

TENDER SPECIFICATION

BHEL: PSSR: SCT: 1435

FOR

Handling at site stores / storage yard, transporting to site, inspection, pre-assembly, erection, alignment, welding, NDT, fixing of hangers & supports, chemical cleaning / pickling, oil flushing, water flushing, hydro testing & steam blowing, surface finish, supply & application of primer & finish paints including labeling & flow direction on the piping over insulation & hangers and supports, pre-commissioning, commissioning, trial operation & handing over to customer of **LP piping** and its associated items / systems , hangers and supports, valves, miscellaneous equipments and other equipments supplied under SG & Aux., TG & Aux. and Common packages for **Unit – 1&2**

at

North Chennai TPS 2x600 MW, STAGE – II ,
M/s TNEB, Athipattu, NCTPS, Chennai.
Tamilnadu state

VOLUME –I BOOK - I

TECHNOCOMMERCIAL BID (Book I & II)

Book-I consists of

- **Notice Inviting Tender,**
- **Volume-IA : Technical Conditions of Contract**

Book-II consists of

- **Volume-IB : Special conditions of Contract,**
- **Volume-IC : General conditions of Contract**
- **Volume-ID : Forms & Procedures**



BHARAT HEAVY ELECTRICALS LIMITED

(A Government of India Undertaking)

Power Sector – Southern Region

690, Anna Salai, Nandanam, Chennai – 600 035.

BHARAT HEAVY ELECTRICALS LIMITED
(A Government of India Undertaking)
Power Sector, Southern Region
690, Anna Salai, Nandanam, Chennai – 35

Tender Specification No. BHEL: PSSR: SCT: 1435

for

Handling at site stores / storage yard, transporting to site, inspection, pre-assembly, erection, alignment, welding, NDT, fixing of hangers & supports, chemical cleaning / pickling, oil flushing, water flushing, hydro testing & steam blowing, surface finish, supply & application of primer & finish paints including labeling & flow direction on the piping over insulation & hangers and supports, pre-commissioning, commissioning, trial operation & handing over to customer of **LP piping** and its associated items / systems , hangers and supports, valves, miscellaneous equipments and other equipments supplied under SG & Aux., TG & Aux. and Common packages for **Unit – 1&2 of North Chennai TPS 2x600 MW, STAGE – II**, M/s TNEB, Athipattu, NCTPS, Chennai.

One set of Tender documents consisting of

- 1) TECHNOCOMMERCIAL BID - 2 copies
- 2) PRICE BID - 2 copies

Book Sl no

Issued to
M/s

Refer NIT for Last date of submission

Please note this tender document is not transferable

For and on behalf of
BHARAT HEAVY ELECTRICALS LIMITED

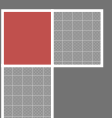
ADDL GENERAL MANAGER / CONTRACTS

Place: Chennai -35
Date:

Rev 00
6th July
2010

NOTICE INVITING TENDER

Bharat Heavy Electricals Limited



NOTICE INVITING TENDER (NIT)

NOTE: BIDDER MAY DOWNLOAD FROM WEB SITES OR PURCHASE TENDERS FROM THIS OFFICE ALSO

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To

Dear Sir / Madam

Sub : NOTICE INVITING TENDER

Sealed offers in two part bid system are invited from reputed & experienced bidders (meeting [PRE QUALIFICATION CRITERIA](#) as mentioned in Annexure-I) for the subject job by the undersigned on the behalf of BHARAT HEAVY ELECTRICALS LIMITED as per the tender document. Following points relevant to the tender may please be noted and complied with.

1.0 Salient Features of NIT

| Sl. No | ISSUE | DESCRIPTION |
|--------|-----------------------------------|---|
| i | Tender Number | BHEL PSSR SCT 1435 |
| ii | Broad Scope of job | Handling at site stores / storage yard, transporting to site, inspection, pre-assembly, erection, alignment, welding, NDT, fixing of hangers & supports, chemical cleaning / pickling, oil flushing, water flushing, hydro testing & steam blowing, surface finish, supply & application of primer & finish paints including labeling & flow direction on the piping over insulation & hangers and supports, pre-commissioning, commissioning, trial operation & handing over to customer of LP piping and its associated items / systems , hangers and supports, valves, miscellaneous equipments and other equipments supplied under SG & Aux., TG & Aux. and Common packages for Unit – 1&2 of North Chennai TPS 2x600 MW, STAGE – II , M/s TNEB, Athipattu, NCTPS, Chennai. |
| iii | DETAILS OF TENDER DOCUMENT | |
| a | Volume-IA | <u>Technical</u> Conditions of Contract (TCC) consisting of Scope of work, Technical Specification, Drawings, Procedures, Bill of Quantities, Terms of payment, etc |
| b | Volume-IB | Special Conditions of Contract (SCC) |
| c | Volume-IC | General Conditions of Contract (GCC) |
| | | Applicable |
| | | Applicable |
| | | Applicable |

