.1060	GX	0.00	1.00				
37	-0.1060	GX	0.00	1.00				
20	-0.1000	GX	0.00	1.59				
21	-0.1000	GX	0.00	1.59				
7	-0.0930	GX	0.00	1.17				
8	-0.0930	GX	0.00	1.17				
52	-0.0930	GX	0.00	0.50				
53	-0.0930	GX	0.00	0.50				
54	-0.0930	GX	0.00	0.50				
55	-0.0930	GX	0.00	0.50				
38	-0.1070	GX	0.00	1.07				
39	-0.1070	GX	0.00	1.07				
40	-0.1070	GX	0.00	1.07				
41	-0.1070	GX	0.00	1.07				
48	-0.1070	GX	0.00	1.07				
49	-0.1070	GX	0.00	1.07				
50	-0.1070	GX	0.00	1.07				
51	-0.1070	GX	0.00	1.07				

LOADING 5 LOADTYPE WIND TITLE WIND LOAD +Z

MEMBER LOAD - UNIT KN METE

MEMBER	UDL		L1	L2	CON	L	LIN1	LIN2
1	0.0330	GZ	0.00	1.00				
2	0.0330	GZ	0.00	1.00				
3	0.0330	GZ	0.00	1.00				
4	0.0330	GZ	0.00	1.00				

5	0.0330	GZ	0.00	2.00
6	0.0330	GZ	0.00	2.00
34	0.0330	GZ	0.00	1.00
35	0.0330	GZ	0.00	1.00
36	0.0330	GZ	0.00	1.00
37	0.0330	GZ	0.00	1.00
7	0.0320	GY	0.00	1.17
8	0.0320	GY	0.00	1.17
20	0.0320	GY	0.00	1.59
21	0.0320	GY	0.00	1.59
9	0.1280	GZ	0.00	0.95
10	0.1280	GZ	0.00	1.00
11	0.1280	GZ	0.00	1.02
18	0.1280	GZ	0.00	1.02
23	0.1280	GZ	0.00	1.00
24	0.1280	GZ	0.00	1.02
27	0.1280	GZ	0.00	1.02
32	0.1280	GZ	0.00	0.95
44	0.1280	GZ	0.00	0.95
46	0.1280	GZ	0.00	0.95
12	0.1340	GZ	0.00	0.95
13	0.1340	GZ	0.00	1.00
14	0.1340	GZ	0.00	1.02
19	0.1340	GZ	0.00	1.02
25	0.1340	GZ	0.00	1.00
26	0.1340	GZ	0.00	1.02
28	0.1340	GZ	0.00	1.02
33	0.1340	GZ	0.00	0.95
45	0.1340	GZ	0.00	0.95
47	0.1340	GZ	0.00	0.95
38	0.1130	GZ	0.00	1.07
39	0.1130	GZ	0.00	1.07
40	0.1130	GZ	0.00	1.07
41	0.1130	GZ	0.00	1.07
48	0.1130	GZ	0.00	1.07
49	0.1130	GZ	0.00	1.07
50	0.1130	GZ	0.00	1.07
51	0.1130	GZ	0.00	1.07

LOADING 6 LOADTYPE WIND TITLE WIND LOAD -Z

MEMBER LOAD - UNIT KN METE

MEMBER	UDL		L1	L2	CON	L	LIN1	LIN2
1	-0.0310	GZ	0.00	1.00				
2	-0.0310	GZ	0.00	1.00				
3	-0.0310	GZ	0.00	1.00				
4	-0.0310	GZ	0.00	1.00				
5	-0.0310	GZ	0.00	2.00				
6	-0.0310	GZ	0.00	2.00				
34	-0.0310	GZ	0.00	1.00				
35	-0.0310	GZ	0.00	1.00				

36	-0.0310 GZ	0.00	1.00
37	-0.0310 GZ	0.00	1.00
7	-0.0320 GY	0.00	1.17
8	-0.0320 GY	0.00	1.17
20	-0.0320 GY	0.00	1.59
21	-0.0320 GY	0.00	1.59
9	-0.1340 GZ	0.00	0.95
10	-0.1340 GZ	0.00	1.00
11	-0.1340 GZ	0.00	1.02
18	-0.1340 GZ	0.00	1.02
23	-0.1340 GZ	0.00	1.00
24	-0.1340 GZ	0.00	1.02
27	-0.1340 GZ	0.00	1.02
32	-0.1340 GZ	0.00	0.95
44	-0.1340 GZ	0.00	0.95
46	-0.1340 GZ	0.00	0.95
12	-0.1280 GZ	0.00	0.95
13	-0.1280 GZ	0.00	1.00
14	-0.1280 GZ	0.00	1.02
19	-0.1280 GZ	0.00	1.02
25	-0.1280 GZ	0.00	1.00
26	-0.1280 GZ	0.00	1.02
28	-0.1280 GZ	0.00	1.02
33	-0.1280 GZ	0.00	0.95
45	-0.1280 GZ	0.00	0.95
47	-0.1280 GZ	0.00	0.95
38	-0.1180 GZ	0.00	1.07
39	-0.1180 GZ	0.00	1.07
40	-0.1180 GZ	0.00	1.07
41	-0.1180 GZ	0.00	1.07
48	-0.1180 GZ	0.00	1.07
49	-0.1180 GZ	0.00	1.07
50	-0.1180 GZ	0.00	1.07
51	-0.1180 GZ	0.00	1.07

FOR LOADING - 1

APPLIED JOINT EQUIVALENT LOADS

JOINT	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM-Z
1	0.00000E+00	-4.68599E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	0.00000E+00	-4.68599E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
3	3.08657E-17	-3.88102E-01	1.92911E-18	-4.58665E-02	-3.33196E-18	-2.76741E-03
4	3.08657E-17	-3.88102E-01	3.85822E-18	4.58665E-02	2.35197E-18	-2.76741E-03
5	0.00000E+00	-4.68599E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
6	6.17315E-17	-5.68850E-01	7.71643E-18	6.88661E-02	6.46792E-18	-2.98975E-04
7	0.00000E+00	-4.68599E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
8	6.17315E-17	-5.68850E-01	1.92911E-18	-6.88661E-02	-6.27192E-18	-2.98975E-04
9	0.00000E+00	-9.37198E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
10	-1.26476E-10	-4.71247E-01	7.71643E-18	4.82146E-02	6.07592E-18	-6.53176E-05
11	0.00000E+00	-9.37198E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
12	-1.26476E-10	-4.71247E-01	0.00000E+00	-4.82146E-02	-6.27192E-18	-6.53176E-05
13	0.00000E+00	-5.48261E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
14	0.00000E+00	-5.48261E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
15	-9.73222E-11	-2.51605E-01	0.00000E+00	-2.52150E-02	-1.37198E-18	3.13170E-03
16	-9.73222E-11	-2.51605E-01	3.85822E-18	2.52150E-02	2.35197E-18	3.13170E-03
17	-3.69861E-10	-4.52192E-01	0.00000E+00	-4.82146E-02	-6.27192E-18	-4.46433E-09

APPLIED JOINT EQUIVALENT LOADS

JOINT	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM-Z
18	-3.69861E-10	-4.52192E-01	7.71643E-18	4.82146E-02	6.27192E-18	-4.46433E-09
19	0.00000E+00	-7.42729E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
20	0.00000E+00	-7.42729E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
21	0.00000E+00	-2.14785E-01	0.00000E+00	-2.52150E-02	-1.56798E-18	0.00000E+00
22	-3.99015E-10	-2.15569E-01	0.00000E+00	-2.52150E-02	-1.56798E-18	4.46433E-09
23	0.00000E+00	-2.14785E-01	7.71643E-18	2.52150E-02	1.56798E-18	0.00000E+00
24	-3.99015E-10	-2.15569E-01	7.71643E-18	2.52150E-02	1.56798E-18	4.46433E-09
25	-1.94644E-10	-2.15569E-01	0.00000E+00	-2.52150E-02	-1.56798E-18	0.00000E+00
26	-1.94644E-10	-2.15569E-01	7.71643E-18	2.52150E-02	1.56798E-18	0.00000E+00
27	-3.85959E-10	-3.98223E-01	3.85822E-18	-4.58665E-02	-3.13596E-18	-1.19049E-09
28	-3.85959E-10	-3.98223E-01	7.71643E-18	4.58665E-02	3.13596E-18	-1.19049E-09
29	-1.56659E-11	-1.13471E-01	1.92911E-18	0.00000E+00	0.00000E+00	0.00000E+00
30	-1.56659E-11	-1.13471E-01	1.92911E-18	0.00000E+00	0.00000E+00	0.00000E+00
31	4.01625E-10	-1.13471E-01	-1.92911E-18	0.00000E+00	0.00000E+00	0.00000E+00
32	4.01625E-10	-1.13471E-01	-1.92911E-18	0.00000E+00	0.00000E+00	0.00000E+00
33	0.00000E+00	-4.41558E-02	3.85822E-18	0.00000E+00	0.00000E+00	0.00000E+00
34	0.00000E+00	-4.41558E-02	7.71643E-18	0.00000E+00	0.00000E+00	0.00000E+00
35	0.00000E+00	-4.41558E-02	3.85822E-18	0.00000E+00	0.00000E+00	2.38098E-09
36	0.00000E+00	-4.41558E-02	7.71643E-18	0.00000E+00	0.00000E+00	2.38098E-09
37	-3.13318E-11	-4.87019E-02	3.85822E-18	0.00000E+00	0.00000E+00	0.00000E+00
38	3.13319E-11	-4.87019E-02	-3.85822E-18	0.00000E+00	0.00000E+00	0.00000E+00
39	-3.13318E-11	-4.87019E-02	3.85822E-18	0.00000E+00	0.00000E+00	0.00000E+00
40	3.13319E-11	-4.87019E-02	-3.85822E-18	0.00000E+00	0.00000E+00	0.00000E+00

STATIC LOAD/REACTION/EQUILIBRIUM SUMMARY FOR CASE NO. 1
LOADTYPE DEAD TITLE DEAD LOAD

CENTER OF FORCE BASED ON Y FORCES ONLY (METE).
(FORCES IN NON-GLOBAL DIRECTIONS WILL INVALIDATE RESULTS)

X = 0.477819600E+01
Y = 0.161997261E+01
Z = -0.425000024E+00

***TOTAL APPLIED LOAD (KN METE) SUMMARY (LOADING 1)
SUMMATION FORCE-X = 0.00
SUMMATION FORCE-Y = -7.81
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= -3.32 MY= 0.00 MZ= -37.32

***TOTAL REACTION LOAD(KN METE) SUMMARY (LOADING 1)
SUMMATION FORCE-X = 0.00
SUMMATION FORCE-Y = 7.81
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 3.32 MY= 0.00 MZ= 37.32

MAXIMUM DISPLACEMENTS (CM /RADIANS) (LOADING 1)

	MAXIMUMS	AT NODE
X =	-6.28509E-02	29
Y =	-1.08539E-01	28
Z =	-3.23422E-02	39
RX=	-1.02846E-03	27
RY=	-3.18244E-04	28
RZ=	-1.07282E-03	3

EXTERNAL AND INTERNAL JOINT LOAD SUMMARY (KN METE)-

JT	EXT FX/ INT FX	EXT FY/ INT FY	EXT FZ/ INT FZ	EXT MX/ INT MX	EXT MY/ INT MY	EXT MZ/ INT MZ	
							SUPPORT=1
1	0.00	-0.05	0.00	0.00	0.00	0.00	
	-0.30	-0.78	0.03	0.02	0.00	0.17	111111
2	0.00	-0.05	0.00	0.00	0.00	0.00	
	-0.30	-0.78	-0.03	-0.02	0.00	0.17	111111
5	0.00	-0.05	0.00	0.00	0.00	0.00	
	0.27	-1.11	-0.04	-0.03	0.00	-0.14	111111
7	0.00	-0.05	0.00	0.00	0.00	0.00	
	0.27	-1.11	0.04	0.03	0.00	-0.14	111111
9	0.00	-0.09	0.00	0.00	0.00	0.00	
	-0.01	-0.66	-0.04	-0.02	0.00	0.01	111111
11	0.00	-0.09	0.00	0.00	0.00	0.00	
	-0.01	-0.66	0.04	0.02	0.00	0.01	111111
13	0.00	-0.05	0.00	0.00	0.00	0.00	
	0.04	-0.36	0.04	0.01	0.00	-0.01	111111
14	0.00	-0.05	0.00	0.00	0.00	0.00	
	0.04	-0.36	-0.04	-0.01	0.00	-0.01	111111
19	0.00	-0.07	0.00	0.00	0.00	0.00	
	-0.01	-0.68	0.04	0.02	0.00	0.01	111111
20	0.00	-0.07	0.00	0.00	0.00	0.00	
	-0.01	-0.68	-0.04	-0.02	0.00	0.01	111111

FOR LOADING - 3
APPLIED JOINT EQUIVALENT LOADS

JOINT	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM-Z
1	4.65000E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	-7.75000E-03
2	4.65000E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	-7.75000E-03
3	4.65000E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	7.75000E-03
4	4.65000E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	7.75000E-03
5	4.65000E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	-7.75000E-03
6	4.65000E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	7.75000E-03
7	4.65000E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	-7.75000E-03
8	4.65000E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	7.75000E-03
9	9.30000E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	-3.10000E-02
10	9.30000E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.10000E-02
11	9.30000E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	-3.10000E-02
12	9.30000E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.10000E-02
13	4.79700E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	-9.35415E-03
14	4.79700E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	-9.35415E-03
15	4.79700E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	9.35415E-03
16	4.79700E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	9.35415E-03

APPLIED JOINT EQUIVALENT LOADS

JOINT	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM-Z
17	6.97400E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.84230E-02
18	6.97400E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.84230E-02
19	6.97400E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	-1.84230E-02
20	6.97400E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	-1.84230E-02
27	1.14869E-01	9.69743E-10	3.85822E-18	0.00000E+00	0.00000E+00	0.00000E+00
28	1.14869E-01	9.69743E-10	3.85822E-18	0.00000E+00	0.00000E+00	0.00000E+00
29	1.50435E-01	-2.47037E-10	1.92911E-18	0.00000E+00	0.00000E+00	-8.41803E-10
30	1.50435E-01	-2.47037E-10	1.92911E-18	0.00000E+00	0.00000E+00	-8.41803E-10
31	1.50435E-01	1.20676E-09	1.92911E-18	0.00000E+00	0.00000E+00	-8.41803E-10
32	1.50435E-01	1.20676E-09	1.92911E-18	0.00000E+00	0.00000E+00	-8.41803E-10
33	2.32500E-02	0.00000E+00	-1.92911E-18	1.95997E-19	0.00000E+00	1.93750E-03
34	2.32500E-02	0.00000E+00	-5.78733E-18	3.91995E-19	0.00000E+00	1.93750E-03
35	2.32500E-02	0.00000E+00	-1.92911E-18	1.95997E-19	0.00000E+00	1.93750E-03
36	2.32500E-02	0.00000E+00	-5.78733E-18	3.91995E-19	0.00000E+00	1.93750E-03
37	1.38119E-01	-4.94075E-10	1.92911E-18	-1.95997E-19	0.00000E+00	-1.93750E-03
38	1.38119E-01	2.42354E-09	1.92911E-18	-1.95997E-19	0.00000E+00	-1.93750E-03
39	1.38119E-01	-4.94075E-10	-1.92911E-18	-3.91995E-19	0.00000E+00	-1.93750E-03
40	1.38119E-01	2.42354E-09	-1.92911E-18	-3.91995E-19	0.00000E+00	-1.93750E-03

STATIC LOAD/REACTION/EQUILIBRIUM SUMMARY FOR CASE NO. 3
LOADTYPE WIND TITLE WIND LOAD +X

CENTER OF FORCE BASED ON X FORCES ONLY (METE).
(FORCES IN NON-GLOBAL DIRECTIONS WILL INVALIDATE RESULTS)

X = 0.361354659E+01
Y = 0.117143321E+01
Z = -0.425000022E+00

***TOTAL APPLIED LOAD (KN METE) SUMMARY (LOADING 3)
SUMMATION FORCE-X = 2.69
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= -1.14 MZ= -3.15

***TOTAL REACTION LOAD(KN METE) SUMMARY (LOADING 3)
SUMMATION FORCE-X = -2.69
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 1.14 MZ= 3.15

MAXIMUM DISPLACEMENTS (CM /RADIANS) (LOADING 3)

	MAXIMUMS	AT NODE
X =	1.02569E-01	39
Y =	1.33526E-02	38
Z =	1.13572E-02	38
RX=	-6.34502E-05	38
RY=	2.42436E-04	15
RZ=	-9.40192E-04	16

EXTERNAL AND INTERNAL JOINT LOAD SUMMARY (KN METE)-

JT	EXT FX/ INT FX	EXT FY/ INT FY	EXT FZ/ INT FZ	EXT MX/ INT MX	EXT MY/ INT MY	EXT MZ/ INT MZ	
							SUPPORT=1
1	0.05	0.00	0.00	0.00	0.00	-0.01	
	0.36	0.14	0.00	0.00	0.00	-0.22	111111
2	0.05	0.00	0.00	0.00	0.00	-0.01	
	0.36	0.14	0.00	0.00	0.00	-0.22	111111
5	0.05	0.00	0.00	0.00	0.00	-0.01	
	0.36	-0.14	0.00	0.00	0.00	-0.22	111111
7	0.05	0.00	0.00	0.00	0.00	-0.01	
	0.36	-0.14	0.00	0.00	0.00	-0.22	111111
9	0.09	0.00	0.00	0.00	0.00	-0.03	
	0.06	0.05	0.00	0.00	0.00	-0.06	111111
11	0.09	0.00	0.00	0.00	0.00	-0.03	
	0.06	0.05	0.00	0.00	0.00	-0.06	111111
13	0.05	0.00	0.00	0.00	0.00	-0.01	
	0.16	-0.06	0.01	0.00	0.00	-0.14	111111
14	0.05	0.00	0.00	0.00	0.00	-0.01	
	0.16	-0.06	-0.01	0.00	0.00	-0.14	111111
19	0.07	0.00	0.00	0.00	0.00	-0.02	
	0.10	0.01	0.00	0.00	0.00	-0.10	111111
20	0.07	0.00	0.00	0.00	0.00	-0.02	
	0.10	0.01	0.00	0.00	0.00	-0.10	111111

FOR LOADING - 4

APPLIED JOINT EQUIVALENT LOADS

JOINT	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM-Z
1	-5.30000E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	8.83333E-03
2	-5.30000E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	8.83333E-03
3	-5.30000E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	-8.83333E-03
4	-5.30000E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	-8.83333E-03
5	-5.30000E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	8.83333E-03
6	-5.30000E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	-8.83333E-03
7	-5.30000E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	8.83333E-03
8	-5.30000E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	-8.83333E-03
9	-1.06000E-01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.53333E-02
10	-1.06000E-01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	-3.53333E-02
11	-1.06000E-01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.53333E-02
12	-1.06000E-01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	-3.53333E-02
13	-5.44050E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.06090E-02
14	-5.44050E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.06090E-02
15	-5.44050E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	-1.06090E-02
16	-5.44050E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	-1.06090E-02

APPLIED JOINT EQUIVALENT LOADS

JOINT	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM-Z
17	-7.92500E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	-2.09352E-02
18	-7.92500E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	-2.09352E-02
19	-7.92500E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.09352E-02
20	-7.92500E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.09352E-02
27	-1.14869E-01	-9.69743E-10	-3.85822E-18	0.00000E+00	0.00000E+00	0.00000E+00
28	-1.14869E-01	-9.69743E-10	-3.85822E-18	0.00000E+00	0.00000E+00	0.00000E+00
29	-1.63435E-01	2.47037E-10	-1.92911E-18	0.00000E+00	0.00000E+00	0.00000E+00
30	-1.63435E-01	2.47037E-10	-1.92911E-18	0.00000E+00	0.00000E+00	0.00000E+00
31	-1.63435E-01	-1.20676E-09	-1.92911E-18	0.00000E+00	0.00000E+00	0.00000E+00
32	-1.63435E-01	-1.20676E-09	-1.92911E-18	0.00000E+00	0.00000E+00	0.00000E+00
33	-2.32500E-02	0.00000E+00	1.92911E-18	-1.95997E-19	0.00000E+00	-1.93750E-03
34	-2.32500E-02	0.00000E+00	5.78733E-18	-3.91995E-19	0.00000E+00	-1.93750E-03
35	-2.32500E-02	0.00000E+00	1.92911E-18	-1.95997E-19	0.00000E+00	-1.93750E-03
36	-2.32500E-02	0.00000E+00	5.78733E-18	-3.91995E-19	0.00000E+00	-1.93750E-03
37	-1.38119E-01	4.94075E-10	-1.92911E-18	1.95997E-19	0.00000E+00	1.93750E-03
38	-1.38119E-01	-2.42354E-09	-1.92911E-18	1.95997E-19	0.00000E+00	1.93750E-03
39	-1.38119E-01	4.94075E-10	1.92911E-18	3.91995E-19	0.00000E+00	1.93750E-03
40	-1.38119E-01	-2.42354E-09	1.92911E-18	3.91995E-19	0.00000E+00	1.93750E-03

STATIC LOAD/REACTION/EQUILIBRIUM SUMMARY FOR CASE NO. 4
LOADTYPE WIND TITLE WIND LOAD -X

CENTER OF FORCE BASED ON X FORCES ONLY (METE).
(FORCES IN NON-GLOBAL DIRECTIONS WILL INVALIDATE RESULTS)

X = 0.370077730E+01
Y = 0.115211274E+01
Z = -0.425000022E+00

***TOTAL APPLIED LOAD (KN METE) SUMMARY (LOADING 4)
SUMMATION FORCE-X = -2.91
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 1.24 MZ= 3.35

***TOTAL REACTION LOAD(KN METE) SUMMARY (LOADING 4)
SUMMATION FORCE-X = 2.91
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= -1.24 MZ= -3.35

MAXIMUM DISPLACEMENTS (CM /RADIANS) (LOADING 4)

	MAXIMUMS	AT NODE
X =	-1.08337E-01	37
Y =	-1.34021E-02	25
Z =	1.11591E-02	40
RX=	-6.28813E-05	27
RY=	-2.57067E-04	15
RZ=	9.98499E-04	16

EXTERNAL AND INTERNAL JOINT LOAD SUMMARY (KN METE)-

JT	EXT FX/ INT FX	EXT FY/ INT FY	EXT FZ/ INT FZ	EXT MX/ INT MX	EXT MY/ INT MY	EXT MZ/ INT MZ	
							SUPPORT=1
1	-0.05	0.00	0.00	0.00	0.00	0.01	
	-0.38	-0.15	0.00	0.00	0.00	0.24	111111
2	-0.05	0.00	0.00	0.00	0.00	0.01	
	-0.38	-0.15	0.00	0.00	0.00	0.24	111111
5	-0.05	0.00	0.00	0.00	0.00	0.01	
	-0.38	0.15	0.00	0.00	0.00	0.23	111111
7	-0.05	0.00	0.00	0.00	0.00	0.01	
	-0.38	0.15	0.00	0.00	0.00	0.23	111111
9	-0.11	0.00	0.00	0.00	0.00	0.04	
	-0.06	-0.05	0.00	0.00	0.00	0.07	111111
11	-0.11	0.00	0.00	0.00	0.00	0.04	
	-0.06	-0.05	0.00	0.00	0.00	0.07	111111
13	-0.05	0.00	0.00	0.00	0.00	0.01	
	-0.17	0.06	-0.01	0.00	0.00	0.15	111111
14	-0.05	0.00	0.00	0.00	0.00	0.01	
	-0.17	0.06	0.01	0.00	0.00	0.15	111111
19	-0.08	0.00	0.00	0.00	0.00	0.02	
	-0.11	-0.02	0.00	0.00	0.00	0.10	111111
20	-0.08	0.00	0.00	0.00	0.00	0.02	
	-0.11	-0.02	0.00	0.00	0.00	0.10	111111

FOR LOADING - 5

APPLIED JOINT EQUIVALENT LOADS

JOINT	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM-Z
1	0.00000E+00	0.00000E+00	1.65000E-02	2.75000E-03	0.00000E+00	0.00000E+00
2	0.00000E+00	0.00000E+00	1.65000E-02	2.75000E-03	0.00000E+00	0.00000E+00
3	0.00000E+00	3.85822E-18	7.73000E-02	-2.75000E-03	-9.62667E-03	0.00000E+00
4	0.00000E+00	1.54329E-17	8.01500E-02	-2.75000E-03	-1.00779E-02	2.35197E-18
5	0.00000E+00	0.00000E+00	1.65000E-02	2.75000E-03	0.00000E+00	0.00000E+00
6	0.00000E+00	3.08657E-17	1.47150E-01	-2.75000E-03	-1.08876E-03	7.83990E-19
7	0.00000E+00	0.00000E+00	1.65000E-02	2.75000E-03	0.00000E+00	0.00000E+00
8	0.00000E+00	1.15747E-17	1.41300E-01	-2.75000E-03	-1.04001E-03	0.00000E+00
9	0.00000E+00	0.00000E+00	3.30000E-02	1.10000E-02	0.00000E+00	0.00000E+00
10	2.89366E-18	3.08657E-17	1.68427E-01	-1.33664E-02	-2.37864E-04	0.00000E+00
11	0.00000E+00	0.00000E+00	3.30000E-02	1.10000E-02	0.00000E+00	0.00000E+00
12	1.92911E-18	1.15747E-17	1.62363E-01	-1.32605E-02	-2.27213E-04	0.00000E+00
13	0.00000E+00	1.87200E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
14	0.00000E+00	1.87200E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
15	1.92911E-18	1.87200E-02	6.53633E-02	2.26048E-03	1.08939E-02	-7.83990E-19
16	2.89366E-18	1.87200E-02	6.84272E-02	2.36644E-03	1.14045E-02	-3.13596E-18

APPLIED JOINT EQUIVALENT LOADS

JOINT	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM-Z
17	3.85822E-18	2.53600E-02	1.30727E-01	-1.40129E-09	-1.51976E-08	-7.83990E-19
18	6.75188E-18	2.53600E-02	1.36854E-01	-1.57280E-09	-1.64199E-08	0.00000E+00
19	0.00000E+00	2.53600E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
20	0.00000E+00	2.53600E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
21	0.00000E+00	1.54329E-17	1.28000E-01	0.00000E+00	1.19049E-09	0.00000E+00
22	3.85822E-18	7.71643E-18	1.30727E-01	5.87620E-10	1.63632E-08	7.83990E-19
23	0.00000E+00	3.08657E-17	1.34000E-01	0.00000E+00	0.00000E+00	0.00000E+00
24	6.75188E-18	3.08657E-17	1.36854E-01	4.67773E-10	1.64199E-08	0.00000E+00
25	3.85822E-18	7.71643E-18	1.30727E-01	0.00000E+00	0.00000E+00	0.00000E+00
26	5.78733E-18	3.08657E-17	1.36854E-01	0.00000E+00	0.00000E+00	0.00000E+00
27	-5.78733E-18	7.71643E-18	2.42911E-01	0.00000E+00	-3.57147E-09	0.00000E+00
28	-5.78733E-18	3.08657E-17	2.48611E-01	0.00000E+00	-4.76195E-09	0.00000E+00
29	-1.92911E-18	3.85822E-18	9.36553E-02	2.10451E-10	0.00000E+00	0.00000E+00
30	-1.92911E-18	3.85822E-18	9.36553E-02	2.10451E-10	0.00000E+00	0.00000E+00
31	-1.92911E-18	-3.85822E-18	9.36553E-02	2.10451E-10	0.00000E+00	0.00000E+00
32	-1.92911E-18	-3.85822E-18	9.36553E-02	2.10451E-10	0.00000E+00	0.00000E+00
33	0.00000E+00	7.71643E-18	1.21600E-01	0.00000E+00	0.00000E+00	0.00000E+00
34	0.00000E+00	3.08657E-17	1.27300E-01	0.00000E+00	0.00000E+00	0.00000E+00
35	0.00000E+00	7.71643E-18	1.21600E-01	0.00000E+00	7.73818E-09	7.83990E-19
36	0.00000E+00	3.08657E-17	1.27300E-01	0.00000E+00	9.52391E-09	0.00000E+00
37	-3.85822E-18	7.71643E-18	1.21311E-01	0.00000E+00	0.00000E+00	0.00000E+00
38	-5.78733E-18	-7.71643E-18	1.21311E-01	0.00000E+00	0.00000E+00	0.00000E+00
39	-3.85822E-18	7.71643E-18	1.21311E-01	0.00000E+00	0.00000E+00	0.00000E+00
40	-5.78733E-18	-7.71643E-18	1.21311E-01	0.00000E+00	0.00000E+00	0.00000E+00

STATIC LOAD/REACTION/EQUILIBRIUM SUMMARY FOR CASE NO. 5
LOADTYPE WIND TITLE WIND LOAD +Z

CENTER OF FORCE BASED ON Y FORCES ONLY (METE).
(FORCES IN NON-GLOBAL DIRECTIONS WILL INVALIDATE RESULTS)

X = 0.864936470E+01
Y = 0.704378413E+00
Z = -0.425000043E+00

CENTER OF FORCE BASED ON Z FORCES ONLY (METE).
(FORCES IN NON-GLOBAL DIRECTIONS WILL INVALIDATE RESULTS)

X = 0.401032542E+01
Y = 0.166499244E+01
Z = -0.431371267E+00

***TOTAL APPLIED LOAD (KN METE) SUMMARY (LOADING 5)
SUMMATION FORCE-X = 0.00
SUMMATION FORCE-Y = 0.18
SUMMATION FORCE-Z = 3.96

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 6.66 MY= -15.87 MZ= 1.53

***TOTAL REACTION LOAD(KN METE) SUMMARY (LOADING 5)
SUMMATION FORCE-X = 0.00
SUMMATION FORCE-Y = -0.18
SUMMATION FORCE-Z = -3.96

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= -6.66 MY= 15.87 MZ= -1.53

MAXIMUM DISPLACEMENTS (CM /RADIANS) (LOADING 5)

	MAXIMUMS	AT NODE
X =	-3.94015E-02	29
Y =	-5.73233E-02	36
Z =	5.39748E+00	39
RX=	-9.27760E-02	40
RY=	6.09597E-03	38
RZ=	-4.29339E-04	35

EXTERNAL AND INTERNAL JOINT LOAD SUMMARY (KN METE)-

JT	EXT FX/ INT FX	EXT FY/ INT FY	EXT FZ/ INT FZ	EXT MX/ INT MX	EXT MY/ INT MY	EXT MZ/ INT MZ	
							SUPPORT=1
1	0.00	0.00	0.02	0.00	0.00	0.00	
	0.22	-0.01	0.53	0.89	0.00	-0.12	111111
2	0.00	0.00	0.02	0.00	0.00	0.00	
	-0.22	0.01	0.53	0.89	0.00	0.12	111111
5	0.00	0.00	0.02	0.00	0.00	0.00	
	0.13	0.65	0.67	0.93	0.00	-0.06	111111
7	0.00	0.00	0.02	0.00	0.00	0.00	
	-0.13	-0.65	0.67	0.93	0.00	0.06	111111
9	0.00	0.00	0.03	0.01	0.00	0.00	
	-0.01	0.25	0.29	0.47	0.00	0.01	111111
11	0.00	0.00	0.03	0.01	0.00	0.00	
	0.01	-0.25	0.29	0.47	0.00	-0.01	111111
13	0.00	0.02	0.00	0.00	0.00	0.00	
	0.02	-0.06	0.13	0.12	0.00	-0.02	111111
14	0.00	0.02	0.00	0.00	0.00	0.00	
	-0.02	0.10	0.13	0.12	0.00	0.02	111111
19	0.00	0.03	0.00	0.00	0.00	0.00	
	0.02	-0.14	0.28	0.38	0.00	-0.02	111111
20	0.00	0.03	0.00	0.00	0.00	0.00	
	-0.02	0.19	0.28	0.38	0.00	0.02	111111

FOR LOADING - 6
APPLIED JOINT EQUIVALENT LOADS

JOINT	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM-Z
1	0.00000E+00	0.00000E+00	-1.55000E-02	-2.58333E-03	0.00000E+00	0.00000E+00
2	0.00000E+00	0.00000E+00	-1.55000E-02	-2.58333E-03	0.00000E+00	0.00000E+00
3	0.00000E+00	-3.85822E-18	-7.91500E-02	2.58333E-03	1.00779E-02	-7.83990E-19
4	0.00000E+00	-1.15747E-17	-7.63000E-02	2.58333E-03	9.62667E-03	-1.56798E-18
5	0.00000E+00	0.00000E+00	-1.55000E-02	-2.58333E-03	0.00000E+00	0.00000E+00
6	0.00000E+00	-2.70075E-17	-1.40300E-01	2.58333E-03	1.04001E-03	0.00000E+00
7	0.00000E+00	0.00000E+00	-1.55000E-02	-2.58333E-03	0.00000E+00	0.00000E+00

