

T E N D E R S C H E D U L E
and
DOCUMENT



Tender Notice No: HY/ES/OPGPGPL /MECH/12 ,
dtd. 25/05/2012

For
Mechanical jobs of Erection, Testing, Pre-
Commissioning and
Commissioning of 1X80MW STG at OPGPGPL, GUMMADIPOONDI,
CHENNAI

EXTERNAL SERVICES DEPARTMENT
BHARAT HEAVY ELECTRICALS LIMITED
Ramachandrapuram - Hyderabad -502 032

Price Rs. 1,000/-

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BHARAT HEAVY ELECTRICALS LIMITED
Ramachandrapuram, Hyderabad-500032 (A. P.)

(A Govt. of India Undertaking)

TENDER SPECIFICATION NO: HY/ES/OPGGPL/MECH/12

This Tender specification issued to:

M/s. _____

Prepared by:
Name:
Designation:

Approved by:
Name:
Designation:

Issued by: EXTERNAL SERVICES DEPARTMENT

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BHARAT HEAVY ELECTRICALS LIMITED
Ramachandrapuram, Hyderabad-500032 (A. P.)

(A Govt. of India Undertaking)

Tender Specification No. HY/ ES/OPGPGPL/MECH/12 .

Sealed tenders are invited by the undersigned on behalf of BHEL from experienced contractors for the work of Mechanical jobs of Erection , Testing, Pre-Commissioning and Commissioning of 1X80 MW STG at OPGPGPL, GUMMADIPOONDI, CHENNAI.

Tender Documents, have to be downloaded from BHEL website www.bhel.com by the interested parties. Completed tenders along with separate demand drafts for Earnest Money Deposit of Rs 1,50,000.00 and tender document cost of Rs 1,000.00 (non-refundable) as per the Tender notice will be received at(to be dropped in Drop Box located in) Vendor Complex, BHEL, Hyderabad(Admin Building) latest by 11:00 hrs. on 08.06.2012 and opened on the same day at 14.30 hrs. in the presence of tenderers present at that time.

Additional Gen. Manager (ES)
External Services
BHEL, Hyderabad

REF: HY/ES/OPG PGPL/MECH/12

Important Note for all bidders:

BHEL is supplying 2X80 MW STG Sets for OPG Power Generation Pvt Ltd, Gummadipoondi. For Erection and Commissioning jobs of Unit 2 Mechanical tender documents are made ready and put on BHEL web site. One set of tender documents viz. Tender Notice No. HY/ES/OPGPGPL/MECH/12 Tender Schedule and Document i.e. Technical specification & price bid prepared for this purpose are in two separate folders attached with this letter.

You may please down load these folders separately and submit most competitive quotation for executing the E & C jobs of these two units, along with two DDs mentioned below. All terms and conditions of the tender must be accepted without any deviation for consideration of the submitted tender. Hence please ensure that all pages of both the books i.e. technical and price bids are signed and stamped as acceptance. Technical Bid and two DDs must be sealed in one cover super-scribed with Tender Reference No. HY/ES/OPGPGPL/MECH/12 dtd: 25.05.12 -Technical Bid; Price Bid alone must be sealed in another cover super-scribed with Tender Reference No.

HY/ES/OPGPGPL/MECH/12 dtd: 25.05.12-Price Bid. Both these bid covers must be put in another cover and submitted as single package to BHEL on or before the specified time i.e. 11.00 Hrs on 8.06.2012, to be dropped in Drop Box located at Vendor Complex, BHEL Hyderabad(Admin Building). All these covers must be super-scribed with Tender Reference No. HY/ES/OPGPGPL/MECH/12 dtd: 25.05.12.

EMD for this tender is Rs.1,50,000 .Accordingly DD of Rs.1,50,000 /- for EMD and DD of Rs.1000 /- towards cost of the tender documents(non-refundable) may please be separately drawn on any nationalised bank payable to BHEL, Ramachandrapuram, Hyderabad, A.P. Tender documents submitted without these two DDs shall be rejected. EMD amount shall be adjusted against security deposit in case of successful tenderer and shall be refunded in case of unsuccessful tenderer after finalising the tender.

AGM/ES

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BHARAT HEAVY ELECTRICALS LIMITED
Ramachandrapuram, Hyderabad-500032 (A. P.)

TENDER SPECIFICATION
FOR
CONTENTS

Sno.	Specification No.	Description
Technical Bid (Part-1)		
1	101	General conditions of the contract
2	102	General terms and conditions
3	103	General conditions of contract for erection work
4	104	Information to be furnished by the tenderer
	(Annex 1)	Financial viability
	(Annex 2)	Analysis of similar jobs in progress
	(Annex 3)	Month wise manpower deployment plan
	(Annex 4)	Status of tools and plants
	(Annex 5)	Analysis of unit quoted
	(Annex 6)	Declaration sheet
	(Annex 7)	Check list and schedule of general particulars
5	105	Forms of Agreement
	(Annex 1)	Contract agreement -I
	(Annex 2)	Contract agreement -I I
	(Annex 3)	Guarantee towards security deposit
	(Annex 4)	Performance Bank Guarantee
6	301	Specification for Insulation and Cladding
Finance Bid (Part-2)		
7	201	Project information
8	202	Scope of work
9	203	Erection schedule
10	204	Price tabulation
11	205	Terms of payment
12	205A	Extra Man Hour Rate



GENERAL CONDITIONS OF THE CONTRACT

Spec. No.101

1.00 INSTRUCTIONS TO THE BIDDER

- 1.01 The tender specification in original book duly furnishing all the details required under and other documents as required in the following passages, should be duly signed on each page and sent in a sealed cover super scribing, the nature of work as given in Tender Notice.
- 1.02 Tenders submitted by post should be sent by "Registered post, acknowledgement due and should be posted with due allowance for any postal delay. Tenders received after the due date and time of opening will not be considered on any account. Telegraph offers and offers received by E-Mails may not be considered.
- 1.03 Tenders shall be opened by Dy.Gen.Manager (External Services) or his authorised representative at his office at the time and date as specified in tender notice in the presence of such of those bidders or their authorised representatives who may be present.
- 1.04 Bidders are advised to visit site and ascertain the existing conditions with regard to material handling and transport of materials to the place of work before submitting the bids.
- 1.05 Bidders shall submit the bid in two separate sealed covers super scribing as "Technical Bid" and "Price Bid" Technical bids alone will be opened on due date and time and in the presence of the bidders who wish to be present.
- 1.06 The Bidders should closely pursue all the clauses indicated in the annexed specifications and the appendices before quoting. Should the Bidders have any about the meaning of any portion of the specification or find discrepancies or omissions in the drawings or any of the tender documents, he should at once address the authority inviting the tender for clarification before the submission of the tender.
- 1.07 Before tendering, the Bidders are advised to inspect the site of work and its environment and be well acquainted with the actual working and other prevalent conditions, position of material and labor, drawings and specifications, and other documents which form part of agreement to be entered into. No. claim will be entertained later on the ground of lack of knowledge.
- 1.08 Bidders advised to kindly note and to certify in the Technical Bids that no deviations are taken by them to our Tender Specification both General and Commercial Terms and Conditions. Bidders taking deviations to any of BHEL's Terms and Conditions will run the risk of being disqualified and their price Bids may be considered, nor opened.
- 1.09 Kindly note that BHEL reserves the full, un qualified and absolute right to reject any or all the Tenders or any part thereof, without assigning any reasons there for. Kindly note that BHEL will not take any responsibility for late receipt, or non-receipt of any of the bids or tenders.
- 1.10 BHEL also reserves its full, unqualified and absolute right to split the contract in more than one successful bidder in order to expedite the work and award the same to more than one bidder.

2.00 QUALIFICATION OF BIDDERS:

- 2.01 Only those Bidders who have previous experience in the work of the nature, description and scope detailed in this specification shall quote for this work and such Bidders shall detail their experience particularly in the erection, testing and commissioning,



GENERAL CONDITIONS OF THE CONTRACT

Spec. No.101

- 2.02 Each Bidder shall also submit a declaration to the effect that the Bidder is an Engineering Construction or an Associate or Firm which has successfully carried out large works of this nature and has adequate organisation and experienced personnel to handle this type and magnitude of work.
- 2.03 Full information should also be given by the Bidder in respect of the following:
- 2.04 If an individual:
- 1) His full name, address and place of business
 - 2) His financial status
 - 3) His previous experience
- 2.05 In case of partnership firms.
- 1) The names of all the partners and their address
 - 2) The financial status of the firm and its partners
 - 3) Previous experience of the firm and its partners
- 2.06 In case of Companies:
- 1) 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)
 - 2) Nature of business carried on by the Company and the provisions of its memorandum relating thereof.
 - 3) Names and particulars including addresses of the Directors.
 - 4) Their previous experience.
- 3.00 VALIDITY OF TENDER:**
- 3.01 The Bidder has to specify that the rates in the tender shall be valid for a period of 120 days acceptance reckoned from the date of opening of tender.
- 3.02 If the Bidder withdraws or revokes his tender or revises the Bidder rates or conditions for any item within the aforesaid period, his Earnest Money Deposit is liable to be forfeited.
- 3.03 Bidders shall not increase their quoted rates in case the Bharat Heavy Electricals Limited, calls for negotiations. Such negotiations shall not amount to cancellation or withdrawal of the original offer and the rates originally quoted shall be binding on the Bidders.



GENERAL CONDITIONS OF THE CONTRACT

Spec. No.101

4.00 PROPOSAL & DATA

The Bidder must fill up the following / sheets as per instructions given in clause No. 401 below and in various sections of these tender documents:

1. Erection schedule
2. Price tabulation
3. Declaration sheet

- 4.01 Each Bidder shall supply the data required in price bid and they must be properly signed by authorised representatives of the Bidders. These signed Pages in their entirety shall be retained with and shall be a Part of Bidder's formal proposal. The Bidder shall completely fill in the above information required for the above mentioned schedules.
- 4.02 The Bidder should quote the rates in English language and international numerical only. The rates should be in whole rupees. These rates should be entered in figures as well as in words. Failure to comply with these requirements may result in the rejection of the tender.
- 4.03 For the purpose of this tender, the metric system of Units shall be used.
- 4.04 All entries in the tender should either be typed or be in one ink. Corrections, erasures and over writings are not permitted and may render such tenders to summary rejection. All cancellations and insertions should be duly attested by the Bidders.

5.00 AUTHORISATION AND ATTESTATION:

- 5.01 Each tender shall be signed by the Bidder with his usual signature. Tender by Partnership or Hindu Joint family firm may be signed in the firms' name by one of the partners or the Karta or Manager as the case may be or any of the duly authorised representative followed by the name and designation of the person so signing. A copy of the Instrument of partnership duly certified by a partner as a true copy should be submitted along with the tender.
- 5.02 Tender by a Company shall be signed with the name of the Company by a person authorised in this behalf and a Power of Attorney, or other satisfactory proof showing that the person signing the tender documents on behalf of the Company is duly authorised to do so, shall accompany the tender.
- 5.03 Signature of the Bidder shall be attested by two responsible individuals of status AND THEIR ADDRESS, NAMES, OCCUPATIONS SHALL be indicated below their signatures in English. All SIGNATURES SHALL BE DATED.



GENERAL CONDITIONS OF THE CONTRACT

Spec. No.101

6.00 TENDER BY OTHER THAN INDIVIDUALS:

6.01 When the tender submitted is not in the name of an individual, the tender shall disclose the nature, construction and registration of the tendering firm and the tender shall be signed by the person or persons duly authorised to do so by means of legally valid document (or a duly certified copy of the same), which shall be attached with the tender. For illustration, in the event of a tender being submitted by a partnership firm, it must be signed by each member thereof, or in the event of the absence of any partner, it must be signed on his behalf by a person holding power of attorney authorizing his to do so (such power of attorney shall be produced along with the tender.) It must also be disclosed whether the firm is registered under the Indian Partnership Act or not and in case it is so registered, the registration number shall be furnished.

6.02. The successful Bidder shall produce the Partnership Deed and Power of Attorney to BHEL for perusal.

7.00 INCOMPLETE TENDER PAPERS:

If the tender document issued to an intending Bidder is incomplete, he shall request the office of BHEL, Hyderabad-32, to complete the same before he delivers his tender. The tender submitted by the contractor should be complete in all respects.

8.00 EARNEST MONEY:

8.01 Every tender must be accompanied by a cash receipt issued by Bharat Heavy Electricals limited, Ramachandrapuram, Hyderabad-502 032, towards the earnest money for the tender OR Demand draft on any Nationalised Bank payable at Hyderabad in favour of Bharat Heavy Electricals limited, Hyderabad -32. The rate of earnest money deposit shall be as under:

Works costing upto Rs. 2 lakh	NIL
Works costing more than Rs. 2 lakh and upto Rs. 5 lakhs	Rs. 10,000/-
Works costing more than Rs.5 lakhs and upto Rs.10 lakhs	Rs. 20,000/-
Works costing more than Rs.10 lakhs and upto Rs.20 lakhs	Rs. 40,000/-
Works costing more than Rs. 20 lakhs and upto Rs.30 lakhs	Rs. 60,000/-
Works costing more than Rs. 30 lakhs and upto Rs.50 lakhs	Rs. 1,00,000/-
Works costing more than Rs. 50 lakhs and upto Rs.100 lakhs	Rs. 1,50,000/-
Works costing more than Rs.100 lakhs	Rs.2,00,000/-

8.02 NOTE: Cheques, Currency notes, Money Orders or Postal orders will not be accepted in lieu of the deposit receipt referred to above.

8.03 No interest shall be allowed on the earnest money or on any money due to the bidder by BHEL.



GENERAL CONDITIONS OF THE CONTRACT

Spec. No.101

- 8.04 Tenders received without earnest money in full in the manner prescribed above shall be summarily rejected.
- 8.05 The earnest money deposited by the successful Bidder as above will be retained towards security deposit for the due fulfillment of the Contract.
- 8.06 In the case of unsuccessful Bidders, the earnest money deposit will be refunded to them within a reasonable time on their applying to the Sr.Manager (E.S) Bharat Heavy Electricals Limited, Ramachandrapuram, Hyderabad 500032, after intimation is sent to them of the rejection of their tenders.

9.00 SECURITY DEPOSIT:

- 9.01 Upon acceptance of his tender, **the successful Bidder must deposit 50% of Security Deposit including EMD amount**, within the time specified in the letter of intent, with the Accounts Officer / Sales, Bharat Heavy Electricals Limited, Ramachandrapuram, Hyderabad-32 either in cash, or in the form of Government or other approved securities endorsed / pledged to the said Accounts Officer / Sales, a sum which together with the Earnest Money already paid by him will amount to the following depending upon the value of the work.
- | | | |
|------|---------------------------|---|
| 9.02 | Up to Rs. 10 Lakh | 10% of the quoted value |
| 9.03 | Above 10 Lakh to 50 Lakhs | 1 lakh + 7½ % of the amount exceeding Rs.10 Lakh. |
| 9.04 | Above 50 Lakhs | 4 lakh + 5 % of the amount exceeding Rs.50Lakh. |
- 9.05 Failure by the successful Bidder to deposit the Security Deposit amount as mentioned above within the stipulated time, which will include any extensions that may be granted by the authorities, will render his earnest money deposit liable to forfeiture and his tender shall be considered as withdrawn.

As an alternative to 9.00, the successful Bidder, on receipt of letter of intent, can convey his acceptance in writing for conversion of EMD into security deposit upon which the balance amount of money i.e. the total amount towards security deposit as per 5.01 with the EMD converted into security deposit shall be made good by depositing the additional amount or by furnishing a bank guarantee. When the total security deposit along with EMD is realised as per this clause, no further deduction will be made on this account except for payment in respect of extra works done which shall be subject to retention of 5% of their value.

- 9.06 In lieu of sub clause 9.05 and 9.06 the contractor can furnish a bank guarantee in the form Prescribed by Bharat Heavy Electricals Limited from any nationalised Bank for the entire amount of security Deposit required by BHEL for this contract instead of making cash payment. The validity of such Bank Guarantee shall cover the entire period of erection commissioning and guarantee period.
- 9.07 If any part of the Security Deposit of the Contractor is held in the form of approved securities, it shall be kept transferred in the name of Accounts officer (Sales) Finance BHEL, Hyderabad-32 in such a manner that he can realise it without reference to the Contractor. BHEL shall not be responsible for any loss of securities or any depreciation



GENERAL CONDITIONS OF THE CONTRACT

Spec. No.101

in the value of the securities while they are in BHEL's custody or for any loss of interest thereon.

- 9.08 If the Contractor duly performs and completes the Contract in all respects to the entire satisfaction of BHEL and presents an absolute "NO DEMAND CERTIFICATE" in the prescribed form and returns in good condition, the specification, drawings and other properties belonging to BHEL, handed over, lent or hire by them for carrying out the said erection work, the security Deposit / the Bank Guarantee furnished towards security deposit will be released to the Contractor after deducting all costs of expenses or other amounts that are due to be paid to BHEL under this or other contacts entered into with the Contractor.
- 9.09 BHEL reserves the right of forfeiture of security deposit in addition to other claims and penalties in the event of Contractor's failure to fulfill any of the Contractual obligations or in the event of termination of Contract as per terms and conditions of Contract. The decision of BHEL in this respect is final and conclusive. ..

9.10 **EXECUTION OF AGREEMENT:**

The Contractor's responsibility under this Contract will commence from the date of commencement of work by the contractor as certified by the Resident Engineer of BHEL. Contractor shall be required to execute an agreement in the prescribed form (Specimen Contract form attached) with the BHEL within a reasonable time after the acceptance of his tender and in any case before submitting the first bill for payment. The expenses for completing and stamping the agreement shall be borne by the Contractor.

10.00 DATA TO BE ENCLOSED WITH TENDER:

- 10.01 Certificate from a scheduled bank to prove his financial ability to undertake the work
- 10.02 An experience list giving particulars of the various erection works executed by the tender indicating the particulars and value of each work, completion and also a list of site locations and particulars of various erection works that are under progress. A certified copy to that effect from the Customer will be preferred, for the works so far completed by the Bidder.
- 10.03 The organisation pattern that will be followed for this work giving the names of engineers and supervisors and their qualifications and experience as well as the number of skilled and unskilled persons that will be engaged shall be furnished by the Bidder.
- 10.04 A certificate of income tax verification from the appropriate Income Tax Authority in the forms prescribed. This certificate will be valid for one year from the date of issue or for the period prescribed therein for all tenders submitted during the period. In the case of Proprietary and Partnership firms, it will be necessary to produce the Certificate aforementioned for the proprietary firms and for each of the partners, as the case may be.
- 10.05 A certificate of Sales Tax verification from the appropriate Sales Tax authorities in the forms prescribed. This Certificate will be valid for one year from the date of issue or for the period indicated in the certificate for all the tenders submitted during the period.



GENERAL CONDITIONS OF THE CONTRACT

Spec. No.101

10.06 If the Bidder is a registered corporation and if the certificates mentioned in clause No.10.04 and 10.05 above for the current year had already been produced during the calendar year in which the tender is made, it will be sufficient if particulars regarding the previous occasion on which the said certificates were produced are given.

10.07 Partnership deed as specified in Clause 5.01.

10.08 OTHER CONDITIONS:

10.09 With their quotations, the Bidders shall sign all the pages of the tender specification including appendices, specifications conditions and schedules in token of complete acceptance thereof and enclose the same along with the technical bid.

10.10 If a Bidder expires after the submission of his tender or after the acceptance of his tender, the Bharat Heavy Electricals Limited, may, at their discretion, cancel such tender. If a partner of a firm expires after the submission of the tender or after the acceptance of the tender, the Bharat Heavy Electricals Limited may cancel such tender at their discretion unless the firm retains its character.

10.11 The Bharat Heavy Electricals Limited will not be bound by any Power of Attorney granted by the Bidder or by changes in the composition of the firm made subsequent to the execution of the contract. They may, however, recognise such Power of Attorney and changes after obtaining proper legal advice, the cost of which will be chargeable to the contractor concerned.

10.12 REJECTION OF TENDERS:

10.13 Conditional and un-witnessed tenders, tenders containing exorbitant rates and amounts and tenders which are incomplete and otherwise considered defective and tenders not in accordance with the tender conditions, specifications etc. are all liable to be rejected.

10.14 If the Bidder deliberately gives wrong information in his tender, or creates conditions favorable for the acceptance of his tender, the Bharat Heavy Electricals Limited reserves the right to reject such tender at any stage.

10.15 Canvassing in any form in connection with the tenders is strictly Prohibited and the tenders submitted by the Bidders who resort to canvassing will be liable to rejection.

10.16 Should a Bidder or contractor have a relation or relations or in the case of a firm or company of contractors, one or more of its Partners / Shareholders have a relation or relation employed in the Capacity of an Officer in BHEL, the authority inviting tender shall be informed of the fact at the time of placement of the tender, failing which BHEL may in its sole discretion reject the tender or Contract the same has already been entered into and the earnest money/security deposit of the Bidder/contractor stands forfeited.

10.17 The acceptance of tender will rest with BHEL which does not bind itself to accept the lowest and reserves to itself the right.



GENERAL CONDITIONS OF THE CONTRACT

Spec. No.101

- 1) To reject any or all the tenders without assigning any reasons or giving explanation therefore, or,
- 2) To split up the work among two or more Bidders, or,
- 3) to accept the work in part and not in entirety if considered expedient by BHEL in their sole and absolute discretion without assigning any reasons or giving any explanation therefore. In case only a part of the tender is accepted, the time for completion may also be suitably reduced by BHEL.
- 4) Conditional tenders, tenders containing absurd or unworkable amounts and tenders which are incomplete and otherwise considered defective and tenders not in accordance with the tender conditions, specifications etc., are liable to be rejected.

10. 18 ORGANISATION CHART:

An attested copy of the power of Attorney, in case the tender is signed by an individual other than the sole Proprietor, shall also be attached

IN CASE OF AN INDIVIDUAL: His full name, experience, address and nature of business.

Or

IN CASE OF PARTNERSHIP FIRMS: The names of all the partners with addresses and their experience,- A copy of the partnership deed/Instrument of Partnership duly certified by a Notary Public shall be enclosed.,

Or

IN CASE OF COMPANIES: Date and place of registration including date of commencement certificate in case of public companies and the nature of business carried on by the company. Certified copies of Memorandum and Articles of Association are also to be furnished. Also indicate names, addresses and experience of the Directors.

10. 19 The bidders are requested to enclose photo copies of the following documents, along with the technical bid, for their previous site at which they are working or where they have just completed the work (For item a only)
 - a) Labour licence.
 - b) Labour insurance.
 - c) PAN card No.
 - d) TIN No.
 - e) Service Tax Licence No.
 - f) Bank account for EFT
 - g) Provident fund registration
 - h) IBR welder qualification certificate
 - i) Electrical Inspectorate's licence for erection, commissioning of electrical machines and electrical works
 - j) A) letter from your bankers certifying your financial soundness and credit worthiness. This letter could be directly sent to Sr. Manager (External Services),



GENERAL CONDITIONS OF THE CONTRACT

Spec. No.101

BHEL, Hyderabad if it is of a confidential nature. The Bankers should clearly indicate the over drafting facilities permitted by them in favour of the bidder.

- k) Balance sheets for the past three (3) preceding years
- l) Proposed organisation staff chart at site

Bidders to kindly note that in absence of the above documents their tender is liable to be summarily rejected.



GENERAL TERMS AND CONDITIONS

Spec. No.102

1.0 **DEFINITIONS:**

The following terms shall have the meaning hereby assigned to them except where the context otherwise required:

1.01 "BHEL" shall mean Bharat Heavy Electricals Limited, Hyderabad- 502032 or its Administrative Officers or its site Engineer/Officer, or its Resident Engineer/Resident Manager or other Engineers/Officer authorised to deal with any matters with which these persons are concerned on its behalf.

1.02 "Resident Engineer/Resident Manager" or "Project Manager" or "Engineer-in charge" "Manager-in-charge- or "Engineer" shall mean officer deputed by Bharat Heavy Electricals Limited, Hyderabad 502032 to be in charge of the erection work of the turbo sets supplied by Bharat Heavy Electricals Limited, at the site of the work as well as Manager, External Service.

1.03 "Executive Director" or "Group General Manager" or "General Manager" shall mean the Officer in Administrative charge of Bharat Heavy Electricals Limited, Hyderabad-502032.

1.04 "Manager or Sr.Manager, External Services" shall mean the Officer of Bharat Heavy Electricals Limited Hyderabad-502032 who directs the erection work at site from the headquarters at Hyderabad-502032.

1.05 "BHEL Staff" shall mean any employee of Bharat Heavy Electricals Limited, Hyderabad-502 032.

1.06 The terms "Approved" or "Directed" or "Instructed" shall mean approved, directed or instructed by Bharat Heavy Electricals Limited. Hyderabad-502032.

2.0 **SINGULAR AND PLURAL ETC.**

Words carrying singular number shall also include plural and vice versa where the context so required. Words imparting the masculine gender shall be taken to include the feminine gender and words imparting persons shall include any company or Association or body of Individuals, whether incorporated or not

3.0 **HEADINGS:**

The headings in these general conditions are solely for the purpose of facilitating reference and shall not be deemed to be part thereof or be taken into consideration in the interpretation or construction thereof of the Contract.

4.0 **LAW GOVERNING THE CONTRACT:**

4.01 The Contractor shall be governed by the law for the time being in force in the Republic of India.

4.02 In respect of any suit or other legal proceedings arising under or relating to this contract the Courts at Sangareddy / Hyderabad only shall have Jurisdiction.



GENERAL TERMS AND CONDITIONS

Spec. No.102

5.0 **ISSUE OF NOTICE:**

The contractor shall furnish to the Engineer, BHEL, Hyderabad 502032 the name designation and address of his authorised agent and all complaints, notices, communications and reference shall be deemed to have been duly given to the Contractor if delivered to the Contractor or his authorised agent or left at or Posted to the address either of the Contractor or his representative and shall be deemed to have been so given in the case of posting on the day on which they would have reached such address in the ordinary course or on the day they were so delivered or handed over.