| | | | |
|------|---|---|-----------------------|
| d | Volume-ID | Forms and Procedures | Applicable |
| e | Volume-II | Price Schedule (Absolute value). | Applicable |
| iv | Issue of Tender Documents | <p>1. <u>Sale from BHEL PSSR Regional office at :Chennai</u> Start : 13-12-2010 Closes: 03-01-2011 , Time :15.00 Hrs</p> <p>2. From BHEL website (www.bhel.com) Tender documents can however be downloaded from website till due date of submission</p> | Applicable |
| v | DUE DATE & TIME OF OFFER SUBMISSION | <p>Date : 04 /01/ 2011 , Time :15.00Hrs Place : <u>BHEL PSSR :Chennai</u> Tenders can be submitted through representative / in person at SCT Dept, BHEL PSSR, Chennai.</p> | Applicable |
| vi | OPENING OF TENDER | <p>Date : 04 /01/ 2011 , Time :15.30Hrs Notes: (1) In case the due date of opening of tender becomes a non-working day, tenders shall be opened on next working day at the same time. (2) Bidder may depute representative to witness the opening of tender</p> | Applicable |
| vii | EMD amount | Rs 2,00,000/- (Rupees Two Lakhs Only) | Applicable |
| viii | COST OF TENDER | Rs 2000/-. | Applicable |
| ix | LAST DATE FOR SEEKING CLARIFICATION | At least 7 days before the due date of offer submission or two days before the scheduled date of pre-bid meeting whichever is earlier along with soft version also, addressing to undersigned & to others as per contact address given below | Applicable |
| x | Schedule of Pre Bid Discussion (PBD) | Date: 22/12/2010. time 10.00AM at BHEL:PSSR:Chennai-35 | Applicable. |
| xi | INTEGRITY PACT & DETAILS OF INDEPENDENT EXTERNAL MONITOR (IEM) | Bidders shall enter into an Integrity Pact (IP) with BHEL as per format given at Volume 1D Formats of this tender. The bidders are required to return this Integrity Pact (IP) along with Techno Commercial Bid duly signed and stamped by the authorized signatory who signs the bid. It may be noted that only those bidders who have entered into such an IP with BHEL would be competent to participate against this tender .i.e. entering into this pact is a preliminary qualifications for the bidders. The Independent External Monitor against this NIT shall be Shri ... | Not Applicable |

| | | | |
|-----|-----------------------|---|--|
| xii | Latest updates | Latest updates on the important dates, Amendments, Correspondences, Corrigenda, Clarifications, Changes, Errata, Modifications, Revisions, etc to Tender Specifications will be hosted in BHEL webpage (www.bhel.com → Tender Notifications →View Corrigendums) and not in the newspapers. Bidders to keep themselves updated with all such information | |
|-----|-----------------------|---|--|

- 2.0 The offer shall be submitted as per the instructions of tender document and as detailed in this NIT. Bidders to note specifically that all pages of tender document, including these NIT pages of this particular tender together with subsequent correspondences shall be submitted by them, duly signed & stamped on each page, as part of offer. **Rates / Price including discounts/rebates, if any, mentioned anywhere / in any form in the techno-commercial offer other than the Price Bid, shall not be entertained.**
- 3.0 Unless specifically stated otherwise, bidder shall remit cost of tender and courier charges if applicable, in the form of Demand Draft drawn in favour of Bharat Heavy Electricals Ltd, payable at Power Sector Regional HQ at Chennai issuing the Tender, along with techno-commercial offer. Bidder may also choose to deposit the Tender document cost by cash at the Cash Office as stated above against sl no iv of 1, on any working day; and in such case copy of Cash receipt is to be enclosed with the Techno Commercial offer. Sale of tender Documents shall not take place on National Holidays, holidays declared by Central or State Governments and BHEL PS HQ at Chennai, Sundays and second/ last Saturdays
- 4.0 Unless specifically stated otherwise, bidder shall deposit EMD through Demand Draft/Pay Order in favour of Bharat Heavy Electricals Ltd, payable at Chennai. For other details and for 'One Time EMD' please refer General Conditions of Contract.
- 5.0 **Procedure for Submission of Tenders:** The Tenderers must submit their Tenders to Officer inviting Tender, as detailed below:
- PART-I consisting of 'PART-I A (Techno Commercial Bid)' & 'PART-I B (EMD/COST of TENDER)' in two separate sealed and superscribed envelopes (ENVELOPE-I & ENVELOPE-II)
 - PART-II (Price Bid) – in sealed and superscribed envelope (ENVELOPE-III)
 - One set of each document shall be retained by the bidder for their reference.
- 6.0 The contents for ENVELOPES and the superscription for each sealed cover / Envelope are as given below. **(All pages to be signed and stamped)**

| Sl no | Description | Remarks |
|-------|---|---------------|
| | Part-I A | |
| | <p><u>ENVELOPE – I superscribed as :</u> PART-I (TECHNO COMMERCIAL BID) TENDER NO : NAME OF WORK : PROJECT: DUE DATE OF SUBMISSION:</p> <p>CONTAINING THE FOLLOWING:-</p> | |
| i. | Covering letter/Offer forwarding letter of Tenderer. | |
| ii. | <p>Duly filled-in 'No Deviation Certificate' as per prescribed format to be placed after document under sl no (i) above.</p> <p>Note:</p> <p>a. In case of any deviation, the same should be submitted separately for technical & commercial parts, indicating respective clauses of tender against which deviation is taken by bidder. The list of such deviation shall be placed after document under sl no (i) above. It shall be specifically noted that deviation recorded elsewhere shall not be entertained.</p> <p>b. BHEL reserves the right to accept/reject the deviations without assigning any reasons, and BHEL decision is final and binding.</p> <p>i). In case of acceptance of the deviations, appropriate loading shall be done by BHEL</p> <p>ii). In case of unacceptable deviations, BHEL reserves the right to reject the tender.</p> | |
| iii. | <p>Supporting documents/ annexure/ schedules/ drawing etc as required in line with Pre-Qualification criteria.</p> <p>It shall be specifically noted that all documents as per above shall be indexed properly and credential certificates issued by clients shall distinctly bear the name of organization, contact phone no, FAX no, etc.</p> | |
| iv. | All Amendments / Correspondences / Corrigenda / Clarifications / Changes / Errata etc., pertinent to this NIT. | |
| v. | Integrity Pact Agreement (Duly signed by the authorized signatory) | If applicable |
| vi. | Duly filled-in annexures, formats etc as required under this Tender Specification/NIT | |
| vii. | Notice inviting Tender (NIT) | |
| viii. | Volume – I A : <u>Technical</u> Conditions of Contract (TCC) consisting of Scope of work, Technical Specification, Drawings, Procedures, Bill of Quantities, Terms of payment, etc | |
| ix. | Volume – I B : Special Conditions of Contract (SCC) | |