APPLIED JOINT EQUIVALENT LOADS

JOINT	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM-Z
8	0.00000E+00	-1.15747E-17	-1.46150E-01	2.58333E-03	1.08876E-03	-7.83990E-19
9	0.00000E+00	0.00000E+00	-3.10000E-02	-1.03333E-02	0.00000E+00	0.00000E+00
10	-2.89366E-18	-3.08657E-17	-1.60363E-01	1.25938E-02	2.27213E-04	-7.83990E-19
11	0.00000E+00	0.00000E+00	-3.10000E-02	-1.03333E-02	0.00000E+00	0.00000E+00
12	-1.92911E-18	-1.15747E-17	-1.66427E-01	1.26998E-02	2.37864E-04	7.83990E-19
13	0.00000E+00	-1.87200E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
14	0.00000E+00	-1.87200E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
15	-1.92911E-18	-1.87200E-02	-6.84272E-02	-2.36644E-03	-1.14045E-02	7.83990E-19
16	-2.89366E-18	-1.87200E-02	-6.53633E-02	-2.26048E-03	-1.08939E-02	3.13596E-18
17	-2.89366E-18	-2.53600E-02	-1.36854E-01	1.57280E-09	1.64199E-08	7.83990E-19
18	-6.75188E-18	-2.53600E-02	-1.30727E-01	1.40129E-09	1.51976E-08	0.00000E+00
19	0.00000E+00	-2.53600E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
20	0.00000E+00	-2.53600E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
21	0.00000E+00	-1.54329E-17	-1.34000E-01	0.00000E+00	0.00000E+00	0.00000E+00
22	-2.89366E-18	-1.15747E-17	-1.36854E-01	-4.67773E-10	-1.64199E-08	-7.83990E-19
23	0.00000E+00	-3.08657E-17	-1.28000E-01	0.00000E+00	-1.19049E-09	0.00000E+00
24	-6.75188E-18	-3.08657E-17	-1.30727E-01	-5.87620E-10	-1.63632E-08	0.00000E+00
25	-3.85822E-18	-7.71643E-18	-1.36854E-01	0.00000E+00	0.00000E+00	0.00000E+00
26	-5.78733E-18	-3.08657E-17	-1.30727E-01	0.00000E+00	0.00000E+00	0.00000E+00
27	3.85822E-18	-7.71643E-18	-2.53978E-01	0.00000E+00	4.76195E-09	0.00000E+00
28	3.85822E-18	-2.31493E-17	-2.48278E-01	0.00000E+00	3.57147E-09	0.00000E+00
29	1.92911E-18	-3.85822E-18	-9.43392E-02	0.00000E+00	0.00000E+00	0.00000E+00
30	1.92911E-18	-3.85822E-18	-9.43392E-02	0.00000E+00	0.00000E+00	0.00000E+00
31	1.92911E-18	3.85822E-18	-9.43392E-02	0.00000E+00	0.00000E+00	0.00000E+00
32	1.92911E-18	3.85822E-18	-9.43392E-02	0.00000E+00	0.00000E+00	0.00000E+00
33	0.00000E+00	-7.71643E-18	-1.27300E-01	0.00000E+00	0.00000E+00	0.00000E+00
34	0.00000E+00	-2.31493E-17	-1.21600E-01	0.00000E+00	0.00000E+00	0.00000E+00
35	0.00000E+00	-7.71643E-18	-1.27300E-01	0.00000E+00	-9.52391E-09	0.00000E+00
36	0.00000E+00	-2.31493E-17	-1.21600E-01	0.00000E+00	-7.73818E-09	-7.83990E-19
37	3.85822E-18	-7.71643E-18	-1.26678E-01	0.00000E+00	0.00000E+00	0.00000E+00
38	3.85822E-18	7.71643E-18	-1.26678E-01	0.00000E+00	0.00000E+00	0.00000E+00
39	3.85822E-18	-7.71643E-18	-1.26678E-01	0.00000E+00	0.00000E+00	0.00000E+00
40	3.85822E-18	7.71643E-18	-1.26678E-01	0.00000E+00	0.00000E+00	0.00000E+00

STATIC LOAD/REACTION/EQUILIBRIUM SUMMARY FOR CASE NO. 6
LOADTYPE WIND TITLE WIND LOAD -Z

CENTER OF FORCE BASED ON Y FORCES ONLY (METE).
(FORCES IN NON-GLOBAL DIRECTIONS WILL INVALIDATE RESULTS)

X = 0.864936470E+01
Y = 0.704378413E+00
Z = -0.425000024E+00

CENTER OF FORCE BASED ON Z FORCES ONLY (METE).
(FORCES IN NON-GLOBAL DIRECTIONS WILL INVALIDATE RESULTS)

X = 0.399242172E+01
Y = 0.166722488E+01
Z = -0.418659135E+00

***TOTAL APPLIED LOAD (KN METE) SUMMARY (LOADING 6)
SUMMATION FORCE-X = 0.00
SUMMATION FORCE-Y = -0.18
SUMMATION FORCE-Z = -3.98

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= -6.70 MY= 15.87 MZ= -1.53

***TOTAL REACTION LOAD(KN METE) SUMMARY (LOADING 6)
SUMMATION FORCE-X = 0.00
SUMMATION FORCE-Y = 0.18
SUMMATION FORCE-Z = 3.98

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 6.70 MY= -15.87 MZ= 1.53

MAXIMUM DISPLACEMENTS (CM /RADIANS) (LOADING 6)

	MAXIMUMS	AT NODE
X =	-4.03762E-02	30
Y =	-5.92836E-02	35
Z =	-5.61760E+00	37
RX=	9.69007E-02	38
RY=	-6.23723E-03	40
RZ=	-4.45532E-04	36

EXTERNAL AND INTERNAL JOINT LOAD SUMMARY (KN METE)-

JT	EXT FX/ INT FX	EXT FY/ INT FY	EXT FZ/ INT FZ	EXT MX/ INT MX	EXT MY/ INT MY	EXT MZ/ INT MZ	
							SUPPORT=1
1	0.00	0.00	-0.02	0.00	0.00	0.00	
	-0.23	0.01	-0.54	-0.90	0.00	0.12	111111
2	0.00	0.00	-0.02	0.00	0.00	0.00	
	0.23	-0.01	-0.54	-0.90	0.00	-0.12	111111
5	0.00	0.00	-0.02	0.00	0.00	0.00	
	-0.13	-0.66	-0.68	-0.94	0.00	0.06	111111
7	0.00	0.00	-0.02	0.00	0.00	0.00	
	0.13	0.66	-0.68	-0.94	0.00	-0.06	111111
9	0.00	0.00	-0.03	-0.01	0.00	0.00	
	0.01	-0.25	-0.29	-0.46	0.00	-0.01	111111
11	0.00	0.00	-0.03	-0.01	0.00	0.00	
	-0.01	0.25	-0.29	-0.46	0.00	0.01	111111
13	0.00	-0.02	0.00	0.00	0.00	0.00	
	-0.02	0.06	-0.13	-0.12	0.00	0.02	111111
14	0.00	-0.02	0.00	0.00	0.00	0.00	
	0.02	-0.10	-0.13	-0.12	0.00	-0.02	111111
19	0.00	-0.03	0.00	0.00	0.00	0.00	
	-0.02	0.14	-0.28	-0.38	0.00	0.02	111111
20	0.00	-0.03	0.00	0.00	0.00	0.00	
	0.02	-0.19	-0.28	-0.38	0.00	-0.02	111111

```
  LOAD COMBINATION NO.     2
  DL + WL +X

LOADING-     1.     3.
FACTOR -   1.13   1.13

  LOAD COMBINATION NO.     7
  DL + WL -X

LOADING-     1.     4.
FACTOR -   1.13   1.13

  LOAD COMBINATION NO.     8
  DL + WL +Z

LOADING-     1.     5.
FACTOR -   1.13   1.13

  LOAD COMBINATION NO.     9
  DL + WL -Z

LOADING-     1.     6.
FACTOR -   1.13   1.13


  ************ END OF DATA FROM INTERNAL STORAGE ************


   90. LOAD LIST 2 7 TO 9
   91. PARAMETER 1
   92. CODE INDIAN
   93. BEAM 1 MEMB 1 TO 51
   94. FYLD 250000 ALL
   95. RATIO 1 ALL
   96. TRACK 2 ALL
   97. CHECK CODE ALL
```

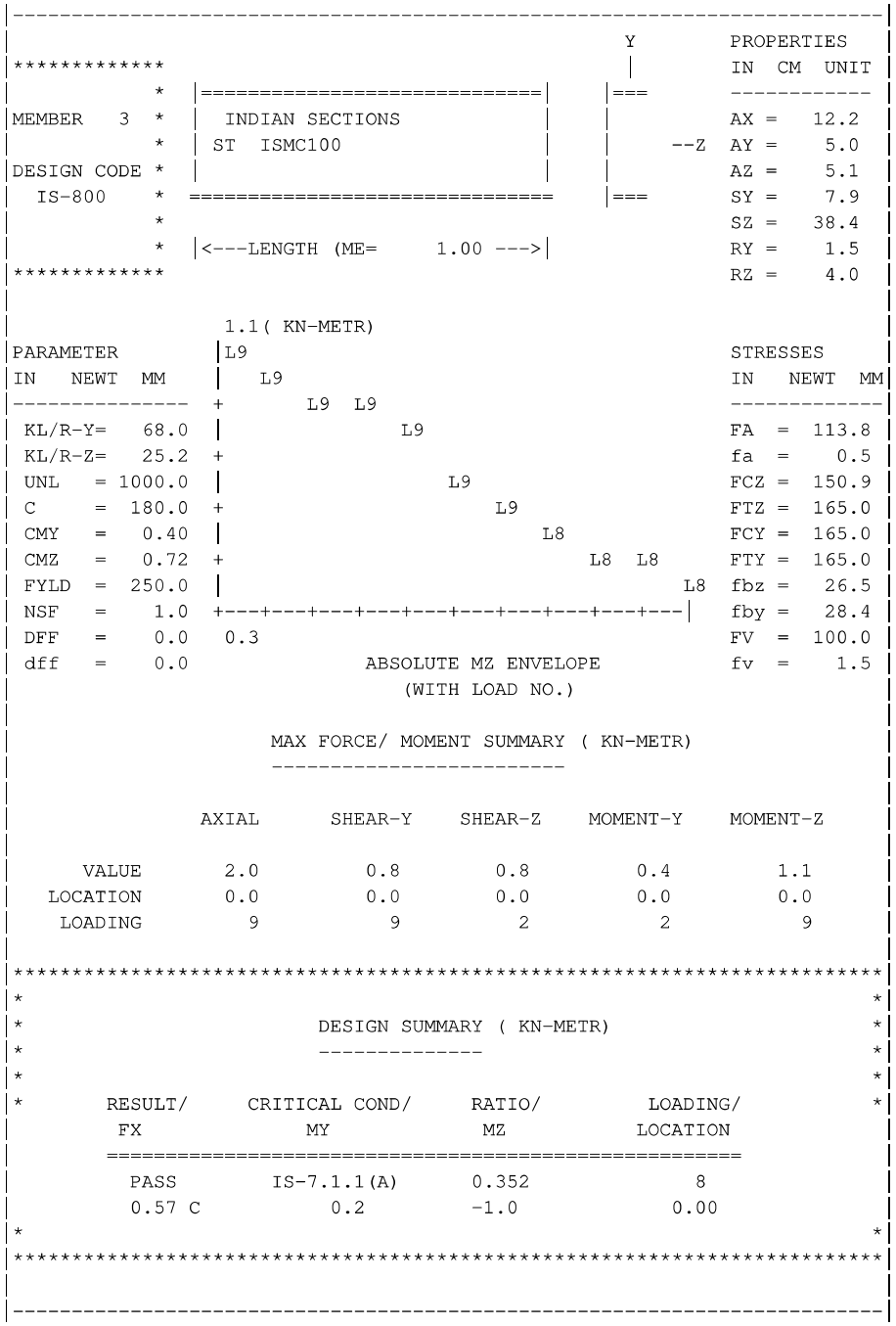
STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                  Y        PROPERTIES    |
|*************                                     |        IN  CM  UNIT   |
|            *  |============================|     |===     ------------   |
|MEMBER   1  *  |  INDIAN SECTIONS           |     |          AX =   12.2  |
|            *  | ST  ISMC100                |     |     --Z  AY =    5.0  |
|DESIGN CODE *  |                            |     |          AZ =    5.1  |
|  IS-800    *  ==============================    |===       SY =   15.9  |
|            *                                             SZ =   38.4  |
|            *  |<---LENGTH (ME=     1.00 --->|             RY =    1.5  |
|*************                                            RZ =    4.0  |
|                                                                         |
|                  1.0( KN-METR)                                          |
|PARAMETER         |L9                                     STRESSES       |
|IN   NEWT  MM     |   L9                                  IN   NEWT  MM  |
|---------------   +       L9  L9                          -------------  |
| KL/R-Y=   68.0   |               L9                      FA  =  113.8   |
| KL/R-Z=   25.2   +                                       fa  =    0.8   |
| UNL   = 1000.0   |                   L9  L9              FCZ =  150.9   |
| C     =  180.0   +                                       FTZ =  165.0   |
| CMY   =   0.40   |                           L9          FCY =  165.0   |
| CMZ   =   0.77   +                               L8  L8  FTY =  165.0   |
| FYLD  =  250.0   |                                   L8  fbz =   25.5   |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|  fby =   20.2   |
| DFF   =    0.0    0.4                                    FV  =  100.0   |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE          fv  =    1.2   |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                    MAX FORCE/ MOMENT SUMMARY ( KN-METR)                 |
|                    -------------------------                            |
|                                                                         |
|               AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z    |
|                                                                         |
|     VALUE       1.1         0.7        0.8         0.5         1.0     |
|   LOCATION      0.0         0.0        0.0         0.0         0.0     |
|    LOADING        7           9          7           7           9     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                        DESIGN SUMMARY ( KN-METR)                       *|
|*                        --------------                                  *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY             MZ           LOCATION            |
|        ========================================================        |
|          PASS        IS-7.1.1(A)      0.298             8               |
|          0.92 C          -0.3         -1.0            0.00              |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                  Y        PROPERTIES    |
|*************                                     |        IN  CM  UNIT   |
|            *  |============================|     |===     ------------   |
|MEMBER   2  *  |  INDIAN SECTIONS           |     |          AX =   12.2  |
|            *  | ST  ISMC100                |     |     --Z  AY =    5.0  |
|DESIGN CODE *  |                            |     |          AZ =    5.1  |
|  IS-800    *  ==============================    |===       SY =   15.9  |
|            *                                             SZ =   38.4  |
|            *  |<---LENGTH (ME=     1.00 --->|             RY =    1.5  |
|*************                                            RZ =    4.0  |
|                                                                         |
|                  1.0( KN-METR)                                          |
|PARAMETER         |L8                                     STRESSES       |
|IN   NEWT  MM     |   L8                                  IN   NEWT  MM  |
|---------------   +       L8  L8                          -------------  |
| KL/R-Y=   68.0   |               L8                      FA  =  113.8   |
| KL/R-Z=   25.2   +                                       fa  =    0.8   |
| UNL   = 1000.0   |                   L8                  FCZ =  150.9   |
| C     =  180.0   +                       L9              FTZ =  165.0   |
| CMY   =   0.40   |                           L9          FCY =  165.0   |
| CMZ   =   0.77   +                               L9  L9   FTY =  165.0   |
| FYLD  =  250.0   |                                     L9 fbz =   25.9   |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---| fby =   20.4   |
| DFF   =    0.0    0.4                                    FV  =  100.0   |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE          fv  =    1.2   |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z   |
|                                                                         |
|      VALUE       1.1         0.7        0.8         0.5         1.0     |
|   LOCATION       0.0         0.0        0.0         0.0         0.0     |
|    LOADING         7           8          7           7           8     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                         DESIGN SUMMARY ( KN-METR)                      *|
|*                         --------------                                 *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY             MZ           LOCATION            |
|        ========================================================        |
|          PASS        IS-7.1.1(A)      0.302             9               |
|          0.93 C          -0.3          1.0            0.00              |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****



STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|     |===     ------------   |
|MEMBER   4  *  |  INDIAN SECTIONS           |     |          AX =   12.2   |
|            *  | ST  ISMC100                |     |     --Z  AY =    5.0   |
|DESIGN CODE *  |                            |     |          AZ =    5.1   |
|  IS-800    *  ==============================    |===       SY =    7.9   |
|            *                                              SZ =   38.4   |
|            *  |<---LENGTH (ME=     1.00 --->|             RY =    1.5   |
|*************                                             RZ =    4.0   |
|                                                                         |
|                  1.1( KN-METR)                                          |
|PARAMETER         |L8                                      STRESSES      |
|IN   NEWT  MM     |   L8                                   IN   NEWT  MM |
|---------------   +       L8  L8                           -------------  |
| KL/R-Y=   68.0   |               L8                       FA  =  113.8   |
| KL/R-Z=   25.2   +                                       fa  =    0.5   |
| UNL   = 1000.0   |                   L8                   FCZ =  150.9   |
| C     =  180.0   +                       L8                FTZ =  165.0   |
| CMY   =   0.40   |                           L9           FCY =  165.0   |
| CMZ   =   0.72   +                               L9  L9     FTY =  165.0   |
| FYLD  =  250.0   |                                     L9   fbz =   26.8   |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|  fby =   28.8   |
| DFF   =    0.0    0.3                                     FV  =  100.0   |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE           fv  =    1.5   |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z   |
|                                                                         |
|      VALUE       2.0         0.8        0.8         0.4         1.1     |
|   LOCATION       0.0         0.0        0.0         0.0         0.0     |
|    LOADING         8           8          2           2           8     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                         DESIGN SUMMARY ( KN-METR)                      *|
|*                         --------------                                 *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY             MZ           LOCATION             |
|        ========================================================        |
|          PASS        IS-7.1.1(A)      0.356             9                |
|          0.56 C           0.2          1.0            0.00               |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|     |===     ------------   |
|MEMBER   5  *  |  INDIAN SECTIONS           |     |          AX =   12.2  |
|            *  | ST  ISMC100                |     |     --Z  AY =    5.0  |
|DESIGN CODE *  |                            |     |          AZ =    5.1  |
|  IS-800    *  ==============================     |===       SY =    7.9  |
|            *                                                SZ =   38.4  |
|            *  |<---LENGTH (ME=     2.00 --->|               RY =    1.5  |
|*************                                               RZ =    4.0  |
|                                                                         |
|                  0.6( KN-METR)                                          |
|PARAMETER         |L9                                        STRESSES     |
|IN   NEWT  MM     |   L9                                     IN   NEWT  MM|
|---------------   +       L9                                 ------------ |
| KL/R-Y=  136.0   |                                          FA  =   53.0 |
| KL/R-Z=   50.4   +           L9                             fa  =    0.9 |
| UNL   = 2000.0   |               L8                        FCZ =  126.1 |
| C     =  180.0   +                   L8                    FTZ =  165.0 |
| CMY   =   0.40   |                       L8            L9  FCY =  165.0 |
| CMZ   =   0.47   +                                 L9       FTY =  165.0 |
| FYLD  =  250.0   |                            L8  L9        fbz =   14.6 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|  fby =    0.8 |
| DFF   =    0.0    0.0                                      FV  =  100.0 |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE           fv  =    0.8 |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z  |
|                                                                         |
|      VALUE       1.1         0.4        0.2         0.1         0.6     |
|   LOCATION       0.0         0.0        0.0         0.0         0.0     |
|    LOADING         9           9          7           7           9     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                         DESIGN SUMMARY ( KN-METR)                      *|
|*                         --------------                                 *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ======================================================          |
|          PASS        IS-7.1.1(A)      0.138             9               |
|          1.13 C           0.0          0.6            0.00              |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

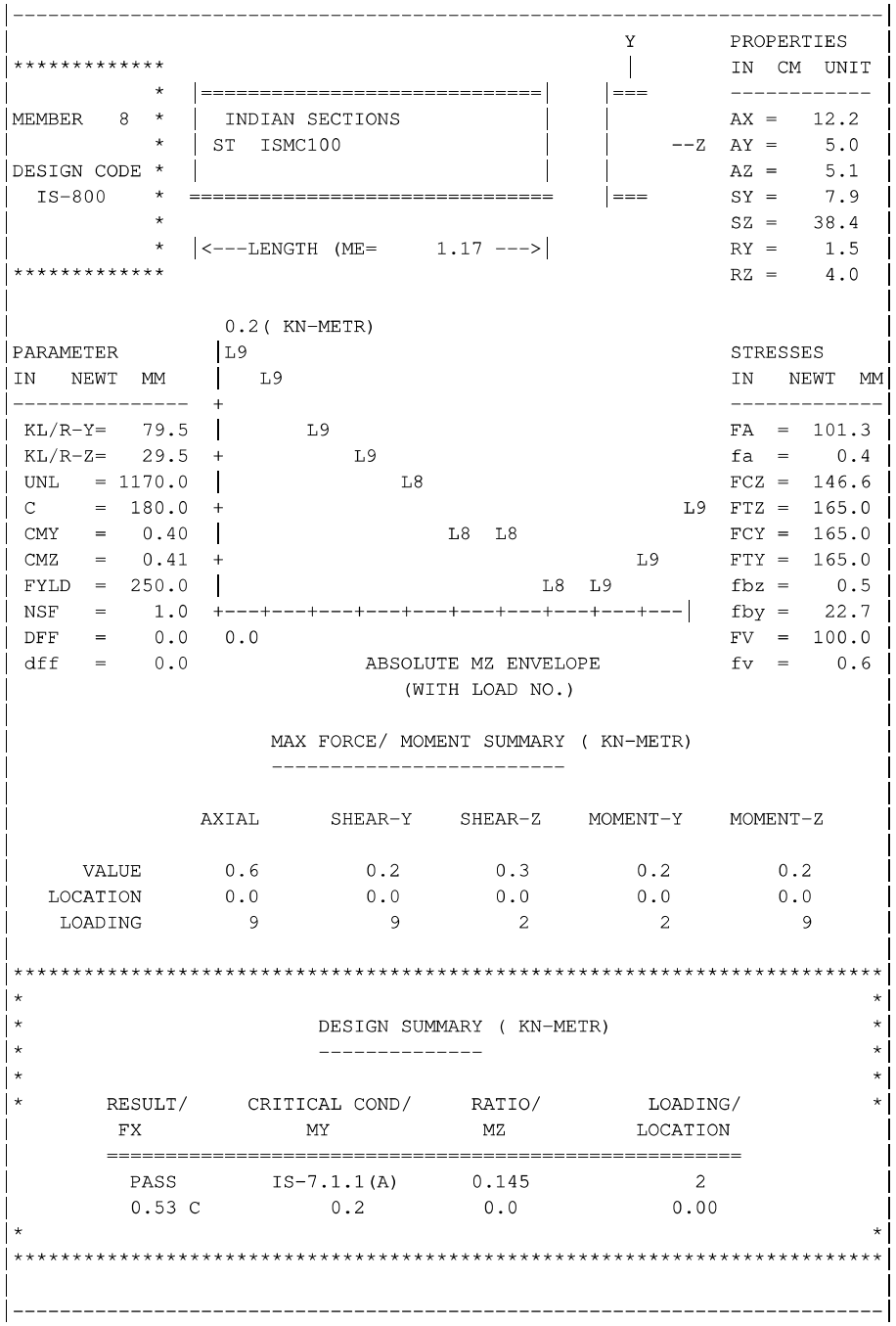
```
|-------------------------------------------------------------------------|
|                                                  Y        PROPERTIES    |
|*************                                     |        IN  CM  UNIT   |
|            *  |============================|     |===     ------------   |
|MEMBER   6  *  |  INDIAN SECTIONS           |     |          AX =   12.2  |
|            *  | ST  ISMC100                |     |     --Z  AY =    5.0  |
|DESIGN CODE *  |                            |     |          AZ =    5.1  |
|  IS-800    *  ==============================    |===       SY =    7.9  |
|            *                                             SZ =   38.4  |
|            *  |<---LENGTH (ME=     2.00 --->|             RY =    1.5  |
|*************                                            RZ =    4.0  |
|                                                                         |
|                  0.6( KN-METR)                                          |
|PARAMETER         |L8                                     STRESSES       |
|IN   NEWT  MM     |   L8                                  IN   NEWT  MM  |
|---------------   +       L8                              -------------  |
| KL/R-Y=  136.0   |                                       FA  =   53.0   |
| KL/R-Z=   50.4   +           L8                         fa  =    0.9   |
| UNL   = 2000.0   |               L8                    FCZ =  126.1   |
| C     =  180.0   +                   L9                 FTZ =  165.0   |
| CMY   =   0.40   |                       L9         L8  FCY =  165.0   |
| CMZ   =   0.47   +                              L8       FTY =  165.0   |
| FYLD  =  250.0   |                            L9  L8     fbz =   14.7   |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|  fby =    0.8   |
| DFF   =    0.0    0.0                                    FV  =  100.0   |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE          fv  =    0.8   |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                    MAX FORCE/ MOMENT SUMMARY ( KN-METR)                 |
|                    -------------------------                            |
|                                                                         |
|               AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z    |
|                                                                         |
|     VALUE       1.1         0.4        0.2         0.1         0.6     |
|   LOCATION      0.0         0.0        0.0         0.0         0.0     |
|    LOADING        8           8          7           7           8     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                        DESIGN SUMMARY ( KN-METR)                       *|
|*                        --------------                                  *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ========================================================        |
|          PASS        IS-7.1.1(A)      0.139             8               |
|          1.13 C          0.0          -0.6            0.00              |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|     |===     ------------   |
|MEMBER   7  *  |  INDIAN SECTIONS           |     |          AX =   12.2   |
|            *  | ST  ISMC100                |     |     --Z  AY =    5.0   |
|DESIGN CODE *  |                            |     |          AZ =    5.1   |
|  IS-800    *  ==============================     |===       SY =    7.9   |
|            *                                                SZ =   38.4   |
|            *  |<---LENGTH (ME=     1.17 --->|               RY =    1.5   |
|*************                                               RZ =    4.0   |
|                                                                         |
|                  0.2( KN-METR)                                          |
|PARAMETER         |L8                                        STRESSES     |
|IN   NEWT  MM     |   L8                                     IN   NEWT  MM|
|---------------   +                                          -------------|
| KL/R-Y=   79.5   |       L8                                 FA  =  101.3 |
| KL/R-Z=   29.5   +           L8                           fa  =    0.4 |
| UNL   = 1170.0   |               L9                       FCZ =  146.6 |
| C     =  180.0   +                                    L8   FTZ =  165.0 |
| CMY   =   0.40   |                   L9  L9               FCY =  165.0 |
| CMZ   =   0.41   +                                 L8      FTY =  165.0 |
| FYLD  =  250.0   |                            L9  L8        fbz =    0.5 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|  fby =   22.7 |
| DFF   =    0.0    0.0                                     FV  =  100.0 |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE           fv  =    0.6 |
|                               (WITH LOAD NO.)                           |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|               AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z    |
|                                                                         |
|     VALUE       0.5         0.2        0.3         0.2         0.2     |
|   LOCATION      0.0         0.0        0.0         0.0         0.0     |
|    LOADING        2           8          2           2           8     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                        DESIGN SUMMARY ( KN-METR)                       *|
|*                        --------------                                  *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ========================================================          |
|          PASS        IS-7.1.1(A)      0.145             2                |
|          0.53 C           0.2          0.0            0.00               |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1

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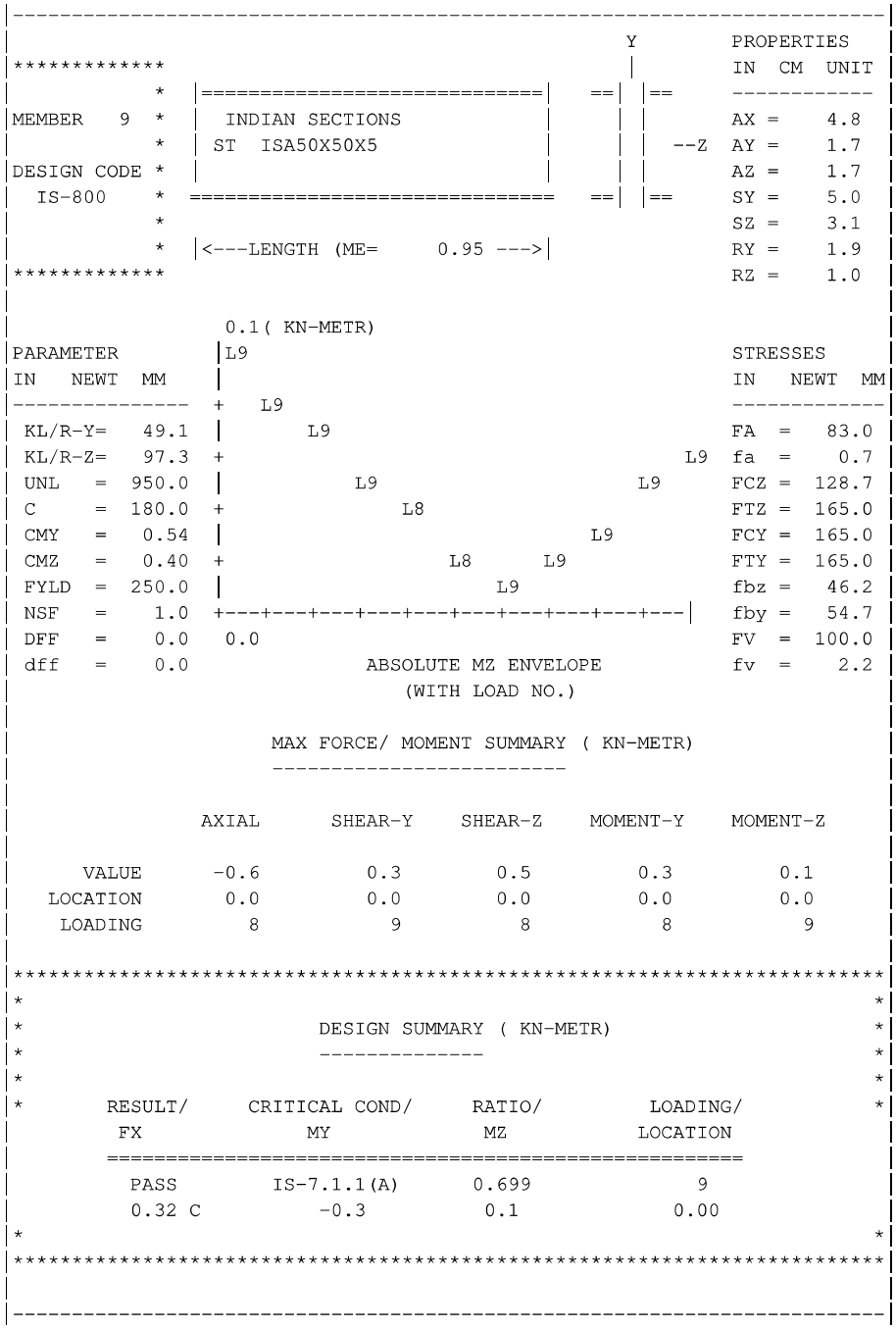
MAX FORCE/ MOMENT SUMMARY (KN-METR)

	AXIAL	SHEAR-Y	SHEAR-Z	MOMENT-Y	MOMENT-Z
VALUE	0.6	0.2	0.3	0.2	0.2
LOCATION	0.0	0.0	0.0	0.0	0.0
LOADING	9	9	2	2	9

DESIGN SUMMARY (KN-METR)

RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
PASS	IS-7.1.1(A)	0.145	2
0.53 C	0.2	0.0	0.00

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
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STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1

****

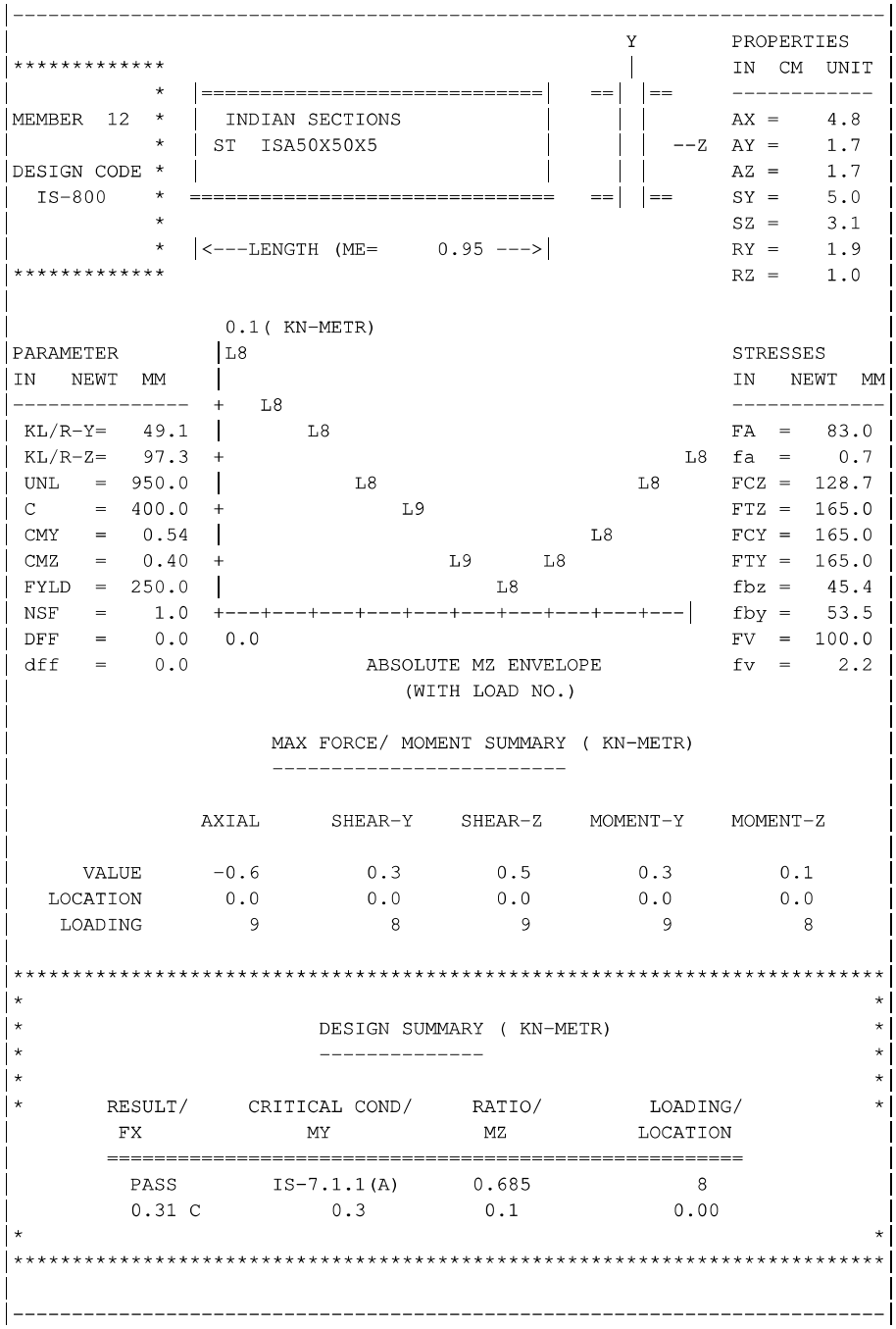
```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  10  *  |  INDIAN SECTIONS           |     | |       AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z  AY =    1.7   |
|DESIGN CODE *  |                            |     | |       AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==     SY =    5.0   |
|            *                                        |       SZ =    3.1   |
|            *  |<---LENGTH (ME=     1.00 --->|      |       RY =    1.9   |
|*************                                       |       RZ =    1.0   |
|                                                                         |
|                  0.1( KN-METR)                                          |
|PARAMETER         |L9                                    STRESSES        |
|IN   NEWT  MM     |                                      IN   NEWT  MM   |
|---------------   +   L9                                 -------------   |
| KL/R-Y=   51.7   |                                      FA  =   78.2    |
| KL/R-Z=  102.5   +       L9                             fa  =    0.4    |
| UNL   = 1000.0   |           L9                         FCZ =  127.6    |
| C     =  180.0   +                                      FTZ =  165.0    |
| CMY   =    0.40  |               L9                 L9  FCY =  165.0    |
| CMZ   =    0.49  +                              L9  L9    FTY =  165.0    |
| FYLD  =  250.0   |                   L2  L8  L9           fbz =   23.4    |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|  fby =    6.2   |
| DFF   =    0.0    0.0                                    FV  =  100.0    |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE          fv  =    1.0    |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z   |
|                                                                         |
|      VALUE       0.2         0.2        0.3         0.1         0.1     |
|   LOCATION       0.0         0.0        0.0         0.0         0.0     |
|    LOADING         9           9          8           8           9     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                         DESIGN SUMMARY ( KN-METR)                      *|
|*                         --------------                                 *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ======================================================          |
|          PASS        IS-7.1.1(A)      0.226             9                |
|          0.20 C           0.0          0.1            0.00               |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  11  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==      SY =    5.0   |
|            *                                         SZ =    3.1   |
|            *  |<---LENGTH (ME=     1.02 --->|          RY =    1.9   |
|*************                                         RZ =    1.0   |
|                                                                       |
|                  0.1( KN-METR)                                        |
|PARAMETER         |L9                                    STRESSES      |
|IN   NEWT  MM     |                                      IN   NEWT  MM |
|---------------   +   L9                                 -------------  |
| KL/R-Y=   52.8   |                                      FA  =   76.2   |
| KL/R-Z=  104.6   +       L9                             fa  =    0.2   |
| UNL   = 1021.3   |                                 L9  L9  L9 FCZ =  127.1 |
| C     =  180.0   +           L9              L9              FTZ =  165.0 |
| CMY   =    0.40  |                       L9                FCY =  165.0 |
| CMZ   =    0.40  +               L7                        FTY =  165.0 |
| FYLD  =  250.0   |                   L9                    fbz =   17.4   |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|  fby =    8.5   |
| DFF   =    0.0    0.0                                     FV  =  100.0   |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE           fv  =    0.9   |
|                                (WITH LOAD NO.)                        |
|                                                                       |
|                    MAX FORCE/ MOMENT SUMMARY ( KN-METR)               |
|                    -------------------------                          |
|                                                                       |
|               AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z  |
|                                                                       |
|     VALUE       0.2         0.2        0.2         0.1         0.1    |
|  LOCATION       1.0         0.0        0.0         0.0         0.0    |
|   LOADING         2           9          8           8           9    |
|                                                                       |
|*************************************************************************|
|*                                                                      *|
|*                        DESIGN SUMMARY ( KN-METR)                     *|
|*                        --------------                                *|
|*                                                                      *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/        *|
|         FX              MY              MZ           LOCATION          |
|        ========================================================      |
|          PASS        IS-7.1.1(A)      0.191             9             |
|          0.09 C          0.0           0.1            0.00            |
|*                                                                      *|
|*************************************************************************|
|                                                                       |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1