6.0 **OCCUPATION AND USE OF LAND:**

No land belonging to BHEL or their clients under temporary possession of BHEL shall be occupied by the contractor without the written permission of B H EL, Hyderabad-502032.

7.0 **COMMENCEMENT OF WORK:**

- 7.01 The Contractor shall commence the work within the time indicated in the Letter Intent from BHEL, Hyderabad 502032 and shall proceed with the same with due expediency and with out delay and adhere to the schedules.
- 7.02 In case the Contractor fails to undertake the work within the specified period after the Contract has been awarded to him, the Earnest Money/Security Deposit already deposited with BHEL will stand forfeited without any further reference to the Contractor.
- 7.03 If the contractor fails to start the work within the stipulated time, BHEL, in its sole jurisdiction will have the right to award the tender to any other tenderer, besides the forfeiture of the earnest, money and security deposit of the Contractor.

8.0 **WORKING HOURS:**

The normal working time for the work will be 48 hours per week, in one shift of 8 hours per day, for six days in week. However, Contractor shall make necessary arrangements and provide extra labour required to carry out the work for two or three shifts per day if required and as instructed by the Engineers of B H EL, to maintain the scheduled erection program. Also the contractor should arrange weekly offs for his workmen/supervisors in such a way is that work is carried out on all days of the week (Monday through Sunday) without hampering the progress of work on account of such adjustments of a weekly offs.

9.0 **CONTRACTOR'S DEFAULT :**

If the Contractor shall fail or neglect to execute the work with due diligence and expediency, or shall refuse or neglect to comply with any orders given to him by the Engineer (BHEL) in connection with the work or shall contravene the provisions of the Contract, the Engineer (BHEL) shall give notice in writing to the contractor to make good such failure, neglect or contravention. Should the Contractor fail to Comply with the notice within the period specified in the notice, the Engineer shall be at liberty forthwith, to execute such part of the work as the Contractor may have failed or

neglected to do, or without prejudice to any other right BHEL may have under the contract to take the work wholly or in part out of the Contractor's hand and contract, with any other person to complete the work or any part thereof and in that event BHEL shall have the free use of all construction equipment and other things that may be at any time on the site in connection with the work, without being responsible to the contractor for fair wear and tear thereof, and to the exclusion of any right of the Contractor over the same and BHEL shall be entitled to retain or withhold and balance amount which may be otherwise due under the Contract to the Contractor or such part thereof as necessary to the payment of the cost of executing the said part of the work or by completing the work as the case may be and of meeting claims of third parties against BHEL arising from or in consequence of the Contractor's failure, neglect, refusal or contravention as aforesaid. If the cost of Completing the work or executing a part thereof or of meeting claims of third parties as aforesaid shall exceed the balance due to the Contractor. The Contractor shall pay such excess to BHEL.

10.0 LIQUIDATED DAMAGES FOR DELAY IN COMPLETION:

In the event of failure on the part of the Contractor to complete the work under this specification within the stipulated period or such extended period as may be agreed to by, BHEL in this regard, the contractor shall be liable to pay to BHEL as liquidated damage and not by way of penalty, a sum equivalent to 0.5% (Half percent) of the total value of the contract for each week or part of a week of the delay between the scheduled time and actual time of completion of work, subject to a maximum of 10% of the total contract value.

10.01 STAY BEYOND CONTRACT PERIOD:

Stipulated rate of progress is based on the anticipated receipt of equipments and materials at site and also the man power, tools and tackles deployed by the contractor. In the event contractor's stay at the site becomes necessary beyond the contract period for reasons not attributable to BHEL, no compensation shall be payable to the contractor. No over run charges are payable.

11.0 SUSPENSION OF ACTIVITIES :

If conditions obtaining at site warrant temporary suspension of activities, the contractor shall do so at the instructions of BHEL Engineer. Compensation, if any for temporary suspension will be discussed and mutually agreed.

12.0 STRIKES AND LOCKOUTS :

In the event of the Contractor's Labour resorting to strike or the contractor resorting to lock-out and if the strike or lock out declared is not settled within a period of one month the BHEL shall have the right to get the erection work executed in whole or part employing its own labour or through any other agency or both and the cost so incurred by BHEL shall be deducted from the Contractor's bill as per the clause 09.00.



GENERAL TERMS AND CONDITIONS

Spec. No.102

13.0 **MODE OF PAYMENT :**

All payments due to the contractor shall be paid only by 'Account Payee Cheques' drawn on State Bank of Hyderabad, Hyderabad 502032 or as may be convenient to BHEL.

14.0 **BHEL'S LIEN ON ALL MONEYS DUE :**

BHEL shall have a lien on and over all or any money that may become due and payable to the Contractor under these presents, and/or also on and over the deposit or Security amount or amounts made under the contract and which may become repayable to the Contractor under the conditions in that behalf herein contained and/or any sums that may become due and payable by Bharat Heavy Electricals Limited, the Contractor either alone or jointly with another or others and either under this, or any other contract or transactions whatsoever between BHEL and the Contractor .

15.0 Whenever any claim for payment of a sum of money arises out of or under the Contract against the Contractor, the BHEL shall be entitled to recover such sum by appropriating in whole or in part the Security deposit deposited by the Contractor, and BHEL shall be entitled to realise securities forming the whole or part of any such Security deposit. In the event of the Security deposit amount being insufficient, the balance shall be recovered by appropriating any sum due to the contractor or any sum which at any time there after may become due to the Contractor under this contract, or any other Contract with BHEL. If even such sum is not sufficient to cover the full amount recoverable the Contractor shall on demand pay to BHEL, the balance amount remaining due.

15.01 For the purpose of this clause, where the Contractor is a Partnership firm, BHEL shall be entitled to recover such amount by appropriating in whole or in part any sum due to any partner of the Firm either in his individual capacity or otherwise.

15.02 Any sum of money due and payable to the Contractor (including Security Deposit returnable to him) under the Contract may be appropriated by the BHEL and set off against any claim of the BHEL for the payment of a sum of money arising out of or under any other Contract made by the Contractor with the BHEL, Hyderabad-502032 or any other units of BHEL.

16.0 **STORES SUPPLIED BY BHEL**

16.01 It is not obligatory on the part of BHEL to supply any tools & tackles or other materials other than those specifically agreed to by BHEL. However, subject to availability, BHEL/ Customer's handling equipments and other plants, tools and tackles may be made available to the Contractor wherever possible on payment of the hire charges as fixed subject to the conditions laid down by BHEL/CUSTOMER from time to time. Unless paid for in cash in advance, such hire charges shall be recovered in one installment from the Contractor's first available bill and if it becomes necessary the same may be adjusted against the Security Deposit with BHEL.

16.02 All the properties of BHEL/their client loaned whether with or without deposit to the Contractor in connection with the Contract, shall remain the properties BHEL / their client as the case may be. The Contractor shall use such properties for the purpose of

execution of the Contract and for no other purpose whatsoever. The contractor shall not sub-loan such properties from his end.

16.03 All 'such properties shall be deemed to be in good conditions when received by the Contractor unless he shall have immediately on receipt of the same thereof, notified the BHEL to the Contrary. If the Contractor fails to notify any defect in the conditions or quality of such properties, he shall be deemed to have lost the .right to do so at any subsequent stages.

16.04 The Contractor shall be responsible for the safe custody of any special equipment and plants supplied to him and shall return them in good condition whenever required by BHEL. In case of non-return, loss, breakage, damage, repairs etc., due to negligence or misuse or otherwise or any other cause for which the Contractor is found responsible, the cost thereof will be recovered from the Contractor. The decision of Engineer regarding the loss or damage and the amount to be recovered shall be final and binding on the Contractor

17.0 **ALTERATIONS IN "SCOPE OF WORK" :**

If at any time after the Commencement of the work, BHEL shall for any reason whatsoever (but not attributable to the Contractor) not require the whole work there of as specified in the tender to be carried out, the Engineer of BHEL shall give notice in writing of the fact to the Contractor who shall have no claim to any payment or Compensation whatsoever on account of any profit or advantage which he might have derived in consequence of the full amount of the work not having been carried out, nor shall the Contractor have any claim for compensation by reason of any alterations having been made in the original specifications, drawings, designs and instructions which shall involve any curtailment of the work as originally contemplated.

18.0 **ALTERATIONS IN WORKS :**

BHEL may require such alterations to be made in the work during its progress, as may be deemed necessary, and after due consideration of the relation which such alterations bear to the work and price stipulated there for in the Contract, BHEL will determine the amount, if any, which shall on that account be added to or deducted from the Contract price, and this decision thereon shall be final and binding on the Contractor. No variation of the Contract shall be valid unless made in writing and agreed to by BHEL.

19.0 **DAMAGES AT THE WORK SITE :**

19.01 If the Contractor or his agents or his workers or servants or other associates shall break, deface, injure or destroy any part of a building, roads, road kerbs, fence enclosures, water pipes, cables, drains, electric or telephone posts or wires, trees, grass or grasslands, or any other property or cultivable grounds contiguous to the premises on which the work or any part of it is beinkg executed, or if any damage shall happen to the work, while in progress, from any cause what-so-ever, the Contractor shall make good at his own expense, or in default, the Engineer may cause the same to be made good by other workmen or by other means and deduct the expense (of which the certificate of Engineer shall be final) from any sums that may then be due or at any time thereafter



GENERAL TERMS AND CONDITIONS

Spec. No.102

become due to the Contractor, or from his security deposit, or the proceeds of sale thereof, or a sufficient portion thereof ,

19.02 In case of damage to or loss of any, erected or otherwise, equipment or components of the BHEL/client or any property belonging to BHEL/their client, caused by the Contractor's men while handling or erecting, due to negligence and carelessness on their part, the responsibility of making good the loss shall rest with the Contractor without loss of time or hindrance to work.. The actual cost of damage without loss of time or hindrance to work. The actual cost of damage of loss together with the overheads will be recovered from the Contractor's bills. Decision of the Site Engineer, regarding the cause and extent of the damage/loss shall be final from the execution of work in full but which he did not derive.

20.0 **CONTRACTOR TO ARRANGE FOR ALL PLANTS, SCAFFOLDING, LADDERS AND MAINTENANCE OF THE SITE IN A CLEAN CONDITION :**

20.01 The Contactor shall supply at his own cost all materials (except) such special materials, if any, as may in accordance with this Contract be supplied by BHEL) plants, tools, appliances, implements, ladders, cordage, tackle, scaffolding, shuttering and temporary work whether original, altered or substituted, and whether included in the specification or other documents forming part or the Contract referred to in these conditions or not, or which may be necessary for the purpose of satisfying or complying with requirements of the Site Engineer or to any matter as to which under these conditions he is entitled to be satisfied or which he is entitled to required together with carriage there for to and from the work. The Contractor shall also supply without charge the requisite number of persons with means and materials necessary for the purpose of setting out the works, counting, weighing and assisting in the measurement of examination at any time and from time to time of the work or materials. On his failure to do so the same may be provided by the Engineer at the expenses of the Contractor and the expenses may be deducted from any money due to the Contractor or from his security deposit or the proceeds of sale thereof or a sufficient portion thereof. The Contractor shall be entirely responsible for the true and perfect setting out and for the Correctness of all parts of the work. If at any time, any errors shall appear in any part of the work the Contractor shall at his own cost, rectify such errors to the satisfaction of the Engineer. The Contractor shall not deposit materials in such places as to cause inconvenience to public /BHEL/client/other cases and will provide all necessary fencing and lights required to protect the public from accidents and shall be bound to bear all the legal expenses for any suit, action or other proceedings of law that may be brought on by any person for injury sustained owing to neglect of the above precautions and to pay the damages and costs which may be awarded in any such suit, action or proceedings to any such persons or which may with the consent of the Contractor be settled or compromised by any such person.

20.02 It shall be responsibility of the Contractor to keep the storage, (pre-assembly yard erection) site and offices used by him, clean and free from all extraneous materials to the satisfaction of Site Engineer. The contractor shall arrange for removing all such materials and depositing them at a specified place at the end of each day. Up-on completion of the work the Contractor shall arrange to remove from the vicinity of work

all scrap, packing materials, rubbish unused and other materials and deposit them in areas specified by the Site Engineer. In the event of his failure to do so, the same will be arranged to be done by other means and the expenses so incurred will be deducted from the Contractor's bills.

21.0 PROVISIONS OF WORKMEN.S COMPENSATION ACT:

In every case in which by virtue of the provisions of section 12, sub-section (1) of the Workmen's Compensation Act, 1923, or any other law for the time being in force, BHEL is obliged to pay compensation to the workmen employed by the Contractor in execution of works. BHEL will recover the same from the Contractor towards the amount of Compensation so paid at 19% interest and without prejudice to the rights of BHEL under section 12, sub-section (2) of the said Act. or any other Law for the time being in force. BHEL shall be at liberty to recover such amount or part thereof any by deducting if from the Security Deposit or from any sum due by BHEL to the Contractor whether under this Contract or otherwise. BHEL shall not be bound to contest any claim made against it under section 12, sub-section (1) of the said Act or any other law for the time being in force except on the written consent / request of the Contractor and upon his giving to BHEL full security for all costs for which BHEL might become liable in consequence of contesting such claim.

22.0 **BHEL NOT RESPONSIBLE FOR CONTRACTOR.S EMPLOYEES:**

22.01 The workers employed by the Contractor shall be the employees of the Contractor for all purposes whatsoever and shall not be deemed to be in the employment of BHEL for any purpose whatsoever. The Contractor shall abide by all rules, laws and regulations that may be in force from time to time regarding the employment or conditions of service of his employees. If under any circumstances whatsoever BHEL is held liable or responsible in any manner whatsoever for the default or omission on the part of the Contractor in the abiding by the aforesaid rules, laws and regulations or is held liable or responsible to the employees of the Contractor in respect of any matter whatsoever, BHEL shall be reimbursed by the Contractor for the same as also of any other expense or cost incurred by BHEL in any proceedings or litigation as a result of any claim demand or act on the part of the employees of the Contractor .

22.02 BHEL reserves the right to insist on the removal from the premises and property of BHEL/ their client any of the Contractor's employees without assigning any reason whatsoever and the Contractor shall remove such men forthwith.

22.03 The Contractor shall as far as possible, give preference to people .from local regions in which the site is situated for employment as skilled labourers in any case all unskilled categories of labour- shall be recruited from the local areas.

23.0 **SUMS PAYABLE TO BHEL BY WAY OF COMPENSATION :**

All sums payable to BHEL by way of Compensation under any of these conditions shall be considered as reasonable compensation to be applied to the use of BHEL without reference to the actual loss or damage occurred, and whether or not any loss or damage shall have been occurred.



GENERAL TERMS AND CONDITIONS

Spec. No.102

24.0 **CONTRACTOR TO COMPLY WITH ALL LAWS AND REGULATIONS ETC.**

24.01 The Contractor shall be responsible to secure compliance with all Central and State Laws as well as the Rules, Regulations, Byelaws, and orders of the local authorities and statutory bodies that may be in force from time to time. He shall give to the Municipal Corporation/Committee. Police and other relevant authorities all such notices etc., as may be required by law and obtain all requisite licenses for temporary constructions, enclosures etc. and pay all fees, taxes and such other dues or charges which may be leviable on account of any of his operations in executing the works under this Contract. He shall make good at his own cost, any damage to any adjoining property.

24.02 The Contractor shall comply with all laws, statutory rules, safety rules, regulations etc. The payment of wages Act, Minimum wages act workmen's Compensation Act, Industrial Disputes Act, Contract Labour (Regulations & Abolition) Act, 1970 as applicable in the State concerned and the other rules and regulations in force in BHEL that may be applicable. The contractor shall insure his workmen against accident, injury, while at work, as required by the relevant rules and it is the obligation of the contractor to pay compensation if any, to his workmen, as per workmen's Compensation Act and Employer's Liability Act. No responsibility will rest with BHEL in this regard. BHEL is not responsible for any accident to the labour employed by the Contractor due to his negligence, carelessness and non-observance of safety precautions etc. The Contractor must ensure to use safety precautions etc. The contractor must ensure to use safety belts, helmets etc., for his workmen to avoid accidents.

24.02A **LABOUR LEGISLATION:**

The erection Contractor shall comply with the following labour legislation and future legislations in respect of his work and labour engaged by him.

1. Minimum wages Act, 1948 and Rules framed there under
2. Payment of Bonus Act, 1965 and Rules framed there under
3. Payment of wages Act, 1936 and Rules framed there under
4. Equal Remuneration Act, 1976 and Rules framed there under
5. Maternity Benefit Act, 1961 and Rules framed there under
6. Employees Provident Fund Scheme, 1952 and Employees family pension scheme 1971
7. Workmen compensation Act, 1923 and Rules framed there under.
8. Payment of Gratuity Act, 1972 and Rules framed there under
9. Contract Labour (Regulation and Abolition) Act, 1970
10. Factories Act, 1948 and Madhya Pradesh Factory Rules, 1962.
11. Industrial Disputes Act, 1947 and Rules framed there under

24.03 The Contractor is responsible for the provision of health and sanitary arrangements to the workmen and other personnel employed by him as per section IV, clause 30,00

24.04 The Contractor shall observe all the Safety Regulations, in, force in BHEL/clients area etc. during the contract period. "

25.0 **CONTRACTOR TO BE LIABLE FOR ALL TAXES ETC.**

The rates furnished by the Contractor in the tender, should be inclusive of all taxes, tools, octroi, duties, fees, royalty or commissions, etc. applicable in respect of this contract. The contractor shall indemnify BHEL against levy of any taxes etc., in regard to this contract and in the event of BHEL being assessed for any of the said imposts BHEL shall have the right to recover the total amount assessed from the Contractor's dues and the Contractor shall also be responsible for all costs, expenses that may be incurred by BHEL in connection with any proceedings or litigations in respect of the same. In respect of employees Provident Fund Scheme applicable to the Contractor's Employees and Employees State insurance scheme, necessary deduction will have to be made from the Contractor bills if applicable and BHEL will have no obligation to pay any compensation on this account.

25.01 The contractor shall get duly registered themselves with local sales tax authorities and pay sales tax on materials procured by them, which is used in the execution of contract work. The contractor shall also get themselves accounted of the local (Govt. local bodies) sales tax regulation/ordinance etc. on the tax leviable on the works contract and register themselves and pay the sale taxes as per local law's regulations. The rates furnished by the bidder in the tender schedule shall include all such taxes. Any claim by the contractor subsequently pleading ignorance to law's regulations, ordinance etc., will not be acceptable to BHEL.

26.0 **GUARANTEE**

Even though the work will be carried out under the supervision of BHEL Engineers, the contractor will be solely responsible for the work and he shall guarantee the work done for a period of twelve months from the date of completion of work as certified by the Engineer for good workmanship 'in Erection/Testing & Commissioning and shall rectify free of cost all defects due to faulty workmanship by him detected during the guarantee period starting from the date of completion of work duly guaranteeing such repairs also for a period of six months after the repairs.

27.0 **FORCE MAJEURE:**

27.01 The following shall amount to Force Majeure Acts of God, acts of any Government. war, sabotage, Riots, Civil commotion, Police action, revolution, flood, fire, cyclones, earthquake, epidemic disease and other similar causes over which the Contractor has no control.

27.02 If the Contractor suffers delay in the execution of the Contractual obligations due to delays caused by Force Mejeure as defined above, the agreed time of completion of the job covered by this Contract or the obligation of the Contractor shall be extended by a period of time equal to the period of delay provided that on the occurrence of any such contingency the Contractor immediately reports to Bharat Heavy Electricals Limited, in writing the causes of each delay

28.0 **CANCELLATION OF CONTRACT:**



GENERAL TERMS AND CONDITIONS

Spec. No.102

BHEL, whose decision shall be final without prejudice to any other right or remedy which shall have accrued or shall accrue there after to BHEL, cancel the contract in any of the following cases:

28.01 FOR CORRUPT ACT:

28.02 It the Contractor shall offer or give to any person in the service of BHEL, any gift or consideration of any kind as in inducement or reward for doing or forbearing to do or for having done or forborne to do any act in relation to the obtaining or execution of this or any other contract for BHEL.

OR

28.03 If the Contractor shall enter into a contract with BHEL in connection with which commission has been paid or agreed to be paid by him or with his knowledge unless the, particulars or any such commission and the terms of payment, thereof have previously been disclosed in writing to the Accepting Officer.

OR

28.04 If the Contractor shall obtain contract with non BHEL as a result of ring tendering or by non-bonafide methods of competitive tendering without first disclosing the fact in writing to the Accepting Officer.

28.05 FOR INSOLVENCY, ASSIGNMENT OR TRANSFER OR SUBLETTING OF CONTRACT CHANGE IN THE FIRM

28.06 If the Contractor being an individual or if a firm, any partner thereof, shall at any time be adjudged bankrupt or order for administration of his state made against him shall take any proceedings, for liquidation or composition under any bankruptcy Act for the time being in force or make any conveyance or assignment of his effects of composition or arrangement for the benefit of his creditors or support to do so, or if any application be made under any bankruptcy Act for the time being in force for the sequestration of his estate or if a trust deed be granted by him on behalf of his creditor

28.07 If the Contractor being a company, shall pass a resolution or the Court shall make an order for the liquidation of its affairs, or a receiver or Manager on behalf of the debenture holder shall be appointed or circumstances shall arise which entitle the Court or debenture holders to appoint a receiver or Manager .

OR

28.08 If the Contractor, assigns, Transfers, sublets or attempts to assign, transfer or sublet any portion of the work without the prior written approval of the accounting officer. (Any such consent shall not relieve the Contractor from any obligation, duty or responsibility under the Contract.)

OR

28.09 If the Contractor being a Partnership Firm introduces a new partner in the firm except with the previous consent in writing of the BHEL which may be granted only upon

production of a written undertaking by the new partner to perform the Contract and accept all liabilities incurred by the firm under the Contract prior to the date of such undertaking.

OR

28.10 If the Contractor being a Partnership firm, on the death or retirement of any partner of the Contractor's firm before he completes performance of the contract.

OR

NOTE: If the Contract is not determined as provided in sub-clause No. 28.10 before retirement of a Partner from the firm, he shall continue to be liable under the Contract for the act of the firm until a copy of the public notice given by him under section 32 of the Partnership Act has been sent by him to BHEL by registered post with acknowledgement due.

28.11 **FOR NONFULFILMENT OF CONTRACTUAL OBLIGATIONS :**

If the Contractor withdraws or abandons the Contract before completion of the works or pleads his inability to carry on the works covered under this contract or BHEL finds during the execution of work the contractor to be inefficient or otherwise incompetent to complete the work as per the time schedule of the Contract, fails to improve the rate of progress of work as stipulated by BHEL from time to time or the Contractor fails to fulfill any of the contractual obligations or contravenes any provisions of the contract at any time, or persistently disregards the instructions of the Engineer at site or fails to take steps to employ competent or additional staff and labour as required under the contract or fails to afford the Engineer or his representative proper facilities for inspecting the work or any part thereof, he shall be deemed to have not fulfilled the contractual obligations.

29.00 CONSEQUENCE OF CANCELLATION:

29.01 Whenever BHEL exercises its authority to cancel the contract under the clause No.28.00 that may complete the work by any means at the Contractor's risk and expense provided always that in the event of the cost of completion (as certified by the Engineer which is final and conclusive) being less than the Contract cost the advantage shall accrue to the BHEL and that if the cost of completion exceeds the moneys due to the Contractor under the Contract, the Contractor shall either pay the excess amount ordered by the Engineer or the same shall be recovered from the Contractor by other means. This will be in addition to the forfeiture of Security Deposit and recovery of liquidation damages as per clause No.10.00

29.02 In case BHEL completes the work under the provisions of this condition the cost of such completion to be taken into account in determining the excess cost to be charged to the Contractor under this condition shall consist of the cost of material purchased and/or labour provided by BHEL with an addition of such percentage to cover superintendence and establishment charges as may be decided by BHEL whose decision shall be final and conclusive.



GENERAL TERMS AND CONDITIONS

Spec. No.102

30.00 ARBITRATION :

- 30.01 All disputes between the parties to the Contract arising out of or relating to the Contract, other than this for which the decision of the Engineer or of any other person bound by the Contract expressed to be final and conclusive, shall after written notice by either party to the Contract to the other party be referred to the sole arbitration of the Officer of BHEL appointed as arbitrator by the Executive Director or Group General Manager or General Manager of Bharat Heavy Electricals Limited, Hyderabad-502 032 in his sole discretion.
30. 02 Unless the parties otherwise agree, such reference shall not take place until after the completion, alleged completion or abandonment of the work or the determination of the Contract.
30. 03 The venue of arbitration shall be such a place or places as may be fixed by the arbitrator in his sole discretion.
30. 04 The award of the arbitrator shall be final, conclusive and binding on both parties of the Contract.

31.00 BIDS

- 31.01 Bidder shall submit the bid in two separate sealed covers super-scribing as 'Technical Bid' and 'Price Bid'. Technical Bids alone will be opened on the due date and time and in the presence of the bidders who wish to be present.
- 31.02 Earnest Money Deposit shall be enclosed to the 'Technical Bid'. The tender cover should be super scribed to indicate the fact that EMD is enclosed. Tenders received without EMD will be rejected.

1.01 SCOPE OF CONTRACT:

The intent of specifications is to provide erection services according to most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for the proper and efficient erection of the plant shall not relieve the Contractor of the responsibility of providing such facilities to complete the erection.

- 1.02 Should any error or ambiguity be discovered in the specification or information furnished to him the Contractor shall forthwith bring the same to the notice of Engineer of BHEL before commencement of work. The Engineer's interpretation in such cases shall be final and binding on the Contractor.
- 1.03 Any part of work for which there is no specification laid down in the contract shall be carried out as per the instructions and requirements of the site Engineer.

2.00 ERECTION RATE:

The tenderer shall quote the lowest rate in the proforma prescribed in the price bid for the complete work listed in the tender notice and as detailed in scope of work, under the conditions stipulated in this tender specification. No extra claim on any account whatsoever shall be allowed by BHEL unless otherwise specifically mentioned in the tender specification.