| | | |
|-------|--|--|
| x. | Volume – I C : General Conditions of Contract (GCC) | |
| xi. | Volume – I D : Forms & Procedures | |
| xii. | Volume – II (UNPRICED – without disclosing rates/price, but mentioning only 'QUOTED' or 'UNQUOTED' against each item | |
| xiii. | Any other details preferred by bidder with proper indexing. | |

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|---|---|--|
| | PART-I B | |
| | <p><u>ENVELOPE – II superscribed as:</u> PART-I (EMD/COST of TENDER) TENDER NO : NAME OF WORK : PROJECT: DUE DATE OF SUBMISSION:</p> <p>CONTAINING THE FOLLOWING:-</p> | |
| i | <p>1. Earnest Money Deposit (EMD) in the form as indicated in this Tender <u>OR</u> Documentary evidence for 'One Time EMD' with BHEL PSSR Chennai</p> <p>2. Cost of Tender (Demand Draft or copy of Cash Receipt as the case may be)</p> | |

| | | |
|----|---|--|
| | PART-II | |
| | PRICE BID consisting of the following shall be enclosed | |
| | <p><u>ENVELOPE-III</u> superscribed as: PART-II (PRICE BID) TENDER NO : NAME OF WORK : PROJECT: DUE DATE OF SUBMISSION:</p> <p>CONTAINING THE FOLLOWING</p> | |
| i | Covering letter/Offer forwarding letter of Tenderer enclosed in Part-I | |
| ii | Volume II – PRICE BID (Duly Filled in Schedule of Rates – rate/price to be entered in words as well as figures) | |

| | | |
|--|---|--|
| | OUTER COVER | |
| | <p><u>ENVELOPE-IV</u> (MAIN ENVELOPE / OUTER ENVELOPE) superscribed as: TECHNO-COMMERCIAL BID, PRICE BID & EMD TENDER NO:</p> | |

| | | |
|---|--|--|
| | NAME OF WORK: PROJECT: DUE DATE OF SUBMISSION: CONTAINING THE FOLLOWING: | |
| i | <ul style="list-style-type: none"> ○ Envelopes I ○ Envelopes II ○ Envelopes III | |

SPECIAL NOTE: All documents/ annexures submitted with the offer shall be properly annexed and placed in respective places of the offer as per enclosure list mentioned in the covering letter. BHEL shall not be responsible for any missing documents.

7.0 No Deviation with respect to tender clauses and no additional clauses/ suggestions/ in Techno-commercial bid/ Price bid shall normally be considered by BHEL. Bidders are requested to positively comply with the same.

8.0 BHEL reserves the right to accept or reject any or all Offers without assigning any reasons thereof. BHEL also reserves the right to cancel the Tender wholly or partly without assigning any reason thereof. Also BHEL shall not entertain any correspondence from bidders in this matter (except for the refund of EMD).

9.0 **Assessment of Capacity of Bidders: (Shall be applicable for all Bid Evaluation from 1st Jan 2011). Bidders capacity for executing the job under tender shall be assessed as per the following:**

i. **Assigning Weightages (A) for Similar Jobs Under-Execution:** Weightages shall be worked out and assigned based on the average number of Similar Works under execution including works yet to be commenced by the agency, in the following manner:

i). Number of Similar Jobs

- a) No. of jobs in BHEL, PSER : Say 'J'
- b) No. of jobs in BHEL, PSSR : Say 'K'
- c) No. of jobs in BHEL, PSWR : Say 'L'
- d) No. of jobs in BHEL, PSNR : Say 'M'
- e) No. of jobs with other customers* : Say 'N' (* Other than BHEL
PSER, PSSR, PSWR & PSNR)
- f) Average No. of Jobs is 'P' = (J+K+L+M+N) divided by 5

ii) Weightage "A" assigned to bidders based on Average Number of jobs "P":

- a) If 'P' = 0-1, "A" will be equal to '3'
- b) If 'P' = 2-3, "A" will be equal to '2'
- c) If 'P' = 4-5, "A" will be equal to '1'
- d) If 'P' is Above 5, "A" will be equal to '0'

II. **Weightage “B” for Quarterly Performance Reports of Vendors:** This shall be based on the averages of the net weighted score obtained by the bidder for the jobs under execution (excluding works not commenced) for the quarter previous to the last quarter reckoned from the date of latest due date of submission, in all four Regions i.e BHEL PSER, PSSR, PSWR & PSNR, in the following manner.

i). **Ratings by Power Sector Region:**

a) PS ER's Rating 'Rer' = $(X_1 + X_2 + \dots + X_n)$

b) PS WR's Rating 'Rwr' = $(X_1 + X_2 + \dots + X_n)$

c) PS SR's Rating 'Rsr' = $(X_1 + X_2 + \dots + X_n)$

d) PS NR's Rating 'Rnr' = $(X_1 + X_2 + \dots + X_n)$

e) **Over all Power Sector Region Rating 'R_{BHEL}' = (Rer+ Rwr+ Rsr+ Rnr) divided by (Ner+ Nwr+ Nsr+ Nnr)**