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MAX FORCE/ MOMENT SUMMARY (KN-METR)

	AXIAL	SHEAR-Y	SHEAR-Z	MOMENT-Y	MOMENT-Z
VALUE	-0.6	0.3	0.5	0.3	0.1
LOCATION	0.0	0.0	0.0	0.0	0.0
LOADING	9	8	9	9	8

DESIGN SUMMARY (KN-METR)

RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
PASS	IS-7.1.1(A)	0.685	8
0.31 C	0.3	0.1	0.00

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1

****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  13  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==      SY =    5.0   |
|            *                                        |        SZ =    3.1   |
|            *  |<---LENGTH (ME=     1.00 --->|                RY =    1.9   |
|*************                                       |        RZ =    1.0   |
|                                                                         |
|                  0.1( KN-METR)                                          |
|PARAMETER         |L8                                      STRESSES       |
|IN   NEWT  MM     |                                        IN   NEWT  MM  |
|---------------   +   L8                                   -------------  |
| KL/R-Y=   51.7   |                                        FA  =   78.2   |
| KL/R-Z=  102.5   +       L8                              fa  =    0.4   |
| UNL   = 1000.0   |           L8                           FCZ =  127.6   |
| C     =  400.0   +                                       FTZ =  165.0   |
| CMY   =    0.40  |               L8                  L8   FCY =  165.0   |
| CMZ   =    0.48  +                              L8  L8     FTY =  165.0   |
| FYLD  =  250.0   |                   L2  L9  L8           fbz =   23.3   |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|  fby =    6.3   |
| DFF   =    0.0    0.0                                     FV  =  100.0   |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE          fv  =    1.0   |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z   |
|                                                                         |
|      VALUE       0.2         0.2        0.3         0.1         0.1     |
|   LOCATION       0.0         0.0        0.0         0.0         0.0     |
|    LOADING         8           8          9           9           8     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                         DESIGN SUMMARY ( KN-METR)                      *|
|*                         --------------                                 *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ========================================================          |
|          PASS        IS-7.1.1(A)      0.227             8                |
|          0.20 C          0.0           0.1            0.00               |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  14  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==      SY =    5.0   |
|            *                                         SZ =    3.1   |
|            *  |<---LENGTH (ME=     1.02 --->|         RY =    1.9   |
|*************                                         RZ =    1.0   |
|                                                                       |
|                  0.1( KN-METR)                                        |
|PARAMETER         |L8                                    STRESSES      |
|IN   NEWT  MM     |                                      IN   NEWT  MM |
|---------------   +   L8                                 -------------  |
| KL/R-Y=   52.8   |                                      FA  =   76.2  |
| KL/R-Z=  104.6   +       L8                             fa  =    0.2  |
| UNL   = 1021.3   |                                 L8  L8  L8 FCZ =  127.1 |
| C     =  400.0   +           L8              L8        FTZ =  165.0  |
| CMY   =    0.40  |                       L8           FCY =  165.0  |
| CMZ   =    0.40  +               L7                    FTY =  165.0  |
| FYLD  =  250.0   |                   L8                fbz =   17.4  |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|  fby =    8.5  |
| DFF   =    0.0    0.0                                   FV  =  100.0  |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE         fv  =    0.9  |
|                                (WITH LOAD NO.)                        |
|                                                                       |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)              |
|                     -------------------------                         |
|                                                                       |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z  |
|                                                                       |
|      VALUE       0.2         0.2        0.2         0.1         0.1   |
|   LOCATION       1.0         0.0        0.0         0.0         0.0   |
|    LOADING         2           8          9           9           8    |
|                                                                       |
|*************************************************************************|
|*                                                                       *|
|*                         DESIGN SUMMARY ( KN-METR)                     *|
|*                         --------------                                *|
|*                                                                       *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/         *|
|         FX              MY              MZ           LOCATION          |
|        ======================================================         |
|          PASS        IS-7.1.1(A)      0.191             8              |
|          0.10 C           0.0          0.1            0.00             |
|*                                                                       *|
|*************************************************************************|
|                                                                       |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                  Y        PROPERTIES    |
|*************                                     |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  15  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==      SY =    5.0   |
|            *                                        |        SZ =    3.1   |
|            *  |<---LENGTH (ME=     0.85 --->|       |        RY =    1.9   |
|*************                                        |        RZ =    1.0   |
|                                                                         |
|                  0.3( KN-METR)                                          |
|PARAMETER         |L8                                        L9  STRESSES  |
|IN   NEWT  MM     |                                              IN   NEWT  MM|
|---------------   +   L8                                  L9      ----------|
| KL/R-Y=   43.9   |                                              FA  =   93.3 |
| KL/R-Z=   87.1   +       L8                        L9           fa  =    0.1 |
| UNL   =  850.0   |           L9               L8                FCZ =  131.0 |
| C     =  180.0   +              L9      L8                     FTZ =  165.0 |
| CMY   =   0.40   |                                              FCY =  165.0 |
| CMZ   =   0.40   +                                              FTY =  165.0 |
| FYLD  =  250.0   |                   L7                         fbz =   92.2 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---+---|  fby =   26.5 |
| DFF   =    0.0    0.0                                          FV  =  100.0 |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE               fv  =    5.0 |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z   |
|                                                                         |
|      VALUE       0.0         0.8        0.7         0.2         0.3     |
|   LOCATION       0.0         0.9        0.0         0.0         0.9     |
|    LOADING         7           9          9           9           9     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                         DESIGN SUMMARY ( KN-METR)                      *|
|*                         --------------                                 *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY             MZ           LOCATION             |
|        ========================================================          |
|          PASS        IS-7.1.1(A)      0.865             9                |
|          0.02 C          -0.1          0.3            0.85               |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  16  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==                     |
|            *                                                 SZ =    2.3   |
|            *  |<---LENGTH (ME=     0.85 --->|                RY =    1.9   |
|*************                                                 RZ =    1.0   |
|                                                                         |
|                  0.1( KN-METR)                                          |
|PARAMETER         |L8                                          L9  STRESSES |
|IN   NEWT  MM     |                                                IN   NEWT  MM|
|---------------   +                                                -------------|
| KL/R-Y=   43.9   |                                                FA  =  150.0 |
| KL/R-Z=   87.1   +   L8                                 L9        fa  =    0.1 |
| UNL   =  850.0   |                                                FCZ =  131.0 |
| C     =  400.0   +                                                FTZ =  165.0 |
| CMY   =    0.40  |        L8                         L9           FCY =  165.0 |
| CMZ   =    0.71  +                L9  L7  L8                      FTY =  165.0 |
| FYLD  =  250.0   |            L9               L8                 fbz =   39.7 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---+---+---|  fby =    0.0 |
| DFF   =    0.0    0.0                                            FV  =  100.0 |
| dff   =    0.0                ABSOLUTE MZ ENVELOPE                fv  =    8.4 |
|                                  (WITH LOAD NO.)                        |
|                                                                         |
|                      MAX FORCE/ MOMENT SUMMARY ( KN-METR)               |
|                      -------------------------                          |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z   |
|                                                                         |
|      VALUE       0.0         0.5        1.4         0.5         0.1     |
|   LOCATION       0.0         0.0        0.9         0.9         0.0     |
|    LOADING         7           8          9           9           8     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                         DESIGN SUMMARY ( KN-METR)                      *|
|*                         --------------                                 *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ======================================================          |
|          PASS        7.1.2 BEND C     0.784              9               |
|          0.03 T           0.5          0.1             0.85              |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  17  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==                     |
|            *                                                 SZ =    2.3   |
|            *  |<---LENGTH (ME=     0.85 --->|                RY =    1.9   |
|*************                                                 RZ =    1.0   |
|                                                                         |
|                  0.1( KN-METR)                                          |
|PARAMETER         |L8                                        L9  STRESSES  |
|IN   NEWT  MM     |                                              IN   NEWT  MM|
|---------------   +                                              -------------|
| KL/R-Y=   43.9   |   L8                                  L9       FA  =  150.0 |
| KL/R-Z=   87.1   +                                               fa  =    0.2 |
| UNL   =  850.0   |                                               FCZ =  131.0 |
| C     =  400.0   +       L8                        L9            FTZ =  165.0 |
| CMY   =   0.40   |           L9               L8                 FCY =  165.0 |
| CMZ   =   0.50   +               L9      L8                       FTY =  165.0 |
| FYLD  =  250.0   |                   L2                          fbz =   43.7 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---+---|   fby =    0.0 |
| DFF   =    0.0    0.0                                           FV  =  100.0 |
| dff   =    0.0               ABSOLUTE MZ ENVELOPE               fv  =    3.1 |
|                                 (WITH LOAD NO.)                         |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z   |
|                                                                         |
|      VALUE      -0.1         0.4        0.5         0.1         0.1    |
|   LOCATION       0.0         0.0        0.0         0.0         0.0    |
|    LOADING         7           8          8           8           8     |
|                                                                         |
|*************************************************************************|
|*                                                                       *|
|*                         DESIGN SUMMARY ( KN-METR)                     *|
|*                         --------------                                *|
|*                                                                       *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/         *|
|         FX              MY              MZ           LOCATION           |
|        ========================================================         |
|          PASS        7.1.2 BEND C     0.412             8               |
|          0.08 T           0.1          0.1            0.00              |
|*                                                                       *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                  Y        PROPERTIES    |
|*************                                     |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  18  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==                     |
|            *                                                 SZ =    2.3   |
|            *  |<---LENGTH (ME=     1.02 --->|                RY =    1.9   |
|*************                                                 RZ =    1.0   |
|                                                                         |
|                  0.1( KN-METR)                                          |
|PARAMETER         |L9                                         STRESSES     |
|IN   NEWT  MM     |                                           IN   NEWT  MM|
|---------------   +   L9                                      -------------|
| KL/R-Y=   52.8   |                                           FA  =  150.0 |
| KL/R-Z=  104.6   +       L9                            L9     fa  =    0.3 |
| UNL   = 1021.3   |                                 L9  L9    FCZ =  127.1 |
| C     =  180.0   +           L9              L9               FTZ =  165.0 |
| CMY   =    0.40  |               L7      L9                  FCY =  165.0 |
| CMZ   =    0.43  +                                           FTY =  165.0 |
| FYLD  =  250.0   |                    L7                     fbz =   18.0 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|   fby =    0.0 |
| DFF   =    0.0    0.0                                       FV  =  100.0 |
| dff   =    0.0               ABSOLUTE MZ ENVELOPE           fv  =    1.2 |
|                                 (WITH LOAD NO.)                         |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z   |
|                                                                         |
|      VALUE       0.2         0.2        0.3         0.1         0.1     |
|   LOCATION       1.0         0.0        0.0         0.0         0.0     |
|    LOADING         2           9          8           7           9     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                         DESIGN SUMMARY ( KN-METR)                      *|
|*                         --------------                                 *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ======================================================          |
|          PASS        7.1.2 BEND C     0.246             7               |
|          0.13 T           0.1          0.0            0.00              |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  19  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==                     |
|            *                                                SZ =    2.3   |
|            *  |<---LENGTH (ME=     1.02 --->|               RY =    1.9   |
|*************                                               RZ =    1.0   |
|                                                                         |
|                  0.1( KN-METR)                                          |
|PARAMETER         |L8                                        STRESSES     |
|IN   NEWT  MM     |                                          IN   NEWT  MM|
|---------------   +   L8                                     -------------|
| KL/R-Y=   52.8   |                                          FA  =  150.0 |
| KL/R-Z=  104.6   +       L8                           L8    fa  =    0.3 |
| UNL   = 1021.3   |                                 L8  L8   FCZ =  127.1 |
| C     =  400.0   +           L8              L8             FTZ =  165.0 |
| CMY   =   0.40   |               L7      L8                 FCY =  165.0 |
| CMZ   =   0.43   +                                         FTY =  165.0 |
| FYLD  =  250.0   |                   L7                     fbz =   18.0 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|  fby =    0.0 |
| DFF   =    0.0    0.0                                     FV  =  100.0 |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE           fv  =    1.2 |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z  |
|                                                                         |
|      VALUE       0.2         0.2        0.3         0.1         0.1     |
|   LOCATION       1.0         0.0        0.0         0.0         0.0     |
|    LOADING         2           8          9           7           8     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                         DESIGN SUMMARY ( KN-METR)                      *|
|*                         --------------                                 *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ========================================================          |
|          PASS        7.1.2 BEND C     0.246             7               |
|          0.13 T          -0.1          0.0            0.00              |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|     |===     ------------   |
|MEMBER  20  *  |  INDIAN SECTIONS           |     |          AX =   12.2   |
|            *  | ST  ISMC100                |     |     --Z  AY =    5.0   |
|DESIGN CODE *  |                            |     |          AZ =    5.1   |
|  IS-800    *  ==============================     |===       SY =    7.9   |
|            *                                                SZ =   38.4   |
|            *  |<---LENGTH (ME=     1.59 --->|               RY =    1.5   |
|*************                                               RZ =    4.0   |
|                                                                         |
|                  0.5( KN-METR)                                          |
|PARAMETER         |L8                                        STRESSES     |
|IN   NEWT  MM     |   L8                                     IN   NEWT  MM|
|---------------   +       L8                                 -------------|
| KL/R-Y=  107.7   |           L8                             FA  =   73.5 |
| KL/R-Z=   40.0   +               L9                       fa  =    0.7 |
| UNL   = 1585.0   |                                          FCZ =  136.0 |
| C     =  180.0   +                   L9                    FTZ =  165.0 |
| CMY   =   0.44   |                       L9           L8    FCY =  165.0 |
| CMZ   =   0.41   +                           L9     L8       FTY =  165.0 |
| FYLD  =  250.0   |                                L9        fbz =    0.7 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|   fby =   15.1 |
| DFF   =    0.0    0.0                                      FV  =  100.0 |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE           fv  =    0.4 |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z   |
|                                                                         |
|      VALUE       1.0         0.4        0.2         0.1         0.5     |
|   LOCATION       0.0         0.0        0.0         0.0         0.0     |
|    LOADING         8           8          7           7           8     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                         DESIGN SUMMARY ( KN-METR)                      *|
|*                         --------------                                 *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ========================================================        |
|          PASS        IS-7.1.1(A)      0.106             2                |
|          0.84 C          0.1           0.0            0.00               |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|     |===     ------------   |
|MEMBER  21  *  |  INDIAN SECTIONS           |     |          AX =   12.2   |
|            *  | ST  ISMC100                |     |     --Z  AY =    5.0   |
|DESIGN CODE *  |                            |     |          AZ =    5.1   |
|  IS-800    *  ==============================    |===       SY =    7.9   |
|            *                                                SZ =   38.4   |
|            *  |<---LENGTH (ME=     1.59 --->|               RY =    1.5   |
|*************                                               RZ =    4.0   |
|                                                                         |
|                  0.5( KN-METR)                                          |
|PARAMETER         |L9                                        STRESSES     |
|IN   NEWT  MM     |   L9                                     IN   NEWT  MM|
|---------------   +       L9                                 ------------- |
| KL/R-Y=  107.7   |           L9                             FA  =   73.5  |
| KL/R-Z=   40.0   +               L8                       fa  =    0.7  |
| UNL   = 1585.0   |                                          FCZ =  136.0  |
| C     =  180.0   +                   L8                    FTZ =  165.0  |
| CMY   =   0.44   |                       L8           L9    FCY =  165.0  |
| CMZ   =   0.41   +                           L8     L9       FTY =  165.0  |
| FYLD  =  250.0   |                                L8        fbz =    0.7  |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|   fby =   15.1  |
| DFF   =    0.0    0.0                                      FV  =  100.0  |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE           fv  =    0.4  |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z   |
|                                                                         |
|      VALUE       1.1         0.4        0.2         0.1         0.5     |
|   LOCATION       0.0         0.0        0.0         0.0         0.0     |
|    LOADING         9           9          7           7           9     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                         DESIGN SUMMARY ( KN-METR)                      *|
|*                         --------------                                 *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ========================================================        |
|          PASS        IS-7.1.1(A)      0.106             2                |
|          0.84 C          0.1           0.0            0.00               |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  22  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==      SY =    5.0   |
|            *                                        |        SZ =    3.1   |
|            *  |<---LENGTH (ME=     0.85 --->|       |        RY =    1.9   |
|*************                                       |        RZ =    1.0   |
|                                                                         |
|                  0.0( KN-METR)                                          |
|PARAMETER         |L7                                        L7  STRESSES  |
|IN   NEWT  MM     |                                              IN   NEWT  MM|
|---------------   +                 L2  L2  L2                   -------------|
| KL/R-Y=   43.9   |                                              FA  =   93.3 |
| KL/R-Z=   87.1   +                                              fa  =    0.0 |
| UNL   =  850.0   |   L7                                    L7   FCZ =  131.0 |
| C     =  180.0   +            L2                 L2           FTZ =  165.0 |
| CMY   =   0.47   |                                              FCY =  165.0 |
| CMZ   =   0.93   +                                              FTY =  165.0 |
| FYLD  =  250.0   |        L2                        L2          fbz =    4.9 |
| NSF   =    1.0   +----+---+---+---+---+---+---+---+---+---+---|  fby =   18.2 |
| DFF   =    0.0    0.0                                          FV  =  100.0 |
| dff   =    0.0                ABSOLUTE MZ ENVELOPE             fv  =    1.7 |
|                                  (WITH LOAD NO.)                        |
|                                                                         |
|                      MAX FORCE/ MOMENT SUMMARY ( KN-METR)               |
|                      -------------------------                          |
|                                                                         |
|                 AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z  |
|                                                                         |
|      VALUE        0.0         0.1        0.3         0.1         0.0    |
|   LOCATION        0.0         0.9        0.0         0.0         0.0    |
|    LOADING          7           8          8           8           7    |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                         DESIGN SUMMARY ( KN-METR)                      *|
|*                         --------------                                 *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ======================================================          |
|          PASS        IS-7.1.1(A)      0.148             8               |
|          0.00 C          0.1           0.0            0.00              |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

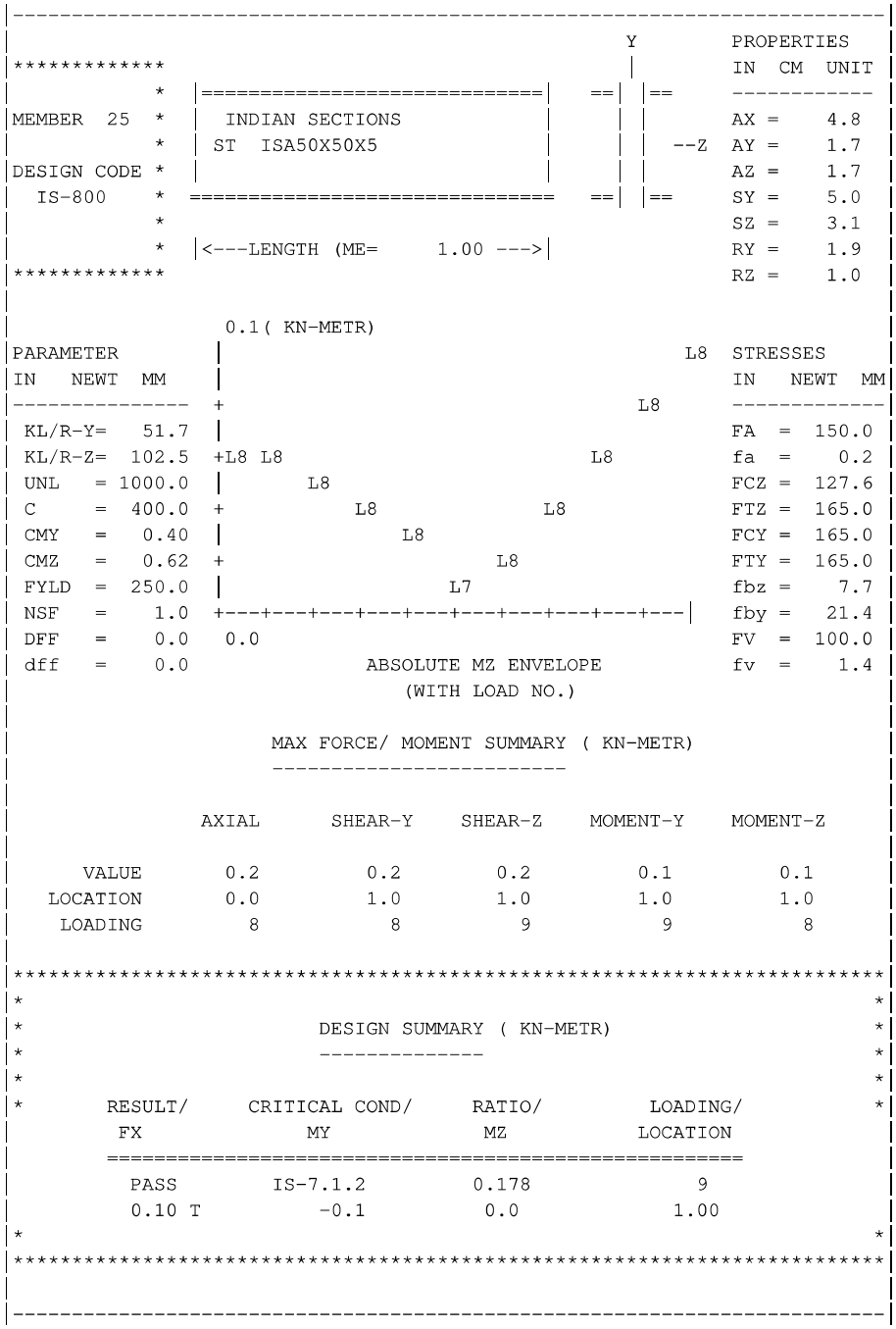
STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                  Y        PROPERTIES    |
|*************                                     |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  23  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==      SY =    5.0   |
|            *                                        |        SZ =    3.1   |
|            *  |<---LENGTH (ME=     1.00 --->|      |        RY =    1.9   |
|*************                                        |        RZ =    1.0   |
|                                                                         |
|                  0.1( KN-METR)                                          |
|PARAMETER         |                                          L9  STRESSES  |
|IN   NEWT  MM     |                                              IN   NEWT  MM|
|---------------   +                                    L9       -------------|
| KL/R-Y=   51.7   |                                              FA  =  150.0 |
| KL/R-Z=  102.5   +L9 L9                          L9             fa  =    0.2 |
| UNL   = 1000.0   |       L9                                     FCZ =  127.6 |
| C     =  180.0   +           L9              L9                FTZ =  165.0 |
| CMY   =   0.40   |               L9                           FCY =  165.0 |
| CMZ   =   0.62   +                       L9                  FTY =  165.0 |
| FYLD  =  250.0   |                    L7                      fbz =    7.7 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---+   fby =   21.4 |
| DFF   =    0.0    0.0                                        FV  =  100.0 |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE             fv  =    1.4 |
|                               (WITH LOAD NO.)                           |
|                                                                         |
|                    MAX FORCE/ MOMENT SUMMARY ( KN-METR)                 |
|                    -------------------------                            |
|                                                                         |
|               AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z    |
|                                                                         |
|     VALUE       0.2         0.2        0.2         0.1         0.1     |
|  LOCATION       0.0         1.0        1.0         1.0         1.0     |
|   LOADING         9           9          8           8           9     |
|                                                                         |
|*************************************************************************|
|*                                                                       *|
|*                        DESIGN SUMMARY ( KN-METR)                      *|
|*                        --------------                                 *|
|*                                                                       *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/         *|
|         FX              MY              MZ           LOCATION           |
|        ========================================================         |
|          PASS        IS-7.1.2         0.178             8              |
|          0.11 T          0.1           0.0            1.00              |
|*                                                                       *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                  Y        PROPERTIES    |
|*************                                     |        IN  CM  UNIT   |
|            *  |============================|    ==| |==     ------------   |
|MEMBER  24  *  |  INDIAN SECTIONS           |      | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |      | |  --Z  AY =    1.7   |
|DESIGN CODE *  |                            |      | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==      SY =    5.0   |
|            *                                        |        SZ =    3.1   |
|            *  |<---LENGTH (ME=     1.02 --->|      |        RY =    1.9   |
|*************                                        |        RZ =    1.0   |
|                                                                         |
|                  0.1( KN-METR)                                          |
|PARAMETER         |                                          L9  STRESSES  |
|IN   NEWT  MM     |                                              IN   NEWT  MM|
|---------------   +                                    L9       -------------|
| KL/R-Y=   52.8   |                                              FA  =   76.2 |
| KL/R-Z=  104.6   +L9 L9                                         fa  =    0.5 |
| UNL   = 1021.3   |       L9                      L9             FCZ =  127.1 |
| C     =  180.0   +           L9                                 FTZ =  165.0 |
| CMY   =   0.40   |               L9          L9                 FCY =  165.0 |
| CMZ   =   0.40   +                       L2                     FTY =  165.0 |
| FYLD  =  250.0   |                   L7                         fbz =   11.3 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|      fby =   17.4 |
| DFF   =    0.0    0.0                                          FV  =  100.0 |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE               fv  =    1.0 |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                    MAX FORCE/ MOMENT SUMMARY ( KN-METR)                 |
|                    -------------------------                            |
|                                                                         |
|               AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z    |
|                                                                         |
|     VALUE       0.2         0.2        0.3         0.1         0.1     |
|   LOCATION      1.0         1.0        1.0         1.0         1.0     |
|    LOADING        2           9          8           8           9     |
|                                                                         |
|*************************************************************************|
|*                                                                       *|
|*                        DESIGN SUMMARY ( KN-METR)                      *|
|*                        --------------                                 *|
|*                                                                       *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/         *|
|         FX              MY              MZ           LOCATION           |
|        ========================================================         |
|          PASS        IS-7.1.1(A)      0.200             2               |
|          0.24 C          0.1           0.0            1.02              |
|*                                                                       *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
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MAX FORCE/ MOMENT SUMMARY (KN-METR)

	AXIAL	SHEAR-Y	SHEAR-Z	MOMENT-Y	MOMENT-Z
VALUE	0.2	0.2	0.2	0.1	0.1
LOCATION	0.0	1.0	1.0	1.0	1.0
LOADING	8	8	9	9	8

DESIGN SUMMARY (KN-METR)

RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
PASS	IS-7.1.2	0.178	9
0.10 T	-0.1	0.0	1.00

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                  Y        PROPERTIES    |
|*************                                     |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  26  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==      SY =    5.0   |
|            *                                        |        SZ =    3.1   |
|            *  |<---LENGTH (ME=     1.02 --->|      |        RY =    1.9   |
|*************                                        |        RZ =    1.0   |
|                                                                         |
|                  0.1( KN-METR)                                          |
|PARAMETER         |                                          L8  STRESSES  |
|IN   NEWT  MM     |                                              IN   NEWT  MM|
|---------------   +                                    L8       -------------|
| KL/R-Y=   52.8   |                                              FA  =   76.2 |
| KL/R-Z=  104.6   +L8 L8                                         fa  =    0.5 |
| UNL   = 1021.3   |       L8                       L8           FCZ =  127.1 |
| C     =  400.0   +           L8                                FTZ =  165.0 |
| CMY   =    0.40  |               L8          L8               FCY =  165.0 |
| CMZ   =    0.40  +                       L2                   FTY =  165.0 |
| FYLD  =  250.0   |                   L7                       fbz =   11.3 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|   fby =   17.4 |
| DFF   =    0.0    0.0                                       FV  =  100.0 |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE             fv  =    1.0 |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                    MAX FORCE/ MOMENT SUMMARY ( KN-METR)                 |
|                    -------------------------                            |
|                                                                         |
|               AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z    |
|                                                                         |
|     VALUE       0.2         0.2        0.3         0.1         0.1     |
|   LOCATION      1.0         1.0        1.0         1.0         1.0     |
|    LOADING        2           8          9           9           8     |
|                                                                         |
|*************************************************************************|
|*                                                                       *|
|*                        DESIGN SUMMARY ( KN-METR)                      *|
|*                        --------------                                 *|
|*                                                                       *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/         *|
|         FX              MY             MZ           LOCATION            |
|        ========================================================         |
|          PASS        IS-7.1.1(A)      0.200             2               |
|          0.24 C          -0.1          0.0            1.02              |
|*                                                                       *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  27  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==      SY =    5.0   |
|            *                                         SZ =    3.1   |
|            *  |<---LENGTH (ME=     1.02 --->|         RY =    1.9   |
|*************                                         RZ =    1.0   |
|                                                                       |
|                  0.1( KN-METR)                                        |
|PARAMETER         |                                        L9  STRESSES  |
|IN   NEWT  MM     |                                            IN   NEWT  MM|
|---------------   +                                            -------------|
| KL/R-Y=   52.8   |L9                                  L9      FA  =   76.2 |
| KL/R-Z=  104.6   +   L9  L9                                   fa  =    0.5 |
| UNL   = 1021.3   |            L9                 L2          FCZ =  127.1 |
| C     =  180.0   +                          L2              FTZ =  165.0 |
| CMY   =    0.40  |                L9                       FCY =  165.0 |
| CMZ   =    0.40  +                        L2                FTY =  165.0 |
| FYLD  =  250.0   |                    L7                    fbz =   15.2 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|  fby =   16.6 |
| DFF   =    0.0    0.0                                       FV  =  100.0 |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE            fv  =    0.9 |
|                                (WITH LOAD NO.)                        |
|                                                                       |
|                    MAX FORCE/ MOMENT SUMMARY ( KN-METR)               |
|                    -------------------------                          |
|                                                                       |
|               AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z  |
|                                                                       |
|     VALUE       0.2         0.2        0.2         0.1         0.1   |
|  LOCATION       1.0         1.0        1.0         0.0         1.0   |
|   LOADING         2           9          8           8           9   |
|                                                                       |
|*************************************************************************|
|*                                                                      *|
|*                        DESIGN SUMMARY ( KN-METR)                     *|
|*                        --------------                                *|
|*                                                                      *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/        *|
|         FX              MY              MZ           LOCATION          |
|        ========================================================      |
|          PASS        IS-7.1.1(A)      0.226             2             |
|          0.22 C          0.1           0.0            1.02            |
|*                                                                      *|
|*************************************************************************|
|                                                                       |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1