- 2.01 The rates quoted by the tenderer shall be firm for the entire duration of the contract irrespective of any variations in the cost of living index, prices of materials, wages of the labour or any other developments arising subsequent to the date of tender.
- 2.02 The rates quoted by the tenderer shall remain uncharged even if the actual quantities erected by the Contractor deviate from the figures in spec given irrespective of the extent and magnitude of such deviation.

3.00 IDLE. LABOUR CHARGES:

BHEL will have on liability to any stoppage/delay caused in the work resulting in the labour of the Contractor being idle either due to maintenance work or breakdown of the erection equipment, tools and tackles to be supplied by BHEL/their clients, if any, or due to any other causes arising from the manner of execution of the work.

4.00 EXTRA CHARGE FOR MODIFICATION. RECTIFICATION & REPAIR:

- 4.01 Major modification and rectification if any due to design and manufacturing deficiencies which warrant major revamping at site, will be considered as extra on submission, after completion of work at the discretion of Resident Engineer. For extra claim, the Contractor may quote man hour rate which means only skilled category including all consumables, tools & tackles etc.

4.02 All the works such as cleaning, leveling, aligning, assembling temporary erection for alignment, scaffolding, checking, dismantling for checking and cleaning, surface preparation, edge preparation of pipes, tubes and plates for welding, cutting, grinding welding, straightening, scraping, fitting up etc., which in the opinion of the Engineer- in-charge are incidental to the final erection and necessary to complete the erection work satisfactorily, shall be carried out by the Contractor for which no extra claim shall be allowed.

5.00 PERIOD OF COMPLETION:

5.01 The time schedule for entire work of erection and commissioning shall be governed by spec. No. 203. Erection schedule.

5.02 For this Purpose, the erection will be deemed to be completed in all respects, only when the trial runs, commissioning and handing over of the equipments to our client are over. The decision of the Engineer-in-charge in this respect shall be final and binding on the Contractor.

5.03 In the event of the date of commissioning being extended beyond the period specified it shall be the responsibility of the Contractor to complete the work to suit the revisions in the programme keeping the rates specified in the price tabulation firm during the extended period without any claim for extra payment on this account

6.00 MEASUREMENT AND PAYMENT FOR THE WORK EXECUTED:

6.01 All items having financial value shall be entered in BHEL Measurement Book by BHEL engineer.

6.02 Work carried out for agreed lumpsums will be described and similarly recorded.

6.03 Lumpsums omissions will be entered for deduction, Measurement shall be restricted to that for which it is required to ascertain the financial liability of BHEL under this contract.

6.04 Work which is to be measured in detail shall be measured as per standard procedure without reference to any local procedures excepting where it is otherwise stated in the tender documents. The measurement shall be taken jointly by persons duly authorized on the part of BHEL and the contractor.

6.05 The Contractor shall bear the expenditure involved if any, in making the measurement. The Contractor shall without extra charges, provide all the assistance with appliance and other things necessary for measurement.

6.06 BHEL Engineer will enter the measurement in BHEL Measurement Book and shall certify regarding the actual work executed in the Measurement Book and bills prepared based on the same.

- 6.07 The Measurement entered in the Measurement Books and the bills prepared shall be signed and dated by both the Contracting parties.
- 6.08 If at any time due to any reason whatsoever, it becomes necessary to remeasure the work done in full or in part, the expense of such measurement shall be borne by the Contractor.
- 6.09 The Contractor will be intimated by Site Engineer of the proposed date of Measurement. If the Contractor's representative fails to participate in the joint measurement, the BHEL Engineer shall have power to proceed by himself to take measurements and in that case the measurement shall be accepted by the Contractor as final.
- 6.10 The contractor shall once in every month submit to site Engineer of BHEL with a copy to Manager (External Services), details of the claims by him up to and including the previous month which are not covered by the Contract Agreement in any of the following respect

1. Deviation from the items and specifications, provided in the Contract Agreement.
2. Extra items /new items of work
3. Items in respect of which rates have not been settled.

He should in addition furnish a clean certificate to the effect that the claims submitted by him as aforesaid cover all his claims and no further claims shall be raised by him in respect of the work done up to and including the period under report.

- 7.00 **Terms of Payment:** See Specification No. 205

No levy or payment of charge made or imposed shall be by reasons of any clerical error or by reasons of any mistake in the amount levied or demanded or charged.

- 8.00 **CONTRACTOR'S PERSONNEL: FACILITIES & SERVICES**

The Contractor shall provide services and facilities including all the specially skilled labour such as high pressure welders (gas, TIG, and arc}, millwright fitters, pipe fitters, erectors etc. in addition to other skilled, semi-skilled and unskilled labour required for the erection work contemplated under this specification. In case the labour strength/ services/facilities have to be increased to complete the erection work to suit the programme given from time to time, the same has to be complied with as per the requirements of the Resident Engineer without any claim for extra payment.

- 8.01 The Contractor shall employ only fully trained and competent men with previous experience on this job. They have to hold valid certificates wherever necessary as per statutory requirements and also as required by the Engineers of BHEL. BHEL reserves the right to decide the suitability of workers and other personnel who may be employed by the Contractor.

- 8.02 It is the responsibility of the Contractor to have the required number of qualified supervisory engineering staff who can read the drawings and execute the work as per drawings and understand and carryout works as per BHEL Engineers instructions in the absence of drawings wherever required and control the Contractor's labour force
- 8.03 It must be clearly understood that the day to day working and utilization of the labour employed by the Contractor shall be regulated solely according to the instructions of the Engineer of BHEL.
- 8.04 The supervisory staff employed by the Contractor shall also ensure proper out-turn of work and discipline by the labour put on the job by the Contractor and III general ensure that the works are carried out in a safe and correct manner and in coordination with labour or staff employed directly by BHEL or any other Contractors of BHEL/ their client.
- 8.05 Contractor shall submit a weekly progress report of works on approved proforma to the Engineer. Contractor shall also plan and carryout works according to the target and state the deviation, if any, in the progress report.
- 8.06 Contractor shall also furnish the Site Engineer of BHEL a daily/ weekly labour report showing by classification, the number of employees engaged in various Categories of work.

9.00 ISSUE OF MATERIALS FROM STORES:

- 9.01 The Contractor shall receive the materials from the stores maintained by BHEL at site with due acknowledgement on printed stores issue vouchers. Any loss or damage to the materials duly received by the Contractor will have to be made good by him promptly without any loss of time. Delay in progress of work due to loss or damage of materials will be entirely attributable to the Contractor.
- 9.02 All the tools and tackles, lifting devices, transporting equipments required by the Contractor for transporting from storage yard to the pre-assembly area, pre -assembly areas to erection site and for erection and commissioning shall be arranged by the Contractor himself.

10.00 TOOLS AND PLANT:

- 10.01 The tools and plant given in the list at Annexure-1 are only for erection and commissioning. Tools and plant required for unloading, loading, storage, transportation etc. for the components are not covered in the list and additional tools and plant required for this purpose shall be arranged by the Contractor at his own cost.
- 10.02 If, any equipment and material issued to the Contractor are damaged or lost, the Contractor shall immediately report to the Engineer the particulars and the circumstances in which the damage or loss took place, for lodging insurance claims. Failure to report in time will result in summary recovery of the item lost or damaged, from the running bills of the Contractor. In case the claims are not realized from the Insurance Company either

partly or in full, then necessary recoveries corresponding to the Contractor's liability in this regard will be made from the monthly bills/deposits of the Contractor.

10.03 Reconciliation of stores issued to the Contractor for work is the primary responsibility of the Contractor. All the surplus/damaged unused materials, package materials/containers, gunny bags etc., supplied by/belonging to BHEL shall be returned to BHEL in the condition in which they were received. All the materials shall be stored 15 cm above the ground by use of concrete blocks or wooden sleepers. No material shall be allowed to remain on ground at any time. All openings in the components shall be kept covered till they are in final position. This work should be taken up and completed as required by BHEL. Necessary recovery will be affected from the Contractor for the materials not returned or accounted for as per BHEL's rules.

10.04 The Contractor, during the progress of work should provide, erect and maintain at his own cost necessary tool crib, store room and office room in the machine hall. He shall also provide temporary workshops required for proper and efficient execution of the work at his own cost. The planning, location and erection of these shall have the approval of the Engineer of B H EL.

11.00 FOUNDATION AND CIVIL WORKS:

11.01 Buildings and other necessary civil works for equipments etc. will be provided by the client of BHEL. However, all adjustment of the foundation level, dressing and chipping of foundation surfaces, foundation bolt pockets and grouting of equipments, auxiliaries after alignments etc. as may be required for the erection of equipment/plants will have to be carried out by the Contractor at his own cost. Supports for pipes, valves, flanges etc, are to be grouted wherever necessary, by the contractor with cement concrete at his own cost, as per instructions of the BHEL Engineer. All materials like cement, steel, sand, gravel etc. for the purpose of grouting shall be arranged by the contractor at his own cost including special grout mixes.

11.02 Any civil work damaged by the Contractor in the execution of the work shall have to be made good by contractor at his own cost to the satisfaction of BHEL/its client

12.00 PRE-ASSEMBLY:

The Contractor shall transport the equipment and materials requiring pre-assembly from the storage yard to the pre-assembly areas. The contractor shall take delivery of the components and equipment from the storage yard after getting the approval of the Engineer on standard indent forms to be specified by the BHEL Engineer. After completion of erection work, complete and detailed account of the equipments so erected shall be submitted to BHEL duly certified by BHEL Engineer, by the Contractor.

12.01 Any fabrication including supply of Engineering materials required for pre-assembly or erection of pre-assembled blocks/pieces other than those made available by BHEL or their clients at site shall be Contractor's responsibility at his cost.

13.00 METHOD OF ERECTION: -

The components of equipments are sent in partly assembled and partly disassembled condition for convenience of transport. They are to be dismantled, cleaned, assembled stage by stage, erected, matched (including minor modification), aligned and adjustments carried out.

Valves, fittings and pumps are to be thoroughly cleaned where necessary by dismantling the same before erecting and aligning. Valves are requiring hydraulic testing, checking of operation and setting are to be done by the contractor. Any test rig required for these operations will be fabricated by Contractor with his material. All the above activities are to be carried out by the Contractor within his stipulated rates. Careful handling of equipment while lifting and transporting is required. Highest care should be taken, especially while lifting heavy equipments like compressor barrels and casings, turbine casing, rotors, condensers and other heat exchangers etc.

14.00 ERECTION:

14.01 The scope of erection shall include transporting to work spot the materials from storage yard/pre-assembly area, erection work alignment pre-heating, welding, post heating, heat treatment, stress relieving and X-raying, leveling adjusting etc. till the turbo-set and other equipments are finally tested and approved for acceptance and are taken over by BHEL/their clients for putting into commercial operation.

14.02 The Contractor shall provide at his own cost in sufficient quantity all consumables

- a) Sealing material, shellac compound, hemp fiber- klingerite, permanite, CAP gaskets, gland packing, adhesive and other tapes etc.
- b) Lubricants, oils, paints, varnishes, thinners etc.
- c) Cleaning material like washing soda, soap, dungy cloth, cotton waste, carbon tetrachloride etc.
- d) Adhesive papers, tapes, grinding and lapping stones, emery cloth, emery paper etc.
- e) Soldering and welding material including thermo chinks, fluxes, all electrodes, oxygen, acetylene, argon (for carbon, steel, alloy steel & stainless steel) etc.
- f) Hardware items including nuts, bolts, structural steel etc. for enabling works.
- g) Electrical items such as cables, bulbs, switch etc. for enabling works.
- h) Packing plates and shims for leveling and aligning equipment
- i) Scaffolding etc.
- j) Miscellaneous items of consumables nature not specifically mentioned but required for erection purposes incidental to such works. The materials so supplied and used shall be of the best quality and subject to prior approval of BHEL.
- k) All grout mixes.

15.00 **PROTECTION:**

The Contractor shall take all reasonable care to protect the work under erection till such time the erected equipments are taken over by BHEL/their client. Wherever necessary, suitable fencing and lighting shall have to be provided by the Contractor as a safety measure against accidents and damage of property of BHEL/their clients. Caution

notices shall be displayed by the Contractor to give warning to the persons working at site of access to any part which may be deemed to be unsafe and hazardous.

16.0 PAINTING:

All the items erected-main equipments, auxiliaries, piping, etc. will have to be painted by band or spray as directed by the Engineer with paint procured by Contractor. For items received painted, two coats of finish paint over one/two coats of primer are essential. For items received and erected without any paint, two coats of finish paints over two coats of primer are essential. The quality, specification, colors and brand of paint are subject to approval by the Engineer. The scope of work includes scraping off old paint where required, colour bands, lettering, arrows, etc., as directed. Provision of scaffolding, consumables etc. incidental to the work are to be arranged by the contractor at his own cost. The work is subject to inspection/approval by BHEL's clients. Paint weight is not considered for tonnage purposes. Painting of all equipment and piping is to be carried out by the contractor. All shop painted equipments is to be painted with two coats of finish paint using ""APCODUR" of Asian Paints or equivalent. All the piping to be painted with primer and two coats of finish paint of approved colour and brand with Synthetic enamel paint. The contractor shall arrange for the painting deploying his own tools, tackles, manpower, etc.

- 16.01 In case of damage or loss to any equipment or components or any property thereof of BHEL or their clients caused by the Contractor's men while handling and erecting the same due to negligence and carelessness on the part of the Contractor's workmen, the responsibility of repairing or replacing shall rest with the contractor. In case the Contractor fails to make good loss or damage within a reasonable time, the actual cost of damage or loss together with overheads will be recovered from Contractor's bill. Decision of BHEL regarding the cause as well as extent of the cost of damage shall be final and binding on the Contractor. Delay in progress or works due to this will be attributable to contractor.
- 16.02 Until the plants or equipments are deemed to have been taken over, the Contractor shall be liable for and shall be deemed to have agreed to indemnify BHEL or their clients occasioned by negligence or fault of the Contractor or his personnel.
- 16.03 The erection devices, alignment fixtures, including supply of materials for same, tools and tackles, lifting device and all other materials necessary to carry out the entire work shall be arranged by the Contractor. Before putting into use all such fixtures, devices, etc. shall have to be approved by BHEL.
- 16.04 The contractor shall execute the work in the most substantial and workman like manner. Accuracy of work in stipulated time is an essential part of this contract. The Contractor shall be responsible to ensure the assembly and workmanship to confirm to the dimensions and tolerances given in the drawing, specifications, quality or suitability or measurements, or as per the instructions of Engineer. If any portion of work is found to be defective, in specification or measurements, the Contractor shall dismantle and redo

the work at his cost to the satisfaction of BHEL. Time lost on this account will be attributable to the Contractor.

- 16.05 Fabrication of pipes 2" & below for which isometric drawings are not given, like governing oil lines, and seal oil lines, has to be done at site as per the site conditions, for which pipes are supplied in commercial lengths. Fabrication of bends, tees elbows, reducers etc. for pipes of dia up to 2" and below will also be done at site by the contractor at no extra cost from the above pipes supplied in commercial lengths. However, bends, tees, elbows, reducers etc. above 2" will be supplied ready made.
- 16.06 Permanent supports for an II the pipes of all diameters wherever required are to be fabricated at site by the Contractor within his quoted rates. However special supports like spring suspensions, clamps, and hanger rods will be supplied by BHEL. Material for fabrication such as plates, angles, channels, rods, I - sections, pipes etc. will be supplied in running lengths. Fabrication as above will include adjustments by cutting and welding as required. Temporary supports will have to be provided wherever required at contractor's cost.
- 16.07 The pressure parts shall be erected in conformity with the provision of the Indian Boiler Regulations and will be subject to inspection by the Chief inspector of Boilers, or anyone appointed by him in his sole jurisdiction.
- 16.08 Non-destructive tests like hydrostatic pressure test, air tightness test etc. as instructed by the Engineer from time to time, shall be carried out by the Contractor to the satisfaction of BHEL/it's client.
- 16.09 Scope of erection also includes any installation work on pressure parts, connected with instruments and controls.
- 16.10 For alignment and level adjustments of the equipments like Pumps, motors etc. necessary shim plates and pickings suitably fabricated, wherever required, shall be arranged by the Contractor at his own cost.

17.00 WELDING:

- 17.01 All necessary preheating, of welds and stress relieving operation of welds are part of the erection work and shall be performed by the Contractor in accordance with the relevant regulations and standards of BHEL practice and to the satisfaction of BHEL Engineer and in accordance with the drawings and specifications.
- 17.02 Erection of equipment involves good quality welding dye penetration test heat treatment radiography work. Wherever required 100% dye penetration test, have to be carried out as per instructions of BHEL Engineers. Contractor's personnel Technicians along with laborers engaged should have adequate knowledge on the above works.
- 17.03 The pressure parts shall be erected in conformity with the provision of Indian Boiler Regulations and may be directed as per any other standard/specification in practice in BHEL. The method of welding (Viz.) Arc, Gas, TIG or other method may be indicated in

the detailed drawings. BHEL Engineer will have the option of changing the method of welding as per site requirements.

- 17.04 Welding of high pressure parts shall be done by certified High pressure Welders who possess valid certificate or CIB of the state in which the equipment is erected as per provision of I BR... The high pressure Welders who possess necessary certificate shall appear well in advance before the expiry of the validity of this certificate for requalification test as per relevant provision of IBR and keep the certificate valid till the completion of work. The services of such welders, the validity of whose certificates have expired shall have to be terminated forthwith.
- 17.05 All Welders deployed on this work shall be tested and approved by BHEL Engineer before they are actually engaged on work though they may possess the IBR Certificate BHEL reserves the right to reject any welder without assigning any reason
- 17.06 BHEL Engineer is entitled to stop any welder from the work if his work is unsatisfactory for any technical reasons or there is a high percentage of rejection of joints welded by him, which, in the opinion of the BHEL Engineer, will adversely affect the quality or the welding though the welder has earlier passed the tests prescribed by BHEL Engineer. The welders having passed qualification tests does not relieve the Contractor of a Contractual obligation to check on the Welder's performance.
- 17.07 All charges towards testing of Welders for approval of Welders for engaging in the erection work shall be borne by the Contractor.
- 11.08 Sufficient quantity of test plates and pipe pieces as considered adequate for testing contractor's welders will have to be arranged by Contractor at his cost. All the other expenses in conducting the test including radiography and heat treatment shall also be borne by the Contractor.
- 11.09 All welded joints shall be subjected to acceptance by BHEL Engineer.
- 18.00 **WELDING AND THEIR PRESERVATION:**
- 18.01 The electrodes/wires and related supplies as required for site welding are to be procured by the Contractor at his cost.
- 18.02 All the welding electrodes/wires shall be stored by the Contractor carefully to prevent deterioration of their properties. Proper care should be taken to preserve low hydrogen electrodes, alloy steel & stainless steel electrodes which have to be stored in an air-conditioned room at constant relative humidity by the contractor.
- 18.03 All these electrodes shall be dried in the electric drying oven to temperature and period specified by the Engineer, before they are used for erection work.

19.00 HEAT TREATMENT:

- 19.01 Preheating, post weld heating and stress relieving after welding, is part of erector's work and shall be performed by the Contractor in accordance with IBR regulations and BHEL Engineer's requirement. Contractor shall arrange to supply heating equipment with automatic recording devices. Also the contractor shall have to arrange for labour, all heating elements, thermocouples, etc., insulating material like mineral wool, asbestos, cloth, ceramic beads, asbestos ropes, etc., required for heat treatment and stress relieving works. During preheat and stress relief operations, the temperature shall be measured at least at two different points for pipes above 200 mm dia. by thermocouple, and recorded on a continuous printing type recorder. All the recorded graphs for heat treatment works shall be the property of BHEL. The contractor has to provide thermo chinks temperature recorders, thermocouple attachment units, graph sheets, etc. for checking.
- 19.02 The contractor shall maintain a record in the form as prescribed by BHEL of all operations carried out on each weld and maintain a record indicating the number of welds, the names of Welders who welded the sama, date and time of start and completion, preheat temperature radiographic results, rejection, if any percentage of rejections, etc., and submit copies of the same to the BHEL Engineer as required. Interpretation of the BHEL Engineer regarding acceptability or otherwise of the welds shall be final. All site welding joints shall be subject to acceptance by BHEL Engineers.
- 19.03 The Contractor shall carry out the edge preparation of weld joints at site in accordance with details acceptable to BHEL Engineer. Wherever possible, machining or automatic flame cutting will be allowed only for edge preparation. Some extra lengths in various fabricated pipes given as erection allowance shall have to be cut and edges prepared to suit the site conditions at no extra cost.
- 19.04 Heat treatment may be required to be carried out at anytime (day and night) to ensure the continuity of the progress. The contractor shall make all arrangements including labour required for the work as per directions of B H EL.
- 19.05 All the data such as heating temperature, heating rate, soaking time, maximum temperature reached during heat treatment shall be properly recorded and documented which will be the property of BHEL.
- 19.06 Oxy.-acetylene flame heating or exothermic chemical heating for stress relieving is not permitted. Heating shall be by means of Electric Induction Coil or Electric Resistance coil. Potentiometric type recorders shall only be used for temperature recording purposes.
- 20.00 **RADIOGRAPHY:**
- 20.01 Radiography work of welds connected with this contract shall be arranged by the Contractor including provision of services of Technicians and necessary equipment and consumables like Isotope camera, X-ray films, and chemicals. Also contractor has to provide necessary labour required such as Riggers, Helpers, etc. to assist the technician for carrying out the above radiography work and making other arrangements such IS providing scaffolding approaches, plat-form, lighting arrangements at his cost as per the instructions of BHEL. It may be noted that invariably the radiography will be carried out after the normal working hours only.

- 20.02 Radiography inspection of welds shall be performed in accordance with requirements and recommendations of BHEL Engineer and also as per the directions of BHEL's customer. The minimum extent of radiographic inspection shall be as per provision of IBR Reg. (151) h. They may, however be increased depending upon the performance of the individual Welder at the discretion of BHEL Engineer/Boiler Inspection Authority.
- 20.03 Quantum of radiography shall be enforced as per the specifications and as per the drawings. BHEL Engineer reserves the right to alter the quantum of radiography of joints. The decision of the BHEL Engineer in this regard is fixed and final and binding on the contractor. Any rectifications required shall have to be done by the Contractor at his cost. All X-ray films of joints radiographed at site in connection with work shall be properly preserved in air-conditioned rooms and shall become the property of BHEL.
- 20.04 All field welded joints shall be subjected to dye-Penetrant examination as specified in the respective drawings and shall have to be accepted by BHEL Engineer. Any rectifications required shall have to be done by the contractor at his cost.
- 20.05 For carrying out ultrasonic testing of welded joints large size tubes and pipes, it will be necessary to prepare the surface by grinding to a smooth finish and contour as desired by BHEL Engineer. The Contractor's scope of work includes such preparation and no extra charges are payable for this.
- 20.06 It may also become necessary to adopt inter layer Radiography/MPT/UT depending upon the site/technical requirement necessitating interruptions in continuity of the work and making necessary arrangements for carrying out the above work. The contractor shall take all this into account and quote the price inclusive of all such work and radiography.
- 20.07 The welded surface irrespective of place of welding shall be cleaned of slag and painted at the center with primer paint to prevent corrosion at no extra cost towards this.
- 20.08 All the welded joints of steam admission pipelines to HPT, IPT and LPT shall have to be subject to non-destructive tests, viz. magnetic particle test, dye-penetration test and hardness test in addition to radiography. All the weld seams shall be properly ground and subjected to 100% radiographic examination.
- 20.09 The contractor shall have to do root run or gas welding for pipe joints by TIG process wherever required as per the instructions of BHEL Engineer.
- 20.10 Welding of hangers' supports, stubs, and impulse piping is to be carried out by the contractor according to drawing, specifications and as per BHEL Engineer's instructions. Preheating, post-heating, stress relieving, etc., have to be carried out by the contractor according to drawing and specifications and as per BHEL Engineer's instructions.
- 21.00 **CLEANING OF EQUIPMENTS**
- 21.01 The Contractor shall take necessary measures to ensure that will all the machined surfaces are greased and covered, for proper protection.

- 21.02 The contractor shall clean the internal surfaces of all piping before erection mechanically and by air blowing as per the instructions of the site Engineer. The inside of all the equipments shall be thoroughly cleaned before they are installed.
- 21.03 All pressure parts and such other lines as may be directed by the Engineer shall be acid pickled, flushed with alkali water, oil, steam, or air as directed. Cleaning sequence and arrangements of temporary piping will be directed by the Engineer and contractor shall execute the work under the direction of the Engineer. Temporary pipe material and other connecting material including and/ alkali will be supplied by BHEL.
- 21.04 After flushing with water, steam blowing or after chemical cleaning as indicated by the Engineer all parts of equipments (viz. valves etc) shall be dismantled, checked for accumulation of dust wear or damage, cleaned Rectified/replaced if necessary and reassembled by the Contractor without any claim for extra cost., However, the parts to be replaced in such cases will be supplied by BHEL.
- 21.05 All the bearings, gear boxes etc, of the equipments and electrical motors to be erected are provided with protective grease only. Contractor shall arrange as and when required by the Engineer, for cleaning these bearings gear boxes etc. with kerosene or some other agent, if necessary by dismantling some of the parts of the equipment already installed and shall arrange for re-greasing/lubricating them with recommended lubricants and for assembling back the dismantled parts. Lubricants will however be supplied free of cost.
- 21.06 The Contractor shall provide all labour for execution of work including installation and dismantling of temporary piping, strainers, valves and instruments required for conducting the cleaning work.
- 21.07 The Contractor shall effectively protect the finished work from action of weather and from damage or defacement and shall cover the finished parts when and where required for their protection
- 22.00 **HYDROSTATIC TESTING:** -
- 22.01 All pressure parts and some of the low pressure parts shall be subjected to the hydrostatic pressure test as required by the Indian Boiler Regulations & API. ASME, STDS, TEMA, ASAB, 31.3 IBR, ASME APC (ASAB 31.3) Contractor shall supply all necessary labour and equipment required for conducting the test.
- 22.02 The test shall be performed by the Contractor to the complete satisfaction of the Boiler Inspector and the Engineer. All leaky joints shall be cut out repaired or rewelded as directed and test repeated until satisfactory results are obtained.
- 23.00 **INSULATION:**
The Contractor should carryout thermal insulation (Supply end application) for equipment and piping. He should also carry out cold insulation and insulation for personal protection where required.