(where “X₁, X₂, X₃,...X_n” is the net weighted score obtained by the bidder as per the “Evaluation of Contractor Performance (Quarterly)” against the various contracts ‘N’ under execution in the respective Region).

ii) **Weightage “B” assigned to bidders based on Overall Power Sector Rating (R_{BHEL}):**

a) If R_{BHEL} is 80% and above, “B” will be equal to ‘6’

b) If R_{BHEL} is > 70% < 80%, “B” will be equal to ‘5’

c) If R_{BHEL} is > 60% < 70%, “B” will be equal to ‘4’

d) If R_{BHEL} is = < 60%, “B” will be equal to ‘0’

III. **Evaluation of Bidders capacity to execute the job under tender:**

shall be based on the sum of scores obtained in ‘A’ and ‘B’, as below:

a) **6 or above : Considered ‘Qualified’ for the job under tender**

b) **Less than 6: Considered ‘NOT Qualified’ for the job under tender**

IV. **Explanatory note:**

a) Similar work means Boiler or Turbine or Civil or Electrical or CI, etc as detailed in the scope irrespective of rating of Plant

b) Quarter shall be as per the quarter defined in the “Evaluation of Contractor performance (Quarterly)”. For contracts where annexed Quarterly Evaluation performance was not part of the contract, ‘Quarterly Performance Reports’ previous to the last quarter reckoned from the date of latest due date of submission, given by the respective project site against the contract will be the basis for evaluation.

- c) Vendors who are not executing any jobs presently in the Region and first timers to the Region, may be considered subject to satisfying all other tender conditions
- d) 'Under execution' shall mean works in progress upto Boiler Steam Blowing (for Boiler and Auxilliarities) or Synchronisation (for all other jobs including Civil) shall be considered.

- 10.0 Since the job shall be executed at site, bidders must visit site/ work area and study the job content, facilities available, availability of materials, prevailing site conditions including law & order situation etc before quoting for this tender. They may also consult this office before submitting their offers, for any clarifications regarding scope of work, facilities available at sites or on terms and conditions. No additional claim shall be entertained by BHEL in future, on account of non-acquaintance of above.
- 11.0 For any clarification on the tender document, the bidder may seek the same in writing or through e-mail, as per specified format, within the scheduled date for seeking clarification, from the office of the undersigned. BHEL shall not be responsible for receipt of queries after due date of seeking clarification due to postal delay or any other delays. Any clarification / query received after last date for seeking clarification may not be normally entertained by BHEL and no time extension will be given.
- 12.0 BHEL may decide holding pre-bid discussion [PBD] with all intending bidders as per date indicated in the NIT. The bidder shall ensure participation for the same at the appointed time, date and place as may be decided by BHEL. Bidders shall plan their visit accordingly. The outcome of pre-bid discussion (PBD) shall also form part of tender.
- 13.0 In the event of any conflict between requirement of any clause of this specification/ documents/ drawings/data sheets etc or requirements of different codes/standards specified, the same to be brought to the knowledge of BHEL in writing for clarification before due date of seeking clarification (whichever is applicable), otherwise, interpretation by BHEL shall prevail. Any typing error/missing pages/ other clerical errors in the tender documents, noticed must be pointed out before pre-bid meeting/submission of offer, else BHEL's interpretation shall prevail.
- 14.0 Unless specifically mentioned otherwise, bidder's quoted price shall deemed to be in compliance with tender including PBD.
- 15.0 Bidders shall submit Integrity Pact Agreement (Duly signed by authorized signatory who signs in the offer), **if applicable**, along with techno-commercial bid. This pact shall be considered as a preliminary qualification for further participation. **The names and other details of Independent External Monitor (IEM) for the subject tender is as given at point (xi) of 1 above.**

- 16.0 The Bidder has to satisfy the Pre Qualifying Requirements stipulated for this Tender in order to be qualified. The Price Bids of only those bidders will be opened who will be qualified for the subject job on the basis of pre-qualification evaluation/ techno-commercial bids, approval/ acceptance of customer (as applicable), etc. and date of opening of price bids shall be intimated to only such bidders.
- 17.0 In case BHEL decides on a 'Public Opening', the date & time of opening of the sealed PRICE BID shall be intimated to the qualified bidders and in such a case, bidder may depute one authorised representative to witness the price bid opening. BHEL reserves the right to open 'in-camera' the 'PRICE BID' of any or all Unsuccessful/Disqualified bidders under intimation to the respective bidders.
- 18.0 Validity of the offer shall be for **six months** from the latest due date of offer submission (including extension, if any) or specified otherwise in SCC of tender.
- 19.0 BHEL reserves the right to decide the successful bidder on the basis of Reverse Auction process. In such case all qualified bidders will be intimated regarding procedure/ modality for Reverse Auction process prior to Reverse Auction and price will be decided as per the rules for Reverse Auction. .
- However, if reverse auction process is unsuccessful as defined in the RA rules/procedures, or for whatsoever reason, then the sealed 'PRICE BIDS' will be opened for deciding the successful bidder. BHEL's decision in this regard will be final and binding on bidder.
- 20.0 On submission of offer, further consideration will be subject to compliance to tender & qualifying requirement and customer's acceptance, as applicable.
- 21.0 In case the bidder is an "Indian Agent of Foreign Principals", 'Agency agreement has to be submitted along with Bid, detailing the role of the agent along with the terms of payment for agency commission in INR, along with supporting documents.
- 22.0 The bidders shall not enter into any undisclosed M.O.U. or any understanding amongst themselves with respect to tender.
- 23.0 In case Consortium Bidding is allowed as per Pre Qualifying Requirement, then Prime Bidder and Consortium Partner shall enter into Consortium Agreement. Validity period of Consortium Agreement shall be 6 months after which the same can be re validated.