****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  28  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==      SY =    5.0   |
|            *                                        |        SZ =    3.1   |
|            *  |<---LENGTH (ME=     1.02 --->|      |        RY =    1.9   |
|*************                                       |        RZ =    1.0   |
|                                                                         |
|                  0.1( KN-METR)                                          |
|PARAMETER         |                                        L8  STRESSES    |
|IN   NEWT  MM     |                                            IN   NEWT  MM|
|---------------   +                                            -------------|
| KL/R-Y=   52.8   |L8                                  L8      FA  =   76.2  |
| KL/R-Z=  104.6   +   L8  L8                                   fa  =    0.5  |
| UNL   = 1021.3   |            L8                 L2          FCZ =  127.1  |
| C     =  400.0   +                          L2              FTZ =  165.0  |
| CMY   =    0.40  |                L8                       FCY =  165.0  |
| CMZ   =    0.40  +                        L2                FTY =  165.0  |
| FYLD  =  250.0   |                    L7                    fbz =   15.2  |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|  fby =   16.6  |
| DFF   =    0.0    0.0                                       FV  =  100.0  |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE            fv  =    0.9  |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                    MAX FORCE/ MOMENT SUMMARY ( KN-METR)                 |
|                    -------------------------                            |
|                                                                         |
|               AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z    |
|                                                                         |
|     VALUE       0.2         0.2        0.2         0.1         0.1     |
|   LOCATION      1.0         1.0        1.0         0.0         1.0     |
|    LOADING        2           8          9           9           8     |
|                                                                         |
|*************************************************************************|
|*                                                                       *|
|*                        DESIGN SUMMARY ( KN-METR)                      *|
|*                        --------------                                 *|
|*                                                                       *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/         *|
|         FX              MY             MZ           LOCATION            |
|        ========================================================         |
|          PASS        IS-7.1.1(A)      0.226             2               |
|          0.22 C          -0.1          0.0            1.02              |
|*                                                                       *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1

****

```
                                                Y        PROPERTIES
*************                                   |        IN  CM  UNIT
            *   |============================|    ==|  |==     ------------
MEMBER  29  *   |  INDIAN SECTIONS           |      |  |       AX =    4.8
            *   |  ST  ISA50X50X5            |      |  |  --Z  AY =    1.7
DESIGN CODE *   |                            |      |  |       AZ =    1.7
  IS-800    *   ==============================   ==|  |==
            *                                                   SZ =    2.3
            *   |<---LENGTH (ME=     0.85 --->|                 RY =    1.9
*************                                                   RZ =    1.0

                  0.0( KN-METR)
PARAMETER         |                L8  L7  L9                   STRESSES
IN   NEWT  MM     |                                             IN   NEWT  MM
---------------   +            L8              L9              -------------
 KL/R-Y=   43.9   |                                             FA  =   93.3
 KL/R-Z=   87.1   +L9                                      L8   fa  =    0.2
 UNL    =  850.0  |       L8                       L9           FCZ =  131.0
 C      =  180.0  +                                             FTZ =  165.0
 CMY    =   0.50  |                                             FCY =  165.0
 CMZ    =   0.54  +                                             FTY =  165.0
 FYLD   =  250.0  |   L8                                 L9     fbz =   10.1
 NSF    =    1.0  +---+---+---+---+---+---+---+---+---+---+    fby =    0.0
 DFF    =    0.0   0.0                                         FV  =  100.0
 dff    =    0.0               ABSOLUTE MZ ENVELOPE            fv  =    0.3
                                  (WITH LOAD NO.)

                      MAX FORCE/ MOMENT SUMMARY ( KN-METR)
                      -------------------------

                 AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z

      VALUE       0.1         0.2        0.2         0.0         0.0
   LOCATION       0.0         0.0        0.9         0.4         0.5
    LOADING         7           9          9           9           9

*************************************************************************
*                                                                       *
*                         DESIGN SUMMARY ( KN-METR)                     *
*                         --------------                                *
*                                                                       *
*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *
         FX              MY              MZ           LOCATION
        ========================================================
          PASS        IS-7.1.1(A)      0.080              9
          0.12 C          0.0            0.0            0.50
*                                                                       *
*************************************************************************
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1

****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  30  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==                     |
|            *                                                 SZ =    2.3   |
|            *  |<---LENGTH (ME=     0.85 --->|                RY =    1.9   |
|*************                                                 RZ =    1.0   |
|                                                                         |
|                  0.0( KN-METR)                                          |
|PARAMETER         |                L7  L7  L7                  STRESSES    |
|IN   NEWT  MM     |                                            IN   NEWT  MM|
|---------------   +                                            -------------|
| KL/R-Y=   43.9   |            L7              L7              FA  =   93.3 |
| KL/R-Z=   87.1   +                                           fa  =    0.3 |
| UNL   =  850.0   |                                            FCZ =  131.0 |
| C     =  180.0   +       L7                      L7          FTZ =  165.0 |
| CMY   =    1.00  |                                            FCY =  165.0 |
| CMZ   =    1.00  +L2                                   L2    FTY =  165.0 |
| FYLD  =  250.0   |   L7                              L7       fbz =   11.3 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|   fby =    0.0 |
| DFF   =    0.0    0.0                                       FV  =  100.0 |
| dff   =    0.0               ABSOLUTE MZ ENVELOPE           fv  =    0.0 |
|                                 (WITH LOAD NO.)                         |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z   |
|                                                                         |
|      VALUE       0.1         0.1        0.1         0.0         0.0     |
|   LOCATION       0.0         0.9        0.0         0.4         0.4     |
|    LOADING         7           8          8           2           7     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                         DESIGN SUMMARY ( KN-METR)                      *|
|*                         --------------                                 *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ========================================================          |
|          PASS        IS-7.1.1(A)      0.090             7                |
|          0.15 C           0.0           0.0            0.43              |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  31  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==                     |
|            *                                                SZ =    2.3   |
|            *  |<---LENGTH (ME=     0.85 --->|               RY =    1.9   |
|*************                                               RZ =    1.0   |
|                                                                         |
|                  0.0( KN-METR)                                          |
|PARAMETER         |                L7  L7  L7                 STRESSES    |
|IN   NEWT  MM     |                                           IN   NEWT  MM|
|---------------   +                                           ------------|
| KL/R-Y=   43.9   |            L7              L7             FA  =   93.3 |
| KL/R-Z=   87.1   +                                           fa  =    0.3 |
| UNL   =  850.0   |                                          FCZ =  131.0 |
| C     =  180.0   +       L9                      L8          FTZ =  165.0 |
| CMY   =    1.00  |L8                                   L9   FCY =  165.0 |
| CMZ   =    1.00  +                                          FTY =  165.0 |
| FYLD  =  250.0   |   L9                              L8     fbz =   11.2 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|  fby =    0.0 |
| DFF   =    0.0    0.0                                     FV  =  100.0 |
| dff   =    0.0               ABSOLUTE MZ ENVELOPE          fv  =    0.0 |
|                                 (WITH LOAD NO.)                         |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z  |
|                                                                         |
|      VALUE       0.1         0.2        0.2         0.0         0.0     |
|   LOCATION       0.0         0.9        0.0         0.4         0.4     |
|    LOADING         7           9          9           2           7     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                         DESIGN SUMMARY ( KN-METR)                      *|
|*                         --------------                                 *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ========================================================          |
|          PASS        IS-7.1.1(A)      0.088             7               |
|          0.12 C          0.0            0.0            0.43              |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1

****

```
                                                  Y        PROPERTIES
*************                                     |        IN  CM  UNIT
            *   |============================|    ==|  |==     ------------
MEMBER  32  *   |  INDIAN SECTIONS           |      |  |       AX =    4.8
            *   |  ST  ISA50X50X5            |      |  |  --Z  AY =    1.7
DESIGN CODE *   |                            |      |  |       AZ =    1.7
  IS-800    *   ==============================    ==|  |==
            *                                                   SZ =    2.3
            *   |<---LENGTH (ME=     0.95 --->|                 RY =    1.9
*************                                                   RZ =    1.0

                  0.1( KN-METR)
PARAMETER         |                L9  L9  L9                   STRESSES
IN   NEWT  MM     |                                             IN   NEWT  MM
---------------   +           L9              L9                ------------
 KL/R-Y=   49.1   |       L9                                     FA  =  150.0
 KL/R-Z=   97.3   +                                 L9          fa  =    1.5
 UNL    =  950.0  |   L9                                        FCZ =  128.7
 C      =  180.0  +                                     L9      FTZ =  165.0
 CMY    =   0.68  |                                             FCY =  165.0
 CMZ    =   0.88  +L9                                           FTY =  165.0
 FYLD   =  250.0  |                                        L9   fbz =   18.5
 NSF    =    1.0  +---+---+---+---+---+---+---+---+---+---|   fby =    0.0
 DFF    =    0.0   0.0                                        FV  =  100.0
 dff    =    0.0               ABSOLUTE MZ ENVELOPE           fv  =    0.9
                                  (WITH LOAD NO.)

                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)
                     -------------------------

                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z

      VALUE      -0.7         0.1        0.3         0.3         0.1
   LOCATION       0.0         1.0        1.0         0.0         0.5
    LOADING         8           9          8           8           9

*************************************************************************
*                                                                       *
*                        DESIGN SUMMARY ( KN-METR)                      *
*                        --------------                                 *
*                                                                       *
*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *
         FX              MY              MZ           LOCATION
        ======================================================
          PASS        7.1.2 BEND C     0.419              8
          0.74 T          -0.3          0.0            0.00
*                                                                       *
*************************************************************************
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  33  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==                     |
|            *                                                 SZ =    2.3   |
|            *  |<---LENGTH (ME=     0.95 --->|                RY =    1.9   |
|*************                                                 RZ =    1.0   |
|                                                                         |
|                  0.1( KN-METR)                                          |
|PARAMETER         |                L8  L8  L8                  STRESSES     |
|IN   NEWT  MM     |                                            IN   NEWT  MM|
|---------------   +           L8              L8               -------------|
| KL/R-Y=   49.1   |       L8                                    FA  =  150.0 |
| KL/R-Z=   97.3   +                                 L8         fa  =    1.6 |
| UNL   =  950.0   |   L8                                        FCZ =  128.7 |
| C     =  400.0   +                                    L8      FTZ =  165.0 |
| CMY   =    0.68  |                                             FCY =  165.0 |
| CMZ   =    0.89  +L8                                           FTY =  165.0 |
| FYLD  =  250.0   |                                       L8    fbz =   19.0 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---+---|  fby =    0.0 |
| DFF   =    0.0    0.0                                         FV  =  100.0 |
| dff   =    0.0               ABSOLUTE MZ ENVELOPE             fv  =    0.9 |
|                                 (WITH LOAD NO.)                         |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z   |
|                                                                         |
|      VALUE      -0.8         0.1        0.3         0.3         0.1    |
|   LOCATION       0.0         1.0        1.0         0.0         0.5    |
|    LOADING         9           8          9           9           8     |
|                                                                         |
|*************************************************************************|
|*                                                                       *|
|*                         DESIGN SUMMARY ( KN-METR)                     *|
|*                         --------------                                *|
|*                                                                       *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/         *|
|         FX              MY              MZ           LOCATION           |
|        ========================================================         |
|          PASS        7.1.2 BEND C     0.429             9               |
|          0.75 T           0.3          0.0            0.00              |
|*                                                                       *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                  Y        PROPERTIES    |
|*************                                     |        IN  CM  UNIT   |
|            *  |============================|     |===     ------------   |
|MEMBER  34  *  |  INDIAN SECTIONS           |     |          AX =   12.2  |
|            *  | ST  ISMC100                |     |     --Z  AY =    5.0  |
|DESIGN CODE *  |                            |     |          AZ =    5.1  |
|  IS-800    *  ==============================     |===       SY =    7.9  |
|            *                                                 SZ =   38.4  |
|            *  |<---LENGTH (ME=     1.00 --->|               RY =    1.5  |
|*************                                                 RZ =    4.0  |
|                                                                         |
|                  0.4( KN-METR)                                          |
|PARAMETER         |L8                                         STRESSES     |
|IN   NEWT  MM     |   L8                                      IN   NEWT  MM|
|---------------   +       L8                                  -------------|
| KL/R-Y=   68.0   |           L8                              FA  =  113.8 |
| KL/R-Z=   25.2   +               L8                        fa  =    0.2 |
| UNL   = 1000.0   |                                           FCZ =  150.9 |
| C     =  180.0   +                   L8                     FTZ =  165.0 |
| CMY   =   0.46   |                       L8            L9    FCY =  165.0 |
| CMZ   =   0.56   +                                  L9       FTY =  165.0 |
| FYLD  =  250.0   |                           L8  L9          fbz =   10.8 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|   fby =   34.1 |
| DFF   =    0.0    0.0                                       FV  =  100.0 |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE            fv  =    1.0 |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                    MAX FORCE/ MOMENT SUMMARY ( KN-METR)                 |
|                    -------------------------                            |
|                                                                         |
|               AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z    |
|                                                                         |
|     VALUE       0.8         0.6        0.4         0.3         0.4     |
|   LOCATION      0.0         0.0        1.0         0.0         0.0     |
|    LOADING        9           9          7           7           8     |
|                                                                         |
|*************************************************************************|
|*                                                                       *|
|*                        DESIGN SUMMARY ( KN-METR)                      *|
|*                        --------------                                 *|
|*                                                                       *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/         *|
|         FX              MY              MZ           LOCATION           |
|        ========================================================         |
|          PASS        IS-7.1.1(A)      0.281             8               |
|          0.29 C           0.3         -0.4            0.00              |
|*                                                                       *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                  Y        PROPERTIES    |
|*************                                     |        IN  CM  UNIT   |
|            *  |============================|     |===     ------------   |
|MEMBER  35  *  |  INDIAN SECTIONS           |     |          AX =   12.2  |
|            *  | ST  ISMC100                |     |     --Z  AY =    5.0  |
|DESIGN CODE *  |                            |     |          AZ =    5.1  |
|  IS-800    *  ==============================    |===       SY =    7.9  |
|            *                                              SZ =   38.4  |
|            *  |<---LENGTH (ME=     1.00 --->|             RY =    1.5  |
|*************                                              RZ =    4.0  |
|                                                                         |
|                  0.4( KN-METR)                                          |
|PARAMETER         |L9                                      STRESSES      |
|IN   NEWT  MM     |   L9                                   IN   NEWT  MM |
|---------------   +       L9                               -------------  |
| KL/R-Y=   68.0   |           L9                           FA  =  113.8  |
| KL/R-Z=   25.2   +               L9                     fa  =    0.2  |
| UNL   = 1000.0   |                                        FCZ =  150.9  |
| C     =  180.0   +                   L9                  FTZ =  165.0  |
| CMY   =   0.46   |                       L9          L8   FCY =  165.0  |
| CMZ   =   0.56   +                                 L8      FTY =  165.0  |
| FYLD  =  250.0   |                            L9  L8      fbz =   11.0  |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|  fby =   34.5  |
| DFF   =    0.0    0.0                                     FV  =  100.0  |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE           fv  =    1.0  |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z  |
|                                                                         |
|      VALUE       0.8         0.6        0.4         0.3         0.4     |
|   LOCATION       0.0         0.0        1.0         0.0         0.0     |
|    LOADING         8           8          7           7           9     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                        DESIGN SUMMARY ( KN-METR)                       *|
|*                        --------------                                  *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ========================================================          |
|          PASS        IS-7.1.1(A)      0.284             9                |
|          0.29 C           0.3          0.4            0.00               |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                  Y        PROPERTIES    |
|*************                                     |        IN  CM  UNIT   |
|            *  |============================|     |===     ------------   |
|MEMBER  36  *  |  INDIAN SECTIONS           |     |          AX =   12.2  |
|            *  | ST  ISMC100                |     |     --Z  AY =    5.0  |
|DESIGN CODE *  |                            |     |          AZ =    5.1  |
|  IS-800    *  ==============================    |===       SY =    7.9  |
|            *                                              SZ =   38.4  |
|            *  |<---LENGTH (ME=     1.00 --->|              RY =    1.5  |
|*************                                              RZ =    4.0  |
|                                                                         |
|                  0.4( KN-METR)                                          |
|PARAMETER         |                                          L9  STRESSES    |
|IN   NEWT  MM     |                                      L9      IN   NEWT  MM|
|---------------   +                                                -------------|
| KL/R-Y=   68.0   |L8                               L9             FA  =  150.0 |
| KL/R-Z=   25.2   +   L8                        L9                 fa  =    0.0 |
| UNL   = 1000.0   |                                               FCZ =  150.9 |
| C     =  180.0   +       L8              L9                       FTZ =  165.0 |
| CMY   =   0.40   |           L8                                   FCY =  165.0 |
| CMZ   =   0.40   +              L8                               FTY =  165.0 |
| FYLD  =  250.0   |                  L9                            fbz =    8.0 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---+---|   fby =   28.8 |
| DFF   =    0.0    0.1                                           FV  =  100.0 |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE                 fv  =    1.2 |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                    MAX FORCE/ MOMENT SUMMARY ( KN-METR)                 |
|                    -------------------------                            |
|                                                                         |
|               AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z    |
|                                                                         |
|     VALUE       1.8         0.7        0.4         0.3         0.4      |
|   LOCATION      0.0         0.0        1.0         0.0         1.0      |
|    LOADING        9           9          2           2           9      |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                        DESIGN SUMMARY ( KN-METR)                       *|
|*                        --------------                                  *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION             |
|        ========================================================          |
|          PASS        IS-7.1.2         0.223             8                |
|          0.00 T          -0.2         -0.3            0.00               |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                  Y        PROPERTIES    |
|*************                                     |        IN  CM  UNIT   |
|            *  |============================|     |===     ------------   |
|MEMBER  37  *  |  INDIAN SECTIONS           |     |          AX =   12.2  |
|            *  | ST  ISMC100                |     |     --Z  AY =    5.0  |
|DESIGN CODE *  |                            |     |          AZ =    5.1  |
|  IS-800    *  ==============================    |===       SY =    7.9  |
|            *                                              SZ =   38.4  |
|            *  |<---LENGTH (ME=     1.00 --->|              RY =    1.5  |
|*************                                              RZ =    4.0  |
|                                                                         |
|                  0.4( KN-METR)                                          |
|PARAMETER         |                                        L8  STRESSES    |
|IN   NEWT  MM     |                                    L8      IN   NEWT  MM|
|---------------   +                                              ----------|
| KL/R-Y=   68.0   |L9                              L8            FA  =  150.0 |
| KL/R-Z=   25.2   +   L9                       L8               fa  =    0.0 |
| UNL   = 1000.0   |                                             FCZ =  150.9 |
| C     =  400.0   +       L9              L8                     FTZ =  165.0 |
| CMY   =   0.40   |           L9                                 FCY =  165.0 |
| CMZ   =   0.40   +               L9                           FTY =  165.0 |
| FYLD  =  250.0   |                   L8                         fbz =    8.0 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---+     fby =   29.2 |
| DFF   =    0.0    0.1                                         FV  =  100.0 |
| dff   =    0.0               ABSOLUTE MZ ENVELOPE             fv  =    1.3 |
|                                 (WITH LOAD NO.)                         |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z   |
|                                                                         |
|      VALUE       1.8         0.7        0.4         0.3         0.4     |
|   LOCATION       0.0         0.0        1.0         0.0         1.0     |
|    LOADING         8           8          2           2           8     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                         DESIGN SUMMARY ( KN-METR)                      *|
|*                         --------------                                 *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ========================================================        |
|          PASS        IS-7.1.2         0.226             9               |
|          0.02 T          -0.2          0.3            0.00               |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1

****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  38  *  |  INDIAN SECTIONS           |     | |       AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z  AY =    1.7   |
|DESIGN CODE *  |                            |     | |       AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==     SY =    5.1   |
|            *                                        |       SZ =    2.3   |
|            *  |<---LENGTH (ME=     1.07 --->|      |       RY =    1.9   |
|*************                                       |       RZ =    1.0   |
|                                                                         |
|                  0.0( KN-METR)                                          |
|PARAMETER         |L0                                        L0  STRESSES  |
|IN   NEWT  MM     |L0                                        L0  IN   NEWT  MM|
|---------------   +L0                                        L0  ------------|
| KL/R-Y=   55.5   |L0                                        L0  FA  =   71.6 |
| KL/R-Z=  110.0   +L0                                        L0  fa  =    2.3 |
| UNL   = 1073.5   |L0                                        L0  FCZ =    0.0 |
| C     =  180.0   +L0                                        L0  FTZ =    0.0 |
| CMY   =    0.00  |L0                                        L0  FCY =    0.0 |
| CMZ   =    0.00  +L0                                        L0  FTY =    0.0 |
| FYLD  =  250.0   |L0                                        L0  fbz =    0.0 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---+   fby =    0.0 |
| DFF   =    0.0    0.0                                        FV  =  100.0 |
| dff   =    0.0               ABSOLUTE MZ ENVELOPE            fv  =    0.0 |
|                                 (WITH LOAD NO.)                         |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z   |
|                                                                         |
|      VALUE       1.1          0.0        0.0         0.0         0.0    |
|   LOCATION       0.0          0.0        0.0         0.0         0.0    |
|    LOADING         9            0          0           0           0    |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                         DESIGN SUMMARY ( KN-METR)                      *|
|*                         --------------                                 *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ========================================================          |
|          PASS        COMPRESSION      0.032             9                |
|          1.10 C           0.0           0.0           0.00               |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1

****

```
                                                                    Y        PROPERTIES
*************                                                       |        IN  CM  UNIT
            *   |============================|    ==| |==      ------------
MEMBER  39  *   |  INDIAN SECTIONS           |       | |        AX =    4.8
            *   | ST  ISA50X50X5             |       | |  --Z  AY =    1.7
DESIGN CODE *   |                            |       | |        AZ =    1.7
  IS-800    *  ==============================   ==| |==      SY =    5.1
            *                                                    SZ =    2.3
            *   |<---LENGTH (ME=     1.07 --->|                 RY =    1.9
*************                                                    RZ =    1.0

                  0.0( KN-METR)
PARAMETER         |L0                                          L0  STRESSES
IN   NEWT  MM     |L0                                          L0  IN   NEWT  MM
---------------   +L0                                          L0  -------------
 KL/R-Y=   55.5   |L0                                          L0  FA  =   71.6
 KL/R-Z=  110.0   +L0                                          L0  fa  =    2.3
 UNL    = 1073.5  |L0                                          L0  FCZ =    0.0
 C      =  180.0  +L0                                          L0  FTZ =    0.0
 CMY    =    0.00 |L0                                          L0  FCY =    0.0
 CMZ    =    0.00 +L0                                          L0  FTY =    0.0
 FYLD   =  250.0  |L0                                          L0  fbz =    0.0
 NSF    =    1.0  +---+---+---+---+---+---+---+---+---+---+---|  fby =    0.0
 DFF    =    0.0   0.0                                           FV  =  100.0
 dff    =    0.0               ABSOLUTE MZ ENVELOPE              fv  =    0.0
                                  (WITH LOAD NO.)

                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)
                     -------------------------

                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z

      VALUE       1.1          0.0        0.0         0.0         0.0
   LOCATION       0.0          0.0        0.0         0.0         0.0
    LOADING         2            0          0           0           0

**************************************************************************
*                                                                        *
*                         DESIGN SUMMARY ( KN-METR)                      *
*                         --------------                                 *
*                                                                        *
*       RESULT/     CRITICAL COND/     RATIO/         LOADING/           *
         FX              MY              MZ           LOCATION
        ========================================================
          PASS        COMPRESSION      0.032             2
          1.11 C          0.0            0.0           0.00
*                                                                        *
**************************************************************************
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1

****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  40  *  |  INDIAN SECTIONS           |     | |       AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z  AY =    1.7   |
|DESIGN CODE *  |                            |     | |       AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==     SY =    5.1   |
|            *                                        |       SZ =    2.3   |
|            *  |<---LENGTH (ME=     1.07 --->|      |       RY =    1.9   |
|*************                                       |       RZ =    1.0   |
|                                                                         |
|                  0.0( KN-METR)                                          |
|PARAMETER         |L0                                    L0  STRESSES     |
|IN   NEWT  MM     |L0                                    L0  IN   NEWT  MM|
|---------------   +L0                                    L0  -------------|
| KL/R-Y=   55.5   |L0                                    L0  FA  =   71.6 |
| KL/R-Z=  110.0   +L0                                    L0  fa  =    2.3 |
| UNL   = 1073.5   |L0                                    L0  FCZ =    0.0 |
| C     =  400.0   +L0                                    L0  FTZ =    0.0 |
| CMY   =    0.00  |L0                                    L0  FCY =    0.0 |
| CMZ   =    0.00  +L0                                    L0  FTY =    0.0 |
| FYLD  =  250.0   |L0                                    L0  fbz =    0.0 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|  fby =    0.0 |
| DFF   =    0.0    0.0                                      FV  =  100.0 |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE           fv  =    0.0 |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z   |
|                                                                         |
|      VALUE       1.1         0.0        0.0         0.0         0.0     |
|   LOCATION       0.0         0.0        0.0         0.0         0.0     |
|    LOADING         7           0          0           0           0     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                         DESIGN SUMMARY ( KN-METR)                      *|
|*                         --------------                                 *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ========================================================        |
|          PASS        COMPRESSION      0.032             7               |
|          1.09 C           0.0           0.0           0.00              |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1

****

```
                                                  Y        PROPERTIES
*************                                     |        IN  CM  UNIT
            *   |============================|    ==|  |==     ------------
MEMBER  41  *   |  INDIAN SECTIONS           |      |  |       AX =    4.8
            *   |  ST  ISA50X50X5            |      |  |  --Z  AY =    1.7
DESIGN CODE *   |                            |      |  |       AZ =    1.7
  IS-800    *   ==============================    ==|  |==     SY =    5.1
            *                                                  SZ =    2.3
            *   |<---LENGTH (ME=     1.07 --->|               RY =    1.9
*************                                                 RZ =    1.0

                  0.0( KN-METR)
PARAMETER         |L0                                      L0  STRESSES
IN   NEWT  MM     |L0                                      L0  IN   NEWT  MM
---------------   +L0                                      L0  -------------
 KL/R-Y=   55.5   |L0                                      L0  FA  =   71.6
 KL/R-Z=  110.0   +L0                                      L0  fa  =    2.3
 UNL    = 1073.5  |L0                                      L0  FCZ =    0.0
 C      =  180.0  +L0                                      L0  FTZ =    0.0
 CMY    =    0.00 |L0                                      L0  FCY =    0.0
 CMZ    =    0.00 +L0                                      L0  FTY =    0.0
 FYLD   =  250.0  |L0                                      L0  fbz =    0.0
 NSF    =    1.0  +---+---+---+---+---+---+---+---+---+---|   fby =    0.0
 DFF    =    0.0   0.0                                        FV  =  100.0
 dff    =    0.0               ABSOLUTE MZ ENVELOPE          fv  =    0.0
                                  (WITH LOAD NO.)

                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)
                     -------------------------

                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z

      VALUE       1.1         0.0        0.0         0.0         0.0
   LOCATION       0.0         0.0        0.0         0.0         0.0
    LOADING         2           0          0           0           0

*************************************************************************
*                                                                       *
*                        DESIGN SUMMARY ( KN-METR)                      *
*                        --------------                                 *
*                                                                       *
*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *
         FX              MY              MZ           LOCATION
        ========================================================
          PASS        COMPRESSION      0.032             2
          1.11 C          0.0            0.0           0.00
*                                                                       *
*************************************************************************
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                  Y        PROPERTIES    |
|*************                                     |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  42  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==      SY =    5.0   |
|            *                                        |        SZ =    3.1   |
|            *  |<---LENGTH (ME=     0.85 --->|      |        RY =    1.9   |
|*************                                        |        RZ =    1.0   |
|                                                                         |
|                  0.1( KN-METR)                                          |
|PARAMETER         |L9                                        STRESSES      |
|IN   NEWT  MM     |                        L9            L8  IN   NEWT  MM|
|---------------   +           L8  L8          L9              ------------- |
| KL/R-Y=   43.9   |                    L7                    FA  =   93.3  |
| KL/R-Z=   87.1   +                                  L9       fa  =    0.1  |
| UNL   =  850.0   |       L8                                  FCZ =  131.0  |
| C     =  180.0   +                                           FTZ =  165.0  |
| CMY   =    0.40  |                                           FCY =  165.0  |
| CMZ   =    0.40  +                                     L9    FTY =  165.0  |
| FYLD  =  250.0   |   L8                                      fbz =   16.6  |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|  fby =    9.6  |
| DFF   =    0.0    0.0                                     FV  =  100.0  |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE           fv  =    2.4  |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                    MAX FORCE/ MOMENT SUMMARY ( KN-METR)                 |
|                    -------------------------                            |
|                                                                         |
|               AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z    |
|                                                                         |
|     VALUE       0.0         0.3        0.4         0.1         0.1     |
|  LOCATION       0.0         0.0        0.0         0.6         0.0     |
|   LOADING         8           9          9           9           9     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                        DESIGN SUMMARY ( KN-METR)                       *|
|*                        --------------                                  *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ========================================================          |
|          PASS        IS-7.1.1(A)      0.186             9                |
|          0.03 C          0.0           0.1            0.00               |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  43  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==                     |
|            *                                                 SZ =    2.3   |
|            *  |<---LENGTH (ME=     0.85 --->|                RY =    1.9   |
|*************                                                 RZ =    1.0   |
|                                                                         |
|                  0.1( KN-METR)                                          |
|PARAMETER         |L8                                        L9  STRESSES  |
|IN   NEWT  MM     |                                              IN   NEWT  MM|
|---------------   +                                              -------------|
| KL/R-Y=   43.9   |                                              FA  =  150.0 |
| KL/R-Z=   87.1   +   L8                                  L9      fa  =    0.2 |
| UNL   =  850.0   |                                              FCZ =  131.0 |
| C     =  400.0   +                                              FTZ =  165.0 |
| CMY   =    0.47  |       L8                        L9           FCY =  165.0 |
| CMZ   =    0.56  +           L9  L9      L8  L8                 FTY =  165.0 |
| FYLD  =  250.0   |                   L2                         fbz =   36.7 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---+---|  fby =    0.0 |
| DFF   =    0.0    0.0                                          FV  =  100.0 |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE               fv  =    2.6 |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z   |
|                                                                         |
|      VALUE      -0.1         0.4        0.4         0.1         0.1    |
|   LOCATION       0.0         0.9        0.0         0.0         0.9    |
|    LOADING         7           9          8           8           9     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                         DESIGN SUMMARY ( KN-METR)                      *|
|*                         --------------                                 *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ========================================================          |
|          PASS        7.1.2 BEND C     0.331             8               |
|          0.09 T           0.1          0.1            0.00              |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                  Y        PROPERTIES    |
|*************                                     |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  44  *  |  INDIAN SECTIONS           |     | |       AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z  AY =    1.7   |
|DESIGN CODE *  |                            |     | |       AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==                     |
|            *                                                SZ =    2.3   |
|            *  |<---LENGTH (ME=     0.95 --->|               RY =    1.9   |
|*************                                               RZ =    1.0   |
|                                                                         |
|                  0.1( KN-METR)                                          |
|PARAMETER         |                                    L8  L8  STRESSES    |
|IN   NEWT  MM     |                              L8  L8          IN   NEWT  MM|
|---------------   +                         L8                   -------------|
| KL/R-Y=   49.1   |                     L9                        FA  =  150.0 |
| KL/R-Z=   97.3   +                L9                             fa  =    1.3 |
| UNL   =  950.0   |            L9                                 FCZ =  128.7 |
| C     =  180.0   +       L9                                       FTZ =  165.0 |
| CMY   =   0.79   |                                               FCY =  165.0 |
| CMZ   =   0.73   +   L9                                          FTY =  165.0 |
| FYLD  =  250.0   |L9                                             fbz =   28.8 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---+---|   fby =    0.0 |
| DFF   =    0.0    0.0                                           FV  =  100.0 |
| dff   =    0.0               ABSOLUTE MZ ENVELOPE               fv  =    0.6 |
|                                 (WITH LOAD NO.)                         |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z   |
|                                                                         |
|      VALUE      -0.6         0.1        0.2         0.3         0.1     |
|   LOCATION       0.0         0.0        0.0         0.9         0.9     |
|    LOADING         8           8          8           8           8     |
|                                                                         |
|*************************************************************************|
|*                                                                       *|
|*                         DESIGN SUMMARY ( KN-METR)                     *|
|*                         --------------                                *|
|*                                                                       *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/         *|
|         FX              MY              MZ           LOCATION           |
|        ========================================================         |
|          PASS        7.1.2 BEND C     0.509             8               |
|          0.61 T          -0.3          0.1            0.95              |
|*                                                                       *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                  Y        PROPERTIES    |
|*************                                     |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  45  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==                     |
|            *                                                 SZ =    2.3   |
|            *  |<---LENGTH (ME=     0.95 --->|                RY =    1.9   |
|*************                                                 RZ =    1.0   |
|                                                                         |
|                  0.1( KN-METR)                                          |
|PARAMETER         |                                      L9  L9  STRESSES  |
|IN   NEWT  MM     |                                 L9  L9          IN   NEWT  MM|
|---------------   +                           L9                    -------------|
| KL/R-Y=   49.1   |                                                 FA  =  150.0 |
| KL/R-Z=   97.3   +                 L8  L9                         fa  =    1.3 |
| UNL   =  950.0   |                                                 FCZ =  128.7 |
| C     =  400.0   +        L8  L8                                   FTZ =  165.0 |
| CMY   =    0.79  |                                                 FCY =  165.0 |
| CMZ   =    0.73  +   L8                                           FTY =  165.0 |
| FYLD  =  250.0   |L8                                               fbz =   29.5 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---+---+---|  fby =    0.0 |
| DFF   =    0.0    0.0                                             FV  =  100.0 |
| dff   =    0.0                ABSOLUTE MZ ENVELOPE                 fv  =    0.6 |
|                                  (WITH LOAD NO.)                        |
|                                                                         |
|                      MAX FORCE/ MOMENT SUMMARY ( KN-METR)               |
|                      -------------------------                          |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z   |
|                                                                         |
|      VALUE      -0.6         0.1        0.2         0.3         0.1    |
|   LOCATION       0.0         0.0        0.0         0.9         0.9    |
|    LOADING         9           9          9           9           9     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                         DESIGN SUMMARY ( KN-METR)                      *|
|*                         --------------                                 *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ========================================================          |
|          PASS        7.1.2 BEND C     0.519              9               |
|          0.62 T           0.3          0.1             0.95              |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  46  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==      SY =    5.0   |
|            *                                         SZ =    3.1   |
|            *  |<---LENGTH (ME=     0.95 --->|        RY =    1.9   |
|*************                                         RZ =    1.0   |
|                                                                       |
|                  0.2( KN-METR)                                        |
|PARAMETER         |                                        L9  STRESSES  |
|IN   NEWT  MM     |                                            IN   NEWT  MM|
|---------------   +                                   L9       -------------|
| KL/R-Y=   49.1   |                                 L9          FA  =   83.0 |
| KL/R-Z=   97.3   +                            L9               fa  =    1.0 |
| UNL   =  950.0   |                                             FCZ =  128.7 |
| C     =  180.0   +L9                    L9                    FTZ =  165.0 |
| CMY   =    0.57  |   L9                                        FCY =  165.0 |
| CMZ   =    0.44  +       L9      L8  L8                        FTY =  165.0 |
| FYLD  =  250.0   |           L7                                fbz =   55.3 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---+    fby =   60.2 |
| DFF   =    0.0    0.0                                         FV  =  100.0 |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE              fv  =    2.3 |
|                                (WITH LOAD NO.)                        |
|                                                                       |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)              |
|                     -------------------------                         |
|                                                                       |
|               AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z  |
|                                                                       |
|     VALUE      -0.8         0.3        0.5         0.4         0.2    |
|   LOCATION      0.0         0.9        0.9         0.9         0.9    |
|    LOADING        8           9          8           8           9    |
|                                                                       |
|***********************************************************************|
|*                                                                      *|
|*                        DESIGN SUMMARY ( KN-METR)                     *|
|*                        --------------                                *|
|*                                                                      *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/        *|
|         FX              MY             MZ           LOCATION          |
|        ========================================================      |
|          PASS        IS-7.1.1(A)      0.806             9             |
|          0.47 C          -0.3          0.2            0.95            |
|*                                                                      *|
|***********************************************************************|
|                                                                       |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  47  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==      SY =    5.0   |
|            *                                         SZ =    3.1   |
|            *  |<---LENGTH (ME=     0.95 --->|         RY =    1.9   |
|*************                                         RZ =    1.0   |
|                                                                       |
|                  0.2( KN-METR)                                        |
|PARAMETER         |                                        L8  STRESSES  |
|IN   NEWT  MM     |                                            IN   NEWT  MM|
|---------------   +                                    L8      -------------|
| KL/R-Y=   49.1   |                                  L8        FA  =   83.0 |
| KL/R-Z=   97.3   +                             L8             fa  =    1.0 |
| UNL   =  950.0   |                                           FCZ =  128.7 |
| C     =  400.0   +L8                    L8                    FTZ =  165.0 |
| CMY   =    0.57  |   L8                                      FCY =  165.0 |
| CMZ   =    0.44  +       L8      L9  L9                      FTY =  165.0 |
| FYLD  =  250.0   |           L7                              fbz =   54.3 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---+   fby =   58.8 |
| DFF   =    0.0    0.0                                       FV  =  100.0 |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE            fv  =    2.3 |
|                                (WITH LOAD NO.)                        |
|                                                                       |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)              |
|                     -------------------------                         |
|                                                                       |
|               AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z  |
|                                                                       |
|     VALUE      -0.8         0.3        0.5         0.4         0.2    |
|   LOCATION      0.0         0.9        0.9         0.9         0.9    |
|    LOADING        9           8          9           9           8    |
|                                                                       |
|***********************************************************************|
|*                                                                     *|
|*                        DESIGN SUMMARY ( KN-METR)                    *|
|*                        --------------                               *|
|*                                                                     *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/       *|
|         FX              MY             MZ           LOCATION          |
|        ========================================================       |
|          PASS        IS-7.1.1(A)      0.790             8             |
|          0.46 C           0.3          0.2            0.95            |
|*                                                                     *|
|***********************************************************************|
|                                                                       |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1