The quality of insulation material is subject to approval by BHEL and the work should be got executed by the contractor through agencies reputed in the field like M/s. Lloyds Insulation etc. to standard specifications. The cost of the supply and application of insulation should be included within the overall cost of the contract. The weight of insulation done will not be reckoned for purposes of tonnage erected. For detailed technical specifications etc. please refer to the following documents enclosed to this tender schedule (a) TC 51751 (b) 3-30826-00001. (c) -----

24.00 OIL FILLING:

Oil for flushing purposes should be drawn from the stores of BHEL or its client as directed and filled into the lube oil tank. Thorough cleaning of the L.O. tanks and S.O. tanks including painting of the inside surface where required with Apcodur or equivalent paint to be supplied by BHEL is necessary. On completion of flushing, oil is to be drained and fresh charge for trial run and commissioning filled. Oil for second filling also has to be drawn from stores as mentioned above. The work being incidental to the main erection work under contract, no extra payment is envisaged and weight of oil filled will not be considered for tonnage purposes.

25.00 INSPECTION AND TEST RUN:

The Contractor shall provide personnel for the test run of all equipments erected by him to work under the direction of the Engineer, in case any defect is detected during test run such as loose components, undue noises or vibration, strain on connected equipment etc., the Contractor shall immediately attend to these defects and take necessary corrective measures.

25.01 Contractor shall provide personnel for the testing of all equipments erected by him to work under the direction of the engineer, after the solo run of the turbine, the contractor shall provide personnel for the bearings inspection.

26.00 COMMISSIONING..

26.01 The Contractor shall carry out all tests such as hydrostatic pressure test, function test OT pumps & motors, sole run of Turbine, leak test of compressors etc. as per standards followed by BHEL. Necessary skilled and unskilled personnel and supervisory staff as may be required shall be supplied by the Contractor during start up, testing and commissioning of the equipment.

26.02 Contractor shall install temporary piping if required in connection with testing and commissioning of these units at various points, as required by the Engineer and shall remove them in a neat and workman like manner after tests are over all at no extra cost.

26.03 The erection, testing and commissioning of the (Turbo-Generator/Turbo compressor) units should be carried out in accordance with drawings and specifications which shall be supplied to the Contractor by the Engineer from time to time under the supervision/guidance of and to the entire satisfaction of the Engineer of BHEL. This shall, however in no way relieve the Contractor of his responsibility of providing adequate and competent supervisory staff. Drawings and specifications will be supplied only after ensuring that the contractor has employed qualified, trained Engineers/Supervisors for

supervising the job. Drawings and specifications will not be handed over to the unqualified men of Contractor.

27.00 DRAWINGS AND DOCUMENTS:

- 27.01 The drawings enclosed with this specification are intended only to illustrate and generally indicate scope and nature of erection work involved and shall not necessarily be considered as final and accurate in any or all aspects and some changes may be made as required at a later date.
- 27.02 Upon award of Contract all the detailed erection drawings sufficient to carry out the erection work will be loaned to the Contractor.
- 27.03 All the detailed drawings/notes which will be available with the Engineer at Site shall form an integral part of the Contract.
- 27.04 Any documents, drawings, or designs supplied by BHEL to the Contractor in pursuance of the Contract shall remain the property of BHEL and any information derived there from Or otherwise communicated to the Contractor shall be regarded as secret and confidential and shall not, without the consent in writing of BHEL be published or disclosed either in full or in part to any third party or be made use of by the Contractor except for the purpose of implementing this contract. On completion of work, the documents, drawings and designs supplied shall be returned to BHEL in good condition failure of which will entitle the BHEL to recover the cost of the same if BHEL decides so. The decision of BHEL in this regard will be final and conclusive and binding on the Contractor.

28.00 FACILITIES PROVIDED BY BHEL/THEIR CLIENTS AT SITE:

28.01 **LAND:-**

BHEL/client will allot sufficiently leveled area, storage sheds for storage of Turbo-compressors & components and pre-assembly area at a suitable location. For contractor's Office shed sufficient area will be allotted on rent as charged by BHEL's client. The remittance of rent shall be as directed by BHEL/their clients. Upon completion of the work, the contractor shall dismantle and clear all debris as directed by BHEL.

28.02 **ELECTRICITY:**

- a) Electricity for construction purpose will be made available at 3 Ph. 415 V 4 wire systems "At a single point in the project site. The bidders are advised to visit site and ascertain full details of the same before submitting their offers." Power will be charged at the rate charged by BHEL's clients. Further distribution of power to various erection equipments and power tools shall be arranged by Contractor by providing his own under ground cable, main switch board, distribution switch board, service connections etc. and shall meet all the local statutory requirements.

- b) The Contractor has to make his own arrangements for metering equipment which should be kept under the custody of the owner/purchaser.
- c) The Contractor shall not be entitled to any compensation on account of interruptions /shut downs or temporary power failures.

28.03 WATER SUPPLY

Water (including drinking water) required for construction purposes will be supplied at one point for each purpose. The consumption of water will be charged at the rates fixed by BHEL's client. The Contractor shall make necessary arrangements at his cost for further distribution and storage of water for various purposes as required. Metering of the water consumption for different purposes shall be arranged at the cost of the contractor and should be kept under custody of owner/purchaser.

- 28.04 BHEL reserves the right to draw water and electricity without charges, from the distribution line laid by the Contractor. However, the consumption will be paid for at the same rates as charged by clients of BHEL. The Contractor shall have no compensation for claim of extension of time for failure or short supply of water and electricity. He should make alternative arrangements so as to ensure the completion of work within the time stipulated.
- 28.05 Customer's workshop facilities and cranes and other heavy equipment required for construction may be made available to the Contractor at the rates as may be fixed by Customers, subject to their availability and provided they do not affect the Customer's work.
- 28.06 All electrodes are to be arranged by the contractor.
- 28.07 Oil for first filling for the Turbo-compressors/Turbo-generators will be supplied by BHEL's Client. Wastage of oil during erection, Oil flushing etc. shall be made up by the Contractor at his own cost.
- 28.08 Instruments used by Contractor for work purposes shall be made available to BHEL Engineers whenever required without any extra charge.
- 28.09 BHEL shall provide instruments required by their Engineers for commissioning of turbo-compressors. However, the Contractor shall arrange for instruments as included in the list of tools and plants at his own cost.
- 28.10 BHEL will arrange for Engineers required for commissioning. However, the Contractor shall arrange workers and supervisory staff round the clock where necessary during commissioning and till handing over of the set.
- 28.11 BHEL shall supply material required for temporary piping and other connected materials for flushing or blowing of the pipelines.

29.00 PROJECT SITE RULES:

In addition to what has been mentioned in the general and special conditions, the site rules mentioned hereinafter shall be strictly observed by the Contractor and his employees. Contractor's work shall be also subject to inspection by Customer's Engineers and the Contractor shall provide all necessary assistance for such inspections.

29.01 PRE-COMMISSIONING TEST AND TRIAL OPERATIONS:

On completion of mechanical erection by the Contractor each item of the equipment and plant shall be thoroughly inspected by BHEL for correctness and for completion of thermal insulation etc. The Contractor shall also carry out within his quoted rates the installation of metering and connected wiring and piping works, laying out connected cables, cable jointing and generally carry out all works connected with their testing and commissioning and thereafter the Contractor shall put forth the equipment and plants for pre-commissioning tests at site. The procedure for pre-commissioning tests to be performed at site shall be as per agreement between BHEL and Customer.

29.02 TESTING AND INITIAL OPERATION.

The Contractor shall at his own cost perform the following work to be completed before trial operation as defined. The works to be carried out for this purpose shall include the following but details of the same shall be strictly in accordance with the drawings, specifications and technical information furnished by the BHEL and duly approved by Customer.

1. Alignment of generator/compressor and turbine tandem unit
2. Adjustment of eccentricity for cylindrical part and/or rotary part under cold condition and hot condition.
3. Tightness test and/or pneumatic test of intercoolers, after coolers, surface condenser and other heat exchangers.
4. Pressure test and/or pneumatic test of all pipeline system
5. Cleaning of generator/compressor and turbine inner parts by oil and other cleaning agents where needed
6. Flushing of process gas line system by air/mechanical cleaning and/or pickling.
7. Flushing of steam line system by steam.
8. Flushing of condensate line system by water.
9. Acid and chemical cleaning of oil line system.
10. Flushing of miscellaneous small line system by Air.
11. Alignment of all pipe line connection to the unit.
12. Adjustment of pipe hanger supports including spring supports

13. Initial and preliminary checking of all wiring, tubing and cabling before energizing.
14. Function test of control valves and other valves.
15. Function test of all electrical items and pumps.
16. Trial operation of oil console unit.
17. Oil circulation of oil system for flushing purpose
18. Painting of all equipments, pipes where needed
19. Trial operation of Hot well pumps.
20. Function test of steam ejector.
21. Vacuum test of surface condenser unit.
22. Trial operation of all auxiliary units
23. Initial charge of lubricant, seal and control oils
24. Supply and application of thermal insulation work for turbine and other equipments and piping.
25. Turbine spin test.
26. Adjustment of turbine trip device.
27. Adjustment of steam inlet governor and extraction governor.
28. Piping test of safety valve on steam extraction line
29. Generator/Compressor and turbine tandem trial run
30. Adjustment of servo motor and steam inlet control valves

The above tests shall be carried out under the supervision of BHEL's supervisory personnel on satisfactory completion of all pre-commissioning tests; the trial operation of the units shall start. The trial operation shall be considered successful if it is proved that the unit can operate continuously during the period of trial operation. Tests at site including the trial operation will be carried out in compliance with Customers' instructions. During trial operation, no repair or adjustment other than running adjustment will be permitted.

29.03 **GUARANTEE TESTS AT SITE:**

The guarantee tests of the plant shall be carried out after achieving 100% output of the equipment which may take around six months from the date of commissioning immediately after the conclusion of the operation. Detailed tests for conducting the

guarantee tests shall be given later. Guarantee tests shall be carried out jointly by the representatives of BHEL and the Customer. The worker and supervisory personnel required during guarantee tests shall be provided by the Contractor without any extra charge.

29.04 **LOCATION OF HUTS:**

Temporary huts shall not be erected by the Contractor until the position and the type of construction have been agreed by BHEL.

29.05 **EXCAVATION:**

No excavation shall be started without the written permission of the BHEL who will inform the position of any known buried pipes or cables.

29.06 **INSPECTION OF CONSTRUCTIONAL PLANT:**

BHEL shall have the right to inspect any constructional plant and to forbid its use, if in the opinion of the BHEL, it is found unsuitable and no claim arising there from shall be made by the Contractor. Any defective or rejected constructional plant shall be removed from the site by the Contractor if directed to do so by BHEL

29.07 **FIRE:**

The Contractor shall use all reasonable means to prevent an outbreak of fire and shall render immediate assistance in case of fire.

All inflammable materials shall be stored at site strictly as directed by the BHEL. No fire shall be lit without the permission of the BHEL.

The Contractor shall arrange for necessary hand extinguishers in his store workshop and at work sites to deal with fires on the spot.

The Contractor shall report immediately to the Site Engineer BHEL of any outbreak of fire in or near the Contract site.

29.08 **STAGING AND SCAFFOLDING:**

Properly constructed staging with safe means of access shall be provided for all works that cannot be done from the ground or other safe means of support. No staging shall be less than 625 mm wide except for suspended scaffolds. Trestle scaffolds and scaffolds on the outside of any sloping roof which shall be at least 450 mm wide. As far as possible, scaffolding shall be of tubular steel structure. BHEL shall have the right to declare any staging or scaffolding as unsafe and require the Contractor to effect necessary improvement before using such staging or scaffolding. No claims arising from rejection of any staging or scaffolding shall be made by the Contractor.

29.09 **BARRIERS:**

All construction areas in or near existing plant buildings, access routes or through fare shall be adequately protected with barriers by the Contractor.

29.10 **IONIZING RADIATIONS:**

The Contractor shall not consign or bring to the Site any radioactive substance nor use thereon such substance or any X-ray apparatus, until he has obtained written instructions in regard to such use from BHEL and he shall comply with all such instructions.

If the Use of such substance or apparatus by the Contractor on the site has been agreed, the Contractor shall obtain the permission of BHEL before such use.

29.11 OBSERVANCE OF RULES:

The Contractor shall explain to each of his employees, the site rules in a language which is understood by the employees.

The Contractor shall be responsible for the compliance by his employees with the site rules and shall make their compliance therewith a condition of employment.

29.12 IDENTIFICATION OF EMPLOYEES:

The Contractor shall arrange to issue individual identity card/token to all his employees. Contractor's employees will be allowed only on production of the Identification cards/tokens as the case may be.

29.13 WITHDRAWAL OF IDENTIFICATION CARDS ETC:

When a person ceases to be employed by the Contractor the Contractor shall collect back the identification cards/tokens from such persons.

29.14 NOTICES ON THE SITE:

The Contractor shall inform his employees that all site rules and all notices in any place on the site shall be strictly complied with. (Attention is drawn to the fact, that in certain areas smoking is not permitted and naked flames are not allowed).

29.15 HOURS OF WORK:

Contractor's employees shall conform to the starting, finishing and meal break-time as per site regulations. For work outside normal working hours, the Contractor shall obtain before hand the written permission of BHEL.

29.16 STORAGE AND CARE OF MATERIALS:

The Contractor shall store his plant and materials only in areas allocated to him.

He shall be solely responsible for the care of all his plant, tools and materials and shall make no claim against BHEL for any loss or damage thereto.

The Contractor shall be responsible for keeping the site neat and tidy to the entire satisfaction of the customer. Pieces of wood, packing box timber, shuttering planks, brickbats, excavation soil etc., will not be allowed to remain scattered on the site. Such and any other rubbish must be disposed off as per instructions of BHEL.

29.17 REMOVAL OF MATERIAL FROM SITE:

No Plant, tools or material, whether belonging to the Contractor or otherwise shall be removed from the site without written permission of BHEL.

29.18 PARKING OF VEHICLES:

The Contractor or his employees shall park their vehicles including personal cars only in areas allocated for the purpose.

29.19 RELIGIOUS FUNCTIONS:

The Contractor shall not allow his employees to hold any religious function at site except with the written permission of BHEL.

29.20 FEMALE WORKERS:

No woman shall be employed on the site by the Contractor except between hours 6.00 am and 7.00 pm.

29.21 TOILET FACILITIES:

The Contractor shall arrange for suitable toilet facilities, separate for men and women employees on the site and maintain the same in proper hygienic condition.

29.22 EATING ETC. ON SITE:

The Contractor shall ensure that his employees take their food only at specified places. Eating directly on the job shall not be permitted.

29.23 WASTAGE OF WATER:

Contractor shall ensure that no water is wasted in any manner. He shall use press type taps if the customer so directs to prevent loss of water arising from Contractor's employees leaving the taps open.

29.24 FOSSILS ETC.

All fossils, coins, and similar articles of value or antiquity discovered on the site shall be handed over to site Engineer of BHEL by the Contractor.

29.25 LIVING ON SITE:

No Contractor's employees will be allowed to live on the site. Outside working hours no employee shall be allowed to remain on the site without the prior permission of the Site Engineer, BHEL.

29.26 INFECTIOUS DISEASE:

The Contractor shall report to Site Engineer, BHEL any cases of infectious disease amongst his employees and shall remove such cases from the site forthwith.

29.27 ACCIDENTS:

All accidents must be reported to the Site Engineer, BHEL without fail. The Contractor shall be responsible for complying with all statutory requirements in case of accident major or minor.

29.28 DISCLOSURE OF INFORMATION:

The Contractor's employees must not communicate to persons other than BHEL any information on the design or performance of the plant or machinery. The Contractor must not take away from the site any samples, plans or drawings without written permission of BHEL.

29.29 **PHOTOGRAPHS:**

The Contractor may take photographs of progress of his work only with prior permission from BHEL.

29.30 **SMOKING:**

A Contractor's employee must not smoke on those parts of the site where notices prohibiting smoking are displayed.

29.31 **INTOXICATING LIQUOR:**

Anybody found to be under the influence of intoxicating liquor shall be refused admittance to the site or evicted from the site.

In toxicating liquor must not be brought to the site nor be accepted from any person the site.

29.32 **PRIVATE TRADING:**

A Contractor's employee must not conduct any form of private trading including money lending on the site.

29.33 **MEDICAL FACILITIES:**

Since no medical facility other than the standard medical kit will be available at site, medical facilities beyond the above will not be provided to the Contractor's supervisory staff & workmen. Contractor shall make his own arrangements for such medical facilities at his own cost.

29.34 **PROVIDENT FUND:**

The tenderer should have been covered under the Employees Provident Fund a miscellaneous Provisions Act, 1952 as an unexemplified unit and should furnish the code No allotted to him by the provident Fund Authorities. In case his is an exempted unit the code No. allotted for the same by the Provident Fund authorities should quoted. Please note that tenders not complying with the above requirement will not consider".

29.35 **FOR ELECTRICAL:**

Laying, jointing and termination of power cables shall be done by certified electrician holding valid license from licensing authority of the state where the work is being carried out and must qualify himself from engineer in charge at site.

The Contractor should possess valid work license & on electrics from inspectorate authority of the state where the work is being carried out.

30.00 **FIRST AID:**

a) At the work site there shall be maintained in a readily accessible place, first aid appliances and medicines including an adequate supply of sterilized dressings and sterilized cotton wool. The appliances shall be kept in good order. They shall be placed under the charge of a responsible person who shall be readily available during working hours.

30.01 DRINKING WATER:

- a) Water of good quality fit for drinking purposes shall be provided for the workers on a scale of not less than five liters per head per day.
- b) Where drinking water is obtained from an intermittent public water supply each worksite shall be provided with a storage tank where such water shall be stored.
- c) Every water supply storage tank shall be at a distance of not less than 15M from any latrine, drain or other source of pollutions. Where water has to be drawn from an existing well which is within such proximity of any latrine, drain or other source of pollution, the well shall be properly chlorinated before water is drawn from it for drinking. All such wells be entirely closed and be provided with a trap door which shall be dust proof and water proof.
- d) A reliable pump shall be fitted to each well; the trap door shall be kept locked and opened only for inspection or cleaning which shall be done at least once a month.

30.02 WASHING AND BATHING PLACES:

Adequate washing and bathing places shall be provided separately for men and women. Such places shall be kept clean and well-drained. Bathing or washing should not be allowed in or near any drinking water well.

30.03 LATRINES AND URINALS:

There shall be provided within the precincts of every worksite, latrines and urinals in an accessible place and the accommodation, separately for each of them shall be on the following scale or on the scale so directed by the site engineer of BHEL in any particular case.

1. Where the number of persons employed does not exceed 50
2. Where the number of persons employed exceeds 50 but does not exceed 100
3. For every additional 100

If women are employed, separate latrines and urinals screened from those for men, shall be provided on the same scale.

Except in work sites provided With water-flushed latrines connected with water-borne sewage system, all latrines shall be provided with receptacles on dry earth system which shall be cleaned at least four times daily and at least twice during working hours and kept in a strictly sanitary condition. The receptacles shall be tarred inside and outside at least once in a year.

The excreta from the latrines shall be disposed off at the Contractor's in out way pits approved by the local member of scavengers and conservancy staff to keep the latrines and urinals in a clean condition.

30.04 **SHELTERS DURING REST:**

At the worksite there shall be provided free of cost two suitable sheds, one for meals and the other for rest for the use of workers.

30.05 **CRÈCHES:**

At every work site at which 50 or more woman are ordinarily employed, there shall be provided huts of suitable size for the use of children under the age of 6 years belonging to such women. One hut shall be used for infant's games and play and the other as their bed-room. The huts shall not be constructed on a standard lower than the following:

1. Thatched roofs
2. Mud floors and walls
3. Planks spread over the mud floor and covered with matting

The use of the huts shall be restricted to children, their attendants and mothers of the children.

30.06 **CANTEENS:**

A cooked food canteen on -a moderate scale shall be provided for the benefit of workers if it is considered expedient.

30.07 **SHED FOR WORKERS:**

The Contractor should provide at his own expense sheds for housing the workers. The sheds shall be of a standard note less than the cheap shelter type to live in which the workers in a locality are accustomed. A floor area of about 6' x 6' for 2 persons, shall be provided. The sheds are to be in rows with 5 clear space between sheds and 80' clear space between rows if conditions permit. The worker's camp shall be laid out in units of 400 persons, each unit to have a clear space of 50' on each side.

NOTE: In case where alternative facilities exist in regard to the amenities mentioned rules 1 to 8 of the relevant rules should be scored out with due attestation at the time of implementing the agreement.

31.00 **SAFETY INSTRUCTIONS -**

1. All the work shall be preplanned regarding the safety measures before they are taken up in hand. The workers shall be instructed as to how to work safely.
2. Fire precautions and safety regulations shall be observed by one and all.

3. Safety lectures shall be organized in the interest of the person's life, health and safety during work.
4. Fire:-extinguishers, buckets of sand and water shall be provided in working area within the reach of each working area.
5. Fire alarm' switches shall be fixed in such a way that any layman can operate the same in emergency.
6. Near every telephone the phone number of the fire station shall be mentioned in a visible place.
7. Warning boards, 'Dangerous Zone' boards, 'No admission' boards and 'No smoking' boards shall be displayed wherever necessary
8. Safety instructions in languages understood by workers and other staff shall be displayed in prominent places.
9. First aid cabin with a compounder shall be kept at a convenient place at site. An 'Ambulance Van' shall also be kept ready in working hours near the cabin.
10. First aid instructions chart for electrical shock shall be displayed at prominent places
11. The workers shall be provided with the appropriate safety equipments for job
12. In work place, only the authorized passage for entrance and exit shall be used.
13. Persons wearing cloth like Nylon and Terylene shall not approach the fire when there is a fire accident.
14. Workers shall wear tight fitting clothes as loose cloths are liable to be caught in equipment in motion. Workers shall also use footwear giving proper protection.
- 15.No person shall be allowed to work under the influence of intoxicating drinks.
16. Before entering the prohibited area necessary permission shall be obtained.
17. Holes and pits shall be covered with suitable planks, slabs end chequered plates.
18. It should be ensured that no unauthorized person is allowed to operate drain valves of the tanks filled with fluids such a soil etc. or any other valves meant for equipment that is under operation
19. Unauthorized persons shall not be allowed to repair any machines or equipments.
20. Dropping of tools and tackles is forbidden.

21. Any equipment shall be started or put into operation only by authorized persons.
22. Tools and tackles shall be in sound condition and proper tools shall be used for proper work.
23. No person shall be allowed to lean over the tack-welded structures or hand railing. Also no load shall be applied on tack-welded joints.
24. Placing the fingers in holes of the couplings, in between the flange joints and between any moving parts shall be avoided.
25. Using compressed air for joke or even pointing hose at another person shall not be done
26. Working spots shall be kept clean and in order.
27. Whenever repair work is to done on a running machine or in any charged line (with hot water, steam pressure line, acid line, power line) written clearance shall be obtained from the concerned authorities. Before commencing the work, it shall be ensured that the safety steps are actually followed by them.
28. Continuous watch shall be kept over the men working in closed places like condenser tanks and cable ducts, so that they can be removed out, if they feel suffocated. If necessary, sufficient light and ventilation shall be provided.
- 29.00 **LIST OF SAFETY PRECAUTIONS TO BE OBSERVED BY THE CONTRACTOR:**
- 29.01 The contractor shall take all necessary safety precautions and arrange for appropriate appliances as per direction of BHEL to its authorized officials to prevent loss of human lives, injuries to personnel engaged, and damage to property.
- 29.02 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 officials:
 - i) Safety Helmets conforming to IS-2925, 1984
 - ii) Safety Belts conforming to IS-3521, 1983
 - iii) Safety shoes conforming to IS-1989, 1978
 - iv) Eye & Face Protection devices IS-8520, 1977 and Conforming to IS-8940' 1978
 - v) Hand & body protection IS-2573. 1975, IS-6994, 1973 Devices conforming to IS-8807, 1978, IS-8519, 1977
- 29.03 The contractor shall not use any hand-lamp energized by electric power with supply voltage of more than 24 volts.

- 29.04 All portable electric tools used by the Contractor shall have safe plugging system to sources of power and be appropriately earthed.
- 29.05 All tools, tackles lifting appliances, scaffolds, cradles, safety nets, ladders, equipment etc. used by the contractor shall be of safe design and construction. The authorized BHEL officials shall have the right to ban the use of any item, if such use is considered to be dangerous by the concerned BHEL officials. :
- 29.06 If the Contractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carryout instructions issued by the authorized BHEL officials, BHEL shall have the right to take corrective steps at the risk and cost of the contractor.
- 29.07 The contractor shall take all necessary fire safety precautions as per directions of the authorized BHEL official.
- 29.08 In case of a fatal or disabling injury accident to any person due to lapses by the contractor, BHEL shall have the right to impose appropriate financial penalty on the sub-contractor and recover the same from payment due to the contractor for suitably compensating the victim or his/her dependents. Before imposing the penalty, appropriate enquiry shall be held by BHEL.
- 29.09 In case of any damage to property due to lapses by the contractor, BHEL shall have the right to recover the cost of such damages from the payments due to the contractor after holding an appropriate enquiry.
- 29.10 In case of any delay in the completion of a job due to mishaps attributable to lapses by the contractor, BHEL shall have the right to recover cost of such delay from the payments due to the contractor, after notifying the contractor suitably.
- 29.11 If the contractor fails to improve the standards of safety in its operation to the satisfaction of BHEL after being given reasonable opportunity to do so, BHEL shall have the right to terminate the contract and got the job completed at the risk and cost of the sub-contractor,
- 29.12 If the contractor succeeds in carrying out its job in time without any fatal or disabling injury accident and without any damage to property, the BHEL shall favorably consider rewarding the contractor suitably for its performance.