'Stand alone' bidder cannot become a **prime bidder** or a **consortium bidder** in **a consortium bidding**. Prime bidder shall neither be a consortium partner to other prime bidder nor take any other consortium partners. However, consortium partner may enter into consortium agreement with other prime bidders. In case of non compliance, consortium bids of such Prime bidders will be rejected.

24.0 The bidder shall submit documents in support of possession of ‘Qualifying Requirements’ duly self certified and stamped by the authorized signatory, indexed and properly linked in the format for PQR. In case BHEL requires any other documents/proofs, these shall be submitted immediately.

25.0 The bidder may have to produce original document for verification if so decided by BHEL.

26.0 **Order of Precedence**

In the event of any ambiguity or conflict between the Tender Documents, the order of precedence shall be in the order below:

- a. Amendments/Clarifications/Corrigenda/Errata etc issued in respect of the tender documents by BHEL
- b. Notice Inviting Tender (NIT)
- c. Price Bid
- d. Technical Conditions of Contract (TCC)—Volume-1A
- e. Special Conditions of Contract (SCC) —Volume-1B
- f. General Conditions of Contract (GCC) —Volume-1C
- g. Forms and Procedures —Volume-1D

For BHARAT HEAVY ELECTRICALS LTD

AGM /SCT

Enclosure

01. Annexure-1: Pre Qualifying criteria.
02. Annexure-2: Check List.
- 03 Other Tender documents as per this NIT.

PRE QUALIFYING CRITERIA

| | |
|-----------|---|
| JOB | Handling at site stores / storage yard, transporting to site, inspection, pre-assembly, erection, alignment, welding, NDT, fixing of hangers & supports, chemical cleaning / pickling, oil flushing, water flushing, hydro testing & steam blowing, surface finish, supply & application of primer & finish paints including labeling & flow direction on the piping over insulation & hangers and supports, pre-commissioning, commissioning, trial operation & handing over to customer of LP piping and its associated items / systems , hangers and supports, valves, miscellaneous equipments and other equipments supplied under SG & Aux., TG & Aux. and Common packages for Unit – 1&2 of North Chennai TPS 2x600 MW, STAGE – II , M/s TNEB, Athipattu, NCTPS, Chennai. |
| TENDER NO | BHEL PSSR SCT 1435 |

| Sl. No | PRE QUALIFICATION CRITERIA | Bidders claim in respect of fulfilling the PQR Criteria | |
|--------|---|--|--------------------------------|
| | | Name and Description of qualifying criteria | Page no of supporting document |
| A | Submission of Integrity Pact duly signed (if applicable) | Not applicable | |
| B | Assessment of Capacity of Bidder to execute the work as per sl no 9 of NIT (if applicable) | <u>Shall be applicable for Bid Evaluation from 1st Jan 2011</u> | |
| C | <p><u>Technical</u></p> <p>The bidder should have executed minimum one Unit capacity of 210MW or above capacity Piping, in the last seven years. The term “Executed” means the unit should have been synchronized.</p> <p style="text-align: center;">Or</p> <p>The bidder should have executed minimum one Unit capacity of 210MW or above capacity Boiler, in the last seven years. The term “Executed” means boiler safety valve floating.</p> | | |

| | | | |
|--|---|-----------------------|--|
| D 1 | Financial TURNOVER Bidders must have achieved an average annual financial turnover (audited) of Rs 150 lakhs or more over last three financial years i.e., 2007-08, 2008-09 & 2009-10 | | |
| 2 | NETWORTH Net worth of the bidder based on the latest audited accounts as furnished for 'D1' above should be positive. | | |
| 3 | PROFIT Bidders must have earned profit in any one of the three financial years in the last three years defined in 'D1' above | | |
| E | Approval of Customer (if applicable) Note: Names of bidders who stand qualified after compliance of criteria A to D shall be forwarded to customer for their approval. Price bid of only those bidders shall be opened who are approved by customer. | Applicable | |
| F | Consortium criteria (if applicable) | Not applicable | |
| G | Notwithstanding the above, BHEL reserves the right to reject any or all the Tenders for reasons whatsoever beyond its control and the decision of BHEL is final. | Applicable | |
| Explanatory Notes for QR 'A' 1.The word 'executed' means the bidder should have achieved the criteria specified in the QR even if the total contract has not been completed or closed 2.Bidder to submit Audited Balance Sheet and Profit and Loss Account for the respective years as given above along with all annexures (a) The word 'executing' means ----- | | | |

BIDDER SHALL SUBMIT ABOVE PRE-QUALIFICATION CRITERIA FORMAT, DULY FILLED-IN, SPECIFYING RESPECTIVE ANNEXURE NUMBER AGAINST EACH CRITERIA AND FURNISH RELEVANT DOCUMENT (copies of Work order / LOI / LOA and work completion certificate) IN THE RESPECTIVE ANNEXURES IN THEIR OFFER.