****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  48  *  |  INDIAN SECTIONS           |     | |       AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z  AY =    1.7   |
|DESIGN CODE *  |                            |     | |       AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==     SY =    5.1   |
|            *                                        |       SZ =    2.3   |
|            *  |<---LENGTH (ME=     1.07 --->|      |       RY =    1.9   |
|*************                                       |       RZ =    1.0   |
|                                                                         |
|                  0.0( KN-METR)                                          |
|PARAMETER         |L0                                        L0  STRESSES  |
|IN   NEWT  MM     |L0                                        L0  IN   NEWT  MM|
|---------------   +L0                                        L0  ------------|
| KL/R-Y=   55.5   |L0                                        L0  FA  =   71.6 |
| KL/R-Z=  110.0   +L0                                        L0  fa  =    2.0 |
| UNL   = 1073.5   |L0                                        L0  FCZ =    0.0 |
| C     =  180.0   +L0                                        L0  FTZ =    0.0 |
| CMY   =    0.00  |L0                                        L0  FCY =    0.0 |
| CMZ   =    0.00  +L0                                        L0  FTY =    0.0 |
| FYLD  =  250.0   |L0                                        L0  fbz =    0.0 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---+   fby =    0.0 |
| DFF   =    0.0    0.0                                          FV  =  100.0 |
| dff   =    0.0               ABSOLUTE MZ ENVELOPE              fv  =    0.0 |
|                                 (WITH LOAD NO.)                         |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z   |
|                                                                         |
|      VALUE       0.9         0.0        0.0         0.0         0.0     |
|   LOCATION       0.0         0.0        0.0         0.0         0.0     |
|    LOADING         9           0          0           0           0     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                         DESIGN SUMMARY ( KN-METR)                      *|
|*                         --------------                                 *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ========================================================          |
|          PASS        COMPRESSION      0.027             9                |
|          0.94 C           0.0          0.0            0.00               |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1

****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  49  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==      SY =    5.1   |
|            *                                        |        SZ =    2.3   |
|            *  |<---LENGTH (ME=     1.07 --->|      |        RY =    1.9   |
|*************                                       |        RZ =    1.0   |
|                                                                         |
|                  0.0( KN-METR)                                          |
|PARAMETER         |L0                                        L0  STRESSES  |
|IN   NEWT  MM     |L0                                        L0  IN   NEWT  MM|
|---------------   +L0                                        L0  ------------|
| KL/R-Y=   55.5   |L0                                        L0  FA  =   71.6 |
| KL/R-Z=  110.0   +L0                                        L0  fa  =    1.9 |
| UNL   = 1073.5   |L0                                        L0  FCZ =    0.0 |
| C     =  180.0   +L0                                        L0  FTZ =    0.0 |
| CMY   =    0.00  |L0                                        L0  FCY =    0.0 |
| CMZ   =    0.00  +L0                                        L0  FTY =    0.0 |
| FYLD  =  250.0   |L0                                        L0  fbz =    0.0 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---+   fby =    0.0 |
| DFF   =    0.0    0.0                                        FV  =  100.0 |
| dff   =    0.0               ABSOLUTE MZ ENVELOPE            fv  =    0.0 |
|                                 (WITH LOAD NO.)                         |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z   |
|                                                                         |
|      VALUE       0.9         0.0        0.0         0.0         0.0     |
|   LOCATION       0.0         0.0        0.0         0.0         0.0     |
|    LOADING         2           0          0           0           0     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                         DESIGN SUMMARY ( KN-METR)                      *|
|*                         --------------                                 *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ========================================================        |
|          PASS        COMPRESSION      0.026             2               |
|          0.90 C           0.0           0.0           0.00              |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                  Y        PROPERTIES    |
|*************                                     |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  50  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==      SY =    5.1   |
|            *                                        |        SZ =    2.3   |
|            *  |<---LENGTH (ME=     1.07 --->|      |        RY =    1.9   |
|*************                                        |        RZ =    1.0   |
|                                                                         |
|                  0.0( KN-METR)                                          |
|PARAMETER         |L0                                        L0  STRESSES  |
|IN   NEWT  MM     |L0                                        L0  IN   NEWT  MM|
|---------------   +L0                                        L0  -------------|
| KL/R-Y=   55.5   |L0                                        L0  FA  =   71.6 |
| KL/R-Z=  110.0   +L0                                        L0  fa  =    1.9 |
| UNL   = 1073.5   |L0                                        L0  FCZ =    0.0 |
| C     =  180.0   +L0                                        L0  FTZ =    0.0 |
| CMY   =    0.00  |L0                                        L0  FCY =    0.0 |
| CMZ   =    0.00  +L0                                        L0  FTY =    0.0 |
| FYLD  =  250.0   |L0                                        L0  fbz =    0.0 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---+   fby =    0.0 |
| DFF   =    0.0    0.0                                        FV  =  100.0 |
| dff   =    0.0               ABSOLUTE MZ ENVELOPE            fv  =    0.0 |
|                                 (WITH LOAD NO.)                         |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z   |
|                                                                         |
|      VALUE       0.9         0.0        0.0         0.0         0.0     |
|   LOCATION       0.0         0.0        0.0         0.0         0.0     |
|    LOADING         8           0          0           0           0     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                         DESIGN SUMMARY ( KN-METR)                      *|
|*                         --------------                                 *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ========================================================          |
|          PASS        COMPRESSION      0.027             8               |
|          0.93 C           0.0           0.0           0.00              |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1

****

```
                                                                    Y        PROPERTIES
*************                                                       |        IN  CM  UNIT
            *   |============================|    ==| |==      ------------
MEMBER  51  *   |  INDIAN SECTIONS           |       | |        AX =    4.8
            *   | ST  ISA50X50X5             |       | |  --Z  AY =    1.7
DESIGN CODE *   |                            |       | |        AZ =    1.7
  IS-800    *  ==============================   ==| |==      SY =    5.1
            *                                                    SZ =    2.3
            *   |<---LENGTH (ME=     1.07 --->|                 RY =    1.9
*************                                                    RZ =    1.0

                  0.0( KN-METR)
PARAMETER         |L0                                          L0  STRESSES
IN   NEWT  MM     |L0                                          L0  IN   NEWT  MM
---------------   +L0                                          L0  -------------
 KL/R-Y=   55.5   |L0                                          L0  FA  =   71.6
 KL/R-Z=  110.0   +L0                                          L0  fa  =    1.9
 UNL    = 1073.5  |L0                                          L0  FCZ =    0.0
 C      =  180.0  +L0                                          L0  FTZ =    0.0
 CMY    =    0.00 |L0                                          L0  FCY =    0.0
 CMZ    =    0.00 +L0                                          L0  FTY =    0.0
 FYLD   =  250.0  |L0                                          L0  fbz =    0.0
 NSF    =    1.0  +---+---+---+---+---+---+---+---+---+---+---|  fby =    0.0
 DFF    =    0.0   0.0                                           FV  =  100.0
 dff    =    0.0               ABSOLUTE MZ ENVELOPE              fv  =    0.0
                                  (WITH LOAD NO.)

                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)
                     -------------------------

                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z

      VALUE       0.9         0.0        0.0         0.0         0.0
   LOCATION       0.0         0.0        0.0         0.0         0.0
    LOADING         2           0          0           0           0

**************************************************************************
*                                                                        *
*                        DESIGN SUMMARY ( KN-METR)                       *
*                        --------------                                  *
*                                                                        *
*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *
         FX              MY              MZ           LOCATION
        ========================================================
          PASS        COMPRESSION      0.026             2
          0.90 C          0.0            0.0           0.00
*                                                                        *
**************************************************************************
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                  Y        PROPERTIES    |
|*************                                     |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  52  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==      SY =    5.0   |
|            *                                        |        SZ =    3.1   |
|            *  |<---LENGTH (ME=     0.50 --->|       |        RY =    1.9   |
|*************                                        |        RZ =    1.0   |
|                                                                         |
|                  0.0( KN-METR)                                          |
|PARAMETER         |L8                                    STRESSES         |
|IN   NEWT  MM     |   L8  L8                            IN   NEWT  MM    |
|---------------   +           L8                        -------------    |
| KL/R-Y=   25.8   |               L8                    FA  =  150.0     |
| KL/R-Z=   51.2   +                   L8                 fa  =    0.2     |
| UNL   =  500.0   |                   L8  L8            FCZ =  138.8     |
| C     =  180.0   +                                     FTZ =  165.0     |
| CMY   =    0.60  |                            L8  L8    FCY =  165.0     |
| CMZ   =    0.60  +                                 L8    FTY =  165.0     |
| FYLD  =  250.0   |                                     L0 fbz =   11.5     |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---| fby =   12.2     |
| DFF   =    0.0    0.0                                    FV  =  100.0     |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE          fv  =    0.7     |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z   |
|                                                                         |
|      VALUE      -0.1         0.1        0.2         0.1         0.0     |
|   LOCATION       0.0         0.0        0.0         0.0         0.0     |
|    LOADING         2           2          9           9           8     |
|                                                                         |
|*************************************************************************|
|*                                                                       *|
|*                         DESIGN SUMMARY ( KN-METR)                     *|
|*                         --------------                                *|
|*                                                                       *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/         *|
|         FX              MY              MZ           LOCATION           |
|        ======================================================           |
|          PASS        IS-7.1.2         0.145             8               |
|          0.08 T          0.1           0.0            0.00              |
|*                                                                       *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1

****

```
|-------------------------------------------------------------------------|
|                                                 Y        PROPERTIES     |
|*************                                    |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  53  *  |  INDIAN SECTIONS           |     | |       AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z  AY =    1.7   |
|DESIGN CODE *  |                            |     | |       AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==                     |
|            *                                                SZ =    2.3   |
|            *  |<---LENGTH (ME=     0.50 --->|               RY =    1.9   |
|*************                                               RZ =    1.0   |
|                                                                         |
|                  0.1( KN-METR)                                          |
|PARAMETER         |L9                                        STRESSES     |
|IN   NEWT  MM     |   L9  L9                                 IN   NEWT  MM|
|---------------   +           L9                            -------------|
| KL/R-Y=   25.8   |               L9                         FA  =  150.0 |
| KL/R-Z=   51.2   +                                          fa  =    0.1 |
| UNL   =  500.0   |                       L9                FCZ =  138.8 |
| C     =  400.0   +                                          FTZ =  165.0 |
| CMY   =    0.60  |                           L9              FCY =  165.0 |
| CMZ   =    0.60  +                               L9  L9      FTY =  165.0 |
| FYLD  =  250.0   |                                     L0    fbz =   32.8 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|   fby =    0.0 |
| DFF   =    0.0    0.0                                      FV  =  100.0 |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE            fv  =    0.9 |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                    MAX FORCE/ MOMENT SUMMARY ( KN-METR)                 |
|                    -------------------------                            |
|                                                                         |
|               AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z    |
|                                                                         |
|     VALUE      -0.1         0.2        0.1         0.1         0.1      |
|  LOCATION       0.0         0.0        0.0         0.0         0.0      |
|   LOADING         7           9          8           8           9      |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                        DESIGN SUMMARY ( KN-METR)                       *|
|*                        --------------                                  *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ========================================================          |
|          PASS        7.1.2 BEND C     0.209             9                |
|          0.03 T           0.0          0.1            0.00               |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                  Y        PROPERTIES    |
|*************                                     |        IN  CM  UNIT   |
|            *  |============================|   ==| |==     ------------   |
|MEMBER  54  *  |  INDIAN SECTIONS           |     | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |     | |  --Z   AY =    1.7   |
|DESIGN CODE *  |                            |     | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==                     |
|            *                                                 SZ =    2.3   |
|            *  |<---LENGTH (ME=     0.50 --->|                RY =    1.9   |
|*************                                                 RZ =    1.0   |
|                                                                         |
|                  0.1( KN-METR)                                          |
|PARAMETER         |L8                                         STRESSES     |
|IN   NEWT  MM     |   L8  L8                                  IN   NEWT  MM|
|---------------   +       L8  L8                              -------------|
| KL/R-Y=   25.8   |               L8                          FA  =  150.0 |
| KL/R-Z=   51.2   +                                           fa  =    0.1 |
| UNL   =  500.0   |                   L8  L8                  FCZ =  138.8 |
| C     =  400.0   +                                           FTZ =  165.0 |
| CMY   =   0.60   |                           L8              FCY =  165.0 |
| CMZ   =   0.60   +                               L8  L8      FTY =  165.0 |
| FYLD  =  250.0   |                                      L0   fbz =   31.9 |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|   fby =    0.0 |
| DFF   =    0.0    0.0                                       FV  =  100.0 |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE            fv  =    0.9 |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                    MAX FORCE/ MOMENT SUMMARY ( KN-METR)                 |
|                    -------------------------                            |
|                                                                         |
|               AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z    |
|                                                                         |
|     VALUE      -0.1         0.1        0.1         0.1         0.1     |
|   LOCATION      0.0         0.0        0.0         0.0         0.0     |
|    LOADING        7           8          9           9           8      |
|                                                                         |
|*************************************************************************|
|*                                                                       *|
|*                        DESIGN SUMMARY ( KN-METR)                      *|
|*                        --------------                                 *|
|*                                                                       *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/         *|
|         FX              MY              MZ           LOCATION           |
|        ========================================================         |
|          PASS        7.1.2 BEND C     0.201             8               |
|          0.03 T           0.0          0.1            0.00              |
|*                                                                       *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

STAAD.PRO CODE CHECKING - (IS-800:1984) v1.1
****

```
|-------------------------------------------------------------------------|
|                                                  Y        PROPERTIES    |
|*************                                     |        IN  CM  UNIT   |
|            *  |============================|    ==| |==     ------------   |
|MEMBER  55  *  |  INDIAN SECTIONS           |      | |        AX =    4.8   |
|            *  | ST  ISA50X50X5             |      | |  --Z  AY =    1.7   |
|DESIGN CODE *  |                            |      | |        AZ =    1.7   |
|  IS-800    *  ==============================   ==| |==      SY =    5.0   |
|            *                                        |        SZ =    3.1   |
|            *  |<---LENGTH (ME=     0.50 --->|      |        RY =    1.9   |
|*************                                        |        RZ =    1.0   |
|                                                                         |
|                  0.0( KN-METR)                                          |
|PARAMETER         |L9                                  STRESSES           |
|IN   NEWT  MM     |   L9                               IN   NEWT  MM      |
|---------------   +           L9                       -------------      |
| KL/R-Y=   25.8   |               L9                   FA  =  150.0       |
| KL/R-Z=   51.2   +                   L9               fa  =    0.2       |
| UNL   =  500.0   |                       L9           FCZ =  138.8       |
| C     =  400.0   +                                    FTZ =  165.0       |
| CMY   =   0.60   |                           L9  L9   FCY =  165.0       |
| CMZ   =   0.60   +                                L9    FTY =  165.0       |
| FYLD  =  250.0   |                                   L0  fbz =   11.9     |
| NSF   =    1.0   +---+---+---+---+---+---+---+---+---+---|  fby =   12.8  |
| DFF   =    0.0    0.0                                   FV  =  100.0       |
| dff   =    0.0              ABSOLUTE MZ ENVELOPE         fv  =    0.8       |
|                                (WITH LOAD NO.)                          |
|                                                                         |
|                     MAX FORCE/ MOMENT SUMMARY ( KN-METR)                |
|                     -------------------------                           |
|                                                                         |
|                AXIAL      SHEAR-Y    SHEAR-Z    MOMENT-Y    MOMENT-Z   |
|                                                                         |
|      VALUE      -0.1         0.1        0.2         0.1         0.0     |
|   LOCATION       0.0         0.0        0.0         0.0         0.0     |
|    LOADING         2           2          8           8           9     |
|                                                                         |
|*************************************************************************|
|*                                                                        *|
|*                        DESIGN SUMMARY ( KN-METR)                       *|
|*                        --------------                                  *|
|*                                                                        *|
|*       RESULT/     CRITICAL COND/     RATIO/         LOADING/          *|
|         FX              MY              MZ           LOCATION            |
|        ========================================================          |
|          PASS        IS-7.1.2         0.151              9               |
|          0.09 T          -0.1          0.0             0.00               |
|*                                                                        *|
|*************************************************************************|
|                                                                         |
|-------------------------------------------------------------------------|
```

************** END OF TABULATED RESULT OF DESIGN **************

98. STEEL MEMBER TAKE OFF ALL

STEEL TAKE-OFF

PROFILE	LENGTH(METE)	WEIGHT(KN)
ST ISMC100	17.51	1.641
ST ISA50X50X5	38.01	1.399
	TOTAL =	3.040

MEMBER	PROFILE	LENGTH (METE)	WEIGHT (KN)
1	ST ISMC100	1.00	0.094
2	ST ISMC100	1.00	0.094
3	ST ISMC100	1.00	0.094
4	ST ISMC100	1.00	0.094
5	ST ISMC100	2.00	0.187
6	ST ISMC100	2.00	0.187
7	ST ISMC100	1.17	0.110
8	ST ISMC100	1.17	0.110
9	ST ISA50X50X5	0.95	0.035
10	ST ISA50X50X5	1.00	0.037
11	ST ISA50X50X5	1.02	0.038
12	ST ISA50X50X5	0.95	0.035
13	ST ISA50X50X5	1.00	0.037
14	ST ISA50X50X5	1.02	0.038
15	ST ISA50X50X5	0.85	0.031
16	ST ISA50X50X5	0.85	0.031
17	ST ISA50X50X5	0.85	0.031
18	ST ISA50X50X5	1.02	0.038
19	ST ISA50X50X5	1.02	0.038
20	ST ISMC100	1.59	0.149
21	ST ISMC100	1.59	0.149
22	ST ISA50X50X5	0.85	0.031
23	ST ISA50X50X5	1.00	0.037
24	ST ISA50X50X5	1.02	0.038
25	ST ISA50X50X5	1.00	0.037
26	ST ISA50X50X5	1.02	0.038
27	ST ISA50X50X5	1.02	0.038
28	ST ISA50X50X5	1.02	0.038
29	ST ISA50X50X5	0.85	0.031
30	ST ISA50X50X5	0.85	0.031
31	ST ISA50X50X5	0.85	0.031
32	ST ISA50X50X5	0.95	0.035
33	ST ISA50X50X5	0.95	0.035
34	ST ISMC100	1.00	0.094
35	ST ISMC100	1.00	0.094
36	ST ISMC100	1.00	0.094
37	ST ISMC100	1.00	0.094
38	ST ISA50X50X5	1.07	0.040
39	ST ISA50X50X5	1.07	0.040

40	ST	ISA50X50X5	1.07	0.040
41	ST	ISA50X50X5	1.07	0.040
42	ST	ISA50X50X5	0.85	0.031
43	ST	ISA50X50X5	0.85	0.031
44	ST	ISA50X50X5	0.95	0.035
45	ST	ISA50X50X5	0.95	0.035
46	ST	ISA50X50X5	0.95	0.035
47	ST	ISA50X50X5	0.95	0.035
48	ST	ISA50X50X5	1.07	0.040
49	ST	ISA50X50X5	1.07	0.040
50	ST	ISA50X50X5	1.07	0.040
51	ST	ISA50X50X5	1.07	0.040
52	ST	ISA50X50X5	0.50	0.018
53	ST	ISA50X50X5	0.50	0.018
54	ST	ISA50X50X5	0.50	0.018
55	ST	ISA50X50X5	0.50	0.018
			----------	----------
		TOTAL =		3.040