32.00 HANDLING OF LOADS: -

1. Only the authorized operator should be allowed to operate a crane.
2. The operator should operate the crane only on the instructions from the slinger or the supervisor in charge for the work concerned.
3. The operator shall immediately stop the crane as soon as he gets the stop signal.

4. The operator and the stinger should be full conversant with the operating signals and the slinger should be very careful to give appropriate signal for each movement of the crane. Necessary codes will be given by our representative at the site.
5. It is always advisable to engage experienced personnel for handling the loads
6. Intermediate signaling man shall be provided whenever the operator cannot be seen by the slinger.
7. If the crane brake dose not works properly, the crane shall be operated and the defect shall be rectified immediately.
8. Work with utmost care when having the hook near its, extreme line.
9. Before leaving the crane the main switch must be switched off by the operator.
10. Inclined pull or pulling of heavy loads is forbidden.
11. The lifting capacity of the crane should not be exceeded at any time.
12. All slings shall be tested initially and later periodically. They shall carry a metal ring or its safe lifting capacity shall be marked. This limit shall not be exceeded.
13. While selecting the sling, the safe load carrying capacity shall be ensured on the basis of angle between the sling ends. A chart showing the relation between the sling capacity and safe load carrying capacity at various angles should be available.
14. Marks on the case for placing the slings shall be looked for before lifting the case there are no markings, decide carefully suitable place for putting the sling.
15. Fastening the slings around the sharp edges shall be avoided, soft packing like soft wool, gunny bag pieces and tin sheet etc., shall be provided where necessary.
16. The crane hook shall be properly centered to the load to avoid swinging of load before the load is lifted.
17. Wherever the lifting tackles are provided the same shall be utilized for lifting the equipments.
18. Equal distribution of loads on the slings while lifting is essential.
19. Before lifting a load, all the loose parts shall be fastened with main load properly and all the unwanted material shall be removed from it to prevent them from falling down.
20. Where special care to prevent a heavy load on crane from rotating or swinging is necessary, the load may be tied with manila ropes, which shall be guided by holding tight. Care shall be taken to move the load very slowly and to ensure that the ropes do not get entangled with any object.
21. Transporting the loads over the running machines, equipment under erection (like turbine and Generator) and over the persons is prohibited.

22. Keeping the toads hanging on the crane hook for a long period should be avoided.
 23. No person shall be allowed to stand on the load or under the load where it is either lifted or moved.
 24. The bearing capacities of the floor shall be ensured before placing any load on the same.
 25. Whenever slings, ropes or chains are carried crane hook, care shall be taken to fasten them to the hook and they should not be allowed to swing or to get entangled with other objects. Otherwise they may damage other equipment.
 26. Slings ropes and chains used for handling the loads are to be inspected regularly and shall be stored on sling stand and preserved against the weather influences.
 27. In case of any rope-breakage and knots in slings the operator shall immediately arrange for off-loading the sling.
 28. Stretching of sling or cracks are the indication of breakage of the rope.
 29. Knotting and winding the slings around the hook for reducing its length is forbidden.
 30. Only tested tackles shall be used for joining chains or slings.
 31. The crane ropes are to be lubricated with acid less adhesive grease.
 32. The slings chains hooks and shackles shall not be dropped or dragged on the floor.
 33. All valves shall be lifted with their bodies and not by their wheels.
- 33.00 **INSTRUCTIONS ON TRANSPORT OF IMPORTANT PARTS FROM STORE TO SITE:**
1. Proper planning is necessary to shift the equipments safely from the stores to the required spot.
 2. The actual weight and the dimensions of the equipment shall be checked so as to arrange the suitable crane and trailers, wagons, trucks etc.
 3. Route shall be decided in advance to transport the equipment over the culverts below the over head power lines and below the telephone lines etc. Some times cables may have to be lifted up to allow the heavy weights with the trailer to pass.
 4. Line clear shall be obtained (in writing if necessary) a day earlier to transport the important equipments like Rotors of Turbine and Generator, turbine casing, end stator (of Generator), Condensers and heaters etc.

5. Precision mechanical and electrical equipments shall not be left open on the road because of any break down of the transport vehicles.
6. Responsible Officer shall be present at the time of the movement of heavy and special equipment.
7. Heavy equipment shall not be allowed to pass through the bends on the road.
8. In case of non-availability of over head cranes or gantry crane a mobile crane with required capacity shall be arranged for transportation.
9. Stoppages of the loaded trailers shall be minimized while transporting from stores to the site.

34.00 HANDLING AND USING OF CYLINDERS ETC:

1. At the erection site gas cylinders and oil barrels shall be transported by crane only with suitable carrier fabricated for this purpose.
2. Valve protection caps shall not be removed while transporting the cylinders.
3. Carrying the cylinders on the shoulder is prohibited
4. In case of work spots not easily accessible by passages, a cylinder may be transported by 20 men by using a thick and strong, wooden beam on their shoulder and tying the cylinder to it. The cylinder shall be kept near to the ground. One more man should accompany them for assistance.
5. No cylinder shall be rolled down on the ground.
6. On plain surfaces the cylinders can be rolled in a slant position by keeping them on the edge of the base.
7. Sudden dropping of cylinders, hammering them, tapping on them the live electrode for testing the arc, smoking near the cylinders and sitting on the cylinders are prohibited.
8. The cylinders shall be secured in vertical position before using the same for work. Acetylene cylinders shall always be stored and utilized in vertical position,
9. Before connecting the respective regulators on the cylinders, clean the threads and valve passage by opening the cylinder valve momentarily. Then secure the union of the regulators in respective direction of the threads (Acetylene in anti- clockwise direction and oxygen in clock- wise direction).
10. The cylinders shall be kept away from hot plates, hot air, steam line, falling molten metal from welding or cutting work, oil line. They shall be kept away from electrical circuits also.

11. After utilizing the cylinders the valves shall be kept in closed position.
12. The cylinders shall not be utilized as supports or as rollers for moving some equipment.
13. Tampering with the cylinder valve and its serial number are strictly prohibited.
14. If any continuous leakage is found in the cylinder the same shall be shifted to a safer place, while returning the cylinder, the number and the defect shall be intimated to the supplier.
15. Do not use defective regulators, hose, cutting & welding torches.
16. Unauthorized persons shall not meddle with the above said apparatus.
17. Proper wrenches shall be used for this operation.
18. On the empty cylinders words 'EMPTY' or 'MT', shall be written and they shall be kept in separate place.
19. Slings and electrical magnets shall not be used to handle the cylinders.
20. Grease should not be used on any part of Oxyacetylene apparatus.

35.00 SCAFFOLDING AND ITS SAFETY PRECAUTION:

1. Even without the individuals demand scaffolding shall be arranged for any worker when the job is beyond his reach.
2. To ensure the stability of scaffolding shake the platform by both the hands and ensure its stability before boarding on the same.
3. Material for scaffolding shall be a sound one especially, wooden plank pipe, clamp, bolt, nut, binding wire etc.
4. Using any of type ropes except binding wire or clamps on the scaffolding for welding work is prohibited.
5. Lifting of any heavy object from ground by standing on the scaffolding shall be avoided
6. Persons working on elevation shall be provided with all the safety coverings like hand gloves goggles" safety belts and also helmets, if any work is going on above them.
7. Scaffolding shall be provided with hand railings or some thick manila rope can be utilized for the same purpose if it has to remain for a longer periods.
8. Placing or storing of heavy material on the scaffolding shall be prohibited.

9. Unwanted items shall be collected in a bag or in a bucket and then lowered manually by some rope instead of throwing the same on the walk way.
10. Testing, the arc of electrodes on the scaffolding pipes is prohibited.

36.00 SAFETY REGARDING WELDING:

1. Necessary safety equipment should be supplied to the welders, chippers and grinders (i.e. shield with 'good glass, apron, hand gloves, leg guards, goggles etc.)
2. Do not allow anybody to look at the welding arc with naked eye.
3. Welding cable shall be checked periodically to ensure that its insulation is preserved in perfect condition.
4. Do not allow welding cable to mix or lie with the power cable or with oxy-acetylene hoses
5. Welding cable shall not be allowed to come in contact with the important surfaces of equipment (especially on the parting plane of the turbine, inside the generator stator valve seating, flange joints and over the threads of pipe, bolts and nuts.
6. No inflammable material shall be left below the welding work (for example cotton waste, cloth pieces wooden material, papers, tarpaulin oil and petrol barrels and oxy -acetylene cylinders etc).
7. Only an authorized welder shall be allowed to work on the jobs for which he is qualified. .
8. Welding generator or transformer shall be switched off whenever not being used.
9. Gas cylinder valve shall be closed as soon as gas welding or cutting work is over.

37.00 'X' RAY AND ISOTOPES:

1. Only authorized employees shall be permitted to handle the 'x' ray equipment and isotopes.
2. Necessary precautions shall be taken while handling x- ray equipments and isotopes as advised by the manufacturer of the same.
3. 'Danger Zone' boards shall be displayed around the spot of testing over the specified area.
4. Periodical medical check-up shall be taken by the individual who handles the isotope and 'x- ray equipments and he shall act as per the doctor's advice.

5. This work should preferably be carried out on holidays or in the night when there are very few persons around.
6. Methods of storing and the plan of the building (stores) shall be obtained from the manufacturer/supplier of those equipments.
7. The container shall be sealed before keeping in the store.
8. Persons including the 'X'-ray tube operator should not expose themselves to direct beam of X-ray.
9. Even authorized persons should have shield to protect themselves from direct or scattered radiation.
10. The safety precautions and procedures shall be instructed to all the persons.
- 11 All the authorized persons who handle the X-Ray and Isotope equipment shall be kept informed of the harmful effect on human body and shall be utilized only for the minimum required period.
12. While handling such equipment, hands and body shall be kept away. Tongs and other suitable devices shall be used when handling the equipment.

38.00 ELECTRICAL:

1. All the electrical equipments like switches, starters, welding machines, motors and transformers shall be protected against weather conditions,
2. All the electrical connections shall be periodically checked by the authorized certified electrical supervisor.
3. Whenever electrical faults are noticed they must be immediately attended to.
4. All the portable lamps shall be suitable for 24V supply.
5. Operating the electrical equipments or activating the circuits with wet hands is forbidden.
6. Protective rubber gloves and rubber shoes shall be used before working on electrical lines.
7. Before switching any new electrical equipment, proper earthing shall be done. Effectiveness of earthing connection shall be checked periodically.
8. Direction of rotation shall be checked just after giving connection to welding machine motor, etc.
9. Indicating lamps shall be fixed on the provisional cubicles on different floors as well as on overhead crane live wires.

10. Whenever the supply fails in all the phases or in any one of the phase, all the electrical machinery shall be put off immediately (especially 3 phase motors and welding generators).
11. Repairs to electrical equipments or lines shall not be carried out unless the main switch is switched off and fuses are removed. A board with words 'DOES NOT SWITCH ON MEN AT WORK' shall be hung on the switch. Before commencing the repairs, the terminals shall be tested with a tester to ensure that the supply is off.
12. No unauthorized person shall switch on any switch or interfere with the electric circuit

DANGEROUS RADIATIONS

39.00 X-Rays:

1. No X-Ray the tube operator or other worker shall deliberately expose himself to a direct beam of X-Rays.
2. All X-Ray tubes used shall be of self-protected shock-proof type
3. The protection of the tube shall be of full protective thickness
4. Any continuously-excited X-ray tube shall be provided with a load shutter of full protective thickness and so arranged that it can be operated and closed only from the control panel
5. The control panel of mobile X-Ray sets used in industry shall be placed and operated from behind fixed or temporary screening of adequate protective thickness
6. During X-Ray exposures all persons other than the control operator shall be:
 - a) Shielded from direct or scattered radiation by screening of adequate protective thickness.
 - b) Excluded from any area around the X-Ray tube and the article being radiographed be determined by competent authority in each particular case
7. The area as determined by the above paragraph shall be temporarily delimited by roping off or by other suitable fencing
8. Visible warning signs or audible signals or both shall be provided and operated immediately prior to and during radiographic exposures of X-Ray units
9. Wherever possible' the useful X-Ray beam from X.-Ray units shall be directed away from alt occupied spaces and the beam cross section limited to the smallest area necessary for work.

40.00 RADIOACTIVE SUBSTANCES:

40.01 GENERAL:

1. The persons who are employed in the radiographic work shall be medically examined particularly for chest and blood analysis prior to .their employment.
2. They shall be medically examined periodically during their employment in radiographic work and workers found to be having the maximum permissible amount of radium in the body shall be removed forthwith from further exposure to radioactive substances and shall not return to work involving such exposure until medically advised that they are permissible.

3. All persons handling the radio-active substance shall be kept informed of the harmful effects on human body and shall handle only minimum quantities necessary for Work, remain in proximity to such substances only for the minimum time necessary and keep the hands and body as far away as possible from such substances by handling them with tongs or other suitable devices.
4. All persons shall be thoroughly instructed about the safety precautions and procedures.
5. Persons exposed to radioactive substance should have a high calcium diet.

40.02 STORAGE & TRANSPORTATION:

1. The isotope shall be sealed and kept in a store house specially built for this purpose.
2. The store house with the isotope shall be reliably protected from entry of unauthorized persons.
3. Sign boards shall be exhibited in the store house to forbid the entrance of unauthorized persons.
4. Only authorized persons shall be permitted to handle the isotopes or X-Ray equipments
5. The ampoule shall be transported to the place of work either by a wheel barrow 1 .5M long or by men with the help of rod keeping a minimum distance of one meter between the container and persons who carry it. It shall never be carried on shoulders.

40.03 HANDLING:

1. In field radiography protection can be obtained by distance alone. Hence steps must be taken to ensure that all the persons are far away from the radiation source to ensure safety.
2. To limit the exposure to other persons it is recommended to cordon off the area and exhibit warning sign boards.
3. The permissible dose for man to be exposed by radiation shall not be more than 0.5 per day.
4. Unauthorized persons shall not be allowed in the radiation area.
5. No person shall be permitted to handle radiation sources without wearing the film badge of the Atomic Energy Establishment or any other registering instrument such as Dosimeters etc.
6. As the radiation hazards are deleterious to health it is advisable to carryout the works during the night shift or when minimum number of persons is working around.

LIST OF TOOLS AND PLANT

ANNEXURE-I

Description Quantity	Specifications	3.
1.	2.	3.
A. <u>HANDLING & LIFTING EQUIPMENT:</u>		
1. Hydraulic jack.	Capacity-25 T lift = 200 mm Dia of the table, piston = 90 mm Min. height above the ground level = 260 mm	4 Nos.
2.	Force on the lever = 30 Kg. Length of the level = 625 mm	
2. Screw Jack (ratchet type)	Capacity: 5T lift 200 mm	4 Nos.
3. Jack bolts	Min. ht. 75 mm, lift- 30 mm dia of bolt -36 mm	16 Nos.
4. Hand ratchet Jack	Capacity -5T stroke: 370 mm Height above the ground level 90 mm Force on the level -50 Kg	2 Nos.
5. Hand ratchet Jack with chain and hooks.	Capacity- 1.5 lift-- 2M Arm length -440 mm force on the lever-55 Kg. Min. distance between the top and bottom Hook: 440 mm, Hook size = 40 mm	6 Nos.
6. Chain pulley blocks	Capacity - 3T, lift -6m	4 Nos.
7. Steel ropes with loops as per Site requirement,		
8. Eye bolts CSNO2 as per site requirement		

1	2	3
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B. MACHINERY:

1. Power saw	H. P. -1.5 Blade length 600 mm throats 200 mm, strokes/min = 60	1 No
2. Elec. Air compressor With air receiver (Tank) pressure = 7 atp	Capacity -5m ³ /minute Tank capacity = 3.5 M ³ 3 phase electrical motor: 440 V, 50 C/s air cooled With pressure gauge, starter for Motor, auto-start/stop, necessary Valves, tank with drain and Safety valve OR 2 of 2.6 M ³ /min. 6 atp tank: 1. 8 M ³ all other things are same as above.	1 No
3. Elec. Bench grinder with two Wheels	H. p. =1, RPM =2900, wheel dia =200 mm Thickness = 25 mm, 440V 3 phase 50 c/s	1 No
4. Portable electrical drilling Machine dia: 15 mm	Dia. of the drill =15 mm Power=350 watts 250V, 50 c/s	2 Nos.
5. Flexible shaft portable elec. Grinding machine	Shaft dia, =20 mm, Length- 5M Min. RPM = 2800 Input -1.3 kW With various shaped grinding wheels	1 No.
6. Portable pneumatic drill with Morse taper No-3 dia 32 mm	Drill dia. 32 mm Air condenser 1.8 M ³ /min. working pressure 5/7 atp RPM -190/360	1 No.
7. Portable pneumatic grinder	Wheel dia=100 mm Thickness=20 mm Working pressure 5/7 atp	1 No.
8. Portable pneumatic grinder	Wheel dia =200 mm, Thickness = 40 mm, Working pressure 5/7 atp.	1 No.



GENERAL CONDITIONS OF CONTRACT FOR ERECTION WORK

Page
38 of 41

Spec -103

1	2	3
9. Chamfering machine Portable size 75 to 250 mm dia	Czechoslovakian make (CKD) 6.8 KW 415 V motor with a starter on a trolley with a universal shaft coupling chamfering tool. Jaws are to accommodate the sizes 75 to 250 mm. OR similar one	1 No.
10. Hydraulic pipe bending machine, hand operated	1/2" to 2" mean radius of bend 45 to 230 mm with the blocks for 1/2", 3/4", 1", 1 1/4", 1 1/2", 1 3/4" and 2"	1 set
11. Gas welding & cutting set with pressure gauges for oxygen and acetylene	Cutting & welding up to 50 mm	1 set
12. Welding transformer set with regulator	350 A, AC Max = 450 Amps Min = 75 Amps About 30 KVA Secondary = 85 V, Primary = 400/440V	2 sets
13. Welding D. C. Generator set with regulator	320 A, DC 90 V, Max: 320 Amps, Min: 30 A Motor KVA: 20, 2910 RPM 440V.	2 sets
14. Annealing Transformer and inductor	Full set suitable for annealing alloy steel pipes (Mat. 13 cr. 44 Mo), after welding max, pipe size/-150 x 14 variation of annealing temp. reqd. 600°C to 720°C similar to A.C.L.C. Belgium makes)	1 set
15. Argon welding equipment		2 No
16. Electrode drying oven automatic with temp control	Capable of accommodating 6 or 8 packets electrodes	1 No.
17. Camera for Iridium 192 5 curies isotope and manipulator rod. Iridium\ 192 isotope		1 No.
18. Plastic cassettes 10 x 48 cm		2 Nos.
19. Lead screens	10 X 48 cm	2 sets
20. Lead letters	12 mm	2 sets



GENERAL CONDITIONS OF CONTRACT FOR ERECTION WORK

Page
39 of 41

Spec -103

1	2	3
21. Lead numbers	12 mm	2 sets
22. Gevaret D-4 films	10 x 48 cm	2 pkts
23. Developer to make 13.5 liter	1 tin	1 tin
24. Fixer to make 13.5 liter		1 No.
25. Tube bending machine (5 to 25 mm)		1 No.
26. Portable needle grinder pneumatic / electrical		1 No.
27. All common tools like straight edge, fitters vice vernier calipers, micrometers, dial gauges, lever type dial gauges, feeler gauges, surface plate, spanners, screw drivers, hammers, mallets etc. tools as required by RE at site to be brought by the Contractor.		

C. PROTECTIVE EQUIPMENT:

1. Hand gloves -rubber with cotton in lay' Hand gloves-leather with five fingers	(12"-4 pairs & 14"-4 pairs)	8 pairs 8 pairs
2. Hand gloves- leather	Flat	30 pairs
3. Hand gloves for welders		7 pairs
4. Asbestos hand gloves with flannel lining	(12"-2 pairs and 14"-2 pairs)	4 pairs
5. Goggles for gas Welders		8 Nos.
6. Goggles for grinders		12 Nos.
7. Arc welders shield with hand gear & hand shield		4 Nos. each
8. Spare glasses for Arc Welders shield	i) clear ii) dark	32 Nos. 16 Nos.



GENERAL CONDITIONS OF CONTRACT FOR ERECTION WORK

Page
40 of 41

Spec -103

1	2	3
9. Spare glasses for gas Welder's & goggles	i) clear ii) dark	14 Nos. 16 Nos.
D. MISCELLANEOUS:		
1. Gas Hose Oxygen and Acetylene	Bore dia, 10 mm 25, 50 & 75M lengths	2 sets each
2. Wire brushes for welders	150 x 25 mm 3 rows wire bristles 5 rows wire bristles	6 Nos. 6 Nos.
3. Gas cutting nozzles cleaning kit		2 sets
4. Spare glasses for grinder's goggles/ Protective helmets	Clear	16 Nos. 18 Nos.
4a. Leather apron	24" x 42"	5 Nos.
5. Safety belts		6 Nos.
6. Polythene cloth	1.5M x 20M	1 No.
7. Leg guards (Leather)		6 sets

SPECIAL TOOLS AND TACKLES REQUIRED FOR ERECTION OF INDUSTRIAL TURBINES:

1. Set of Torque spanners (M 6 to M 64)
2. Electric Bolt heating equipment
3. Feeler gauges (length 300; 200 mm of different widths)
4. Flexible Torch lights with mirror
5. Inside and outside micrometers (0 to 250 mm, dia in different steps)
6. Lever type and plunger type dial indicators
7. Micron dial indicators
8. Leaf feeler gauges (0.03 and 0.05 mm)
9. Depth gauges up to 400 mm
10. Lead wire measuring gauges
11. WOOD WARD governor tool kit

12. BOROSCOPES:

- a) Flexible type
- b) Rigid type

13. Shock pulse meter

14. BENTLY NEVADA dynamic data Manager for computerized vibration monitoring and signature analysis

15. Lube Oil analyzer

16. Polaroid camera

17. Digital / 35 mm camera

18. Stroboscope

19. Magnifying glasses

CONSUMABLES:-

1. Birkosit

2. Hylomer

3. Led plate 200

4. Loctite 221'601,621

5. Molykote 321 R

NOTE: - i) All the tools should be procured in sufficient quantities by the Contractor

ii) The list of tools & tackles mentioned above are indicative only. The contractor has to mobilize the required tools & Plant in sufficient quantity to carryout the erection, testing and commissioning. He may obtain the guidance from the Resident Manager/- Resident Engineer in this matter.

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BHARAT HEAVY ELECTRICALS LIMITED- HYDERABAD

External Services Department

(Site Erection Notes)

OIL PIPING

- 1) All dimensions /elevations refer to C.L. of pipe lines unless otherwise specified.
- 2) a) Pipe routing shall be done strictly as per drawing. Wherever dimensions are not specified same may be routed as per site convenience.
b) Pipe nominal size 2" and below shall be routed as per site convenience unless otherwise specified in the drawing.
- 3) a) Fusion faces shall be as per plant standard No. HY0620599.
b) Weld edges shall be debarred before welding.
- 4) Follow the following WPS Nos. for weld joints:
Carbon steel (SA 106-B or Eq): WE 003/A2 Stainless steel (A312TP 321 or Eq):WE-313/A2 or A1.
- 5) 10% of welds selected at random shall be tested with liquid penitent
- 6) Drain lines / return headers shall be erected with a slope of 1 Deg in the direction of flow.
- 7) All hangers are of rigid type unless otherwise specified. Small bore pipes shall be Fixed with clips to the nearest structure suitably. For suspension supports refer PGMA No.31322.
- 8) Orifices shall be erected after oil flushing.
- 9) Pipes shall be thoroughly cleaned during erection and should be acid pickled as per drawing No.4-170552 after the lines are completely erected and hydraulically tested.
- 10) Hydraulic test shall be conducted on complete pipe lines (except drain lines) at 1.5 times the max. working pressure before acid pickling.
- 11) After cleaning, all pipes shall be painted as per plant standard No.HY 0674162, unless otherwise specified.

BHARAT HEAVY ELECTRICALS LIMITED- HYDERABAD

External Services Department

(Site Erection Notes)

CLEANING AND PAINTING OF LUBE OIL **(CARBON STEEL AND STAINLESS STEEL)**

Scope: This standard covers the pickling and painting requirement of Carbon Steel Piping and pickling requirements of Stainless Steel Piping.

- 1.0 Mechanical cleaning for Carbon Steel and Stainless Steel Piping.
- 2.1 Mechanical cleaning consists of removing scales, welding spatters, rust, earth residues, previous painting or any other deposits adhering to the metal surface by means of wire brushes, wheels or pneumatic chisel or other similar methods while taking care not to damage the piping metal surface.
- 2.0 **Flushing:** Initially flush the C.S. and S.S. pipe lines with water at 70o C for about one hour.
- 3.0 Degreasing of C.S. and S.S. Pipe lines.
- 4.1 **Purpose:** For removal of any oil, grease etc., which may be adhering to the metal surfaces of line.
- 4.2 **For degreasing:** A solution containing 15% caustic soda and 15% sodium Phosphate in water at 80oC shall be used. The solution shall be kept agitated during degreasing.
- 4.0 **Flushing:** The C.S. and S.S. Pipe lines shall be flushed with hot water at 80o C for 1 hour.
- 5.0 Pickling of Carbon Steel Pipe Lines.
- 6.1 Use a mixture of sulphuric Acid and Hydrochloric Acid. The strength of the pickling solution depending on the surface condition of the part to be treated. The concentration may be up to 20% and temperature can be 20 to 65o C. Duration of pickling shall be 24 hours or use 5% sulphuric acid or use 20% Hydrochloric Acid.
- 6.2 **Washing:** The pipelines shall be flushed with water.
- 6.3 **Neutralization :** In alkaline solution consisting of caustic soda 5% Benzoate 2 to 3% and sodium Nitrate 10% . The PH values of the solution shall be PH 8-10. T. No-time lapse should be allowed between articles 6.2 and 6.3 above. Or 2% phosphoric acid can also be used for Neutralization.
- 6.4 **Drying:** Immediately after neutralization pipe lines shall be dried with compressed air which is free from oils and humidity.
- 6.5 **Protection :** If the pipe lines are not put into service within few days of above treatment, they shall be protected by Anti-oxidizers and fill with Nitrogen.
- 7.0 Pickling of stainless steel pipe lines.
- 7.1 A solution of 7% by vol. of Industrial Nitric Acid and 3% by vol. of industrial sulphuric acid in water at 50o C shall be used for pickling for half an hour.

or

BHARAT HEAVY ELECTRICALS LIMITED- HYDERABAD

External Services Department

(Site Erection Notes)

A solution containing citric acid 8% by Wt. and Rodine 92 A or 130 (Powder) 1-5% by wt. in water at 65oC to 70o C shall also be used for Pickling for 12 hours. However citric acid is preferable.