ANNEXURE - 2

CHECK LIST

NOTE: - Tenderers are required to fill in the following details and no column should be left blank

| | | | |
|----|--|--|-----------------|
| 1 | Name and Address of the Tenderer | | |
| 2 | Details about type of the Firm / Company | | |
| 3 | Details of Contact person for this Tender | Name : Mr/Ms Designation: Telephone No: Mobile No: Fax No: | |
| 4 | EMD DETAILS | DD No: Date : Bank : Amount: <u>Please tick (√) whichever applicable:-</u> ONE TIME EMD / ONLY FOR THIS TENDER | |
| 5 | Validity of offer | To be valid for six months from due date | |
| | | APPLICABILITY | BIDDER REPLY |
| 6 | Whether the format for compliance with PRE QUALIFICATION CRITERIA (ANNEXURE-I) is understood and filled with proper supporting documents referenced in the specified format | Applicable / Not applicable | YES / NO |
| 7 | Audited profit and Loss Account for the last three years submitted | Applicable / Not applicable | YES/NO |
| 8 | Copy of PAN Card submitted | Applicable / Not applicable | YES/NO |
| 9 | Whether all pages of the Tender documents including annexures, appendices etc are read understood and signed | Applicable / Not applicable | YES/NO |
| 10 | Integrity Pact | Applicable / Not applicable | YES/NO |
| 11 | Declaration by Authorised Signatory | Applicable / Not applicable | YES/NO |

| | | | |
|----|---|-----------------------------|--------|
| 12 | No Deviation Certificate | Applicable / Not applicable | YES/NO |
| 13 | Declaration confirming knowledge about Site Conditions | Applicable / Not applicable | YES/NO |
| 14 | Declaration for relation in BHEL | Applicable / Not applicable | YES/NO |
| 15 | Non Disclosure Certificate | Applicable / Not applicable | YES/NO |
| 16 | Bank Account Details for E-Payment | Applicable / Not applicable | YES/NO |
| 16 | Capacity Evaluation of Bidder for current Tender | Applicable / Not applicable | YES/NO |
| 17 | Tie Ups/Consortium Agreement are submitted as per format | Applicable / Not applicable | YES/NO |
| 18 | Power of Attorney for Submission of Tender/Signing Contract Agreement | Applicable / Not applicable | YES/NO |
| 19 | Analysis of Unit rates | Applicable / Not applicable | YES/NO |
| 20 | Unquoted price bid submitted or not | Applicable / Not applicable | YES/NO |

NOTE: STRIKE OFF 'YES' OR 'NO', AS APPLICABLE

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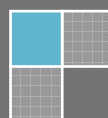
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Rev 00
6th July
2010

VOLUME – IA Part I & II TECHNICAL CONDITIONS OF CONTRACT (TCC)

(Document No PS:MSX:TCC)

BHARAT HEAVY ELECTRICALS LIMITED



TECHNICAL CONDITIONS OF CONTRACT (TCC)

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PART – I CHAPTER – I PROJECT INFORMATION

1. Project Name : North Chennai Thermal Power Station
2. Project Stage : Stage- II
3. No. of Units x Capacity : 2 X 600 MW
4. Project setting up by : Tamil Nadu Electricity Board (TNEB)
5. LOCATION AND APPROACH : (i) Athipattu Village
From Athipattu Railway Station about 6 Km.
From Chennai City about 20 Km.
From Chennai Airport 35 Km
(ii) District: Thiruvallur
(iii) State : Tamil Nadu
6. Nearest Railway Station : i) Athipattu Pudunagar on Chennai – Howrah route
8 KMs from site
ii) Athipattu 6 Km
7. Nearest Major Town & Distance : Chennai 20 Km.
8. Nearest Airport & Distance : Chennai 35 Km
9. Nearest Highway & Distance : All weather road from Pattamandri on
Chennai – Ponneri District Highway / 12 Kms.
10. Temperature: (Dry bulb) : Absolute Max. 45⁰ C(Highest mean monthly Max.35⁰ C)
: Absolute Min. 15⁰ C (Lowest mean monthly Min. 24⁰ C)
: Average 35⁰ C (Design)
11. Relative Humidity
Maximum : 100 %
Minimum : 36 %
Average : 75 % (Design)
12. Annual Rainfall : Max. 2540.8 mm / Average 1600 mm / Min 1175.7 mm.
13. Wind Load : Basic Wind Speed 50 mm/sec. (Max.) /
11.8 KMPH (Average)
14. Transport:
a) By Rail : Broad Gauge Railway line of Southern Railway
b) Road : District High way
15. Seismic Data : Zone – III as defined in IS: 1893 - 2002

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PART – I CHAPTER – II SCOPE OF WORKS

The scope of the work will comprise of but not limited to the following:

- 1.2.1 The scope of work includes Handling at site stores / storage yard, transporting to site, inspection, pre-assembly, erection, alignment, welding, NDT, fixing of hangers & supports, chemical cleaning / pickling, oil flushing, water flushing, hydro testing & steam blowing, surface finish, supply & application of primer & finish paints including labeling & flow direction on the piping over insulation & hangers and supports, pre-commissioning, commissioning, trial operation & handing over to customer of **LP piping** and its associated items / systems , hangers and supports, valves, miscellaneous equipments and other equipments supplied under SG & Aux., TG & Aux. and Common packages for **Unit – 1&2 of North Chennai TPS 2x600 MW, STAGE – II** , M/s TNEB, Athipattu, NCTPS, Chennai
- 1.2.1.1 Receipt of materials / component to be erected by the contractor, loading and transportation from the storage yard to the project site, stacking, storage and preservation.
- 1.2.1.2 Preassembly, Erection, Testing, Commissioning, Trial operation and reliability operation of equipment.
- 1.2.1.3 Final painting including supply of paints.
- 1.2.2 Broad Scope of system covered under scope of work – LP PIPING**
- 1.2.2.1 **The Broad scope covers the installation and commissioning of all**
- Piping and associated all types of fittings, Hanger & supports, expansion bellows, etc.,
 - Flow measuring devices/sensors like nozzles, orifice plates, etc.,
 - Air and moisture traps, air release valves
 - Safety relief valves, butter fly valves, Expansion joints
 - Valves –with Manual, electrical, pneumatic operated actuators
 - All Misc. Pumps – Horizontal, vertical and submersible with motors including HT Motors
 - Strainers, filters, coolers, Pre fabricated tanks
 - Hoists & cranes –either manual or motor operated
 - Chemical dosing system Skid and associated equipments
 - **RODM Plant Equipments & Piping erection and Chemical handling/loading**
- 1.2.2.2 **The area of work covers, but not limited to the following systems:**
- Boiler & auxiliaries system
 - TG & Auxiliaries system