********** END OF DATA FROM INTERNAL STORAGE **********

99. PERFORM ANALYSIS

** ALL CASES BEING MADE ACTIVE BEFORE RE-ANALYSIS. **

100. FINISH

********** END OF THE STAAD.Pro RUN **********

**** DATE= JAN 2,2021 TIME= 13:28:15 ****

```
*************************************************************
*   For technical assistance on STAAD.Pro, please visit     *
*   http://selectservices.bentley.com/en-US/                *
*                                                           *
*   Details about additional assistance from                *
*   Bentley and Partners can be found at program menu       *
*   Help->Technical Support                                 *
*                                                           *
*      Copyright (c) 1997-2014 Bentley Systems, Inc.
*               http://www.bentley.com                      *
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DEVELOPMENT OF 100 MW (AC) FLOATING SOLAR PHOTOVOLTAIC PLANT AT NTPC RAMAGUNDAM SUPER THERMAL POWER PLANT

TITLE OF THE DRAWING:	**SLD- SINGLE LINE DIAGRAM AC**
DOCUMENT NO:	**5747-004-PVE-P-006**

SL.NO	CONTENTS
1	SLD- SINGLE LINE DIAGRAM AC

REV NO.	DATE	STATUS	INITIALS		INITIALS
5	18.11.2020	FOR APPROVAL	BHEL-EDN-BLR	VIPINDAS C P	M SREENATH
4	10.11.2020	FOR APPROVAL	BHEL-EDN-BLR	VIPINDAS C P	M SREENATH
3	13.08.2020	FOR APPROVAL	BHEL-EDN-BLR	VIPINDAS C P	M SREENATH
2	31.07.2019	FOR APPROVAL	BHEL-EDN	[illegible]	M SREENATH
1	29.09.2019	FOR APPROVAL	BHEL-EDN	[illegible]	M SREENATH
0	31.07.2019	FOR APPROVAL	BHEL-EDN	[illegible]	M SREENATH

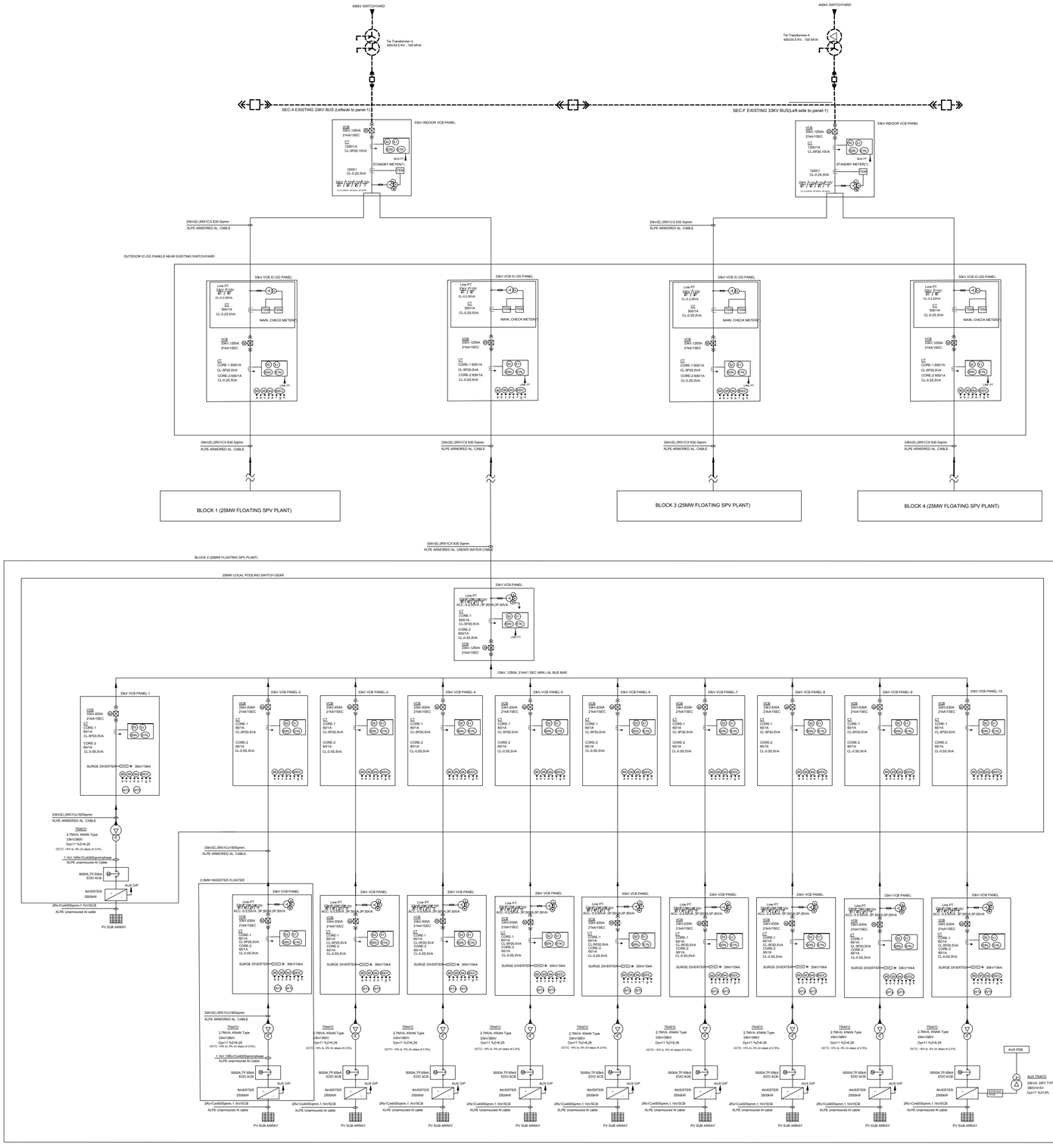
Signature Not Verified
Digitally signed by P.Rahman
Date: 2020.11.25 15:25:45 IST
Reason: CAT I
Location: NTPCEOC

PROJECT:	PREPARED BY	CHECKED BY	APPROVED BY
DEVELOPMENT OF 100 MW (AC) FLOATING SPV PLANT AT NTPC RAMAGUNDAM SUPER THERMAL POWER PLANT	5747-004-PVE-P-006		10.11.2020
			PAGE - 1

Compliance sheet Date:18-11-20

NTPC Comment:	BHEL Reply:
mention the panel no identified for solar injection	At Section-A, VCB panel along with Adopter panel shall be kept left side of the existing panel-1. At Section-F, VCB panel along with Adopter panel shall be kept left side of the existing panel-1. (changed due to size constraint)
revise metering CT ratio and pT as per last discussion for separate CT and PT for metering requirement.	Revised in-line with comments and approved HT Switchgear document
Check 21 kA or actually offered is 25kA	Fault rating is 21 kA only.
Revise inverter breaker fault current	Updated in the revised document
MCCB rating (in Aux. Tf line): 63A,70kA	Updated in the revised document

DRAWING NO. 5747-004-PVE-P-006



LEGEND DETAILS

SL. NO.	SYMBOL	DESCRIPTION
1		INVERTER DUTY TRANSFORMER
2		VCB 33kV,630/1250A 21kA/1SEC
3		SURGE DIVERTER, 33kV/10kA
4	86	MASTER TRIP RELAY
5	95 / 74TC / 95C	TRIP CIRCUIT SUPERVISION RELAY
6	30	ANTI PUMPING RELAY
7	WTA	WINDING TEMPERATURE ALARM
8	WTT	WINDING TEMPERATURE TRIP
9		VCB ON
10		VCB OFF
11		SPRING CHARGE
12		AUTO TRIP
13		TRIP CIRCUIT HEALTHY
14		SERVICE POSITION
15		TEST POSITION
16		DC FAILURE
17	50	INST OVER CURRENT RELAY
18	51	IDMT OVER CURRENT RELAY
19	50N	NEUTRAL INSTANTANEOUS OVER CURRENT RELAY
20	51N	IDMT EARTH FAULT RELAY
21	MFR	MULTI FUNCTION METER
22		CURRENT TRANSFORMER
23	27	UNDER VOLTAGE RELAY
24	59	OVER VOLTAGE RELAY
25		POTENTIAL TRANSFORMER
26		FUSE
27	500/5TO	CBCT
28	MBR	TARIFF ENERGY METER
29	DCFI	DC FAILURE INDICATION
30	49	WINDING TEMP INDICATOR AND OIL TEMP INDICATOR

NOTE: 1) * TWO METERS WILL BE HANDED OVER TO NTPC

2) TOTAL 12 Nos OF TEMs ARE CONSIDERED AS PER NIT REQUIREMENT

3) AUX POWER FOR 4 Nos OF OUTDOOR IC–OG PANELS AND 2 Nos OF INDOOR HT PANELS NEAR TO EXISTING SWITCHGEAR ROOM WILL BE PROVIDED BY NTPC.

4) DRY TYPE AUX TRANSFORMER (OUTDOOR) WILL BE PLACED IN LOCAL POOLING INV FLOATER PLATFORM NEAR TO CMCS AND CABLE WILL BE TAKEN TO AUX PDB INSTALLED IN CMCS

REV.	DATE	ALTERED / CHECKED / APPROVED	DESCRIPTION
05	18.11.20		1) AC SLD MODIFIED AS PER CUSTOMER COMMENTS compliance sheet is attached
04	10.11.20		1) AC SLD MODIFIED AS PER CUSTOMER COMMENTS compliance sheet is attached
03	12.08.20		1) AC SLD MODIFIED AS PER CUSTOMER COMMENTS compliance sheet is attached
02	05.12.19		1) AC SLD MODIFIED AS PER DISCUSSIONS WITH NTPC & BHEL ON 28.11.19 2) LBS CHANGED TO VCB IN 25MW O/G 3) INV TRF DESCRPN CHANGED AS DRY,KNAN
01	30.09.19		PCU & TRANSFORMER CAPACITY CHANGED. AS PER ROUTE SURVEY CONDUCTED ON 04.08.19, 2X50MW EVACUATION PROPOSED.

	NAME	SIGN	DATE
DRAWN	MAMATHA		29.07.19
CHECKED	VCP		29.07.19
APPROVED	MS		29.07.19

DISTRIBUTION OF PRINTS

DEPT.	CODE
SC&PV	439

PROJECT : 100MW (AC) FLOATING SOLAR POWER PLANT
CUSTOMER : NTPC–RAMAGUNDAM

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

TITLE: **SINGLE LINE DIAGRAM–AC**

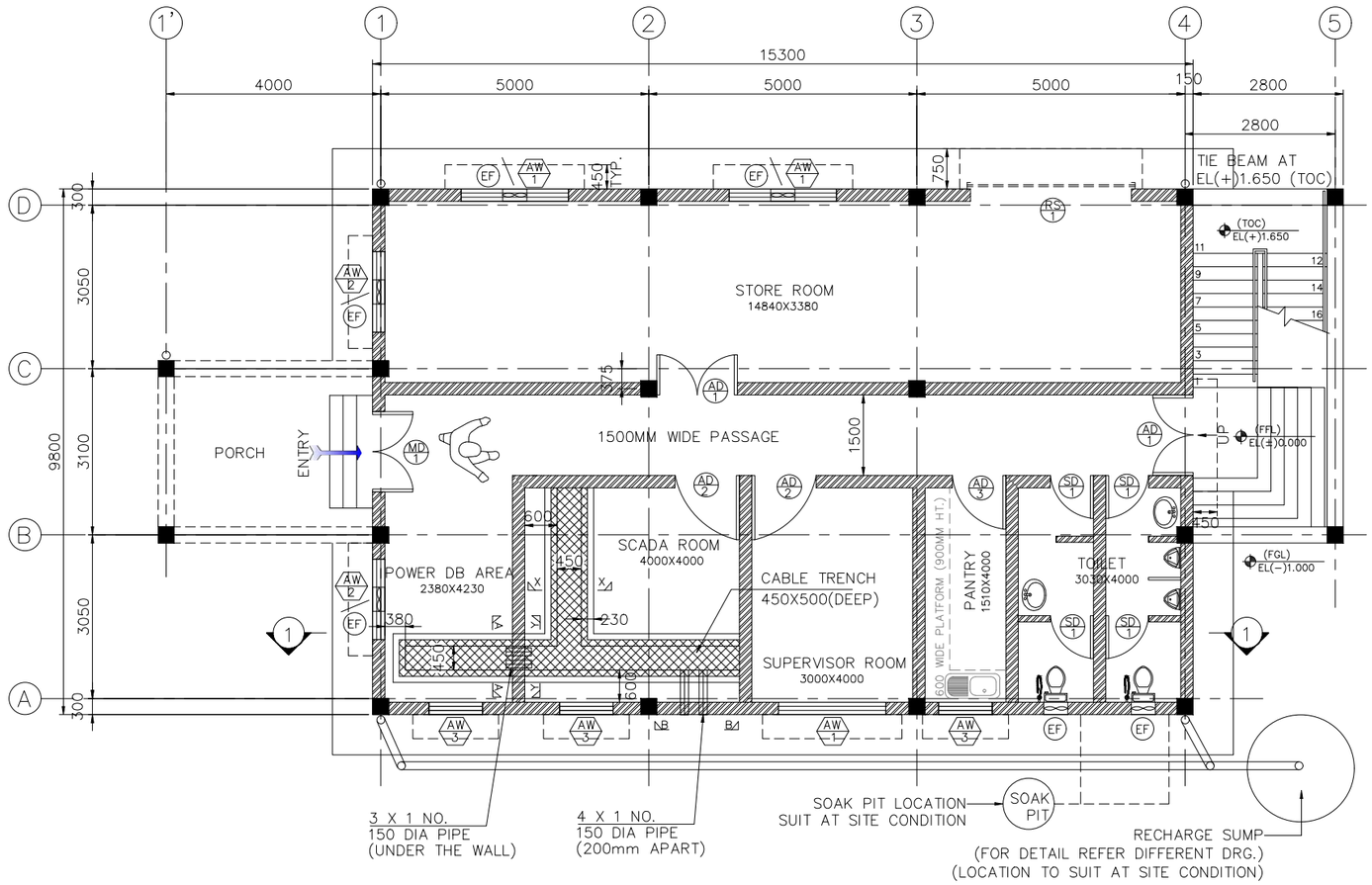
No. OF SHEETS: 01
SHEET No.: 01
REV: 05

NTPC DRWG. 5747-004-PVE-P-006

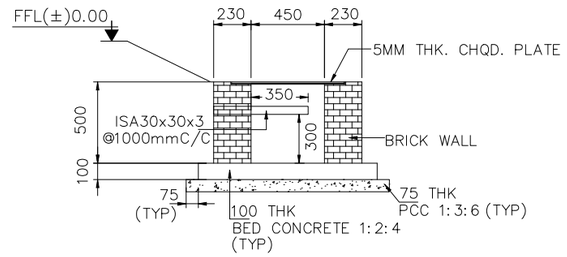
BHEL DRG. No.

A0 SIZE

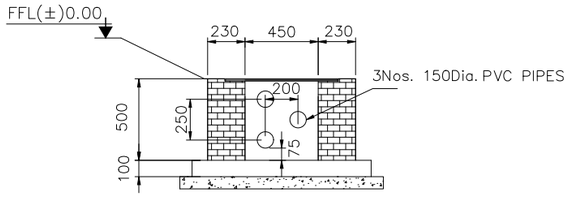
INVENTORY NO. | SIGN & DATE | REF. DRG.NO.



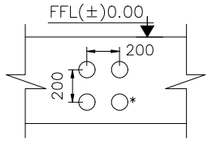
GROUND FLOOR PLAN
(SCALE 1:75)



SECTION X−X & SECTION Y−Y
(SCALE 1:25)



VIEW A−A
(SCALE 1:25)



VIEW B−B
(NOT TO SCALE)

* 4NOS. 150DIA. PVC PIPES SHALL BE PLACED AS PER THE SITE CONDITION

DRAWING CHANGE NOTICE

NOTE:
1. THE ANGLE ISA 30x30x3 SHALL BE EMBEDDED INSIDE THE 230THK. CABLE TRENCH BRICK WALL AT 1000mm C/C.
2. PAINTING OF STRUCTURAL STEEL SHALL BE DONE AS PER CLAUSE 2.7 OF D2 OF TECHNICAL SPECIFICATION.

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD
										01	29.09.20	SR	MN	MK	00	26.09.20	SR	MN	MK
											REVISED TO INCORPORATE NTPC COMMENTS VIDE E-MAIL DATED: 29.09.2020.					SUBMITTED FOR APPROVAL.			

DEPT. SC&PV
STATUS CONTRACT
DISTRIBUTION

100MWp FLOATING SOLAR PV PLANT FOR NTPC
AT RAMAGUNDAM, TELANGANA

OWNER:
NATIONAL THERMAL POWER CORPORATION

BHARAT HEAVY ELECTRICALS LTD
ELECTRONICS DIVISION, BANGALORE

TITLE
CMCS−ARCHITECTURE PLAN, ELEVATIONS, SECTION & FINISHING.

SCALE 1:100
DRAWING NO.
5747−004−PVC−F−050
SHEET 1 OF 1
REV. 01

DEVELOPMENT OF 100 MW (AC) FLOATING SOLAR PHOTOVOLTAIC PLANT AT NTPC RAMAGUNDAM SUPER THERMAL POWER PLANT

TITLE OF THE DRAWING:	**SLD- Single line diagram DC**
DOCUMENT NO:	**5747-004-PVE-P-007**

SL.NO	CONTENTS
1	SLD- Single line diagram DC

REV NO.	DATE	STATUS	INITIALS	INITIALS	INITIALS
2	02.07.2020	FOR APPROVAL	KRISHNA J	VIPINDAS C P	M SREENATH
1	13.06.2020	FOR APPROVAL	KRISHNA J	VIPINDAS C P	M SREENATH
0	12.12.2019	FOR APPROVAL	KRISHNA J	VIPINDAS C P	M SREENATH

PROJECT:	PREPARED BY	CH	APPROVED BY
DEVELOPMENT OF 100 MW (AC) FLOATING SPV PLANT AT NTPC RAMAGUNDAM SUPER THERMAL POWER PLANT	**5747-004-PVE-P-00**		02.07.2020
			PAGE - 1

Signature Not Verified
Digitally signed by P RAJKUMAR
Date: 2020.07.08 17:45:15 IST
Reason: CATT
Location: NTPCEOC

Compliance sheet

Date:02-07-20

SUBJECT : RGFSPV, 100 MW RAMAGUNDAM FSPV

NTPC DRG NO : 5747-004-PVE-P-007

REVISION NO : 01

DRG TITLE : SLD- Single line diagram DC

APP CATEGORY: II

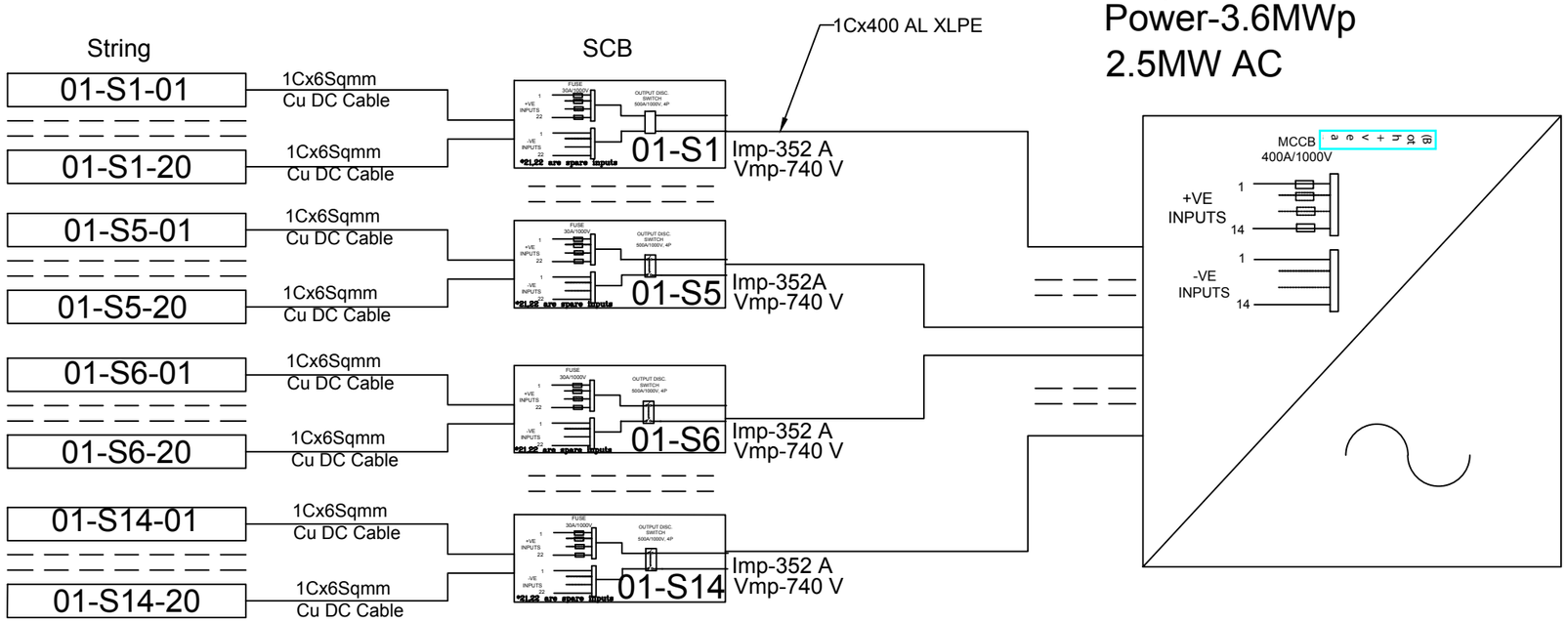
RELEASE DATE :13-06-20

NTPC Comment	BHEL Reply
A typical line diagram showning fuse/link on string(after Y connector) at SCB end to be shown	Updated in revised document
Letter from Solar-inverter manufacturer required regarding ommision of -ve fuse	Mail from inverter manufacturer is attached
What protection is there is DC side of inverter Fuse/MCCB. It need to be shown.	MCCBs are provided at DC side of Inverter. Updated in revised document
1 Nos. per MW as per the specification	Noted and updated in revised document

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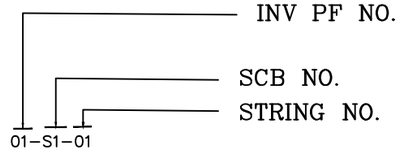
DRG. No 5747-004-PVE-P-007

2.5 MW INVERTER BLOCK
Inverter - 01 (Same for all 40 nos)

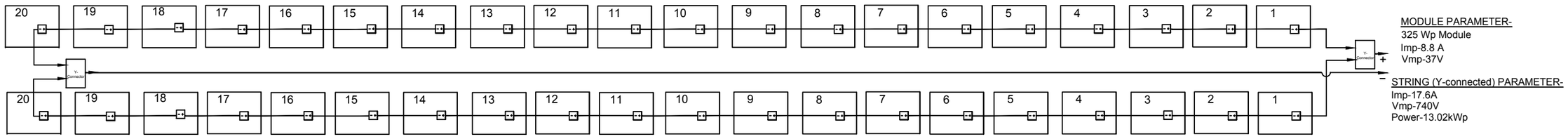


DETAILS	
Modules	Multi
Rating	325Wp (Avg)
No. of modules in one string	2 X 20 nos.
Total no. of modules/Inverter	11220 nos. (Max)
No. of String/Inverter	280 nos. (Max)
Total no. of Strings	11200 nos
DC Plate Rating/Inverter	3.6 MWp
String Mounting Unit	22 in 1 out (20 + 2 spare)
No. of SCB/Inverter	14 nos.
No.of Inverter used	40 nos. 2500 kW
Cable Size–String to SCB	1C 6 mm² Solar grade Copper Cable (EN50618)
Cable Size–SCB to Inverter	2RX1Cx400 sqmm Al XLPE cable
Earthing	1 No. per MW as per the specification– Total 145 no.s will be provided 25X3mm GI strip for grid formation

LEGEND: –



Details	1) Inverter no	2)SCB No	3) No of string inputs	4) String input after Y connector	5) Module Wp	5) DC Capacity/SCB	11) DC Capacity/MMPT	12) DC Capacity/Inverter	13) inverter capacity	14) Over loading per MPPT DC/AC	15) Overloading per inverter DC/AC	16) Y- String current	17) SCB current.
	40	560	22400	11200	325	0.26 MW	1.04 MW (MAX)	3.6 MW	2.5 MW	45%	45%	17.6 A	352A



INTER MODULE CONNECTION IN A Y-CONNECTED STRING

PROJECT : 100MW FLOATING SOLAR POWER PLANT
CUSTOMER : NTPC RAMAGUNDAM

REV.	DATE			REV.	DATE		
02	02.07.20	ALTERED	JK	01	13.06.20	ALTERED	JK
		CHECKED	VCP			CHECKED	VCP
		APPROVED	MS			APPROVED	MS

1. Added fuse details for SCB inputs and inverter DC side,in-line to customer comments

	NAME	SIGN	DATE
DRAWN	JK		191219
CHECKED	VCP		191219
APPROVED	VKY		191219

DISTRIBUTION OF PRINTS

DEPT.	CODE
SC&PV	439

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

CARD CODE

TITLE: DC SINGLE LINE DIAGRAM

No. OF SHEETS	01
SHEET No.	01
REV	00

DRG. No. 5747–004–PVE–P–007

REF. DRG. No.
SIGN. & DATE
INVENTORY No.

Krishna

From: Kevin George C <kevingeorgechittu@tbea.com>
Sent: Monday, March 02, 2020 12:17 PM
To: Saravana Bhavan R
Cc: krishnaj@bhel.in; vipindas.cp@bhel.in; sreenath@bhel.in; 'Sathish'; Vivek m Divakar
Subject: Re: 1000V , 2.5MW TBEA PCU - negative side fuse clarification wrt inverter and SCB

Dear Sir,

Kindly note our feedback –

1. BHEL specifications point - Fuse requirement (at inverter end) in the negative side of incoming DC cable shall be as per inverter manufactures recommendation.
   Kindly provide TBEA recommendation with reasons
   ➔ We are providing 400 A 1000V MCCB on the DC side. There will be individual MCCB for each input and the +ve and -ve poles will be protected by the MCCB.

2. As per TBEA Design concept , whether fuse on negative side of SCB is required or not required?
   ➔ Since we are providing 400 A MCCB, we do not recommend the use of fuse on the negative side of SCB.

Best regards

Kevin George | Sr. Sales Manager

Mob: (+91) 73583 33852

TBEA 特变电工
Equip China Powering the world

TBEA Xi'an Electric Technology Co., Ltd

China Add: No. 70 TBEA Xi'an Industrial Park, Shanglinyuan 4 Road, High-tech zone Xi'an china

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From: Saravana Bhavan R <ravana@bhel.in>
Date: Monday, 2 March 2020 at 11:14 AM
To: <kevingeorgechittu@tbea.com>, 'Sathish' <Sathish@tbea.com>

MOORUM ROAD

DAM GATE

RETAINING WALL

MOORUM ROAD

Array (1)
11000 Modules

Array (2)
11000 Modules

Array (3)
11000 Modules

Array (4)
11000 Modules

Array (5)
11000 Modules

Array (6)
11000 Modules

Array (8)
11000 Modules

Array (7)
11040

Temporary HT Cable Routing

LT Cable Route Completed Array-(4 To 11)

11040 Array 9

10880 Array 10

10920 Array 11

10880 Array 12

10920 Array 13

10920 Array 14

10920 Array 15

11040 Array 21

11040 Array 16

11040 Array 17

11040 Array 18

10920 Array 19

10920 Array 20

11160 Array 22

11160 Array 23

11160 Array 24

11160 Array 25

(LOCAL POOLING)
11040 Array 26

11160 Array 27

11160 Array 28

11160 Array 29

11160 Array 31

11160 Array 32

11160 Array 30

34#

35#

33#

36#

11040 Array 37

11160 Array 38

11160 Array 39

11160 Array 40

N 3,287,440

N 3,287,200

N 3,286,960

N 3,286,720

E 337600

E 337800

E 338000

E 338200

E 338400

E 338600

E 338800

E 339000

E 339200

E 339400

E 339600

ANNEXURE A

PROFORMA OF BANK GUARANTEE FOR EARNEST MONEY

(On non-Judicial paper of appropriate value)

Bank Guarantee No……..

Date……..

To

(Employer's Name and Address)

……..

Dear Sirs,

In accordance with the terms and conditions of Invitation for Bids/Notice Inviting Tender No……1(Tender Conditions), M/s. …….. having its registered office at ……2 (hereinafter referred to as the 'Tenderer'), is submitting its bid for the work of**……..3** invited by ……4.(name of the Employer) through its Unit at ……(

The Tender Conditions provide that the Tenderer shall pay a sum of Rs …… as Earnest Money Deposit in the form therein mentioned. The form of payment of Earnest Money Deposit includes Bank Guarantee executed by a Scheduled Bank.

In lieu of the stipulations contained in the aforesaid Tender Conditions that an irrevocable and unconditional Bank Guarantee against Earnest Money Deposit for an amount of .....5 ..... is required to be submitted by the Tenderer as a condition precedent for participation in the said Tender and the Tenderer having approached us for giving the said Guarantee,

we, the .....[Name & address of the Bank] ..... having our Registered Office at …….(hereinafter referred to as the Bank) being the Guarantor under this Guarantee, hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer without any demur, merely on your first demand any sum or sums of Rs. 5 .....(in words Rupees.....) without any reservation, protest, and recourse and without the beneficiary needing to prove or demonstrate reasons for its such demand.

Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____ _____.

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Vendor/Contractor/Vendors in any suit or proceeding pending before any Court or Tribunal, Arbitrator or any other authority, our liability under this present being absolute and unequivocal.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment hereunder and the Tenderer shall have no claim against us for making such payment.

We …….. Bank further agree that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Tender or to extend the time of submission of from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Tenderer and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Tenderer or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Tenderer or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Tenderer and notwithstanding any security or other guarantee that the Employer may have in relation to the Tenderer's liabilities.

This Guarantee shall be irrevocable and shall remain in force upto and including……..6 and shall be extended from time to time for such period as may be desired by the Employer.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Tenderer but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms hereof. However, unless a demand or claim under this Guarantee is made on us in writing on or before the ……. [7] we shall be discharged from all liabilities under this Guarantee.

We, ……. Bank lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

a) The liability of the Bank under this Guarantee shall not exceed……..5…..
b) This Guarantee shall be valid up to ……6
c) Unless the Bank is served a written claim or demand on or before _____7 all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

For and on behalf of

(Name of the Bank)

Date……

Place of Issue……..

PROFORMA OF BANK GUARANTEE (in lieu of SECURITY DEPOSIT)

In consideration of Bharat Heavy Electricals Limited (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at BHEL House, Siri Fort, New Delhi-110049[1] through its Unit at **BHEL, Solar Business Division, Bangalore** having agreed to exempt_____ (Name of the Vendor / Contractor / Vendors) with its registered office at_____ [2] (hereinafter called the said "Contractor" which term includes vendors), from demand under the terms and conditions of the Contract reference No._____ dated _____ [3] valued at Rs……[4] (Rupees ----------)[4] (hereinafter called the said Contract), of Security Deposit for the due fulfilment by the said Contractor of the terms and conditions contained in the said Contract, on production of a Bank Guarantee for Rs._____[5] (Rupees _____ only),

we ____(indicate the name and address of the Bank) having its Head Office at _____(address of the head Office) (hereinafter referred to as the Bank), , at the request of _____ [Contractor(s)], being the Guarantor under this Guarantee, do hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer, , an amount not exceeding Rs._____ without any demur, immediately on demand from the Employer and without any reservation, protest, and recourse and without the Employer needing to prove or demonstrate reasons for its such demand

Any such demand made on the bank, shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs._____.

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Contractor(s) in any suit or proceeding pending before any Court or Tribunal or Arbitrator or any other authority, our liability under this present being absolute and unequivocal.
The payment so made by us under this guarantee shall be a valid discharge of our liability for payment hereunder and the Contractor(s) shall have no claim against us for making such payment.

We, further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied & the Employer certifies that the terms and conditions of the said Contract have been fully and properly carried out by the said contractor(s) or acceptance of the final bill or discharge of this guarantee by the Employer, whichever is earlier. This guarantee shall initially remain in force upto and including _____6 and shall be extended from time to time for such period as may be desired by the Employer. Unless a demand or claim under this guarantee

is made on us in writing on or before the _____[7], we shall be discharged from all the liability under this guarantee thereafter.

We, ____(indicate the name of the Bank)____ further agree with the Employer that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said contractor(s) and to forbear or enforce any of the terms and conditions relating to the said Contract and we shall not be relieved from our liability by any reason of any such variation or extension being granted to the said contractor(s) or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Contractor but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).

We,……. BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.
Notwithstanding anything to the contrary contained hereinabove:

a) The liability of the Bank under this Guarantee shall not exceed…… [5]

b) This Guarantee shall be valid up to ……[6]

c) Unless the Bank is served a written claim or demand on or before _____[7] all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

Date _____ Day of _____

for____(indicate the name of the Bank)__

(Signature of Authorized signatory)

[1] ADDRESS OF THE EMPLOYER. I.e Bharat Heavy Electricals Limited
[2] ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER.
[3] DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE
[4] CONTRACT VALUE
[5] BG AMOUNT IN FIGURES AND WORDS
[6] VALIDITY DATE ((At least 3 months more than completion period)
[7] DATE OF EXPIRY OF CLAIM PERIOD (At least 3 months more than the present date of validity of BG)

Notes:

1. The expiry of claim period shall be at least 3 months more than the validity date. It may be ensured that the same is in line with the agreement/ contract entered with the Vendor.
2. The BG should be on Non-Judicial Stamp paper/e-stamp paper of appropriate value as per Stamp Act prevailing in the State(s) where the BG is submitted or is to be acted upon or the rate prevailing in the State where the BG was executed, whichever is higher. The Stamp Paper/e-stamp paper shall be purchased in the name of Vendor/Contractor/Supplier /Bank issuing the guarantee.

INTEGRITY PACT

Between

Bharat Heavy Electricals Ltd. (BHEL), a company registered under the Companies Act 1956 and having its registered office at "BHEL House", Siri Fort, New Delhi – 110049 (India) hereinafter referred to as "The Principal", which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the ONE PART

and

_____, (description of the party along with address), hereinafter referred to as "The Bidder/ Contractor" which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the OTHER PART

Preamble

The Principal intends to award, under laid-down organizational procedures, contract/s for _____

_____

_____. The Principal values full compliance with all relevant laws of the land, rules and regulations, and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder(s)/ Contractor(s).

In order to achieve these goals, the Principal will appoint Independent External Monitor(s), who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1 – Commitments of the Principal

1.1 The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles:-

1.1.1 No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a 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.

1.1.2 The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal 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.

1.1.3 The Principal will exclude from the process all known prejudiced persons.

1.2 If the Principal obtains information on the conduct of any of its employees which is a penal offence under the Indian Penal Code 1860 and Prevention of Corruption Act 1988 or any other statutory penal enactment, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions.

Section 2 – Commitments of the Bidder(s)/ Contractor(s)

2.1 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.

2.1.1 The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material, immaterial or any 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.

2.1.2 The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any illegal or 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 introduce cartelization in the bidding process.

2.1.3 The Bidder(s)/ Contractor(s) will not commit any penal offence under the relevant IPC/ PC Act; further the Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

2.1.4 The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

2.2 The Bidder(s)/ Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

Section 3 – Disqualification from tender process and exclusion from future contracts

If the Bidder(s)/ Contractor(s), before award or during execution has committed a transgression through a violation of Section 2 above, or acts in any other manner such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidders(s)/ Contractor(s) from the tender process or take action as per the separate “Guidelines for Suspension of Business Dealings with Suppliers/ Contractors” framed by the Principal.

Section 4 – Compensation for Damages

4.1 If the Principal has disqualified the Bidder(s) from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover the damages equivalent to Earnest Money Deposit/ Bid Security.

4.2 If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to section 3, the Principal shall be entitled to demand and recover from the Contractor liquidated damages equivalent to 5% of the contract value or the amount equivalent to Security Deposit/Performance Bank Guarantee, whichever is higher.

Section 5 – Previous Transgression

5.1 The Bidder declares that no previous transgressions occurred in the last 3 years with any other company in any country conforming to the anti-corruption approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.

5.2 If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

Section 6 – Equal treatment of all Bidders/ Contractors/ Sub-contractors

6.1 The Bidder(s)/ Contractor(s) undertake(s) to demand from his sub-contractors a commitment consistent with this Integrity Pact. This commitment shall be taken only from those sub-contractors whose contract value is more than 20% of Bidder's/ Contractor's contract value with the Principal.

6.2 The Principal will enter into agreements with identical conditions as this one with all Bidders and Contractors.

6.3 The Principal will disqualify from the tender process all bidders who do not sign this pact or violate its provisions.

Section 7 – Criminal Charges against violating Bidders/ Contractors /Sub-contractors

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Vigilance Office.

Section 8 –Independent External Monitor(s)

8.1 The Principal appoints competent and credible Independent External Monitor for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.

8.2 The Monitor is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CMD, BHEL.

8.3 The Bidder(s)/ Contractor(s) accepts that the Monitor has the right to access without restriction to all contract documentation of the Principal including that provided by the Bidder(s)/ Contractor(s). The Bidder(s)/ Contractor(s) will grant the monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his contract documentation. The same is applicable to Sub-contractor(s). The Monitor is under contractual obligation to treat the information and documents of the Bidder(s)/ Contractor(s) / Sub-contractor(s) with confidentiality.

8.4 The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the contract provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the Monitor the option to participate in such meetings.

8.5 As soon as the Monitor notices, or believes to notice, a violation of this agreement, he will so inform the Management of the Principal and request the Management to discontinue or

take corrective action, or heal the situation, or to take other relevant action. The Monitor can in this regard submit non-binding recommendations. Beyond this, the Monitor has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action.

8.6 The Monitor will submit a written report to the CMD, BHEL within 8 to 10 weeks from the date of reference or intimation to him by the Principal and, should the occasion arise, submit proposals for correcting problematic situations.

8.7 The CMD, BHEL shall decide the compensation to be paid to the Monitor and its terms and conditions.

8.8 If the Monitor has reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant IPC / PC Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.

8.9 The number of Independent External Monitor(s) shall be decided by the CMD, BHEL.

8.10 The word 'Monitor' would include both singular and plural.

Section 9 – Pact Duration

9.1 This Pact begins when both parties have legally signed it. It expires for the Contractor 12 months after the last payment under the respective contract and for all other Bidders 6 months after the contract has been awarded.

9.2 If any claim is made / lodged during this time, the same shall be binding and continue to be valid despite the lapse of this pact as specified as above, unless it is discharged/ determined by the CMD, BHEL.

Section 10 – Other Provisions

10.1 This agreement is subject to Indian Laws and jurisdiction shall be registered office of the Principal, i.e. New Delhi.

10.2 Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.

10.3 If the Contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members.

10.4 Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

10.5 Only those bidders/ contractors who have entered into this agreement with the Principal would be competent to participate in the bidding. In other words, entering into this agreement would be a preliminary qualification.

----------	----------
For & On behalf of the Principal	For & On behalf of the Bidder/ Contractor
(Office Seal)	(Office Seal)

Place----------

Date----------

Witness: _____	Witness: _____
(Name & Address) _____	(Name & Address)_____
_____	_____

INTEGRITY PACT

(a) IP is a tool to ensure that activities and transactions between the Company and its Bidders/Contractors are handled in a fair, transparent and corruption free manner. A panel of Independent External Monitors (IEMs) have been appointed to oversee implementation of IP in BHEL. The IP as enclosed with the tender (total 7 sheets) is to be submitted (duly signed by authorized signatory who signs in the offer) along with techno-commercial bid. Only those bidders who have entered into such an IP with BHEL would be competent to participate in the bidding. In other words, entering into this Pact would be a preliminary qualification.

Details of IEM for this tender is furnished below:

Mr. Arun Chandra Verma, IPS (Retd.)
Mr. Virendra Bahadur Singh IPS (Retd)

(b) Please refer Section-8 of the IP for Role and Responsibilities of IEMs. In case of any complaint arising out of the tendering process, the matter may be referred to the IEM mentioned inthe tender. No routine correspondence shall be addressed to the IEM (phone/post/email) regarding the clarifications, time extensions or any other administrative queries, etc. on the tender issued. All such clarification/issues shall be addressed directly to the tender issuing (procurement) department."

GENERAL CONDITIONS

OF

CONTRACT

SOLAR BUSINESS DIVISION
BHARAT HEAVY ELECTRICALS LIMITED
(A Govt. of India Undertaking)
PROF. CNR RAO CIRCLE, IISc POST
MALLESHWARAM
BANGALORE - 560012

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CHAPTER -1

1. GENERAL INSTRUCTION TO TENDERERS

1.1. DESPATCH INSTRUCTION

i) The General Conditions of Contract form part of the Tender specifications. All pages of the tender documents shall be duly signed, stamped and submitted along with the offer in token of complete acceptance thereof. The information furnished shall be complete by itself. The tenderer is required to furnish all the details and other documents as required in the following pages

ii) Tenderers are advised to study all the tender documents carefully. Any submission of tender by the tenderer shall be deemed to have been done after careful study and examination of the tender documents and with the full understanding of the implications thereof. Should the tenderers have any doubt about the meaning of any portion of the Tender Specification or find discrepancies or omissions in the drawings or the tender documents issued are incomplete or shall require clarification on any aspects, the scope of work etc., he shall contact the authority inviting the tender well in time (so as not to affect last date of submission) for clarification before the submission of the tender. Tenderer's request for clarifications shall be with reference to Sections and Clause numbers given in the tender documents. The tender specifications and terms and conditions shall be deemed to have been accepted by the tenderer in the offer. Pre requirements and conditions shall be liable for rejection.

iii) Integrity pact (IP): If NIT calls for Integrity Pact, the same shall be duly signed & stamped by the authorised signatory & submitted along with tender document.

1.2. SUBMISSION OF TENDERS

1.2.1 The tenderers must submit their tenders as per instructions in the NIT

1.2.2 BHEL takes no responsibility for delay, loss or non-receipt of tenders sent by post/courier. The tenders received after the specified time of their submission are treated as 'Late Tenders' and shall not be considered under any circumstances. Offers received by Fax/Email/Internet shall be considered as per terms of NIT.

1.2.3 Tenders shall be opened by authorised Officer of BHEL at his office at the time and date as specified in the NIT, in the presence of such of those tenderers or their authorised representatives who may be present

1.2.4 Tenderers whose bids are found techno commercially qualified shall be informed the date and time of opening of the Price Bids and such Tenderers may depute their representatives to witness the opening of the price bids. BHEL's decision in this regard shall be final and binding.

1.2.5 Before submission of Offer, the tenderers are advised to inspect the site of work and the environments and be well acquainted with the actual working and other prevalent conditions, facilities available, position of material and labour, means of transport and access to Site, accommodation, etc. No claim will be entertained later on the grounds of lack of knowledge of any of these conditions.

1.3. ***LANGUAGE***

1.3.1 The tenderer shall quote the rates in English language and international numerals. These rates shall be entered in figures as well as in words. For the purpose of the tenders, the metric system of units shall be used.

1.3.2 All entries in the tender shall either be typed or written legibly in ink. Erasing and overwriting is not permitted and may render such tenders liable for rejection. All cancellations and insertions shall be duly attested by the tenderer.

1.4 ***PRICE DISCREPANCY:***

1.4.1 Conventional (Manual) Price Bid opening:

i) If, in the price structure quoted for the required goods/services/works, there is discrepancy between the unit price and the total price (which is obtained by multiplying the unit price by the quantity), the unit price shall prevail and the total price corrected accordingly, unless in the opinion of BHEL there is obvious misplacement of decimal point in the unit price, in which case the total price as quoted shall govern and the unit price corrected accordingly

ii) If there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected;

iii) If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject of (i) and (ii) above.

iv) If there is such discrepancy in an offer, the same shall be conveyed to the bidder with target date up to which the bidder has to send his acceptance on the above lines and if the bidder does not agree to the decision of BHEL, the bid is liable to be ignored.

v) In case of lump sum price, if there is any difference between the amount in figures and in words, the amount quoted by the bidder in words shall be taken as correct.

vi) In case of omission in quoting any rate for one or more items, the evaluation shall be done considering the highest quoted rate obtained against the respective items by other tenderers for the subject tender. If the tenderer becomes L-1, the notional rates for the omission items shall be the lowest rates quoted for the respective items by the other tenderers against the respective omission items for the subject job and the 'Total quoted price (loaded for omissions)' shall be arrived at. However, the overall price remaining the same as quoted originally, the rates for all the items in the 'Total quoted price (loaded for omissions)' shall be reduced item wise in proportion to the ratio of 'Original' total price and the 'Total quoted price (loaded for omissions)".

1.4.2 Reverse Auction: In case of Reverse Auction, the successful bidder shall undertake to execute the work as per overall price offered by him during the Reverse Auction process. In case of omission of rates, the procedure shall be as per 'Guidelines for Reverse Auction' enclosed.

i) Offers from tenderers who are under suspension (banned) by any Unit/Region/Division of BHEL shall not be considered. ii) Offers from tenderers who do not comply with the latest guidelines of Ministry/ Commissions of Govt of India shall not be considered.

1.5. EVALUATION OF BIDS

i) Technical Bids submitted by the tenderer will be opened first and evaluated for fulfilling the Pre-Qualification criteria and other conditions in NIT/Tender documents, based on documentary evidences submitted along with the offer, BHEL reserves the right to ask for proofs/documents, clarification in relation to Technical/commercial data during tender evaluation

ii) Price Bids of shortlisted bidders shall only be opened either through the conventional price bid opening or through electronic Reverse Auction, at the discretion of BHEL

iii) Price Bids of unqualified bidders shall not be opened. Reasons for rejection shall be intimated to the vendor before the opening of Price bid.

1.6. DATA TO BE ENCLOSED

The following information in full shall be furnished by the tenderer. Non-submission of this information may lead to rejection of the offer.

i) INCOME TAX PERMANENT ACCOUNT NUMBER, GSTIN, SAC, HSN Certified copies of PAN, GSTIN shall be furnished along with tender. The names, addresses and contact information of the Directors/Partners shall be furnished along with the offer.

ii) An attested copy of the Power of Attorney, in case the tender is signed by an individual other than the sole proprietor.

iii) IN CASE OF INDIVIDUAL TENDERER:

His / her full name, address, PAN, GSTIN and place & nature of business to be furnished. iv)

IN CASE OF PARTNERSHIP FIRM

The names of all the partners and their addresses, a copy of the partnership deed/instrument of partnership shall be enclosed.

v) IN CASE OF COMPANIES:

Date and place of registration including date of commencement certificate in case of Public Companies (certified copies of Memorandum and articles of Association are also to be furnished). Nature of business carried on by the Company and the provisions of the Memorandum relating thereof.

1.7. AUTHORISATION AND ATTESTATION

Tenders shall be signed by a person duly authorised/empowered to do so. An attested copy of the Power of Attorney, in case the tender is signed by an individual other than the sole proprietor shall be submitted along with the tenders

1.8. EARNEST MONEY DEPOSIT

1.8.1 Every tender must be accompanied by the prescribed amount of Earnest Money Deposit (EMD) in the manner described herein.

The EMD may be accepted only in the following forms:

(i) Electronic Fund Transfer credited in BHEL account (before tender opening)

(ii) Banker's cheque/ Pay order/ Demand draft, in favour of BHEL (along with offer) In case total EMD amount is more than Rs 20 Lakh, the amount in excess of Rs 20 lakh maybe accepted in the form of Bank Guarantee from scheduled bank. The Bank Guarantee in such cases shall be valid for at-least six months.

(iii) Through SBI collect (before tender opening)

(iv) No other form of EMD remittance shall be acceptable to BHEL

1.8.2 EMD by the bidder will be forfeited as per Tender Documents if

i) After opening the tender and within the offer validity period, the tenderer revokes his/her tender or makes any modification in his tender which is not acceptable to BHEL.

ii) The Contractor fails to deposit the required Security deposit or commence the work within the period as per LOI/ Contract.

iii) EMD by the tenderer shall be withheld in case any action on the tenderer is envisaged in derailing the tender process by unlawful means.

1.8.3 EMD shall not carry any interest.

1.8.4 In the case of unsuccessful bidders, the Earnest Money will be refunded to them within a reasonable time after acceptance of award by successful tenderer.

1.8.5 EMD of successful tenderer will be converted as part of Security Deposit

1.9. ***SECURITY DEPOSIT***

The total amount of Security Deposit will be 5% of the contract value (including all applicable taxes) EMD of the successful tenderer shall be converted and adjusted towards the required amount of Security Deposit.

1.9.1 Modes of Security deposit:
The balance amount to make up the required Security Deposit of 5% of the contract value may be accepted in the following forms:
i) Cash (as permissible under the extant Income Tax Act) ii) Local cheques of Scheduled Banks (subject to realization)/ Pay Order/ Demand Draft/ Electronic Fund Transfer in favour of BHEL
iii) Bank Guarantee from Scheduled Banks/ Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format should have the approval of BHEL iv) Fixed Deposit Receipt issued by Scheduled Banks/ Public Financial Institutions as defined in the Companies Act (FDR should be in the name of the Contractor, a/c BHEL)