7.2 Same as Art. 6.2 above (Washing)

7.3 Same as Art.6.3 above. (Neutralization)

7.4 Same as Art 6.4 above(Drying)

7.5 Same as Art.6.5 (Protection).

8.0 Painting of CS. Pipe lines.

8.1 Pipe lines shall be cleaned by wire brushing also see Art.2.1 for details.

8.2 Anti-corrosive painting.

Apply 4 coats of anticorrosive paint DURALIT SR 1.423. 2201 of MAX MAYER or its equivalent APCODUR CP 684 yellow with its suitable thinner No.121. The total thickness of dry film shall be around 0.2mm.

8.3 Finish paint.

Apply one coat of DURALIT ISC series 431 (1.431-8176) of MAX MAYER) or its euivalent

APCODOUR CF 692 ADUIRALTY GREY by adding suitable thinner No.181, The thickness of dry film shall be around 0.04mm.

9.0 Stainless steel surfaces do not re quire painting.

**GENERAL INSTRUCTIONS FOR ACID CLEANING (PICKLING) OF
PIPE LINES OF OIL SYSTEM
(TURBO COMPRESSOR AND TURBO GENERATOR SETS)**

1.0 GENERAL:

The purpose of acid cleaning (pickling) is to remove the rust resulted due to long Exposure to the atmospheric conditions and for dislodging the burs, welding slag and the mil scales adhering to the internal surface of the pipe lines. The oil pipe lines include lubricating oil pipe lines, governing oil pipe lines, seal oil system pipe lines and all the drains.

After completing the fabrication of piping for the oil circuit, the pipes shall invariably be pickled. (Note : sand blasting method shall not be resorted to). It is always desirable that this operation is carried out by a reputed agency which is specialized in pickling pipe work. If this is not possible due to any reasons, the following procedures are recommended. The activities involved for this process are given below with detailed procedures in sequential manner.

- 2.0 Methods of pickling pipe lines material wise.
 - 2.1 Carbon steel and alloy steels.
 - 2.2 Stainless steel; and steels with high chromium content.
- 3.0 Preparation at site.
 - 3.1 Mechanical cleaning of oil pipe lines.
 - 3.2 Hydraulic testing of oil pipe lines.
 - 3.3 Steam blowing of oil pipe lines.
 - 3.4 Assembly of oil pipe lines for acid cleaning.
 - 3.5 Pressure testing of contours (loops).
- 4.0 Flushing of the contour with hot water.
- 5.0 Quantity of acid solution and acid cleaning process.
 - 5.1 Circulation process.
 - 5.2 Soaking /filling process.
- 6.0 Flushing with hot water after pickling and neutralization.
- 7.0 Dis-assembly of contours and dry compressed air blowing.
- 8.0 Oil spraying of the pipe sections.
- 9.0 Safety precautions.
- 10.0 Approximate material requirement.

BHARAT HEAVY ELECTRICALS LIMITED- HYDERABAD

External Services Department

(Site Erection Notes)

2.0 METHODS OF PICKLING PIPE LINES MATERIAL WISE.

2.1 Material: carbon steels & alloy steels.

a) Hot water flushing	D.M. water	Item under hot water flushing.
b) Degreasing with an Alkaline solution	Alkaline solution consisting of 50 gms. Of tri-sodium phosphate, 50 gms. of sodium carbonate, 20 gms of caustic soda per 1 ltr of water at 80 deg. C circulation /filling for 2hrs. at 70 to 80 deg.C	Item under circulation process
c) Hot water flushing after degreasing.	Hot water circulation for one hour at 70 to 80 deg.C	Item under hot water flushing.
d) Acid cleaning with	Acid solution consisting of HCL at 10% concentration inhibitor of 1% by volume Other inhibitors like 1% Forma-line or 3% pyridine can also be used. (say roudine 213) and the rest with water at temp 70	Refer item under circulation method
<p>Note: Other acid solutions which are less frequently used are:</p> <p>i) Sulphuric acid 10 to 15% concentration; soaking period 1 hour.</p> <p>ii) Phosphoric acid of 30 to 40% concentration; soaking period 10 hours</p> <p>It is not advising to use NITRIC ACID SOLUTIONS for this Process.</p>		
e) Hot water flushing After acid cleaning. Hot water flushing at 70 to 80 C for one hour.		
f) Neutralisation: After acid cleaning to neutralize the acid a solution of 5 to 10% of caustic soda of 50 gms of Trisodium Phosphate mixed in one liter of water maintained at 40 to 50 Deg. C. can be used. Circulation may be for one hour. Soaking period may be 10 to 20 minutes. However, it is to be continued till the PH value of the solution reaches to the required value of about 8 to 10.		
g) Hot water flushing: Hot water circulation at 80 Deg C for one hour.		
h) Dry with	Air blowing with compressed Air free from oil, moisture etc	Ref. item under air blowing
i) Protecting the interior with	1) Filling the loops with oil and spraying the oil inside the pipes which are not included in the loops 2) Cleaning the pipe ends with cloth	

BHARAT HEAVY ELECTRICALS LIMITED- HYDERABAD

External Services Department

(Site Erection Notes)

2.2 Material : Stainless steel and steels with high chromium content.

ACTIVITY (1)	COMPOSITION AND OTHER DETAILS (2)	FOR DETAILED PROCEDURES REFER ITEMS (3)
a) Hot water washing	D.M.water circulation at about 80Deg C for one hour.	
b) Degreasing with	i) Solution consisting of 15% caustic soda Alkaline solution. plus 15% sodium phosphate per litre of circulation item. Water at 80 Deg C.or ii) Solution consisting of 50 gms trisodium phosphate 50 gms. Of sodium carbonate and 20 gms. Caustic soda per one litre of water at 70 Deg. To 80 Deg.C. CIRCULATION :2 hrs.	Refer pickling
c) Hot water flushing after degreasing	Circulation at 80Deg. C for one hour.	Refer circulation
d) PICKLING:	i) Cleaning with a solution of 7% (by volume) industrial Nitric acid and 3% (by volume) filling industrial sulphuric acid and 90% (by volume water at 50 Deg.C for 30 minutes). ii) Preferably pickling of stainless steel piping may be done with solution containing Citric Acid 6% (by weight),Redine 92 A or 130 (Power) 1.5% (by weight) at a temperature of 65 Deg to 70 Deg.C 12 hours circulation method.	
e) Hot water flushing	Circulation at 80 Deg.C for one hour.	
f) Neutralisation	Solution of 10% Caustic soda and 90% Circulation for one hour.	
g) Hot water flushing	Circulation at 80 Deg.C for one hour.	
h) Dry with:	Air blowing with compressed air free from oil, moisture etc.	
i) Protecting the interior with	i) Filling the loops with oil and spraying the oil inside the pipes which are not included in the loops. ii)Closing the pipe ends with cloth.	

BHARAT HEAVY ELECTRICALS LIMITED- HYDERABAD

External Services Department

(Site Erection Notes)

3.0 PREPARATION AT SITE:

3.1 MECHANICAL CLEANING OF OIL PIPE LINES;

All the pipe sections are thoroughly cleaned with the help of round wire brushed of proper sizes and chains. The tee branches, reducers, bends are cleaned with greater care. Wherever possible the excess of welding metal protruding over the internal surface of the pipe sections are to be removed by grinding or with the help of hand files. After cleaning is done the pipe sections are blown with compressed air to remove the dirt or dust.

The cleaning is continued till all the rust, loose materials, welding burrs, slugs are dislodged and removed. All the joining flanges of the pipe lines are to be scraped and colour matches with the surface plate.

3.2 HYDRAULIC TESTING OF OIL PIPE LINES:

After the successful mechanical cleaning, the pipe lines are hydraulic tested at the recommended pressure and the test results are to be recorded. Maximum possible pipe line sections which form the complete contour are assembled temporarily on a leveled ground for the purpose of hydraulic testing. The selection of sections have to be done from the point of convenience. Pipe sections which can not be included in the contours have to be tested individually. This test is inevitably required for all the high pressure pipe line sections included in the seal oil system.

3.3 STEAM BLOWING OF OIL PIPE LINES:

All the pipe sections which can not be mechanically cleaned are to be steam blown in two stages. The steam required for blowing is obtained from the existing units of a package boiler where no Unit exists. The parameters of the steam used for blowing are 7 to 8 Kg./cm², temperature of 180 To 200 deg. cent. Minimum flow to be maintained during process is 4 to 5 t/hr. Duration of each Blow shall be 15 to 20 minutes. The second blowing is given after cooling the pipe sections to the ambient temperature. The blowing further ensures the removal of all the loose materials, welding slag adhering to the internal surface of the internal surface of the pipe sections.

3.4 ASSEMBLY OF OIL PIPE LINES FOR ACID CLEANING;

Note : Pipe sections of diameter 80mm below are not to be included in the contour. They are acid cleaned by soaking process. Soaking filling method can be done wherever the circulation process is not possible due to air locks and also depending on the loops prepared.

The pipe sections are assembled in different contours on a leveled ground and supported over Wooden sleepers at number of places near the joints. The selection of sections has to be done From the point of convenience. Where parallel flow paths are unavoidable, orifices shall be Provided restrict to flow in the path offering the least resistance for the flow. The contours Shall

BHARAT HEAVY ELECTRICALS LIMITED- HYDERABAD

External Services Department

(Site Erection Notes)

have to be provided with drain points for draining the solution and air vent for removal of air. While charging with the solution. The cleaning of the front pedestal inner oil pipe lines is not done by acid. They are only mechanically cleaned and steam blown. The contours are to be provided with sampling points both a suction and return lines for facilitating the collection samples for analysis.

The contours are also to be provided with valves in suction and return ends for regulating The flow. A drain line to the neutralizing pit with a valves is to be provided before the valve on the return line. A by pass line is also provided for the contour with a valve for facilitating the starting of the acid pumps. All the pipe sections joints are to be provided with acid resistance rubber gaskets only. Wherever temporary pipe lines or blank required, will be provided.

3.5 PRESSURE TESTING OF CONTOURS:

Contours assembled are hydraulic tested with one discharge to the dissolving tank to check for the tightness of all the joints.

4.0 FLUSHING OF THE COUNTOUR WITH HOT WATER.

Hot water flushing of the contours are carried out with filter water prior to acid circulation process in order to remove the dust, dirt or moll scales.. This also helps to check the tightness of all the flanged joints under hot conditions. The filter water is first taken into the dissolving tank and head to a temperature of 60 deg. C by passing steam. The parameter of the steam admitted shall be 8kg.cm² and temperature of 180 to 200 deg.C. The acid circulation pump is then started on re-circulation and further the temp. of the water in the dissolved tank is raised to 70 deg.C by passing more quantity of steam. The air valve provided in the contour is opened and the suction valve of the contour is opened slowly for charging the contour. When all the air is expelled out of the contour, the water starts coming out in the form of a jet from the air vent. After ensuring the complete removal of the air, the air valve is closed and the discharge valve of the contour to the neutralizing pit is opened slowly and the storage tank maintained at a constant level i.e.3/4th gauge throughout the process. The rate of discharge of water to be maintained at 50 t/hr. This quantity may vary from set to set. The approximate time required for the completion of the process is three hours.

5.0 QUANTITY OF ACID SOLUTION AND ACID CLEANING PROCESS:

5.1 SAMPLE CALCULATIONS:

The quantity of acid to be used for cleaning a contour depends upon the volume of contour /piping loop. A sample calculation to arrive at the required quantity of acid for a contour of 6 m³ volume is given below. However, the total quantity of acid required will depend upon the total volume of pipe lines to be cleaned which varies from set to set. .

Volume of contour = 6 m³ The dissolving tank volume is of say =2 m³.

BHARAT HEAVY ELECTRICALS LIMITED- HYDERABAD

External Services Department

(Site Erection Notes)

The working volume of the tank is taken as 10 m³ as the level is to be maintained at ½ of the level gauge glass.

Total volume = 6 + 10 = 16 m³

If acid concentration is chosen as 15% of phosphoric acid (H₃ P₀₄).

For 80% concentration of H₃ P₀₄:

Commercially available quantity of acid required is = 2.4/0.8 = 3 m³. Specific gravity of acid required is 1.75. Weight of H₃ P₀₄ required for 6 m³ contour cleaning is = 1.75 x 3 = 5.25 MT.

5.2 PREPARATION OF SOLUTION AND PROCESS OF CIRCULATION METHOD:

Demineralised water is filled in to the dissolving tank up to the lower gauge glass full. One of the acid circulation pump is started on recirculation through the contour/pipe loop. The temperature of the tank water is raised to 50 deg. Cent. By passing of steam in to the dissolving tank.

Just after the temperature of 50 deg.cent. is attained, the addition of the calculated quantity of acid, a sample from suction of the contour is sent to laboratory for checking required concentration . The temperature of 60 to 80 deg.cent. is maintained throughout the process by controlling required steam quantity. The parameter of the steam is 7 to 8 Kg/cm² and temperature 180 to 200 deg.cent.(care is to be taken to see that the tank level does not increase more than 1 ¾ level gauge glass. The closed circulation of the acid solution is continued for 6 hours after the complete addition of the acid.

During the circulation hourly samples are taken from the suction and return lines and analysed for the following:

- 1) PH
- 2) acidity
- 3) Iron content.

NOTE: The concentration of the acid and type of acid chosen may vary depending upon the material and cleanliness of the pipe lines. Refer item for method of pickling noted.

After the successful completion of the 6 hours circulation the pumps are stopped. The contour is allowed to soak with the solution for one hour. This is called the “Locking of the process”. The circulation is resumed once again for about 15 to 20 minutes and the process is locked for 5 minutes. This operation is repeated for 3 to 4 times to dislodge the extraneous matter that might have been stuck up at the sharp bends of the contour. Even during this locking process, Samples are taken from the suction return lines and analysed as earlier.

Then the complete solution is discharge in to the neutralizing pit first through the pump and then by gravity after stopping the pump. The contour is also drained. While discharging the acid solution, it is neutralized by adding NaOH in to the neutralizing pit.

BHARAT HEAVY ELECTRICALS LIMITED- HYDERABAD

External Services Department

(Site Erection Notes)

5.3 SOAKING PROCESS/FILLING PROCESS:

The pipe sections of diameter 80mm and below which are included in the contour are acid cleaned (pickled) by “soaking process”. This method comprises of blanking one end of the pipe sections completely and filling up of the acid solution prepared with the required concentration. After the pipe section is filled with the acid solution, the other end is also blanked loose to allow the gases to escape.

In some cases, all the small bore pipe sections and other small branches are completely immersed in the tank for digressing, pickling and neutralization and it is ensured that all the pipes are filled inside fully with the solution. In both the methods, it is to be left for 24 hours and after which the solution is drained out from the pipe sections. These were finally blown by steam and air.

6.0 FLUSHING OF THE CONTOUR WITH D.M.WATER:

After the system is completely drained the dissolving tank is filled with the D.M.. Water and the water in the tank is put on recirculation through the acid pump. The contour is slowly charged end the water is put on recirculation through the contour and the bypass valve of the contour is closed. The temperature of the D.M. water of the dissolving tank is raised to 70 to 80 deg. Cent. by passing steam of 7 to 8 Kg/cm² and temperature of 180 to 200 deg. Cent. The discharging valve of the contour to the neutralizing pit is slowly opened and the hot flushing of the contour is started. The recirculation valve to the tank is closed. The rate of discharge to the neutralizing pit is maintained at 50t/hr. This quantity may vary from set to set. The dissolving tank is mad up continuously with D.M. water and the constant level of 1 ³/₄ gauge glass is maintained. The hourly samples from the discharge line is collected and analyzed for the following:

- 1) PH 2) CONDUCTIVITY 3) ACIDITY 4) IRON CONTENT.

The temperature of the water at the dissolving tank is maintained at 70 to 80 deg. Cent. Throughout the process. The rinsing of the contour is deemed to be over when the acidity and iron content becomes nearly equal over a set of consecutive readings of zero. The pipe sections which are soaked are also booked in to contours and rinsed with D.M.water as above or the pipe sections are steam washed till such results as above are obtained. The approximate time required for the above process is 8 hours.

7.0 DESSEMBLY OF CONTOUR AND DRY COMPRESSED AIR BLOWING:

Soon after completing the D.M.water rinsing the pipe sections of the contour are disassembled and taken over a platform where the arrangement for dry compressed air is made compressed air is made available for blowing. The temperature of the compressed air used shall be 50 deg. Cent. And the pressure 3 50 4Kg/cm². The clean dried surface has a dark steel gray colour, which indicates that the acid cleaning is of required standard.

BHARAT HEAVY ELECTRICALS LIMITED- HYDERABAD

External Services Department

(Site Erection Notes)

8.0 OIL SPRAYING OF THE PIPE SECTIONS:-

The dry pipe sections are then sprayed with DTE medium oil for protecting them from further rusting till they are erected back. For this purpose oil is thrown in to the pipe section using a small container and blown with compressed air. The end of the pipe sections are covered with wooden blanks to prevent the entry of the dust. The method of preservation is adopted when the cleaned pipe lines are required to be stored for 1 to 2 months. This is called the “passivation”.

9.0 SAFETY PRECAUTIONS TO BE TAKEN DURING AND AFTER ACID CLEANING:

- 1) The acid cleaning area shall be maintained free from foreign materials which may obstruct the movement of the personnel.
- 2) Ensure that the persons working in the acid cleaning process use the following:
 - a) Rubber gloves
 - b) Goggles
 - c) Aprons
 - d) Gum boots
 - e) Masks
- 3) Ensure the availability of first aid box, eye drops neutralizing bottle and cotton rolls.
- 4) The pipe sections after acid cleaning are to be stored properly so that no moisture or dust enters in to them till erected.
- 5) Smoking is strictly prohibited in the area where acid cleaning is done, no fire should be lit around the area.
- 6) Drilling, cutting, Welding of the pipe sections are strictly prohibited after the acid cleaning. All the stubs for instrument tapings are hence to be provided before acid cleaning and properly Plugged during and after acid cleaning till erected.
- 7) The damaged bolts and nuts during acid cleaning shall be replaced by new ones.
- 8) Due precautions to be taken while tightening the joints of the loop so that they do not leak.

10.0 MATERIAL REQUIREMENT (VARIES FROM-SET TO SET):

- 1) Quantity of filter water: 1250 MT
- 2) Quantity of D.M.Water: 1900 MT

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External Services Department

(Site Erection Notes)

- | | | |
|----|--|--|
| 3) | Quantity of acid: | 16.5 MT |
| 4) | Quantity of steam for heating the solution etc.: | 150 MT |
| 5) | Quantity of Na OH: | 3 MT |
| 6) | Capacity of dissolving tank: | 20 m ³ |
| 7) | Acid pumps: | 100m ³ /hr
10Kg/cm ²
4Nos. |
| 8) | Hot air blower: | 1No. |
| 9) | Thermometer (dial type): | 0 to 100 Deg.C.
1No. |

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External Services Department

(Site Erection Notes)

OIL FLUSHING FOR TG SETS

1. GENERAL

After completion of fabrication, acid pickling and installation the entire oil system should be thoroughly flushed, in order to eliminate all the contaminants, which might have been introduced into the oil system during the erection operations.

Acid pickling (write up Ref.No.4-17-0552) would have already removed all the Residual impurities from the oil system. However, oil flushing is to be carried out to be more sure that no foreign material will be carried by the oil to the bearings and governing elements, which is dangerous to the turboset.

During oil flushing, high velocity of flow in the oil lines can be achieved by temporarily removing the throttling points in governing line and opening the bearing inlet orifices such that drain oil pipe is 2/3 full. These high velocities will help in detaching loose particles Adhering to the pipe walls, so that they will be carried away by the oil flow.

2. FLUSHING OIL:

Oil system can be flushed with the same type of oil that is employed for normal turbine operation

Oil quantity required for flushing is approximately 60% to 70% of the quantity of oil required for normal operation of the turbine. However it has to be ensured that the oil pump does not starve for oil at its suction, during flushing.

After completion of flushing, the oil has to be centrifuged by centrifuging equipment and then tested. From the test results it can be decided whether the oil, after being used for flushing, is still usable as turbine lubricant.

NOTE: Other types of cleaning agents, especially chemical detergents, must never be used for flushing operations.

3. PREPARATION FOR START UP:

OIL TANK: Before filling with oil, the oil tank and strainer are to be thoroughly cleaned. Only cloth but never cotton waste, should be used for cleaning.

The cleaning materials used, should not leave any residue, and then the tank is to be loaded up with oil.

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External Services Department

(Site Erection Notes)

LUBRICATING OIL CIRCUIT:

- a) All the adjustable orifices are to be opened such that drain oil pipes are 2/3 full.
- b) All filter cartridges in lube oil filter are to be removed.
- c) Upper halves of the radial bearings are to be taken out. Journal portion is to be covered with cloth leaving the hole space for oil inlet. The cloth is to be pressed in between the bearing covers such that it will not become loose and pass on along with oil.
- d) Thrust bearing is to be removed.
- e) Proper tightening of all the flanges is to be ensured.
- f) Flushing of delivery pipe lines of the other oil pumps which are not used for flushing operations can be done by connecting their delivery pipe lines to the oil tank before the strainers.
- g) The delivery lines of jacking oil pump need not be flushed. These are to be cleaned after flushing.
- h) Gear boxes are not to be flushed, temporary pipe of 1 1/2" may be connected from inlet to drain through inspection window.

GOVERNING OIL CIRCUITS:

- a) All the orifices in trip oil, secondary oil and primary oil circuits are to be removed.
- b) Damaging devices in secondary oil circuits and primary oil circuits are to be removed.
- c) Control slide is to be taken out from the governing valve servomotors.
- d) Solenoid valve is to be kept in operating position.
- e) Tripping device is to be turned in to operating position locked.
- f) Starting device is to be turned into operating position and locked.
- g) About 20 to 30 mm dia temporary orifice is to be provided in the power oil inlet line to servomotors.
- h) Low lube oil protection is to be ensured for operating position by assembling 13mm thick stopper below the position.

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External Services Department

(Site Erection Notes)

- i) Vacuum protection is to be kept in operating position with the help of lever.
- j) Position is to be removed from emergency stop valve or the

4.FLUSHING OPERATION:

Oil pump is to be switched on . In case of centrifugal pump delivery line is to be closed before switching on the pump and to be gradually opened later. Pump input amperage is to be watched and if it rises too high, pump delivery is to be throttled for reducing it. In case of positive displacement Pumps, all the valves in the delivery are to be kept fully open before switching on the pump. Any leakages found in the oil system are to be curbed.

Flushing is to be started with lube oil header to drain by blocking oil entry to bearings and providing a temporary line between the two headers.

Subsequently the flushing can be extended to individual bearing oil lines, governing system, to all oil pumps, standby coolers, standby filters and over head oil tanks etc.

The best cleaning effect can be obtained by using alternatively hot and cold oil for flushing. Oil should therefore be heater up to 70C to 80 C. Oil temperature should not go up beyond 85 C because higher temperatures may be harmful for the oil.

After flushing for a period of about four hours, at a temperature of 70 deg. To 80deg. Cent., oil is to be allowed to cool down to about 30 to 35 deg. cent. When the pipes also were cooled to that temperature, oil is to be again heated to 70 to 80 deg. Cent. All the pipes must be hot during oil flushing. If any pipes are found to be cold, the reason why oil is not flowing through those lines is to be investigated and the fault to be rectified. Tapping on the pipes at intervals, further improves the removal of foreign materials from the pipe walls.

5. FLUSHING PERIOD:

Coarse impurities will be retained by the strainer in the oil tank. For filtering out the smaller foreign particles, filter cartridges should be kept in position during the last third of the flushing time. Differential pressure across the filter should be watched and paper filter cartridges are to be replaced whenever the differential pressure rises above 1.5 Kg/mm.

Oil centrifuging equipment (if available) in to be kept in service during oil flushing as an additional means of purification . Other oil filtering facilities can be provided by inserting fine filter meshes (approximately 25 microns) at the flange connections of bearing housings. These meshes will enable to check the impurities still present after flushing.

Flushing operation has to be continued until no substantial amounts of contaminants are found in the filters any more or no substantial rise in differential pressure across filters with in a period of 12 hours.

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External Services Department

(Site Erection Notes)

POST FLUSHING OPERATIONS:

- a) Oil tank and strainers are to be cleaned. The oil tank is to be filled up with operating oil to the required level.
- b) Oil filter is to be cleaned . In c are f paper cartridges, used cartridges are to be replaced by new cartridges.
- c) If stop valve is included in the flushing, oil portion is to be cleaned and piston is to be assembled back.
- d) Lower half cells of bearing halves are to be cleaned. Thrust bearing pads and top halves of radial bearings are to be assembled in operating position.
- e) Removed orifices and damping devices are to be assembled back in trip, secondary and primary oil lines.
- f) Primary and secondary oil pipes are to be separately cleaned.
- g) Orifice at the power oil inlet to servomotor is to be removed.
- h) Stopper piece in low lube oil protection is to be removed and cleaned.
- i) Overhauling and assembly of control slide in servomotor is to be carried out.
- j) Temporary lines provided for flushing operation are to be removed.