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- Condensate system
- Drains & vents of all system including effluent discharge, waste water, etc.,
- **Raw water system (Buried piping including civil work and wrapping)**
- Pre Water treatment system
- DM water system
- Auxiliary cooling water system
- DM water cooling system
- Instrument air system
- Service water system
- Potable water system
- Miscellaneous piping systems

The material range from MS, GI, CS, SS, **PVC** etc., the connection are welded, flanged or threaded as per system and drawings.

The valves are operated -manual, electrical or Pneumatic or hydraulic. The valves may be supplied either mounted with or without actuator. If supplied separately, the actuator is to be assembled to the valve at site during erection.

The pumps are supplied along with motors. The motors are to be erected and aligned with the pumps and with gear box wherever supplied as loose.

Note:

FOR FURTHER DETAILED SCOPE OF WORKS REFER RELEVANT CHAPTERS IN THIS BOOK

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PART – I CHAPTER – III FACILITIES & CONSUMABLES IN THE SCOPE OF CONTRACTOR / BHEL (SCOPE MATRIX)

| Sl.No | Description | Scope to be taken care by | | Remarks |
|------------------|--|---------------------------|--------|---|
| | | BHEL | Bidder | |
| 1.3.1.1.0 | ESTABLISHMENT | | | |
| 1.3.1.1.1 | FOR CONSTRUCTION PURPOSE: | | | |
| A | Open space for office | Yes | | |
| B | Open space for storage | Yes | | |
| C | Construction of bidder's office, canteen and storage building including supply of materials and other services | | Yes | |
| D | Bidder's all office equipments, office / store / canteen consumables | | Yes | |
| E | Canteen facilities for the bidder's staff, supervisors and engineers etc | | Yes | |
| F | Fire fighting equipments like buckets, extinguishers etc | | Yes | |
| G | Fencing of storage area, office, canteen etc of the bidder | | Yes | |
| 1.3.1.1.2 | FOR LIVING PURPOSES OF THE BIDDER | | | |
| A | Open space | | Yes | |
| B | Living accommodation | | Yes | |
| 1.3.1.2.0 | ELECTRICITY | | | |
| 1.3.1.2.1 | Electricity For construction purposes (to be specified whether chargeable or free) | | | |
| 1.3.1.2.1.1 | Single point source | Yes | | Chargeable basis at the prevailing rate. Refer 1.3.4 |

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| SI.No | Description | Scope to be taken care by | | Remarks |
|------------------|--|---------------------------|--------|---------|
| | | BHEL | Bidder | |
| | PART I | | | |
| 1.3.1.2.1.2 | Further distribution for the work to be done which include supply of materials and execution | | Yes | |
| 1.3.1.2.2 | Electricity for the office, stores, canteen etc of the bidder which include: | | Yes | |
| 1.3.1.2.2.1 | Distribution from single point including supply of materials and service | | Yes | |
| 1.3.1.2.2.2 | Supply, installation and connection of material of energy meter including operation and maintenance | | Yes | |
| 1.3.1.2.2.3 | Duties and deposits including statutory clearances for the above | | Yes | |
| 1.3.1.2.2.4 | Living facilities for office use including charges | | Yes | |
| 1.3.1.2.2.5 | Demobilization of the facilities after completion of works | | Yes | |
| 1.3.1.2.3 | Electricity for living accommodation of the bidder's staff, engineers, supervisors etc on the above lines.(in case BHEL provides this facility, the scope should be given without ambiguity) | | Yes | |
| 1.3.1.3.0 | WATER SUPPLY | | | |
| 1.3.1.3.1 | For construction purposes: | | | |
| 1.3.1.3.1.1 | Making the water available at single point | | Yes | |
| 1.3.1.3.1.2 | Further distribution as per the requirement of work including supply of materials and execution | | Yes | |
| 1.3.1.3.2 | Water supply for bidder's office, stores, canteen etc | | | |
| 1.3.1.3.2.1 | Making the water available at single point | | Yes | |
| 1.3.1.3.2.2 | Further distribution as per the requirement of work including supply of materials and execution | | Yes | |