v) Securities available from Indian Post offices such as National Savings Certificates, Kisan Vikas Patras etc. (held in the name of Contractor furnishing the security and duly endorsed/ hypothecated/ pledged, as applicable, in favour of BHEL) (Note: BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith) vi) 50% of the required Security Deposit, including the EMD, should be paid before start of the work. Balance of the Security Deposit can be collected by deducting10% of the gross amount progressively from each of the running bills of the Contractor till the total amount of the required Security Deposit is collected. If the value of work done at any time exceeds the contract value, the amount of Security Deposit shall be correspondingly enhanced and the additional Security Deposit shall be immediately deposited by the Contractor or recovered from payment/s due to the Contractor. Security Deposit shall be released to the Contractor upon fulfilment of contractual obligations as per terms of the contract.

1.9.2 The Security Deposit shall not carry any interest.

1.9.3 The validity of Bank Guarantees towards Security Deposit shall be initially up to the completion period as stipulated in the Letter of Intent/Award (plus maintenance period if applicable), and 03 months claim period. The same shall be kept valid by proper renewal till the acceptance of Final Bills of the Contractor, by BHEL

1.9.4 BHEL reserves the right of forfeiture of Security Deposit in addition to other claims and penalties in the event of the Contractor's failure to fulfil any of the contractual obligations or

in the event of termination of contract as per terms and conditions of contract. BHEL reserves the right to set off the Security Deposit against any claims of other contracts with BHEL.

*1.10. **REFUND OF SECURITY DEPOSIT***

50% of the security deposit may be refunded on completion of the work after payment of the final bill and the balance 50% of the security deposit is refunded only after the expiry of the maintenance period from date of completion of work as stipulated in the contract concerned.

***1.10.1** DEFECTS LIABILITY PERIOD:*

The contractor shall be responsible to make good and remedy at his own expenses within such period as may be stipulated by the Engineer-in-charge, any defect which may develop or may be noticed before the expiry of the maintenance period of six months or as stipulated in NIT hereto from the certified date of completion and intimation of which has been sent to the contractor within seven days of the expiry of the said period by a letter sent by hand delivery or by registered post or Email. If contractor fails to attend to the above, defect will be rectified at contractor's risk & cost and same will be deducted from the security deposit/payable amounts available with BHEL.

*1.11. **BANK GUARANTEES***

Where ever Bank Guarantees are to be furnished/submitted by the contractor, the following shall be complied with

i) Bank Guarantees shall be from Scheduled Banks / Public Financial Institutions as defined in the Companies Act. ii) The Bank Guarantees shall be as per prescribed BHEL formats.

iii) It is the responsibility of the bidder to get the Bank Guarantees revalidated/extended for the required period (subject to a minimum period of six months), as per the advice of BHEL. BHEL shall not be liable for issue of any reminders regarding expiry of the Bank Guarantees.

iv) In case extension/further extensions of any Bank Guarantees are not required, the bidders shall ensure that the same is explicitly endorsed by BHEL

v) In case the Bank Guarantees are not extended before the expiry date, BHEL reserves the right to invoke the same by informing the concerned Bank in writing, without any advance notice/communication to the concerned bidder.

vi) Bidders to note that any corrections to Bank Guarantees shall be done by the issuing Bank, only through an amendment in an appropriate non judicial stamp paper.

vii) The Original Bank Guarantee shall be sent directly by the Bank to BHEL under Registered Post (Acknowledgement Due).

1.12. VALIDITY OF OFFER

The rates in the Tender shall be kept open for acceptance for a minimum period of Ninety (90) DAYS from latest due date of offer submission (including extension, if any). In case BHEL calls for negotiations, such negotiations shall not amount to cancellation or withdrawal of the original offer which shall be binding on the tenderers.

1.13 EXECUTION OF CONTRACT AGREEMENT

The successful tenderer's responsibility under this contract commences from the date of issue of the Letter of Intent by BHEL. The Tenderer shall submit an unqualified acceptance to the Letter of Intent/Award within the period stipulated therein.

The successful tenderer shall be required to execute an agreement in the prescribed form, with BHEL, within fifteen days (15 days) after the acceptance of the Letter of Intent/Award, and in any case before releasing the first running bill. The contract agreement shall be signed by a person duly authorized/empowered by the tenderer. The expenses for preparation of agreement document shall be borne by Tenderer.

1.14. REJECTION OF TENDER AND OTHER CONDITIONS

1.14.1 The acceptance of tender will rest with BHEL which does not bind itself to accept the lowest tender or any tender and reserves to itself full rights for the following without assigning any reasons whatsoever: -

a. To reject any or all of the tenders.

b. To split up the work amongst two or more tenderers as per NIT

c. To award the work in part if specified in NIT

d. In case of either of the contingencies stated in (b) and (c) above, the time for completion as stipulated in the tender shall be applicable.

1.14.2 Conditional tenders, unsolicited tenders, tenders which are incomplete or not in the form specified or defective or have been materially altered or not in accordance with the tender conditions, specifications etc., are liable to be rejected.

1.14.3 Tenders are liable to be rejected in case of unsatisfactory performance of the tenderer with BHEL, or tenderer under suspension (hold/banning /delisted) by any unit / region / division of BHEL or tenderers who do not comply with the latest guidelines of Ministry/Commissions of Govt of India. BHEL reserves the right to reject a bidder in case it is observed that they are overloaded and may not be in a position to execute this job. The decision of BHEL will be final in this regard.

1.14.4 If a tenderer who is a proprietor expires after the submission of his tender or after the acceptance of his tender, BHEL may at their discretion, cancel such tender. If a partner of a firm expires after the submission of tender or after the acceptance of the tender, BHEL may then cancel such tender at their discretion, unless the firm retains its character.

1.14.5 BHEL will not be bound by any Power of Attorney granted by changes in the composition of the firm made subsequent to the execution of the contract. They may, however, recognize such power of Attorney and changes after obtaining proper legal advice, the cost of which will be chargeable to the contractor concerned.

1.14.6 If the tenderer deliberately gives wrong information in his tender, BHEL reserves the right to reject such tender at any stage or to cancel the contract if awarded and forfeit the Earnest Money/Security Deposit/any other money due.

1.14.7 Canvassing in any form in connection with the tenders submitted by the Tenderer shall make his offer liable to rejection.

1.14.8 In case the Proprietor, Partner or Director of the Company/Firm submitting the Tender, has any relative or relation employed in BHEL, the authority inviting the Tender shall be informed, along with the Offer. Failing to do so, BHEL may, at its sole discretion, reject the tender or cancel the contract and forfeit the Earnest Money/Security Deposit.

1.14.9 The successful tenderer should not sub-contract part or complete work detailed in the tender specification undertaken by him without written permission of BHEL's Construction Manager/Site Incharge. The tenderer is solely responsible to BHEL for the work awarded to him.

1.14.10 The Tender submitted by a techno commercially qualified tenderer shall become the property of BHEL who shall be under no obligation to return the same to the bidder. However unopened price bids and late tenders shall be returned to the bidders after finalization of contract.

1.14.11 Unsolicited discount received after the due date and time of Bid Submission shall not be considered for evaluation. However, if the party who has submitted the unsolicited discount/rebate becomes the L-I party, then the awarded price i.e contract value shall be worked out after considering the discount so offered.

1.14.12 BHEL shall not be liable for any expenses incurred by the bidder in the preparation of the tender irrespective of whether the tender is accepted or not.

1.15 ***BHEL Fraud Prevention Policy:***

The bidder along with its associate/ collaborators/sub-contractors/ Sub-Vendors/ Consultants/service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website http://www.bhel.com and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as soon as it comes to their notice. Fraud prevention policy and list of Nodal officers shall be hosted on BHEL website, vendor portals of Units/Regions Internet.

CHAPTER-2

2.1 DEFINITION: The following terms shall have the meaning hereby assigned to them except where the context otherwise requires

i) BHEL shall mean Bharat Heavy Electricals Limited, a company registered under Companies Act 1956, with its Registered Office at BHEL HOUSE, SIRI FORT, NEW DELHI – 110 049, or its Authorised Officers or its Site Engineers or other employees authorised to deal with any matters with which these persons are concerned on its behalf.

ii) "EXECUTIVE DIRECTOR" or 'GROUP GENERAL MANAGER' or "GENERAL MANAGER (Incharge)" or "GENERAL MANAGER" shall mean the Officer in SOLAR BUSINESS DIVISION, Prof. CNR Rao Circle, IISc Post, Malleshwaram, Bangalore - 560012

iii) "COMPETENT AUTHORITY" shall mean Executive Director or Group General Manager or General Manager (In-charge) or General Manager or BHEL Officers who are empowered to act on behalf of the Executive Director or General Manager (In-charge) or General Manager of BHEL.

iv) "ENGINEER" or "ENGINEER IN CHARGE" shall mean an Officer of BHEL as may be duly appointed and authorized by BHEL to act as "Engineer" on his behalf for the purpose of the Contract, to perform the duty set forth in this General Conditions of Contract and other Contract documents. The term also includes 'CONSTRUCTION MANAGER' or 'SITE

INCHARGE' as well as Officers

v) "SITE" shall mean the places or place at which the plants/equipment are to be erected and services are to be performed as per the specification of this Tender.

vi) "CLIENT OF BHEL" or "CUSTOMER" shall mean the project authorities with whom BHEL has entered into a contract for supply of equipment or provision of services.

vii) "CONTRACTOR" shall mean the successful Bidder/Tenderer who is awarded the Contract and shall include the Contractor's successors, heirs, executors, administrators and permitted assigns.

viii) "CONTRACT" or "CONTRACT DOCUMENT" shall mean and include the Work Order, Contract Agreement, the accepted appendices of Rates, Schedules, Quantities if any, General Conditions of Contract, Special Conditions of Contract, Instructions to the Tenderers, Drawings, Technical Specifications, the Special Specifications if any, the Tender documents, subsequent amendments mutually agreed upon and the Letter of Intent/Acceptance issued by BHEL. Any conditions or terms stipulated by the contractor in the tender documents or subsequent letters shall not form part of the contract unless, specifically accepted in writing by BHEL in the Letter of Intent/Award and incorporated in the agreement.

ix) "GENERAL CONDITIONS OF CONTRACT" shall mean the 'Instructions to Tenderers' and 'General Conditions of Contract' pertaining to the work for which above tenders have been called for.

x) "TENDER SPECIFICATION" or "TENDER" or "TENDER DOCUMENTS" shall mean General Conditions, Common Conditions, Special Conditions, Price Bid, Rate Schedule, Technical Specifications, Appendices, Annexures, Corrigendum's, Amendments, Forms, procedures, Site information, etc and drawings/documents pertaining to the work for which the tenderers are required to submit their offers. Individual specification number will be assigned to each Tender Specification.

xi) "LETTER OF INTENT" shall mean the intimation by a Post/Fax/email to the tenderer that the tender has been accepted in accordance with provisions contained in the letter. The responsibility of the contractor commences from the date of issue of this letter and all terms and conditions of the contract are applicable from this date.

xii) "COMPLETION TIME" shall mean the period by 'date/month' specified in the 'Letter of Intent/Award' or date mutually agreed upon for handing over of the intended scope of work, the erected equipment/plant which are found acceptable by the Engineer, being of required standard and conforming to the specifications of the Contract.

xiii) "PLANT" shall mean and connote the entire assembly of the plant and equipment's covered by the contract.

xiv) "EQUIPMENT" shall mean equipment, machineries, materials, structural, electrical and other components of the plant covered by the contract.

xv) "TESTS" shall mean and include such test or tests to be carried out on the part of the contractor as are prescribed in the contract or considered necessary by BHEL, in order to ascertain the quality, workmanship, performance and efficiency of the contractor or part thereof.

xvi) "APPROVED", "DIRECTED" or "INSTRUCTED" shall mean approved, directed or instructed by BHEL.

xvii) "WORK or CONTRACT WORK" shall mean and include supply of all categories of labour, specified consumables, tools and tackles and Plants required for complete and satisfactory site transportation, handling, stacking, storing, erecting, testing and commissioning of the equipment's to the entire satisfaction of BHEL.

xviii) "SINGULAR AND PLURALS ETC" words carrying singular number shall also include plural and vice versa, where the context so requires. Words imparting the masculine Gender shall be taken to include the feminine Gender and words imparting persons shall include any Company or Associations or Body of Individuals, whether incorporated or not.

xix) "HEADING" – The heading in these General Conditions are solely for the purpose of facilitating reference and shall not be deemed to be part thereof or be taken as instructions thereof or of the contract.

xx) "MONTH" shall mean calendar month unless otherwise specified in the Tender.

xxi) Day' or 'Days' unless herein otherwise expressly defined shall mean calendar day or days of twenty-four (24) hours each. A week shall mean continuous period of seven (7) days.

xxii) "COMMISSIONING" shall mean the synchronization testing and achieving functional operation of the Equipment with associated system after all initial adjustments, trials, cleaning, re-assembly required at site if any, have been completed and Equipment with associated system is ready for taking into service.

xxiii) "WRITING" shall include any manuscript type written or hand written or printed statement or electronically transmitted messages, under the signature or seal or transmittal of BHEL.

xxiv) "TEMPORARY WORK" shall mean all temporary works for every kind required in or for the execution, completion, maintenance of the work.

xxv) 'CONTRACT PRICE' or 'CONTRACT VALUE' shall mean the sum including applicable taxes mentioned in the LOI/LOA/Contract Agreement subject to such additions thereto or deductions there from as may be made under provisions hereinafter contained

xxvi) "COMMENCEMENT DATE" or "START DATE" shall mean the commencement/start of work at Site as per terms defined in the Tender

xxvii) "SHORT CLOSING" or "FORE CLOSING" of Contract shall mean the premature closing of Contract, for reasons not attributable to the contractor and mutually agreed between BHEL and the contractor

xxviii) "TERMINATION" of Contract shall mean the pre mature closing of contract due to reasons as mentioned in the contract

2.2 LAW GOVERNING THE CONTRACT AND COURT JURISDICTION

The contract shall be governed by the Law for the time being in force in the Republic of India. The Civil Court having original Civil Jurisdiction at Bengaluru, shall alone have exclusive jurisdiction in regard to all claims in respect of the Contract. No other Civil Court shall have jurisdiction in case of any dispute, under this contract

2.3 ISSUE OF NOTICE

2.3.1 Service of notice on contractor: Any notice to be given to the Contractor under the terms of the contract shall be served by sending the same by Registered Post / Speed Post/ FAX / Email to or leaving the same at the Contractor's last known address of the principal place of business (or in the event of the contractor being a company, to or at its Registered Office). In case of change of address, the notice shall be served at changed address as notified in writing by the Contractor to BHEL. Such posting or leaving of the notice shall be deemed to be good service of such notice and the time mentioned to the condition for doing any act after notice shall be reckoned from the date so mentioned in such notice.

2.3.2 Service of notice on BHEL Any notice to be given to BHEL in-charge under the terms of the Contract shall be served by sending the same by post or Email or leaving the same at BHEL address or changed address as notified in writing by BHEL to the Contractor.

2.4 USE OF LAND

No land belonging to BHEL or their Customer under temporary possession of BHEL shall be occupied by the contractor without written permission of BHEL.

2.4.1 STORES AND MATERIALS:

The contractor shall, at his own expense, supply all stores and materials required for the contract, other than those which may be provided by BHEL at the rates detailed therein subject to their availability at the place of issue indicated therein. All stores and materials to be supplied by the Contractor shall be of the best kind as described in the Specifications and the Contractor shall, if required by the Engineer –in- charge furnish him with proof to his satisfaction that the store and materials so comply with the specifications.

The contractor shall, at his own expense and without delay, supply samples of stores and materials proposed to be used in the execution of the work for the approval of the Engineer-in charge, who may reject all stores and materials not corresponding either in quality or character to the approved samples.

In the case of stores provided by BHEL, the Contractor shall bear the cost of loading, transporting to site, unloading, storing under cover as required, assembling & jointing the

several parts together as necessary and incorporating & fixing these stores & materials in the work, including all preparatory work of whatever description that may be required, and closing, preparing, loading and returning empty cases or containers to the place of issue without any extra charges.
Contractor is responsible for safe & secure storage of above material.

2.4.2 PATENT RIGHTS:

The contractor shall fully indemnify BHEL, or the agent, servant, or employee of BHEL, against any action, claim or proceeding relating to infringement or the use of any patent or design or any alleged patent or design rights, and shall pay any royalties which may be payable in respect of any article/ or part thereof included in the contract.

In the event of any claims being made or action brought against BHEL, or any agent, or servant or employee of BHEL., in respect of any of the matters aforesaid, the contractor shall not apply when such increment has taken place in complying with the specific directions issued by the BHEL but the contractor shall pay any royalties payable in respect of any such use.

2.4.3 WATER:

The contractor shall allow in his tender and provide at his cost all water required for the work or his employees on the work, together with all pipes and fittings or other means that may be necessary or required to ensure a proper and ample supply of water for all purpose connected with the work.

In the event of a provision existing in the Tender documents for supply of water on payment by BHEL, water will be supplied from the BHEL supply System, or other sources at any points fixed by the Site Engineer/ Engineer-in-charge on the site of work. The contractor shall make necessary arrangement for lifting, pumping, carrying or conveying the water as required at his own cost. The levy of water charges to be borne by the Contractor in such case shall be specifically mentioned in the Tender documents.

2.4.4 TEMPORARY WORKSHOPS, STORES ETC:

The Contractor shall, during the progress of the work provide, erect and maintain at his own expense all necessary temporary workshops, store, offices, toilets etc., required for the proper and efficient execution of the work. The planning, siting and erection of these building shall have the approval of the Engineer-in-charge and the Contractor shall at all times keep them in a clean and sanitized condition to the entire satisfaction of the Engineer-in-charge.

On completion of the work all such temporary buildings shall be cleared and the site restored to its original state in a clean and tidy condition to the entire satisfaction of the Engineer-incharge.

2.5 COMMENCEMENT OF WORK

2.5.1 Time is essence of contract and is specified in the tender document or in each individual work order.

2.5.2 The contractor shall commence the work within seven (07) days from LOI/work order or as intimated by BHEL and shall proceed with the same with due expedition without delay.

2.5.3 If the contractor fails to start the work within stipulated time as per LOI or as intimated by BHEL, then BHEL at its sole discretion will have the right to cancel the contract. The Earnest Money and/or Security Deposit with BHEL will stand forfeited without any further reference to him without prejudice to any and all of BHEL's other rights and remedies in this regard.

2.5.4 All the work shall be carried out under the direction and to the satisfaction of BHEL.

2.6 MEASUREMENT OF WORK AND MODE OF PAYMENT:

2.6.1 All payments due to the contractors shall be made by electronic mode only, unless otherwise found operationally difficult.

2.6.2 For progress running bill payments: - The Contractor shall present detailed measurement sheets in triplicate, duly indicating all relevant details based on technical documents and connected drawings for work done during the month/period under various categories in line with terms of payment as per contract. The basis of arriving at the quantities, weights shall be relevant documents and drawings released by BHEL. These measurement sheets shall be prepared jointly with BHEL Engineers and signed by both the parties.

2.6.3 These measurement sheets will be checked by BHEL Engineer and quantities and percentage eligible for payment under various groups shall be decided by BHEL Engineer. The abstract of quantities and percentage so arrived at based on the terms of payment shall be entered in Measurement Book and signed by both the parties.

2.6.4 Based on the above quantities, contractor shall prepare the bills in prescribed format and work out the financial value. These will be entered in Measurement Book and signed by both the parties. Payment shall be made by BHEL after effecting the recoveries due from the contractor.

2.6.5 All recoveries due from the contractor for the month/period shall be effected in full from the corresponding running bills unless specific approval from the competent authorities is obtained to the contrary.

2.6.6 Measurement shall be restricted to that portion of work for which it is required to ascertain the financial liability of BHEL under this contract.

2.6.7 The measurement shall be taken jointly by persons duly authorized on the part of BHEL and by the Contractor.

2.6.8 The Contractor shall bear the expenditure involved if any, in making the measurements and testing of materials to be used/used in the work. The contractor shall, without extra charges, provide all the assistance with appliances and other things necessary for measurement.

2.6.9 If at any time due to any reason whatsoever, it becomes necessary to re-measure the work done in full or in part, the expenses towards such re measurements shall be borne by the contractor unless such re measurements are warranted solely for reasons not attributable to contractor.

2.6.10 Passing of bills covered by such measurements does not amount to acceptance of the completion of the work measured. Any left out work has to be completed, if pointed out at a later date by BHEL.

2.6.11 Final measurement bill shall be prepared in the final bill format prescribed for the purpose based on the certificate issued by BHEL Engineer that entire works as stipulated in tender specification has been completed in all respects to the entire satisfaction of BHEL. Contractor shall give unqualified "No Claim" Certificate. All the tools and tackles loaned to him should be returned in satisfactory condition to BHEL. The abstract of final quantities and financial values shall also be entered in the Measurement Books and signed by both parties to the contract. The Final Bill shall be prepared and paid within a reasonable time after completion of work.

2.7 RIGHTS OF BHEL

BHEL reserves the following rights in respect of this contract during the original contract period or its extensions if any, as per the provisions of the contract, without entitling the contractor for any compensation.

2.7.1 To withdraw any portion of work and/or to restrict/alter quantum of work as indicated in the contract during the progress of work and get it done through other agencies to suit BHEL's commitment to its customer or in case BHEL decides to advance the date of completion due to other emergent reasons/ BHEL's obligation to its customer.

2.7.2 To terminate the contract or get any part of the work done through other agency or deploy BHEL's own/hired/otherwise arranged resources, at the risk and cost of the contractor after due notice of a period of two weeks by BHEL, in the event of: -

i) Contractor's continued poor progress

ii) Withdrawal from or abandonment of the work before completion of the work iii)

Contractor's inability to progress the work for completion as stipulated in the contract

iv) Poor quality of work

v) Corrupt act of Contractor

vi) Insolvency of the Contractor

vii) Persistent disregard to the instructions of BHEL

viii) Assignment, transfer, sub-letting of contract without BHEL's written permission

ix) Non fulfilment of any contractual obligations / non-compliance of statutory requirements

x) In the opinion of BHEL, the contractor is overloaded and is not in a position to execute

the job as per required schedule

2.7.3 To meet the expenses including BHEL overheads of 35% & Liquidated damage/penalties arising out of "Risk & Cost" as explained above under Sl.No. 2.7.2. BHEL shall recover the amount from any money due from Contractor, from any money due to the Contractor including Security Deposit or by forfeiting any T&P or material of the contractor under this contract or any other contract of BHEL or by any other means or any combination thereof

2.7.4 To terminate the contract or to restrict the quantum of work and pay for the portion of work executed in case BHEL's contract with their customer are terminated for any reason, as per mutual agreement.

2.7.5 To effect recovery from any amounts due to the contractor under this or any other contract or in any other form, the moneys BHEL is statutorily forced to pay to anybody, due to contractor's failure to fulfil any of his obligations. BHEL shall levy overheads of 35% on all such payments.

2.7.6 While every endeavour will be made by BHEL to this end, they cannot guarantee uninterrupted work due to conditions beyond their control. The Contractor will not be normally entitled for any compensation/extra payment on this account unless otherwise specified elsewhere in the contract.

2.7.7 In case the execution of works comes to a complete halt or reaches a stage wherein worthwhile works cannot be executed and there is no possibility of commencement of work for a period of not less than two months, due to reasons not attributable to the contractor and other than Force Majeure conditions, BHEL may consider permitting the contractor to de mobilize forthwith and re mobilize at an agreed future date. Cost of such demobilization/remobilization shall be mutually agreed. ORC (Over run Charges) in such cases shall not be applicable for the period between the period of demobilization and re mobilisation. The duration of contract/time extension shall accordingly get modified suitably. In case of any conflict, BHEL decision in this regard shall be final and binding on the contractor.

2.7.8 In the unforeseen event of inordinate delay in receipt of materials, drawings, fronts, etc, due to which inordinate discontinuity of work is anticipated, BHEL at its discretion may consider contractor's request to short close the contract, provided that the balance works are minor vis a vis the scope of work envisaged as per the contract. At the point of requesting for short closure, contractor shall establish that he has completed all works possible of completion and he is not able to proceed with the balance works due to constraints beyond his control. In such a case, the estimated value of the unexecuted portion of work as mutually agreed, shall however be reduced from the final contract value.

2.7.9 ***LIQUIDATED DAMAGES/PENALTY***

COMPENSATION FOR DELAY:

If the contractor fails to maintain the required progress in terms of condition 2.10 or to complete the work and clear the site on or before the contracted or extended the period of completion, he shall, without prejudice to any other right or remedy of the BHEL on account of such breach, pay as agreed compensation an amount calculated as stipulated below

For unfinished anticipated value of work where finished portion is fit for use

Rate of compensation as follows:

- *Completion period (as originally stipulated) not exceeding 6 months. ……@ 1 percent per week*
- *Completion period (as originally stipulated) Exceeding 6 months and not exceeding 2 years…@ 0.5 percent per week*
- *Completion period (as originally stipulated) exceeding 2 years…… @ 0.25 percent per week*

Provided always that the total amount of compensation for delay to be paid under condition shall not exceed the under noted percentage of the anticipated contract value

- *Completion period (as originally stipulated) not exceeding 6 months. ……@ 10 percent of anticipated value of work*

- *Completion period (as originally stipulated) Exceeding 6 months and not exceeding 2 years…@ 7.5 percent of anticipated value of work*
- *Completion period (as originally stipulated) Exceeding 2 years……..@ 5 percent of anticipated value of work*

The amount of compensation may be adjusted or set off against any sum payable to the Contractor under this or any other contract with the BHEL.

2.7.10 ***POST TECHNICAL AUDIT OF WORK AND BILLS****: BHEL reserve the right to carry out a post-payment audit and technical examination of the work and final bill including all supporting vouchers, abstract etc., and to enforce recovery of any sums becoming due as a result thereof in the manner provided in the proceeding sub-paragraph's provided however that no such recovery shall be enforced after three years of passing the final bill*

2.8 ***RESPONSIBILITIES OF THE CONTRACTOR IN RESPECT OF LOCAL LAWS, EMPLOYMENT OF WORKERS ETC****.*

The following are the responsibilities of the contractor in respect of observance of local laws, employment of personnel, payment of taxes etc. The subcontractor shall fully indemnify BHEL against any claims of whatsoever nature arising due to the failure of the contractor in discharging any of his responsibilities hereunder:

2.8.1 The contractor at all times during the continuance of this contract shall, in all his dealings with local labour for the time being employed on or in connection with the work, have due regard to all local festivals and religious and other customs.

2.8.2 The contractor shall comply with all applicable State and Central Laws, Statutory Rules, Maternity act, Regulations etc. such as contract labour(R&A) Act 1970, Minimum wage Act 19748, Payment of wages Act 1936,ESI Act 1948, EPF Act 1952, Employees' compensation Act 1923, Provision of Companies Act 1948 & rules thereof, The interstate Migrant Workmen 1979, The Karnataka Factories Rules 1969, Payment of Bonus Act 1965, Payment of Gratuity Act 1972. Child labour Prohibition act 1986, Karnataka Minimum Wage Act , Prevention of sexual harassment at work place Act 2013, Guidelines/notification related to Safai Karamchari Act , Equal Remuneration Act 1976, The company's instructions as issued from time to time in regard to working hours, wages, leaves, holidays etc. for labour as may be enacted by the Government during the tenure of the Contract and having force or jurisdiction at Site. The Contractor shall also give to the local Governing Body, Police and other relevant Authorities all such notices as may be required by the Law.

The contractor shall produce the following registers and forms:

- *Form XIII- Register of work men employed by contractor(Rule 75)*
- *Form XIV- Employment Card issued by contractor(Rule 76)*
- *Form XVI- Muster Roll (Rule 78(1) (a)(i))*

- *Form XVII- Register of Wages (Rule 78(1) (a)(i))*
- *Form XVIII- Register of wages cum Muster Roll(in case of weekly payment)*
- *Form XIX- Wage slip (Rule 78(b))*
- *Form XX- Register of deduction for damages Or Loss Rule 78(1) (a)(ii))*
- *Form XXI- Register of files Rule 78(1) (a)(ii))*
- *Form XXII- Register of Advance Rule 78(1) (a)(ii))* x *Form XXIII- Register of Overtime Rule 78(1) (a)(iii))*
- *Form XXIV- Return to be sent by the contractor to the Licensing officer (Rule 82(1))*

2.8.3 The contractor shall obtain independent License under the Contract Labour (Regulations and Abolition Act) as required from the concerned Authorities based on the certificate (Form-
V) issued by the Principal Employer/Customer

2.8.4 The contractor shall pay all taxes, fees, license charges, deposits, duties, tolls, royalties, commission or other charges which may be levied on account of his operations in executing the contract.

2.8.5 While BHEL would pay the inspection fees and Registration fees of Boiler & explosive/Electrical Inspectorate, all other arrangements for site visits periodically by the Inspectorate to site, Inspection certificate etc. will have to be made by contractor. However, BHEL will not make any payment to the Inspectorate in connection with contractor's Welders/Electricians qualification tests etc.

2.8.6 Contractor shall be responsible for provision of Health and Sanitary arrangements (more particularly described in Contract Labour Regulation & Abolition Act), Safety precautions etc. as may be required for safe and satisfactory execution of contract.

2.8.7 The contractor shall be responsible for proper accommodation including adequate medical facilities for personnel employed by him.

2.8.8 The contractor shall be responsible for the proper behavior and observance of all regulations by the staff employed by him.

2.8.9 The contractor shall ensure that no damage is caused to any person/property of other parties working at site. If any such damage is caused, it is responsibility of the contractor to make good the losses or compensate for the same.

2.8.10 All the properties/equipment/components of BHEL/their Client loaned with or without deposit to the contractor in connection with the contract shall remain properties of BHEL/their Client.

2.8.11 The contractor shall use such properties for the purpose of execution of this contract. All such properties/equipment/components shall be deemed to be in good condition when

received by the contractor unless he notifies within 48 hours to the contrary. The contractor shall return them in good condition as and when required by BHEL/their Client. In case of non-return, loss, damage, repairs etc, the cost thereof as may be fixed by BHEL Engineer will be recovered from the contractor

2.8.12 Any delay in completion of works/or non-achievement of periodical targets due to the reasons attributable to the contractor, the same may have to be compensated by the contractor either by increasing manpower and resources or by working extra hours and/or by working more than one shift. All these are to be carried out by the contractor at no extra cost.

2.8.13 The contractor shall arrange, coordinate his work in such a manner as to cause no hindrance to other agencies working in the same premises.

2.8.14 All safety rules and codes applied by the Client/BHEL at site shall be observed by the contractor without exception. The contractor shall be responsible for the safety of the equipment/material and works to be performed by him and shall maintain all light, fencing guards, slings etc. or other protection necessary for the purpose. Contractor shall also take such additional precautions as may be indicated from time to time by the Engineer with a view to prevent pilferage, accidents, fire hazards. Due precautions shall be taken against fire hazards and atmospheric conditions. Suitable number of Clerical staff, watch and ward, store keepers to take care of equipment/materials and construction tools and tackles shall be posted at site by the contractor till the completion of work under this contract. The contractor shall arrange for such safety devices as are necessary for such type of work and carry out the requisite site tests of handling equipment, lifting tools, tackles etc. as per prescribed standards and practices. Contractor has to ensure the implementation of Health, Safety and Environment (HSE) requirements as per directions given by BHEL/Customer. The contractor has to assist in HSE audit by BHEL/Customer and submit compliance Report. The contractor has to generate and submit record/reports as per HSE plan/activities as per instruction of BHEL/Customer. All tools, plant and equipment brought to the site shall become the property of BHEL and shall not be removed from the site without the prior written approval from BHEL. When the work is finally completed or the Contractor is determined for reasons other than the defaults of the contract, he shall forthwith remove from the site all tools, plants, equipment etc., (other than those as may have been provided by BHEL) and upon such removal, the same shall revert in, and become the property of the contractor.

2.8.15 The contractor will be directly responsible for payment of wages to his workmen on specified date of respective month declared as per applicable Labour Act. A pay roll sheet giving all the payments given to the workers and duly signed by the contractor's representative should be furnished to BHEL site for record purpose.

2.8.16 In case of any class of work for which there is no such specification as laid down in the contract, such work shall be carried out in accordance with the instructions and requirements of the Engineer.

2.8.17 Also, no idle charges will be admissible in the event of any stoppage caused in the work resulting in contractor's labour and Tools & Plants being rendered idle due to any reason at any time.

2.8.18 The contractor shall take all reasonable care to protect the materials and work till such time the plant/equipment has been taken over by BHEL or their Client whichever is earlier.