AMENDMENT - NOTIFICATION

HY 062 05 99 REV.00

PAGE 1 OF 1

WELDING ENDS



Under clause 1.4, read 'ANSI B16.25

as ANSI B16.25-1986

REF:	AMD. NO.	APPROVED:	ISSUED:	DATE:	CUM. SR. NO.
	01	AGM(E&CC)	SR.M(STDS)	JULY, 93	0035



PLANT STANDARD HYDERABAD

HY 062 05 99

PAGE 1 OF 6

WELDING ENDS

1. SCOPE

- 1.1 This standard covers the preparation of butt welding ends of pipes, welding neck flanges and pipe fittings but is equally applicable to other piping components which are connected into the piping system by butt welding.
- 1.2 Materials of piping components for which these welding ends are primarily intended are carbon and alloy steels. They may also be used for non-ferrous materials, upon satisfactory qualification of the welding procedures for the particular material.
- 1.3 This standard covers welding and preparation for one general type of joint only, i.e. without backing ring but does not prescribe specific types of welding processes and procedures. The other 3 general types of joints are (i) with split or noncontinuous backing ring (ii) with solid or continuous backing ring (iii) with consumable insert ring.
- 1.4 This standard is based on ANSI:B16.25

2: WELDING BEVEL DESIGN

- 2.1 Components having nominal wall thicknesses of 3 mm and less may have ends cut square or slightly chamfered ends (see Table 1, type I).
- 2.2 Components having nominal wall thicknesses over 3 mm to 22 mm inclusive shall have single angle bevels (See Table 1, type II).
- 2.3 Components having nominal wall thicknesses greater than 22 mm shall have compound angle bevels (See table 1, type III).
- 2.4 Dimensions of welding ends are given in table 2.

3. TOLERANCES

- 3.1 Dimensions A, B and t
 - 3.1.1 All components other than pipes: As specified in applicable ANSI/Corporate/Product Standard for the particular component.
 - 3.1.2 Pipes: As specified in plant standards HY 104 10 55, HY 106 10 32, HY 106 10 30.

Revision :

Issued **STANDARDS SECTION**
TECHNICAL SERVICES DIVISION

Date :

Prepared :

MAR
PDP

Approved :

Harish k khanijo
Sr. M (Stds.)

Date :

DECEMBER, 83.

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**PLANT STANDARD
HYDERABAD**

HY 062 05 99

PAGE 2 OF 6

WELDING DETAILS FOR PIPES AND PIPING COMPONENTS

TABLE-1

12.5 ✓

TYPE	WELD END THICKNESS-t (mm)	WELDING END DETAIL FOR JOINT WITHOUT BACKING RING	GAP BETWEEN TWO COMPONENTS TO BE BUTT WELDED
	WELD SYMBOL		
I	$t \leq 3$		
II	$22 \geq t > 3$		
III	$t > 22$		

NOTE:

- INTERNAL SURFACE MAY BE CHAMFERED FOR MAINTAINING DIMENSION ϕB AT THE WELD END, IF REQUIRED.
- INTER SECTIONS SHOULD BE SLIGHTLY ROUNDED.
- REPRESENTATION OF SHOP/SITE WELDS ON DRAWINGS SHALL BE AS MENTIONED BELOW.

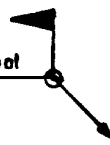
AT SHOP

Weld Symbol



AT SITE

Weld Symbol



- THE WELDING SYMBOLS GIVEN ABOVE ARE AS PER ISO:2553 EXCEPT THAT GIVEN FOR TYPE III.

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TABLE-2 DIMENSIONS OF WELDING ENDS

ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.

OD x t	NOM. DIA. In	SCH. NO.	OD AT WELDING END ϕA	ϕB	t
21.3 X 3.73	1/2	80	21.3	13.84	3.73
21.3 X 4.78	1/2	160	21.3	11.74	4.78
21.3 X 7.47	1/2	XXS	21.3	6.36	7.47
25.0 X 3.6	-	-	25.0	17.8	3.6
25.0 X 5.0	-	-	25.0	15.0	5.0
26.7 X 3.91	3/4	80	26.7	18.88	3.91
26.7 X 5.56	3/4	160	26.7	15.58	5.56
26.7 X 7.82	3/4	XXS	26.7	11.06	7.82
33.4 X 3.38	1	40	33.4	26.64	3.38
33.4 X 4.55	1	80	33.4	24.3	4.55
33.4 X 6.35	1	160	33.4	20.7	6.35
33.4 X 9.09	1	XXS	33.4	15.22	9.09
48.3 X 3.68	1 1/2	40	48.3	40.94	3.68
48.3 X 5.08	1 1/2	80	48.3	38.14	5.08
48.3 X 7.14	1 1/2	160	48.3	34.02	7.14
48.3 X 10.15	1 1/2	XXS	48.3	28.0	10.15
60.3 X 3.91	2	40	60.3	52.48	3.91
60.3 X 5.54	2	80	60.3	49.22	5.54
60.3 X 8.74	2	160	60.3	42.82	8.74
60.3 X 11.07	2	XXS	60.3	38.16	11.07
60.3 X 12.5	2	-	60.3	35.3	12.5
73.0 X 5.16	2 1/2	40	73.0	62.68	5.16
73.0 X 7.01	2 1/2	80	73.0	58.98	7.01
73.0 X 9.53	2 1/2	160	73.0	53.94	9.53
73.0 X 14.02	2 1/2	XXS	73.0	44.96	14.02
76.1 X 3.2	-	-	76.1	69.7	3.2
76.1 X 4.0	-	-	76.1	68.1	4.0
76.1 X 5.0	-	-	76.1	66.1	5.0

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OD x t	NOM. DIA. In	SCH. NO.	OD AT WELDING END ϕ A	ϕ B	t
76.1 X 10.0	-	-	76.1	56.1	10.0
76.1 X 12.5	-	-	76.1	51.1	12.5
88.9 X 4.0	3	-	88.9	80.9	4.0
88.9 X 5.49	3	40	88.9	77.92	5.49
88.9 X 7.62	3	80	88.9	73.66	7.62
88.9 X 11.13	3	160	88.9	66.64	11.13
88.9 X 15.24	3	XXS	88.9	58.42	15.24
108.0 X 16.0	-	-	108.0	76.0	16.0
108.0 X 20.0	-	-	108.0	68.0	20.0
114.3 X 4.5	4	-	114.3	105.3	4.5
114.3 X 6.02	4	40	114.3	102.26	6.02
114.3 X 8.56	4	80	114.3	97.18	8.56
114.3 X 11.13	4	120	114.3	92.04	11.13
114.3 X 13.49	4	160	114.3	87.32	13.49
114.3 X 17.10	4	XXS	114.3	80.1	17.10
114.3 X 32.0	4	-	114.3	50.3	32.0
114.3 X 40.0	4	-	114.3	34.3	40.0
139.7 X 5.0	-	-	139.7	129.7	5.0
139.7 X 10.0	-	-	139.7	119.7	10.0
139.7 X 16.0	-	-	139.7	107.7	16.0
139.7 X 22.2	-	-	139.7	95.3	22.2
139.7 X 25.0	-	-	139.7	89.7	25.0
152.4 X 17.5	-	-	152.4	117.4	17.5
159.0 X 30.0	-	-	159.0	99.0	30.0
168.3 X 4.5	6	-	168.3	159.3	4.5
168.3 X 7.11	6	40	168.3	154.08	7.11
168.3 X 10.97	6	80	168.3	146.36	10.97
168.3 X 14.3	6	120	168.3	139.7	14.3
168.3 X 18.3	6	160	168.3	131.7	18.3
168.3 X 21.95	6	XXS	168.3	124.4	21.95



PLANT STANDARD
HYDERABAD

HY 062 05 99

PAGE 5 OF 6

OD x t	NOM. DIA. In	SCH. NO.	OD AT WELDING END ϕ A	ϕ B	t
193.7 X 32.0	-	-	193.7	129.7	32.0
219.1 X 6.35	8	20	219.1	206.4	6.35
219.1 X 7.04	8	30	219.1	205.02	7.04
219.1 X 8.18	8	40	219.1	202.74	8.18
219.1 X 10.31	8	60	219.1	198.48	10.31
219.1 X 12.7	8	80	219.1	193.7	12.7
219.1 X 18.3	8	120	219.1	182.5	18.3
219.1 X 27.1	8	-	219.1	164.9	27.1
219.1 X 32.0	8	-	219.1	155.1	32.0
219.1 X 36.0	8	-	219.1	147.1	36.0
244.5 X 32.0	-	-	244.5	180.5	32.0
273.0 X 6.35	10	20	273.0	260.3	6.35
273.0 X 7.8	10	30	273.0	257.4	7.8
273.0 X 9.27	10	40	273.0	254.46	9.27
273.0 X 12.7	10	60	273.0	247.6	12.7
273.0 X 15.1	10	80	273.0	242.8	15.1
273.0 X 21.4	10	120	273.0	230.2	21.4
273.0 X 28.58	10	160	273.0	215.84	28.58
273.0 X 33.5	10	-	273.0	206.0	33.5
273.0 X 45.0	10	-	273.0	183.0	45.0
273.0 X 50.0	10	-	273.0	173.0	50.0
323.9 X 6.35	12	20	323.9	311.2	6.35
323.9 X 8.38	12	30	323.9	307.14	8.38
323.9 X 10.31	12	40	323.9	303.28	10.31
323.9 X 12.7	12	XS	323.9	298.5	12.7
323.9 X 17.48	12	80	323.9	288.94	17.48
323.9 X 28.0	12	-	323.9	267.9	28.0
323.9 X 28.58	12	140	323.9	266.74	28.58
355.6 X 9.53	14	30	355.6	336.54	9.53
355.6 X 15.09	14	60	355.6	325.42	15.09

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PLANT STANDARD
HYDERABAD

HY 062 05 99

PAGE 6 OF 6

OD x t	NOM. DIA. In	SCH. NO.	OD AT WELDING END ϕ A	ϕ B	t
355.6 X 12.7	14	XS	355.6	330.2	12.7
355.6 X 19.05	14	80	355.6	317.5	19.05
377.0 X 9.0	-	-	377.0	359.0	9.0
406.4 X 7.5	16	-	406.4	391.4	7.5
406.4 X 9.53	16	30	406.4	387.34	9.53
406.4 X 12.7	16	40	406.4	381.0	12.7
406.4 X 16.0	16	-	406.4	374.4	16.0
406.4 X 21.4	16	80	406.4	363.6	21.4
406.4 X 22.23	16	-	406.4	361.94	22.23
406.4 X 25.0	16	-	406.4	356.4	25.0
457.0 X 12.7	18	XS	457.0	431.6	12.7
457.0 X 14.27	18	40	457.0	428.46	14.27
457.0 X 23.8	18	80	457.0	409.4	23.8
457.2 X 25.0	18	-	457.2	407.2	25.0
457.2 X 32.0	18	-	457.2	393.2	32.0
508.0 X 12.7	20	30	508.0	482.6	12.7
508.0 X 15.11	20	40	508.0	477.78	15.11
508.0 X 28.0	20	-	508.0	452.0	28.0
508.0 X 45.0	20	-	508.0	418.0	45.0
559.0 X 22.2	22	60	559.0	514.6	22.2
559.0 X 32.0	22	-	559.0	495.0	32.0
610.0 X 12.7	24	XS	610.0	584.6	12.7
610.0 X 20.0	24	-	610.0	570.0	20.0

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Hyderabad

GENERAL SPECIFICATION PIPING INSULATION

Page 1 of 5

1.0 INTENT OF SPECIFICATION

This specification is intended to cover design, manufacture, fabrication, testing at manufacturer's shop, complete supply including all accessories and jacketing, delivery F.O.R. site duly packed for transportation of hot thermal insulation for piping, valves, fittings & specialities as specified in insulation data sheet and insulation schedule documents and as required.

Application of insulation will be in the scope of erection contractor(outside purview of this specification).

2.0 GENERAL INFORMATION

2.1 The thermal insulation shall be applied on the outer surface of piping, valves, fittings, equipment etc., to conserve the heat energy and also to maintain the outside surface temperature of the insulation below or at 60⁰ C for the safety of operating personnel.

2.2 Insulation thickness shall be computed on the basis of the following data unless otherwise specified:

- a) Design ambient temperature : 45⁰ C.
- b) Outside surface temperature of insulation jacket : 60⁰ C
- c) Emissivity of Aluminium sheet : 0.11
- d) Thermal conductivity of insulating material at different temperatures shall be as stipulated in IS:8183 & IS:9842 as applicable.
- e) Wind velocity : 1 metre/sec.

2.3 Insulation shall be supplied in thicknesses of 25, 40, 50 and 75 mm and higher thickness shall be made up in multiple layers from them.

2.4 Minimum Recommended Insulation thickness have been shown in Insulation schedule. Bidder, however, shall check the adequacy of the specified thickness and confirm the same. In case the specified thickness is not available from the manufacturer's standard sections, nearest higher section shall be selected where available, or thickness may be built up in layers over the section with the nearest thickness as has been specified. Wherever insulation thickness have not been indicated. Same is to be furnished by the Bidder indicating the corresponding type, class/density, thickness, design values of

DEPARTMENT :	PREPARED BY :	APPROVED BY :	DATE :	DOC. NO.	REV
POWER PLANT ENGINEERING	<i>Sunder</i> V.V.S.S.	<i>S.R.V.K</i> S.R.V.K	03.08.04	PP-5-1503	01



Hyderabad

GENERAL SPECIFICATION PIPING INSULATION

Page 2 of 5

conductivity of thermal insulation, and other design data considered (for items listed under 2.2 above).

- 2.5 All covering necessary to protect insulation from the weather shall be supplied. Also all temporary covering as required during application of insulation to protect the environment/surrounding from insulating materials shall have to be provided.

3.0 CODES AND STANDARDS

All item and work covered under this specification shall conform to the latest edition of the following codes and standards :-

- IS : 280 : Mild Steel Wire for general engineering purpose.
- IS : 737 : Wrought aluminum and aluminum alloys, sheet and strip.
- IS : 3144 : Methods of test for mineral wool thermal insulation materials.
- IS : 3346 : Methods of determination of thermal conductivity of thermal insulating materials.
- IS : 7413 : Codes of practice for application and finishing of thermal insulating materials at temperatures between 40⁰ C & 700⁰ C.
- IS : 8183 : Specification for bonded mineral wool.
- IS : 9842 : Specification for preformed fibrous pipe insulation.

4.0 SCOPE OF WORK

4.1 Scope of Supply

Required amount of insulating material and all other materials e.g. binding wires, stitching wires, coversheets/jacketing, expansion joints, bonding compound, adhesives, insulation supports, fastening materials, bands etc. as specified and as required for all items to be insulated as per Specification.

5.0 MATERIALS TO BE USED

- 5.1 The insulation material to be supplied under this Specification shall be of preformed bonded mineral wool sections as per IS:9842 or bonded mineral wool mat as per IS:8183

DEPARTMENT :	PREPARED BY :	APPROVED BY :	DATE :	DOC. NO.	REV
POWER PLANT ENGINEERING	 V.V.S.S.	 S.R.V.K	03.08.04	PP-5-1503	01



Hyderabad

GENERAL SPECIFICATION PIPING INSULATION

Page 3 of 5

or approved equivalent, to meet the conductivity values as furnished for group 4 density class of the said Indian Standards.

- 5.2 The insulation shall be of preformed bonded mineral wool sections of 150 Kg./Cu.m density as per IS:9842/approved equivalent.
- 5.3 Wherever, preformed bonded mineral wool sections can not be used, factory finished, machine made, machine stitched bonded mineral wool mat of 150 Kg./Cu.m density as per IS:8183 approved equivalent shall be provided.
- 5.4 Insulating material shall be suitable for the temperature of the pipe / equipment. For bonded mineral wool insulation, the bonding substance shall retain its property upto 600 °C.
- 5.5 The insulating material whether dry or wet shall be non-corrosive and shall be incombustible as per relevant standard and free from asbestos.
- 5.6 Depending upon the application procedure, loose insulating materials as per IS:3677 if unavoidable, may be used (partly) on such items as valves etc., subject to Purchaser's approval.
- 5.7 Preformed sections shall be secured by means of aluminium bands of 20 mm x 22 SWG (as per IS-737 or equivalent) atleast at every 500 mm spacing.
- The bonded mineral wool shall be secured by means of galvanized steel wire (as per IS:280 or equivalent) of at least 0.7 mm dia in the form of hexagonal netting of 10 mm to 13 mm aperture.
- 5.8 Binding wire to be used for the application of the insulation shall be galvanized steel wire conforming to IS:280 (latest revision) and of thickness 1.0 to 1.6 mm. For above 400⁰ C, binding wire shall be of S.S of suitable grade.
- 5.9 The stitching wire shall be 0.7 mm diameter copper wire conforming to IS:4412 (latest revision). For above 400⁰ C., stitching wire shall be of S.S. of suitable grade.
- 5.10 Jacketing Material (Cladding)

The metallic jacket over the insulation shall be of Aluminium sheet conforming to IS:737 (latest revision) and thickness not less than 20 SWG., except for small bore piping (pipes less than 80 NB) where 22 SWG. May be used subject to purchaser's approval.

DEPARTMENT :	PREPARED BY :	APPROVED BY :	DATE :	DOC. NO.	REV
POWER PLANT ENGINEERING	 V.V.S.S.	 S.R.V.K	03.08.04	PP-5-1503	01



Hyderabad

GENERAL SPECIFICATION PIPING INSULATION

Page 4 of 5

5.11 All other materials, e.g., insulation supports, expansion joints, washers, etc. shall be of standard design.

6.0 THERMAL INSULATION APPLICATION PROCEDURE

Bidder shall furnish the insulation application procedure for carrying out application At site by erection contractor. All materials as required for application of application shall be in the scope of vendor.

7.0 INSPECTION & TESTING

7.1 The Contractor shall furnish test certificates from any one of the independent authorities listed below or any other reputed body subject to Purchaser's/Consultant's prior approval for all the tests as mentioned later.

- a) National Test House, Calcutta / Bombay.
- b) Central Glass & Ceramic Research Institute, Calcutta.
- c) National Metallurgical Laboratory, Jamshedpur.
- d) Central Mechanical Engineering Research Institute, Durgapur.
- e) National Physical Laboratory, Delhi.
- f) Central Building Research Institute, Roorke, UP.

7.2 The Bidder shall carry out all the tests according to IS:8183/3144 or according to any internationally accepted standard. The tests shall be done on representative samples drawn from the insulating material supplied under this specification. Thermal conductivity tests for the offered insulating material at various mean temperatures and tests to ensure bonding property of bonded mineral wool (if offered) upto 600 Deg.C shall be conducted in presence of Purchaser's representative.

7.3 All the tests mentioned in IS:3144 shall be carried out for establishing various chemical and physical properties in accordance with the procedure laid down therein.

7.4 The Bidder shall furnish the following test reports along with the offer :-

DEPARTMENT :	PREPARED BY :	APPROVED BY :	DATE :	DOC. NO.	REV
POWER PLANT ENGINEERING	 V.V.S.S.	 S.R.V.K	03.08.04	PP-5-1503	01



Hyderabad

GENERAL SPECIFICATION PIPING INSULATION

Page 5 of 5

- a) Thermal conductivity, in mW/cm Deg. C., of the offered insulating material at various mean temperatures.
- b) Bonding property of bonded mineral wool insulation (if offered) upto 600 Deg. C.
- c) A complete chemical analysis report indicating the composition of insulation.
- d) All other tests as per IS:3144.

8.0 PERFORMANCE GUARANTEE

The bidder shall have to meet the specified surface temperature and the conductivity values of the thermal insulation shall not be more than that specified for group 4 of IS 9842 and IS 8183.

9.0 DRAWINGS, DATA AND INFORMATION REQUIRED

- 9.1 The Bidder shall enclose with his offer the following drawings and information as minimum requirement.
 - 9.1.1 A schedule indicating various types of insulation to be furnished, material specification, code and insulation thickness for each equipment, vessel and piping covered under this specification.
 - 9.1.2 Drawings and write up illustrating the application procedure for the insulation materials offered.
 - 9.1.3 Test Certificates for all the tests as applicable for each type of insulating material offered.
 - 9.1.4 A comprehensive experience list giving the name of the projects, customers, order valves, year of execution etc.
- 9.2 The Bidder shall furnish the following data and information after award of contract.
 - 9.2.1 Final versions of all drawings and data as detailed in clause No. 9.1
 - 9.2.2 Application procedure along with write-up and drawings.
 - 9.2.3 All test certificates of insulating materials.

DEPARTMENT :	PREPARED BY :	APPROVED BY :	DATE :	DOC. NO.	REV
POWER PLANT ENGINEERING	 V.V.S.S.	 S.R.V.K	03.08.04	PP-5-1503	01

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HYDERABAD

PRODUCT STANDARD TURBINES & COMPRESSORS

TC – 9 – 1900

REV NO: 02

SHEET 1 OF 3

TECHNICAL SPECIFICATION FOR NON SHRINK FREE FLOW GROUT MIX

1. **SCOPE:** This specification is intended for Non-shrink free flow grout mix to be cast below the base-plates, bedplates and bearing-housings/pedestals supporting the turbine generator sets. This specification applies for manufacture, working (processing) and quality control of non-shrink free-flow grout mix of cement base.
2. **GUIDELINES:** The latest version of the following standards may be referred.
 - DIN 1164:
 - DIN 18555: Mortar from mineral binding agent. (Testing)
 - DIN 50014: Climate and its technical application.
 - DIN 1048: Testing Methods for concrete.
 - DIN 50100: Material testing – Fatigue testing.
3. **REQUIREMENTS OF NON-SHRINK FREE-FLOW GROUT MIX:**
 - 3.1 The non-shrink free-flow grout mix must be made from cement base and shall be a permanently controlled and unchanging compound, to which only water shall be added at site before use.
 - 3.2 A good flowing capability of non-shrink free-flow grout mix must be demonstrated to BHEL through a trial pouring with a large base plate. In this pouring, the grout mix is filled in from one side, flows gradually below the base plate and equalizing itself fills all the hollow pockets. The base plate is taken out after 24 hours and the surface is inspected and judged.
The casting-in of base plates/bed plates with non-shrink free-flow grout mix is made for improvisation of supporting techniques. By this process, a uniform transmission of the mass forces and vibrations of turbo generator to the foundation is achieved.
Usually the cast height measures 50mm with a tolerance of ± 20 mm.
 - 3.3 The non-shrinking property of the grout mix shall be guaranteed. The expansion shall be proportional with in the stabilizing period of approximately 24 hours in order to guarantee a force transmission between foundation and the machine. After 24 hours no more expansion shall take place.
 - 3.4 The non-shrink free-flow grout mix shall have the following properties.
 - Chloride free
 - Non metallic
 - Non corrosive
 - Oil and water resistant
 - Resistance for moisture & Temperature variations.
 - High bonding strength.
 - 3.5 Properties after casting.
 - a) Compressive strength: Minimum 35 N/mm² - after 24 hours
Minimum 60 N/mm² final strength - after 28 days
 - b) Expansion coefficient:
The expansion coefficient of the cast mass shall be same as that of the foundation.
 - c) Impact and Vibration:
Should possess resistance to impact & should withstand vibration with out fracture.
4. **SUPPLIERS AND TYPE OF SUPPLY:**

This is to be purchased only from reputed manufacturers of non-shrink free-flow grout mix. They have to get all the tests done, enumerated below, at a national material-testing laboratory and furnish all the test certificates, which are subject to the acceptance by the design department.

The shrink-free pouring grout is to be packed in packets in the weight range of 25 to 50 kg and supplied. The packing shall be so made that the shrink free pouring grout is well protected from moisture and dirt. The packing must be stamped with date of manufacturing and expiry. Each consignment of shrink-free pouring grout mix must be accompanied by detailed, valid processing (working) instructions (leaflet).

Prepared B.N.Patel	Checked G.P. Rao	Approved G.P. Rao	Date 19.06.1988
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HYDERABAD

PRODUCT STANDARD TURBINES & COMPRESSORS

TC – 9 – 1900

REV NO: 02

SHEET 2 OF 3

5. TESTS OF NON-SHRINK FREE-FLOW GROUT MIX:

(AT NATIONAL MATERIAL TESTING LABORATORY)

- 5.1 Determination of spreading (Slumping dimension) as per DIN 18555, in relation to compound (mixing) ratio of dry non shrink grout: water.
- 5.2 Determination of workability after 10, 20, 30, 50, 70, 90 and 110 minutes at a temperature of 5°C and 20°C.
- 5.3 Determination of beginning and end of solidification.
- 5.4 Determination of bending and compressive strength in accordance with DIN 1164. The tests are to be carried out on test grout mix prism of 4cm x 4cm x 16cm after 8 hours, 1 day, 3 days, 7days, and 28days. The preparation and testing of test pieces is to be done at controlled temperature of 5°C and 20°C.
- 5.5 Determination of change in volume of non-shrink free-flow grout after 1 day, 3 days, 7days, and 28days. Pouring grout mix is to be mixed with a water/powder ratio of 1:5.55 i.e., 0.180, and to be poured into commercial size 1 kg container (Ø 99 mm height 120mm) up to 20mm under the lip. The container is to be set up with a rubber lining and to be covered with a weight 250g until compact.
- This is to be kept at 5°C and ambient temperatures and tested after 24 hours, 3days, 7days and 28 days for change in volume. The water contact at the top of the grout is to be measured with the aid of a volumetric measuring method (refer simplified measuring method to measure the change in volume of a compressed mortar, by Hermann Schmid, in concrete or steel concrete buildings 54th volume, book7, July 1959 Ed. Page 177).
- The results are to be tabulated.
- 5.6 Experiments on compression – Swelling zones on non-shrinking pouring grout. Mortar prisms of 4cm x 4cm x 6.5cm of 28 days or more old (Compression face 4x6.5cm²).
- a) Determination of test sample height in the loading direction and determination of consequent upset under a load of 20.4 N/mm². The shape changes are measured with strain gauges, which are mounted respectively on two opposite faces of the test specimen.
- b) Carrying out fatigue tests in accordance with DIN 50100 under the following conditions:
- Loading (Stresses) in the compression: Swelling zones.
 - Under stress : $\sigma_4 = 0.981 \text{ N/mm}^2$
 - Fluctuation of stress : $2 \sigma_A = 20.4 \text{ N/mm}^2$
 - Loading cycle frequency : n 30 Hz.
 - Limiting number of load cycles: 10^7
- c) Determination of test specimen's upset, when the test piece has not failed till the limiting number of loading cycles during the fatigue test.
- d) Determination of compression strength of loaded test specimens and comparison with compression strength of test specimen, which is not loaded.