2.8.19 The contractor shall not stop the work or abandon the site for whatsoever reason of dispute, excepting force majeure conditions. All such problems/disputes shall be separately discussed and settled without affecting the progress of work. Such stoppage or abandonment shall be treated as breach of contract and dealt with accordingly

2.8.20 The contractor shall keep the area of work clean and shall remove the debris etc. while executing day-to-day work. Upon completion of work, the contractor shall remove from the vicinity of work, all scrap, packing materials, rubbish, unused and other materials and deposit them in places specified by the Engineer. The contractor will also demolish all the hutments, sheds, offices, etc. constructed and used by him and shall clean the debris. In the event of his failure to do so, the same will be arranged to be done by the Engineer and the expenses recovered from the contractor. If the work is executed in Factory premises, no hutment will be allowed.

2.8.21 The contractor shall execute the work in the most substantial and workman like manner in the stipulated time. Accuracy of work and timely execution shall be the essence of this contract. The contractor shall be responsible to ensure that the quality, assembly and workmanship conform to the dimensions and clearance given in the drawings and/ or as per the instructions of the Engineer.

2.8.22 The Contractor to note that some of BHEL's T&Ps/MMDs may not be insured. The Contractor will take necessary precautions and due care to protect the same while in his custody from any damage/ loss till the same is handed over back to BHEL. In case the damage / loss is due to carelessness/ negligence on the part of the contractor, the Contractor is liable to get them repair/ replaced immediately and in case of his failure to do so within a reasonable time, BHEL will reserve the right to recover the loss from the contractor.

2.8.23 The contractor shall provide all watchmen necessary, for the protection of the site, the work, the materials, the tools, plant, equipment and anything else lying on the site during the progress of the work. He shall solely be responsible for and shall take all reasonable and proper steps for protecting, securing, lighting and watching all places on or about the work and the site which may be dangerous to any person whom so ever.

2.8.24 SITE DRAINAGE: All water that may accumulate on the site during the process of the work, or in trenches and excavations shall be removed to the entire satisfaction of the Engineering-charge and at Contractors expense.

2.8.25 INSPECTION OF THE WORK: BHEL Officers concerned with the Contract shall have power at any time to inspect and examine any part of the work and the contractor shall give such facilities as may be required to given for such inspection and examination.

2.8.26 In case the contractor is required to undertake any work outside the scope of this contract, the rates payable shall be those mutually agreed upon if the item rates are not mentioned in existing contract

i. *For any item of wok required to be carried out after the contract has been awarded and which is not covered by Contractors Schedule but is covered by C.P.W.D. schedule of rates the rate payable for such a fresh item will be derived from updated C.P.W.D. schedule of rates by the method of proportion as follows:*

ii. *Rate as per estimated updated C.P.W.D DSR and loading tender excess (plus or minus) on pro–rata basis for nearest analogous items. For other items rate as per estimated C.P.W.D DSR and loading tender excess(plus or minus) iii.If rates are not available in C.P.W.D. DSR, deviated item rates will be derived from market rate with 15% profit and overheads.*

2.9 PROGRESS MONITORING, MONTHLY REVIEW AND PERFORMANCE EVALUATION

2.9.1 A detailed plan/programme for completion of the contractual scope of work as per the time schedule given in the contract shall be jointly agreed between BHEL and Contractor, before commencement of work. The above programme shall be supported by month wise deployment of resources viz Manpower, T&P, Consumables, etc. Progress will be reviewed periodically (Daily/Weekly/Monthly) vis a vis this jointly agreed programme. The Contractor shall submit periodical progress reports (Daily/Weekly/Monthly) and other reports/information including manpower, consumables, T&P mobilization etc as desired by BHEL.

2.9.2 Monthly progress review between BHEL and Contractor shall be based on the agreed programme as above, availability of inputs/fronts etc, and constraints if any, as per prescribed formats. Manpower, T&P and consumable reports as per prescribed formats shall be submitted by contractor every month. Release of RA Bills shall be contingent upon certification by BHEL Site Engineer of the availability of the above prescribed formats duly filled in and signed.

2.9.3 The burden of proof that the causes leading to any shortfall is not due to any reasons attributable to the contractor is on the contractor himself. The monthly progress review shall record shortfalls attributable to (i) Contractor, (ii) Force Majeure Conditions, and (iii) BHEL

*2.10 **TIME OF COMPLETION***

2.10.1 Time is essence of the contract. The time schedule shall be as prescribed in the Contract. The time for completion shall be reckoned from the date of commencement of work at Site as certified by BHEL Engineers

2.10.2 The entire work shall be completed by the contractor within the time schedule or within such extended periods of time as may be allowed by BHEL under clause 2.11

*2.11 **EXTENSION OF TIME FOR COMPLETION***

2.11.1 If the completion of work as detailed in the scope of work gets delayed beyond the contract period, the contractor shall request for an extension of the contract and BHEL at its discretion may extend the Contract.

2.11.2 Based on the monthly reviews jointly signed, the works balance at the end of original contract period less the backlog attributable to the contractor shall be quantified, and the number of months of 'Time extension' required for completion of the same shall be jointly worked out. Within this period of 'Time extension', the contractor is bound to complete the portion of backlog attributable to the contractor. Any further 'Time extension' or 'Time extensions' at the end of the previous extension shall be worked out similarly.

2.11.3 However if any 'Time extension' is granted to the contractor to facilitate continuation of work and completion of contract, due to backlog attributable to the contractor alone, then it shall be without prejudice to the rights of BHEL to impose penalty/LD for the delays attributable to the contractor, in addition to any other actions BHEL may wish to take at the risk and cost of contractor.

2.11.4 A joint programme shall be drawn for the balance amount of work to be completed during the period of 'Time Extension', along with matching resources (with weightages) to be deployed by the contractor as per specified format. Review of the programme and record of shortfall shall be done every month of the 'Time extension' period in the same manner as is done for the regular contract period.

2.11.5 During the period of 'Time extension', contractor shall maintain their resources as per mutually agreed program

2.11.6 At the end of total work completion as certified by BHEL Engineer, and upon analysis of the total delay, the portion of time extensions attributable to (i) Contractor, (ii) Force majeure conditions, and (iii) BHEL, shall be worked out and shall be considered to be exhausted in the same order. The total period of time extensions shall be the sum of (i), (ii) and (iii) above and shall be equal to period between the scheduled date of completion and the actual date of completion of contract. LD shall be imposed/levied for the portion of time extensions attributable to contractor and recoverable from the dues payable to the contractor.

2.12 OVERRUN COMPENSATION (THIS CLAUSE IS NOT APPLICABLE IN BHEL FACTORY & TOWNSHIP PREMISES)

2.12.1 Over Run Compensation (ORC) is payable by way of rate revisions for periods beyond original, contract period subject to the following terms and conditions.

2.12.2 Rates shall be increased by 10% for the first twelve months of one or more extensions beyond original contract period. For the next twelve months of further extensions if any, rates shall be increased as above by 10% over the previous twelve months, and similarly for each subsequent twelve months extension.

2.12.3 Should there be any 'Time extension' for reasons attributable only to the contractor, then the work shall be executed by the contractor at the rates applicable for the period the work was planned

2.12.4 Payment of ORC shall be regulated as follows:

i) Contractor is entitled to Over Run Compensation (ORC) only for the portion of backlog attributable to BHEL.

ii) 50% of the compensation is allocated for deployment of resources agreed as per the joint programme drawn vide 2.11.4. Payment shall however be based on the actual deployment of resources for the month as certified by BHEL, as per weightages assigned therein

iii) 50% of the compensation, is allocated for achieving of planned progress agreed as per the joint programme drawn vide 2.11.4. Payment shall be on pro rata basis for actual achieved quantities

iv) Total Over Run Compensation shall be limited to 10% of the executed contract value as certified in Final Bill. For this purpose, executed contract value excludes PVC, ORC, Supplementary/Additional Items and Extra Works done on Man-day rate basis

2.12.5 Contractor shall not be entitled for any Over Run Compensation (ORC) for the portion of backlog attributable to the contractor. Such works shall be executed at the rates applicable for the period the work was planned

2.13 QUANTITY VARIATION

2.13.1 The quoted rates shall remain firm irrespective of any variations in the individual quantities.

2.14 EXTRA WORKS

2.14.1 All rectifications/modifications, revamping, and reworks required for any reasons not attributable to the contractor, or needed due to any change in deviation from drawings and design of equipment, operation/maintenance requirements, mismatching, or due to damages

in transit, storage and erection/commissioning, and other allied works which are not very specifically indicated in the drawings, but are found essential for satisfactory completion of the work, will be considered as extra works.

2.14.2 Extra works arising on account of the contractor's fault, irrespective of time consumed in rectification of the damage/loss, will have to be carried out by the contractor free of cost. Under such circumstances, any material and consumable required for this purpose will also have to be arranged by the contractor at his cost.

2.14.3 All the extra work should be carried out by a separately identifiable gang, without affecting routine activities. Daily log sheets in the pro-forma prescribed by BHEL should be maintained and shall be signed by the contractor's representative and BHEL engineer. No claim for extra work will be considered/entertained in the absence of the said supporting documents i.e. daily log sheets. Signing of log sheets by BHEL engineer does not necessarily mean the acceptance of such works as extra works.

2.14.4 BHEL retains the right to award or not to award any of the major repair/ rework/modification/rectification/fabrication works to the contractor, at their discretion without assigning any reason for the same

2.14.5 After eligibility of extra works is established and finally accepted by BHEL engineer/designer, payment will be released on competent authority's approval at the following rate.

MAN-HOUR RATE FOR ELIGIBLE EXTRA WORKS: Single composite average labour manhour rate, including overtime if any, supervision, use of tools and tackles and other site expenses and incidentals, consumables for carrying out any major rework/ repairs/ rectification/ modification/ fabrication as certified by site as may arise during the course of erection, testing, commissioning or extra works arising out of transit, storage and erection damages, payment , if found due will be as per applicable minimum wage act

2.14.6 The above composite labour man hour rate towards extra works shall remain firm and not subject to any variation during execution of the work. PVC will not be applicable for extra works. Rate revision, Over Run Charges/compensation etc will not be applicable due to extra works.

2.14.7 Extra Works for Civil Packages shall be regulated as follows

i) Rates for Extra Works arising due to (1) non availability of BOQ (Rate Schedule), OR (2) change in Specifications of materials/works (3) rectification/modification/dismantling & re-erecting etc due to no fault of Contractor, shall be in the order of the following:

a) Item rates are to be derived from similar nature of items in the BOQ (Rate Schedule) with applicable escalation derived from All India Consumer Price Index for Whole Sale Commodities.

b) As per applicable updated CPWD-DSR (or latest edition) with applicable escalation derived, Notification issued by the office of CPWD for 'Cost Index' in that Region where the project is being executed,

c) Item rates are to be worked out on the basis of prevailing market rates mutually agreed between BHEL and Contractor, plus 15% towards Contractor's overheads and profit.

ii) PVC and ORC will not applicable be for (i) above.

2.15 ***SUPPLEMENTARY ITEMS***

2.15.1 For NON Civil Works

Supplementary items are items/works required for completion of entire work but not specified in the scope of work. Subject to certification of such items/works as supplementary items by BHEL Engineer, rates shall be derived on the basis of any one of the following on mutual agreement:

i) Based on percentage breakup/rates indicated for similar/nearby items

ii) In case (i) above does not exist, then BHEL/site may derive the percentage breakup/rates to suit the type of work

2.15.2 For Civil Works

i) Rates for Supplementary Works/Additional Works arising out due to additions/alterations in the original scope of works as per contract subject to certification of BHEL Engineer shall be worked out as under:

a) Item rates which are available in existing BOQ (Rate Schedule) shall be operated with applicable escalation derived from All India Consumer Price Index for Whole Sale Commodities

b) Items of works which are not available in existing BOQ shall be operated as an 'Extra Works' and rate shall be derived as per clause no 2.14

ii) Execution of Supplementary Works/Additional Works through the Contractor shall be at the sole discretion of BHEL, and shall be considered as part of executed contract value for the purpose of Quantity Variation as per clause 2.13

iii) BHEL Engineer's decision regarding fixing the rate as above is final and binding on the contractor. iv) PVC and ORC will not be applicable for (i) above.

2.16 ***STRIKES & LOCKOUT***

2.16.1 The contractor will be fully responsible for all disputes and other issues connected with his labour/employee. In the event of the contractor's labour/employee resorting to strike or

the Contractor resorting to lockout and if the strike or lockout declared is not settled within a period of 15 days, BHEL shall have the right to get the work executed through any other agencies and the cost so incurred by BHEL along with Overhead charges of 35% shall be deducted from the Contractor's bills along with overhead of 35%

2.16.2 For all purposes whatsoever, the employees of the contractor shall not be deemed to be in the employment of BHEL

2.17 FORCE MAJEURE

The following shall amount to Force Majeure: -

2.17.1 Acts of God, act of any Government, War, Sabotage, Riots, Strike, Civil commotion, Police action, Revolution, Flood, Fire, Cyclones, Earth quake and Epidemic and other similar causes over which the contractor has no control.

2.17.2 If the contractor suffers delay in the due execution of the contractual obligation due to delays caused by force majeure as defined above, the agreed time of completion of the job covered by this contract or the obligations of the contractor shall be extended by a period of time equal to period of delay, provided that on the occurrence of any such contingency, the contractor immediately reports to BHEL in writing the causes of delay and the contractor shall not be eligible for any compensation.

*2.18 **ARBITRATION & RECONCILIATION***

2.18.1 In case amicable settlement is not reached in the event of any dispute or difference arising out of the execution of the Contract or the respective rights and liabilities of the parties or in relation to interpretation of any provision by the Contractor in any manner touching upon the Contract, such dispute or difference shall (except as to any matters, the decision of which is specifically provided for therein) be referred to the sole arbitration of the arbitrator appointed by BHEL/In charge.

The award of the Arbitrator shall be binding upon the parties to the dispute Subject as aforesaid, the provisions of Arbitration and Reconciliation Act 1996 (India) or statutory modifications or reenactments thereof and the rules made there under and for the time being in force shall apply to the arbitration proceedings under this clause. The venue of the arbitration shall be the place from which the contract is issued or such other place as the Arbitrator at his discretion may determine

2.18.2 In case of Contract with Public Sector Enterprise (PSE) or a Government Department, the following shall be applicable:

In the event of any dispute or difference relating to the interpretation and application of the provisions of the Contract, such dispute or difference shall be referred to by either party to the arbitration of one of the arbitrators in the department of public enterprises. The award of the arbitrator shall be binding upon the parties to the dispute, provided, however, any party aggrieved by such award may make further reference for setting aside or revision of the award to the Law Secretary, Department of Legal Affairs, Ministry of Law and Justice, Government of India. Upon such reference the dispute shall be decided by the Law Secretary or the Special Secretary or Additional Secretary when so authorized by the Law Secretary, whose decision shall bind the parties hereto finally and conclusively.

2.18.3 The cost of arbitration shall be borne equally by the parties.

2.18.4 Work under the contract shall be continued during the arbitration proceedings

2.19 ***PAYMENTS***

Payments to Contractors are made in any one of the following forms

2.19.1 Running Account Bills (RA Bills)

i) These are for interim payments when the contracts are in progress. The bills for such interim payments are to be prepared by Contractor in prescribed formats (RA Bill forms).

ii) Payments shall be made according to the extent of work done as per measurements taken up to the end of the calendar month and in line with the terms of payments described in the Tender documents along with relevant statutory documents applicable for the work.

iii) Recoveries on account of electricity, water, statutory deductions, etc are made as per terms of contract

iv) Full rates for the work done shall be allowed only if the quantum of work has been done as per the specifications stipulated in the contract. If the work is not executed as per the stipulated specifications, BHEL may ask the contractor to re do the work according to the required specifications, without any extra cost. However, where this is not considered necessary 'OR' where the part work is done due to factors like non-availability of material to be supplied by BHEL 'OR' non availability of fronts 'OR' non availability of drawings, fraction payment against full rate, as is considered reasonable, may be allowed with due regard for the work remaining to be done. BHEL decision in this regard will be final and binding on the contractor.

v) In order to facilitate part payment, BHEL Site Engineer at his discretion may further split the contracted rates/percentages to suit site conditions, cash flow requirements according to the progress of work

2.19.2 Final Bill

Final Bill' is used for final payment on closing of Running Account for works or for single payment after completion of works. 'Final Bill' shall be submitted as per prescribed format after completion of works as per scope and upon material reconciliation, along with the following.

i) 'No Claim Certificate' by contractor

ii) Clearance certificates where ever applicable viz Clearance Certificates from Customer, various Statutory Authorities like Labour department, PF Authorities, Commercial Tax Department, etc

iii) Indemnity bond as per prescribed format BHEL shall settle the final bills after deducting all liabilities of Contractor to BHEL

*2.20 **PERFORMANCE GUARANTEE FOR WORKMANSHIP***

2.20.1 Even though the work will be carried out under the supervision of BHEL Engineers the Contractor will be responsible for the quality of the workmanship and shall guarantee the work done for a period of as mentioned in the contract/NIT from the date of commencement of guarantee period as defined in Technical Conditions of Contract, for good workmanship and shall rectify free of cost all defects due to faulty erection detected during the guarantee period. In the event of the Contractor failing to repair the defective works within the time specified by the Engineer, BHEL may proceed to undertake the repairs of such defective works at the Contractor's risk and cost, without prejudice to any other rights and recover the same from the balance security deposit.

2.20.2 BHEL shall release the balance security deposit subject to the following

i) Contractor has submitted 'Final Bill'

ii) Guarantee period as per contract has expired

iii) Contractor has furnished 'No Claim Certificate' in specified format

iv) BHEL Site Engineer/Construction Manager has furnished the 'No Demand Certificate'

in specified format

v) Contractor has carried out the works required to be carried out by him during the period of Guarantee and all expenses incurred by BHEL on carrying out such works is included for adjustment from the Guarantee money refundable.

2.21 ***CLOSING OF CONTRACTS***

The Contract shall be considered completed and closed upon completion of all contractual obligations and settlement of Final Bill or completion of Guarantee period whichever is later. Upon closing of Contract, BHEL shall issue a completion certificate as per standard format, based on specific request of Contractor.

2.22 ***REVERSE AUCTION/PRICE BID OPENING:***

- *BHEL reserves the right to go for reverse auction at any point of time before opening of Price Bid.*
- *Bids with non-acceptance of reverse auction will be liable for rejection.*
- *Opening of Price Bid at discretion of BHEL.*
- *BHEL shall be at liberty to cancel the tender at any time, before ordering, without assigning any reason.*

2.23 ***SUSPENSION OF BUSINESS DEALINGS***

BHEL reserves the right to take action against Contractors who either fail to perform or Tenderers/Contractor who indulge in malpractices, by suspending business dealings with them in line with BHEL guidelines issued from time to time.

2.24 OTHER ISSUES

2.24.1 Value of Non judicial Stamp Paper for Bank Guarantees and for Contract Agreement shall be not less than Rs 200/- unless otherwise required under relevant statutes.

2.24.2 In case of any conflict between the General Conditions of Contract and Special Conditions of Contract, provisions contained in the Special Conditions of Contract shall prevail.

2.24.3 Unless otherwise specified in NIT, offers from consortium/JVs shall not be considered.

2.24.4 BHEL may not insist for signing of Contract Agreements in respect of low value and short time period contracts

Guidelines for Reverse Auction – 2021

Doc. No. AA:SSP:RA:05
Dated: 08.03.2021

1.0 Scope

This document describes the guidelines to be followed by BHEL for conducting Reverse Auction (RA) for procurement of material/ works/ services. The RA shall follow the philosophy of English Reverse (No ties).

English Reverse (No ties) is a type of auction where the starting price and bid decrement are announced before start of online reverse auction. The interested bidders can thereupon start bidding in an iterative process wherein the lowest bidder at any given moment can be displaced by an even lower bid of a competing bidder, within a given time frame. The bidding is with reference to the current lowest bid in the reverse auction. All bidders will see the current lowest quoted price and their rank. The term 'No ties' is used since more than one bidder cannot give an identical price, at a given instant, during the reverse auction. In other words, there shall never be a tie in the bids.

3.0 Upfront declaration in NIT

Decision to go for RA would be taken before floating of the tender. In case it is decided to go for RA, same shall be declared upfront in NIT by inserting the following **clause:**

"BHEL shall be resorting to Reverse Auction (RA) (Guidelines as available on www.bhel.com) for this tender. RA shall be conducted among the techno-commercially qualified bidders.

Price bids of all techno-commercially qualified bidders shall be opened and same shall be considered for RA. In case any bidder(s) do(es) not participate in online Reverse Auction, their sealed envelope price bid along with applicable loading, if any, shall be considered for ranking."

6.0 Business rules for RA

Model Annexure-I is attached.

7.0 Role of Service Provider

- Acknowledge the receipt of mandate from BHEL.
- Contact the bidders, provide business rules and train them, as required.
- Get the process compliance form signed by all the participating bidders before RA event.

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- Conduct the event as per the contract and business rules.
- Submit the Login Reports, Results, History sheet and authorized final bid from the bidders.
- To obtain price breakup from successful bidder and submit the same to BHEL.

10.0 Reverse Auction Process

10.1 Reverse Auction will be conducted if two or more bidders are techno-commercially qualified. In case of two or three qualified bidders, there shall be no elimination of H1 bidder (whose quote is highest in sealed envelope price bid). In case of four qualified bidders, the H1 bidder shall be eliminated whereas in case of five qualified bidders, H1 & H2 bidders shall be eliminated. However, in case of six or more qualified bidders are available, RA would be conducted amongst first 50% of the bidders arranged in the order of prices from lowest to highest. Number of bidders eligible for participating in RA would be rounded off to next higher integer value if number of qualified bidders is odd (e.g. if 7 bids are qualified, then RA will be conducted amongst lowest four bidders). However, there will be no elimination of qualified bidders who are MSE or qualifying under PPP-MII, Order 2017, irrespective of the number of bidders qualifying techno-commercially.

In case of multiple H1 bidders, all H1 bidders (excluding MSEs and bidders qualifying under PPP-MII, Order 2017) shall be removed provided minimum two bidders remain in fray, else no H1 removal.

10.2 During RA, all bidders will see their rank and current L1 price on the screen. Once the RA is done, the ranking status would be based on the last quoted price of the bidder(s) irrespective of the quote received in RA or sealed envelope price bid.

10.3 No bidder shall be allowed to lower its bid below the current L1 by more than 5 decrements at one go.

11.0 Processing of case after RA

11.2 In case of splitting requirement, bidders who were removed from participation in RA may also be considered for counter offer if the pre-stated (NIT) numbers of suppliers do not accept the counter offer.

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13.0 Others

13.2 In case of enquiry through e-Procurement, the sealed electronic price bid (e-bid) is to be treated as sealed envelope price bid.

13.3 BHEL will inform bidders the details of service provider who will provide business rules, all necessary training and assistance before commencement of online bidding.

13.4 Bidders will be advised to read the 'Business Rules' indicating details of RA event carefully, before reverse auction event.

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Doc. No. AA:SSP:RA:05
Dated: 08.03.2021

Business Rules for Reverse Auction

Annexure – I

This has reference to tender no ***{tender number….date…}***. BHEL shall finalise the Rates for the supply of *{item name}* through Reverse Auction mode. BHEL has made arrangement with M/s. *{Service provider},* who shall be BHEL's authorized service provider for the same. Bidders should go through the instructions given below and submit acceptance of the same.

The technical & commercial terms are as per (a) BHEL Tender Enq. No. {…} dated {...}, (b) Bidders' technical & commercial bid (in case of two part bid) and (c) subsequent correspondences between BHEL and the bidders, if any.

1. Procedure of Reverse Auctioning

i. Price bids of all techno-commercially qualified bidders shall be opened.

ii. **Reverse Auction**: The 'bid decrement' will be decided by BHEL.

iv. Bidders by offering a minimum bid decrement or the multiples thereof can displace a standing lowest bid and become "L1" and this continues as an iterative process. However, no bidder shall be allowed to lower its bid below the current L1 by more than 5 decrements at one go.

v. After the completion of the reverse auction, the Closing Price shall be available for further processing.

vi. Wherever the evaluation is done on total cost basis, after Reverse Auction, prices of individual line items shall be reduced on pro-rata basis.

2. Schedule for reverse auction: The Reverse Auction is tentatively scheduled on *{date}: ;{start time}: ;{Close Time: }*.

3. Auction extension time: If a bidder places a bid in the last {…} minutes of closing of the Reverse Auction and if that bid gets accepted, then the auction's duration shall get extended automatically for another {…} minutes, for the entire auction (i.e. for all the items in the auction), from the time that bid comes in. Please note that the auto-extension will take place only if a bid comes in those last {…} minutes and if that bid gets accepted as the lowest bid. If the bid does not get accepted as the lowest bid, the auto-extension will not take place even if that bid might have come in the last {…}

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minutes. In case, there is no bid in the last {…} minutes of closing of Reverse Auction, the auction shall get closed automatically without any extension. However, bidders are advised not to wait till the last minute or last few seconds to enter their bid during the auto-extension period to avoid complications related with internet connectivity, network problems, system crash down, power failure, etc.

The above process will continue till completion of Reverse Auction.

Complaints/ Grievances, if any, regarding denial of service or any related issue should be given in writing thru e-mail/ fax to M/s. {Service provider} with a copy to BHEL within 15 minutes prior to initial closing time of Reverse Auction.

4. **Bid price:** The Bidder has to quote the {……} Price inclusive of Packing & Forwarding charges, all the routine & type tests as per tender scope, taxes, duties, freight and insurance as specified in tender document. including loading (if indicated by BHEL due to deviations in technical/ commercial terms) for the Items specified. Details are as shown in Excel Sheet for calculation of total cost to BHEL (To be specified by Unit as per NIT conditions).

5. **Bidding currency and unit of measurement:** Bidding will be conducted in *Indian Rupees* per *Unit* of the material as per the specifications {…}

   In case of foreign currency bids, exchange rate (TT selling rate of State Bank of India) as on scheduled date of tender opening (Part-I bid) shall be considered for conversion in Indian Rupees. If the relevant day happens to be a Bank holiday, then the forex rate as on the previous bank (SBI) working day shall be taken.

6. **Validity of bids:** Price shall be valid for {… *days}* from the date of reverse auction. These shall not be subjected to any change whatsoever.

7. **Lowest bid of a bidder**: In case the bidder submits more than one bid, the lowest bid at the end of Reverse Auction will be considered as the bidder's final offer to execute the work.

8. Unique user IDs shall be used by bidders during bidding process. All bids

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made from the Login ID given to the bidders will be deemed to have been made by the bidders/ bidders' company.

9. **Post auction procedure**: BHEL will proceed with the Lowest Bid in the Reverse Auction for further processing.

11. Reverse auction shall be conducted by BHEL (through M/s {*Service Provider*}), on pre-specified date, while the bidders shall be quoting from their own offices/ place of their choice. Internet connectivity shall have to be ensured by bidders themselves.

During the RA process if a bidder is not able to bid and requests for extension of time by FAX/ email/ phone then time extension of additional 15 minutes will be given by the service provider provided such requests come before 5 minutes of auction closing time. However, only one such request per bidder can be entertained.

In order to ward-off contingent situation of connectivity failure bidders are requested to make all the necessary arrangements/ alternatives whatever required so that they are able to circumvent such situation and still be able to participate in the reverse auction successfully. Failure of power or loss of connectivity at the premises of bidders during the Reverse auction cannot be the cause for not participating in the reverse auction. On account of this, the time for the auction cannot be extended and neither BHEL nor M/s. {*Service provider*} is responsible for such eventualities.

12. Proxy bids: Proxy bidding feature is a pro-bidder feature to safe guard the bidder's interest of any internet failure or to avoid last minute rush. The proxy feature allows bidders to place an automated bid in the system directly in an auction and bid without having to enter a new amount each time a competing bidder submits a new offer. The bid amount that a bidder enters is the minimum that the bidder is willing to offer. Here the software bids on behalf of the bidder. This obviates the need for the bidder participating in the bidding process until the proxy bid amount is decrementally reached by other bidders. When proxy bid amount is reached, the bidder (who has submitted the proxy bid) has an option to start participating in the bidding process.

The proxy amount is the minimum amount that the bidder is willing to offer.

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During the course of bidding, the bidder cannot delete or change the amount of a proxy bid.

Bids are submitted in decrements (decreasing bid amounts). The application automates proxy bidding by processing proxy bids automatically, according to the decrement that the auction originator originally established when creating the auction, submitting offers to the next bid decrement each time a competing bidder bids, regardless of the fact whether the competing bids are submitted as proxy or standard bids. However, it may please be noted that if a manual bid and proxy bid are submitted at the same instant manual bid will be recognized as the L1 at that instant.

In case of more than one proxy bid, the system shall bid till it crosses the threshold value of 'each lowest proxy bid' and thereafter allow the competition to decide the final L1 price.

Proxy bids are fed into the system directly by the respective bidders. As such this information is privy only to the respective bidder(s).

13. Bidders are advised to get fully trained and clear all their doubts such as refreshing of Screen, quantity being auctioned, tender value being auctioned etc from M/s {*Service provider*}.

14. M/s. {*Service provider*}, shall arrange to demonstrate/ train the bidder or bidder's nominated person(s), without any cost to bidders. M/s. {*Service provider*}, shall also explain the bidders, all the business rules related to the Reverse Auction. Bidders are required to submit their acceptance to the terms/ conditions/ modalities before participating in the Reverse Auction in the process compliance form as enclosed. Without this, the bidder will not be eligible to participate in the event.

15. Successful bidder shall be required to submit the final prices (L1) in prescribed format (Annexure – VI) for price breakup, quoted during the Reverse Auction, duly signed and stamped as token of acceptance without any new condition (other than those already agreed to before start of auction), after the completion of auction to M/s. {*Service provider*} besides BHEL within two working days of Auction without fail.

16. Any variation between the final bid value and that in the confirmatory

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signed price breakup document will be considered as tampering the tender process and will invite action by BHEL as per extant guidelines for suspension of business dealings (as available on www.bhel.com).

17. Bidders' bid will be taken as an offer to execute the work/ supplies the item as per enquiry no. *{…}* dt. *{…}*. Bids once made by the bidder, cannot be cancelled/ withdrawn and bidder shall be bound to execute the work as mentioned above at bidder's final bid price. Should bidder back out and not execute the contract as per the rates quoted, BHEL shall take action as per extant guidelines for suspension of business dealings (as available on www.bhel.com).

18. Bidders shall be able to view the following on their screen along with the necessary fields during Reverse Auction:

a. Leading (Running Lowest) Bid in the Auction (only total price of package)
b. Bid Placed by the bidder
c. Start Price
d. Decrement value
e. Rank of their own bid during bidding as well as at the close of auction.

19. BHEL's decision on award of contract shall be final and binding on all the Bidders.

20. BHEL reserves the right to extend, reschedule or cancel the Reverse Auction process at any time, before ordering, without assigning any reason, with intimation to bidders.

21. BHEL shall not have any liability to bidders for any interruption or delay in access to the site irrespective of the cause. In such cases, the decision of BHEL shall be binding on the bidders.

22. Other terms and conditions shall be as per bidder's techno-commercial offers and other correspondences, if any, till date.

23. If there is any clash between this business document and the FAQ available, if any, in the website of M/s. *{Service provider},* the terms & conditions given in this business document will supersede the information contained in the FAQs. Any changes made by BHEL/ service provider (due to unforeseen

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contingencies) after the first posting shall be deemed to have been accepted if the bidder continues to access the portal after that time.

24. Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party. If the Bidder or any of his representatives are found to be involved in Price manipulation/ cartel formation of any kind, directly or indirectly by communicating with other bidders, action *as per extant BHEL guidelines for suspension of business dealings (as available on www.bhel.com)*, shall be initiated by BHEL.

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