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ANNEXURE – I FINANCIAL VIABILITY

Page 1

Spec No 104

1. Owner's capital in the business in case of Partnership, please mention percentage shares and amounts). Rs.
2. Quantum of business done during last three financial years
 - 1.
 - 2.
 - 3.
3. Value of fixed Assets of the business in last three years.
 - 1.
 - 2.
 - 3.
4. Guarantee limits (if any) enjoyed by them firm.
5. Over draft limits (if any) enjoyed by the firm.
6. Please enclose audited profit and loss account and Balance sheet for last 3 years (indicate No. of sheets).
7. Certificate from Scheduled Bank to prove Contractor's financial capacity to undertake the work duly indicating the financial limits the tenderer enjoys

NOTE: All the above documents should be duly certified by auditors/Bank as may be applicable.



**ANALYSIS IF SIMILAR JOBS EXECUTED
IN PROGRESS**

ANNEXURE - 2

**Page
No. 2**

Spec 104

Sno	Agency whom awarded	Location of Project	Capacity and Unit Nos.	Scope of work and Tonnage	Date of award	Contract value	% work completed and due date for completion	Date of completion if job is already over	No. of unskilled wrkers deployed at peak	No. of Engineers and supervisors deployed at peak	Details of Major T&P like cranes, Tractor trailers, Winches, Welding M/c. supplied		Consumables like by whom
											By Co ntractors	By other agency	
1	2	3	4	5	6	7	8	9	10	11	12	13	14

(SIGNATURE OF BIDDER)
WITH STAMP



(A) STATUS OF TOOLS & PLANTS

ANNEXURE - 4

**Page
No. 4**

Spec 104

Sno	NAME OF EQUIPMENT	Quantity owned	Registration No. where ever applicable	Documents enclosed for proof of ownership	Present location	Quantity proposed to be deployed for this job.

(B) MONTHWISE MANPOWER DEVELOPMENT PLAN

Sno.	Description of T & P	Months (Indicate No. to be deployed in each month)					
		1st	2nd	3rd	4th	5th	And so on

**SIGNATURE OF BIDDER
WITH STAMP**



Spec No 104

ANNEXURE – 5
ANALYSIS OF UNIT RATE QUOTED

Page 5 of 8

S. No.	Description	Percentage of the Unit rate quoted	Remarks
1.	Salary & Wages for Staff &- Workers		
2.	Consumables		
	a) Cases		
	b) Welding Electrodes		
	c) P .0 .L.		
	d) Others		
3.	Depreciation & Maintenance for T & P		
4.	Depreciation & Maintenance for other items		
5.	Establishment & Administration expenses of site		
6.	Overheads		
7.	Profit		

(SIGNATURE OF BIDDER)
WITH STAMP



ANNEXURE – 6 DECLARATION SHEET

Page 6 of 8

Spec No 104

I, _____
hereby certify that, all the information and data furnished by me with regard to this Tender Specification No. _____ are 'true and complete to the best of my knowledge. I have gone through the specification, conditions and stipulations in detail and agree to comply with the requirements and intent of specification.

I, further certify that I am the duly authorised representative of the under mentioned tenderer and a valid power of attorney to this effect is also enclosed.

Bidder's Name & Address

Authorized representative's signature with name and address



ANNEXURE – 7
CHECK LIST AND SCHEDULE OF
GENERAL PARTICULARS

Spec No 104

NOTE: Tenderers are requested to fill in the following detail and no Column should be left blank.

1. Name & address of the tenderer
2. Telegraphic/Telex addresses
3. Phone No. (Office)
4. Name & Designation of the official of the tenderer to whom all the references shall be made
5. Tenderer's proposal No. & Date
6. Whether EMD submitted (By cash/bank draft/ by.....)
7. Validity of offer/rates quoted for 120 days from the date of opening of tender Yes/No
8. Financial Status as per (in the format Annexure ('1'))
9. Income tax clearance certificate as per clause 10.04 Yes/No
10. Details of experience as per in the format Annexure-2 Yes/No
11. Month wise & Category wise manpower deployment plan as per in the format Annexure: ('3') Yes/No
12. Attested copy of power of attorney. as per clause.5, 02 spcn. 101 Yes/No
13. Details about type of the firm as per clause 10. 20 spcn. 101 Yes/No



ANNEXURE – 7
CHECK LIST AND SCHEDULE OF
GENERAL PARTICULARS

Page 8 of 8

Spec No 104

- | | | |
|-----|---|--------|
| 14. | Status of T & P & Month wise deployment plan as per (in the format Annexure '4') | Yes/No |
| 15. | Analysis of unit rate quoted as per (in the format Annexure 'E'5'). | Yes/No |
| 16. | Declaration sheet as per (in the format Annexure '6') | Yes/No |
| 17. | Labour License as per clause 10.21 Specification 101 | Yes/No |
| 18. | Labour insurance as per clause 10.21 Specification 101 | Yes/No |
| 19. | Provident Fund registration as per clause 10.21 specification 101 | Yes/No |
| 20. | IBR Welders qualification certificate as per Clause 10.21 specification 101 | Yes/No |
| 21. | Electrical Inspectors license as per Clause 10.21 specification 101 | Yes/No |
| 22. | Bankers certificate as per clause 10.21 Specification 101 | Yes/No |
| 23. | Balance sheets as per clause No.10.21 Specification 101 | Yes/No |
| 24. | Organization staff chart as per clause 10.21, Specification 101 | Yes/No |

Date:

SIGNATURE OF TENDERER
SEAL

WITNESS

(SIGNATURE WITH FULL PARTICULARS)

	ANNEXURE – 1 CONTRACT AGREEMENT-1	Page 1 of 3
Spec 105		

Contract Agreement No:

Date:

(To be executed non-judicial Stamp Paper of Rs.100.00)

This agreement made this the _____ day (date) of _____ month _____ (year) between the Bharat Heavy Electrical Limited, Ramachandrapuram, Hyderabad-500032. A.P. having its Registered Office at New Delhi (herein after called the "Company" of the first part and M/s. _____ Having its registered office at _____ (hereinafter called the 'Contractor') of the Second part.

Whereas the Company is desirous of getting the work of _____ executed at _____ in _____ (location) _____ situated at about _____ Kms from _____ (city) more particularly described in the appendices including drawings and specifications attached herewith.

Whereas the said Contractor has agreed to do the aforesaid work of the Company for the total amount of Rs. _____ (Rupees _____ only) excluding Service Tax, subject to the conditions herein contained in these presents, Instructions to Tenderers, General Conditions and special conditions, schedules, appendices, letter of intent and the works shown upon the said drawings and specifications (herein after referred to as the said Contract) which form part of this Agreement.

Initial 50% Security deposit Rs. _____ (Rupees. _____) Including EMD of Rs. _____ already deposited.

And Whereas the said contractor has agreed for deduction 'of 10% value of the running bills for the work executed towards balance 50% security deposit of Rs. _____ (Rupees) _____ only) until the total amount so deducted plus the amount already deposited will be equal to the prescribed security deposit.



ANNEXURE – 1
CONTRACT AGREEMENT-1

Page

2 of 3

Spec 105

Now These Present Witness that in consideration of the said contract, as also of Agreement of good and faithful service to be rendered and performed by the Contractor in the execution of the said work, subject to the stipulation hereinafter expressed.

That the said Contractor will perform the aforesaid work subject to the conditions contained in these presents Instructions to Tenderers, General and Special conditions of Contract and the contract documents attached herewith including the said schedule, specifications, appendices, letter of intent, drawings attached to the Agreement and also such other drawings and instructions as may from time to time be given by the Company. And that the said, Contract shall be deemed to have carefully examined the specifications and conditions of Contract, Appendices, Schedules, letter of Intent, Drawings etc., as aforesaid and also to have satisfied himself as to the nature and character of the work to be executed.

That the said Contractor shall carryout and complete the execution of the said work to the entire satisfaction of the Engineer of company within the agreed time schedule

That the company after proper checking of the bills submitted by the said Contractor will pay to him during the progress of the said work at the said Contract rates and agreed terms of payment, a sum as determined by the company in respect of the work executed by the Contractor .

That the contract shall come into force with retrospective effect from, the date on which the contractor has mobilized his men, materials, tools and tackles at site and certified so by the project/Resident manager/engineer .

That whenever under this contract or otherwise any sum of money shall be recoverable from or payable by the Contractor the same may be deducted in the manner as set out in the conditions of contract as aforesaid.

That all charges on account of Octroi, terminal and sales tax or other duties on materials obtained for the works shall be borne by the said Contractor.

That it is agreed between the parties that the Contractor, will ensure adherence to all statutory requirements under the appropriate State Rules of the Contract Labour (Regulations & Abolition) Act, 1970 in respect of Service conditions for the employment of Contract, Labour the Contractor also

	ANNEXURE – 1 CONTRACT AGREEMENT-1	Page 3 of 3
Spec 105		

hereby undertakes to get himself licensed from the appropriate authority as a Contractor. It is understood by the Contractor that for this agreement to be effective the prime conditions is his fulfilling the condition of being licensed as a contractor under the appropriate State legislation and the continuance of this agreement is subject to his sustained ensures of fulfillment of all statutory requirements, failing which the agreement is liable to immediate termination.

That it is agreed between the parties that the non-exercise of any of the powers conferred on the, authorities of the Company, will not in any manner constitute waiver of the conditions here to contained in these presents and the liability of the said contractor either of past or future compensation shall remain unaffected.

That the expression BHEL wherever occurring means THE BHARAT HEAVY ELECTRICALS LIMITED, Ramachandrapuram, Hyderabad-502 032 (Andhra Pradesh).

The documents here to attach, viz shall form part of this Agreement.

In witness where of the parties have respectively set their signatures in the presence of:

WITNESSES:

(With full address)

- 1.
- 2.

Date:

Signature of Contractor
 (To be signed by a person holding valid
 Power of Attorney of the Company)

WITNESSES:

- 1.
- 2.

For and on behalf of
BHARAT HEAVY ELECTRICALS LIMITED

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ANNEXURE – II
CONTRACT AGREEMENT-II

Page
1 of 3

Spec 105

Contract Agreement No. _____

Date.....

(To be executed non-judicial Stamp Paper of Rs.30.00)

This agreement made this the _____ (day & date) of (month) _____
_____ (year) between Bharat Heavy Electricals Limited,
Ramachandrapuram, Hyderabad-500032, A.P. having its Registered Office at New Delhi
(herein after called the “Company” of the first part and M/s. _____

_____ having their registered office at _____ (hereinafter called the ‘Contractor’)
of the Second part.

WHEREAS the Company is desirous of getting the work of _____
_____ executed at _____
in _____
(location) _____ situated at about _____
Kms from _____ (city) more particularly described in the appendices
including drawings and specifications attached herewith.

WHEREAS the said Contractor has agreed to do the aforesaid work of the Company at
total amount of Rs. _____ (Rupees) _____
_____ only) per tonne subject to the conditions herein contained in these presents,
Instructions to Tenderers, (General Conditions and special conditions, schedules, appendices)
letter of Intent and the work shown upon the said drawings and specifications (herein after
referred to as the said Contract) which form part of this Agreement.

AND WHEREAS the said contractor has furnished a Bank Guarantee for a sum of Rs.
_____ (Rupees) _____ only)
from M/s. _____

Bank valid up to _____ towards security deposit for the satisfactory
completion and performance of the work and whereas the said Bank Guarantee has to be
renewed by the Contractor _____ for the balance period of contract
including guarantee period of twelve months reckoned from the date of successful
commissioning and final acceptance of the Turbo set and in the event of his failure to do so the
Contractor shall pay or accept recovery of the amount of Rs. _____
(Rupees _____ only)

from the Bills forth with in one installment and it has further been agreed that the failure to
renew the Bank Guarantee or failure to pay the aforesaid amount in the manner specified above
shall constitute the breach of contract, and the Company reserves the right to take any legal
action deemed fit for recovering the said sum of Rs. _____ (Rupees _____
_____ only)

Which will be refunded to the Contractor on satisfactory completion of the guaranteed period.



ANNEXURE – II CONTRACT AGREEMENT-II

Page

2 of 3

Spec 105

NOW THESE PRESENT WITNESS that in consideration of the said contract, as also of Agreement of good and faithful service to be rendered and performed by the Contractor in the execution of the said work, subject to the stipulation hereinafter expressed.

THAT the said Contractor will perform the aforesaid work subject to the conditions contained in these presents, Instructions to Tenderers, General and Special conditions of Contract and the contract documents attached herewith including the said schedule, specifications, appendices, letter of intent, drawings attached to the agreement and also such other drawings and instructions as may from time to time be given by the Company. And that the said contractor shall be deemed to have carefully examined the specifications and conditions of contract, Appendices, Schedules, Letter of Intent, Drawings etc., as aforesaid and also to have satisfied himself as to the nature and character of the work to be executed.

THAT the said Contractor shall carry out and complete the execution of the said work to the entire satisfaction of the Engineer of the Company within the agreed time schedule.

THAT the Company after proper checking of the bills submitted by the said contractor will pay to him during the progress of the said work, at the said contract rates and agreed terms of payment, a sum as determined by the Company in respect of the work executed by the Contractor.

THAT the contract shall come into force with retrospective effect from _____ the date on which the Contractor has mobilized his men, materials, tools and tackles at the site and certified so by the Resident Manager / Resident Engineer.

THAT whenever under this contract or otherwise any sum of money shall be recoverable from or Payable by the Contractor the same may be deducted in the manner as set out in the conditions of contract as aforesaid.

THAT all charges on account of Octroi, terminal and sales tax or other duties on materials obtained for the works shall be borne by the said Contractor.

THAT it is agreed between the parties that the Contractor will ensure adherence to all statutory requirements under the appropriate State Rules of the Contractor Labour (Regulations & Abolition) Act, 1970 in respect of service conditions for the employment of Contract Labour. The Contractor also hereby undertakes to get himself licensed from the appropriate authority as a Contractor. It is understood by the Contractor that for this agreement to be effective the prime condition is his fulfilling the condition of being licensed as a contractor under the appropriate State Legislation and the continuance of this agreement is subject to his sustained assurance of fulfillment of all statutory requirements failing which the agreement is liable to immediate termination.

THAT it is agreed between the parties that the non-exercise of any of the powers conferred on the Authorities of the Company will not in any manner constitute waiver of the



ANNEXURE – II
CONTRACT AGREEMENT-II

Page

3 of 3

Spec 105

conditions hereto contained in these presents and the liability of the said contractor either of past or future compensation shall remain unaffected.

THAT the expression BHEL wherever occurring means THE BHARAT HEAVY ELECTRICALS LIMITED, Ramachandrapuram, Hyderabad -500032 (Andhra Pradesh).

The documents hereto attached viz.,
Shall form part of this Agreement.

In witness whereof the parties have respectively set their signatures in the presence of:

WITNESSES:

(With full address)

1.

2.

Date:

Signature of Contractor

(To be signed by 'a person holding valid
Power of Attorney of the Company)

WITNESSES:

1.

2.

For & on behalf of
BHARAT HEAVY ELECTRICALS LIMITED

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ANNEXURE – III
GURANTEE TOWARDS SECURITY
DEPOSIT

Page

1 of 3

Spec 105

(To be executed on a non-judicial stamp paper of the value of Rs. 30/-)

This Deed of Guarantee made this _____ day of _____ one thousand nine hundred and Eighty _____ between _____ (Banks)

hereinafter called "the Guarantor" (which expression shall unless repugnant to the context or meaning thereof be deemed to include its successors and assigns) of the ONE PART and M/s. BHARAT HEAVY ELECTRICALS LIMITED (a Government of India Undertaking) a company incorporated under the companies Act, 1956, having its registered office at BHEL House, siri fort New Delhi -110049 through its Unit/Division at Ramachandrapuram HYDERABAD-500032'(AP.) hereinafter called the Company (which expression shall unless repugnant to the context or meaning thereof be deemed to include its successors and assigns) of the OTHER PART.

WHEREAS M/s. _____ (Hereinafter referred to as the contractor/Supplier) have entered into a contract bearing No. _____ dated _____ (hereinafter referred to as the contract) for the erection and commissioning of _____ with in the company.

AND WHEREAS the contract interlaid provides that the contractor/ Supplier shall furnish to the Company a sum of Rs. _____ (Rupees _____) towards Security deposit for due and faithful performance of the contract in the form and manner specified therein.

AND WHEREAS the contractor/Supplier has approached the Guarantor and in consideration of the arrangement arrived at between the contractor/ Supplier and the Guarantor, the Guarantor has agreed to give the guarantee as hereinafter mentioned in favour of the company.

NOW 'THIS DEED WITNESSES AS FOLLOWS:

The Guarantor do hereby guarantee to the company the due and faithful Performance, observances or discharge or the contract by the contractor/ Supplier and further unconditionally and irrevocably undertake to pay to the company without demur and merely on a demand to the extent of Rs _____ (Rupees _____) and claim made by the company on them for any loss, damage, costs, charges and expenses caused to or suffered by the company by reason of the contractor/ Supplier making any default in the performance observance or discharge of the terms, conditions, stipulations or undertakings or anyone or them as contained in the contract.

The decision of the Company whether any default has occurred or has been committed by the Contractor/Supplier in the performance, observance or discharge of any of the terms, conditions, stipulations or undertakings or anyone of them as contained in the Contract any/or as to the extent of loss, damage, costs, charges and expenses caused to or suffered by the Company by reason of the Contractor /Supplier making any default in the performance observance or discharge of any of the terms, conditions, stipulations or undertakings or any one of them shall



ANNEXURE – III
GURANTEE TOWARDS SECURITY
DEPOSIT

Page

2 of 3

Spec 105

be conclusive and binding on the Guarantor irrespective of the fact whether the Contractor/Supplier admits or denies the default or questions the correctness of any demand made by the Company in Any Court, Tribunal or Arbitration proceedings or before any other Authority.

The Company shall have the fullest liberty without affecting in any way the liability of the Guarantor under this Guarantee, from time to time to vary any of the terms and conditions of the Contract or extend time of performance by the Contractor/Supplier or to postpone for any time and from time to time any of the powers exercisable by it against the Contractor/Supplier and either to enforce or forbear from enforcing any of the terms and conditions governing the contract or securities available to the company and the Guarantor shall not be released from its liability under these presents by any exercise by the Company of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor/Supplier or any other forbearance, act or omission on the part of the Company or any indulgency by the Company to the Contractor/ Supplier or of any other matter or thing whatsoever which under the law relating to, sureties, would, but for this provision, have the effect of so releasing the Guarantor from its liability under this Guarantee.

The guarantor further agrees that the Guarantee herein contained shall remain In full force arid effect during the period that would be taken for the performance of the Contract and its claims satisfied or discharged and till the company certified that the terms and conditions of the Contract have been fully and properly carried out by the Contractor/Supplier and accordingly discharges this Guarantee, subject, however, that the Company shall have no claim under this Guarantee after _____ Years from the date of completion of the contract as the case may be, unless a notice of the claim under this Guarantee has been served on the Guarantor before the expiry of the said period in which case the same shall be enforceable against the Guarantor notwithstanding the fact that the same is enforced after the expiry of the said period.

The Guarantor undertakes not to revoke this Guarantee during the period it is in force except with the previous consent of the Company in writing, and agree that any liquidation or winding up or insolvency or dissolution or any change in the constitution of the Contractor/Supplier or the Guarantor shall not discharge the Guarantor's liability hereunder.

It shall not be necessary for the Company to proceed against the Contractor / Supplier before proceeding against the Guarantor and the Guarantee herein contained shall be enforceable against them notwithstanding any security which the Company may have obtained or obtain from the Contractor/supplier shall at the time when proceedings are taken against the Guarantor hereunder be outstanding Or unrealized.

The Guarantor hereby declares that it has power to execute this Guarantee under its Memorandum and Articles of Association and the executant has full powers to do so on its behalf under the power at Attorney _____ granted to him by the proper authorities of the Guarantor.



ANNEXURE – III
GURANTEE TOWARDS SECURITY
DEPOSIT

Page

3 of 3

Spec 105

IN WITNESS, whereof the _____ (Bank) and M/s. Bharat Heavy Electricals Limited have hereunto set and subscribed their respective hands the day, month and year first above written.

SIGNED FOR AND ON BEHALF OF THE BANK

WITNESSES

1.

2.

Signed For And On Behalf Of
BHARAT HEAVY ELECTRICALS LIMITED

WITNESSES

1.

2.

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ANNEXURE – IV
PERFORMANCE BANK GURANTEE

Page 1 of 3

Spec No 105

(TO BE STAMPED IN ACCORDANCE WITH STAMP ACT)

This Deed of Guarantee made this _____ day of _____ one thousand nine hundred and Eighty _____ between _____ (Bank) hereinafter called "the Guarantor" (which expression shall unless repugnant to the context or meaning thereof be deemed to include its successors and assigns) of the ONE PART and M/s. BHARAT HEAVY ELECTRICALS LIMITED (a Government of India Undertaking) a company incorporated under the companies Act, 1956, having its registered office at BHEL house, siri fort New Delhi. 110049 through its Unit/Division at Ramachandrapuram HYDERAESAD-500032 (AP.) hereinafter called the Company (which expression shall unless repugnant to the context or meaning thereof be deemed to include its successors and assigns) of the OTHER PART.

WHEREAS M/s. _____ (Hereinafter referred to as the contractor/Supplier) have entered into a contract bearing No. _____ Dated _____ (hereinafter referred to as the contract) for the erection and commissioning of _____ with in the company.

AND WHEREAS the contract interalia provides that the contractor Supplier shall furnish to the Company a sum of Rs. _____ (Rupees) _____) towards Security deposit for due and faithful performance of the contract in the form and manner specified therein.

AND WHEREAS the contractor/Supplier has approached the Guarantor and in consideration of the arrangement arrived at between the contractor/ Supplier and the Guarantor the Guarantor has agreed to give the guarantee as hereinafter mentioned in favour of the company.

NOW THIS DEED WITNESSES AS FOLLOWS:

The Guarantor do hereby guarantee to the company the due and faithful performance, observances or discharge or the contract by the contractor/ Supplier and further unconditionally and irrevocably undertake to pay to the company without demur and merely on a demand to the extent of Rs _____ (Rupees _____) and claim made by the company on them for any loss. damage, costs, charges and expenses caused to or suffered by the company by reason of the contractor / Supplier making any default in the performance observance or discharge of the terms, conditions, stipulations, undertakings or anyone or them as contained in the contract.



ANNEXURE – IV PERFORMANCE BANK GUARANTEE

Page 2 of 3

Spec No 105

The decision of the Company whether any default has occurred or has been committed by the Contractor/Supplier in the performance, conditions, stipulations or undertakings or any of the terms, conditions, stipulations, or undertakings or any of them contained in the contract any/or as to the extent of loss, damage, costs, charges and expenses caused to or suffered by the Company by reason of the Contractor/Supplier making any default in the performance observance or discharge of any of the terms, conditions, stipulations, or undertakings or any one of them shall be conclusive and binding on the Guarantor irrespective of the fact whether the Contractor/Supplier admits or denies the default or questions the correctness of any demand made by the Company in Any Court, Tribunal or Arbitration proceedings or before any other Authority.

The Company shall have the fullest liberty without affecting any way the liability of the Guarantor under this Guarantee, from time to time to vary any of the terms and conditions of the Contract or extend time of performance by the contractor/supplier or to postpone for any time and from time to time any of the powers exercisable by it against the contractor/Supplier and either to enforce or forbear from enforcing any of the terms and conditions governing the contract or securities available to the company and the Guarantor shall not be released from its liability under these presents by any exercise by the company of the liberty with reference to the matters aforesaid or by reason of time being given to the contractor/Supplier or any other forbearance, act or omission on the part of the company or any indulgency by the Company to the Contractor/Supplier of any other matter or thing whatsoever which under the law relating to sureties, would but for this provision, have the effect of so releasing the Guarantor from its liability under this Guarantee.

The guarantor further agrees that the Guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the contract and its claims satisfied or discharged and till the company certified that the terms and conditions of the contract have been of the Contract have been fully and properly carried out by the Contractor / Supplier and accordingly discharge this guarantee, subject, however that the company shall have no claim under this Guarantee after _____Years from the date of the completion of the contract as the case may be, unless a notice of the claim under this Guarantee has been served on the Guarantor before the expiry of the said period in which case the same shall be enforceable against the Guarantor notwithstanding the fact that the same is enforced after the expiry of the said period.

The Guarantor undertakes not to revoke this Guarantee during the period it is in for expect wit the pervious consent of the company in writing and agree that any liquidation or winding up or insolvency or dissolution or any change in the constitution of the Contractor/Supplier or the Guarantor shall not discharge the Guarantor's liability hereunder.



ANNEXURE – IV
PERFORMANCE BANK GURANTEE

Page 3 of 3

Spec No 105

It shall not be necessary for the Company to proceed against the Contractor/Supplier before proceeding against the Guarantor and the Guarantee herein contained shall be enforceable against them notwithstanding any security which the Company may have obtained or obtain from the Contractor/supplier shall at the time when proceedings are taken against the Guarantor hereunder be outstanding or unrealized.

The Guarantor hereby declares that it has power to execute this Guarantee under its Memorandum and Articles of Association and the executant has full powers to do so on its behalf under the power at Attorney dated _____ granted to him by the proper authorities of the Guarantor.

IN WITNESS, whereof the _____ (Bank) and M/s. Bharat Heavy Electricals Limited have hereunto set and subscribed their respective hands the day, month and year first above written.

WITNESSES

- 1.
- 2.

SIGNED FOR AND ON BEHALF OF THE BANK

- 1.
- 2.

SIGNED FOR AND ON BEHALF OF
BHARAT HEAVY ELECTRICALS LIMITED