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| SI.No | Description | Scope to be taken care by | | Remarks |
|------------------|--|---------------------------|--------|---------|
| | | BHEL | Bidder | |
| | PART I | | | |
| 1.3.1.4.0 | LIGHTING | | | |
| 1.3.1.4.1 | For construction work (supply of all the necessary materials) At office storage area At the preassembly area At the construction site /area | | Yes | |
| 1.3.1.4.2 | For construction work (Execution of the lighting work / arrangements) At office storage area At the preassembly area At the construction site /area | | Yes | |
| 1.3.1.5.0 | COMMUNICATION FACILITIES for site operations of the bidder | - | | |
| 1.3.1.5.1 | Telephone, Fax, internet, intranet, email etc | | Yes | |
| 1.3.1.6.0 | COMPRESSED AIR SUPPLY | | | |
| 1.3.1.6.1 | Supply of Compressor and all other equipments required for compressor & compressed air system including pipes, valves, storage systems etc | - | YES | |
| 1.3.1.6.2 | Installation of above system and operation & maintenance of the same | - | YES | |
| 1.3.1.6.3 | Supply of the all the consumables for the above system during the contract period | | YES | |

| SI.No | Description | Scope to be taken care by | | Remarks |
|------------------|---|---------------------------|--------|---------|
| | | BHEL | Bidder | |
| | PART II | | | |
| | ERECTION FACILITIES | | | |
| 1.3.2.1.0 | Engineering works for construction | | | |
| 1.3.2.1.1 | Providing the erection drawings for all the equipments covered under this scope | Yes | | |

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| Sl.No | Description | Scope to be taken care by | | Remarks |
|------------|---|---------------------------|--------|--------------------------------------|
| | | BHEL | Bidder | |
| | PART II | | | |
| 1.3.2.1.2 | Drawings for construction methods | | Yes | In consultation with BHEL |
| 1.3.2.1.3 | As-built drawings – wherever deviations observed and executed and also based on the decisions taken at site- example – routing of small bore pipes | Yes | Yes | ” |
| 1.3.2.1.4 | Shipping lists etc for reference and planning the activities | Yes | Yes | ” |
| 1.3.2.1.5 | Preparation of site erection schedules and other input requirements | | Yes | ” |
| 1.3.2.1.6 | Review of performance and revision of site erection schedules in order to achieve the end dates and other commitments | | Yes | |
| 1.3.2.1.7 | Weekly erection schedules based on SI No 1.3.2.1.5 | | Yes | |
| 1.3.2.1.8 | Daily erection / work plan based on SI No 1.3. 2.1.7 | | Yes | For daily monitoring meeting at site |
| 1.3.2.1.9 | Periodic visit of the senior official of the bidder to site to review the progress so that works are completed as per schedule. It is suggested this review by the senior official of the bidder should be done once in every two months. | | Yes | |
| 1.3.2.1.10 | Preparation of preassembly bay | | Yes | |
| 1.3.2.1.11 | Laying of racks for gantry crane if provided by BHEL or brought by the contractor / bidder himself | | | Not applicable |

1.3.3 OPEN SPACE:

Open space for building of temporary office shed and contractor's stores shed(s) will be provided free of charges. Contractor has to make his own arrangements for labour colony.

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1.3.4 ELECTRICITY:

- 1.3.4.1 Construction power will be provided to the contractor on **chargeable basis** at the applicable rate of TNEB under LT tariff V from the nearest substation. For construction purpose electricity will be provided at one single point by BHEL. The required energy meter for measuring power consumption will be provided and installed by BHEL. The contractor shall make his own arrangement for further distribution with necessary isolator/LCB etc. The present LT tariff V rate of TNEB is
- a) Consumption charges at Rs.5.80 per unit
 - b) Fixed charges at Rs. 30 per month
 - c) Electricity Tax on total amount at the rate of 5%
- The TNEB tariff may vary from time to time. Any dispute regarding consumption, the BHEL engineer decision is final
- 1.3.4.2 The required energy meter for measuring power consumption will be provided and installed by BHEL.
- 1.3.4.3 Necessary “Capacitor Banks” to improve the Power factor as stipulated by customer shall be provided by the contractor at his cost as per customer requirement. Penalty if any levied by customer on this account will be recovered from contractor’s bills.
- 1.3.4.4 Any duty, deposit involved in getting the Electricity shall be borne by the bidder. As regards contractor’s office shed also all such expenditure shall be borne by the contractor.
- 1.3.4.5 Provision for distribution of electrical power from the given single central common point to the required places with proper distribution boards, approved cables and cable laying including supply of all materials like cables, switch boards, pipes etc., observing the safety rules laid down by electrical authority of the State / BHEL / their customer with appropriate statutory requirements shall be the responsibility of the tenderer / contractor.
- 1.3.4.6 BHEL is not responsible for any loss or damage to the contractor’s equipment as a result of variations in voltage / frequency or interruptions in power supply.
- 1.3.4.7 As there are bound to be interruptions in regular power supply, power cut/ load shedding in any construction sites, contractor shall make his own arrangement for alternative source of power supply through deployment of adequate number of DG sets at their cost during the power breakdown / failure to get urgent and important work to go on without interruptions. No separate payment shall be made for this contingency.

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1.3.5 **WATER:**

Water (Raw water) required for construction purposes including testing of Equipments will be provided on **chargeable basis** at applicable tariff of TNEB/Metro water from the nearest storage tank located inside the plant area. The required water meter for measuring the consumption will be provided by BHEL and the same shall be installed by the contractor. The required pumps & accessories, pipes for drawing water from the storage tank and further distribution will be arranged by the contractor at their cost.

The prevailing water charge is Rs 66.00 per 1000 litres which may vary from time to time as per TNEB/Metro water conditions. Any dispute regarding consumption, the BHEL engineer decision will be final. In case non availability of water, the contractor shall make his own arrangements for uninterrupted work. No separate payment shall be made for any contingency arrangement made by contractor, due to delay / failure for providing water supply Contractor has to make his own arrangements for his water requirement for Construction purpose and his labour colony at his cost.

1.3.6 **CONSUMABLES:**

The required chemicals for chemical cleaning for the equipments in the scope and Consumables as supplied by the manufacturing units for PVC welding of R.O system will be provided by BHEL on free of charges. All welding electrodes, Gases and other consumables shall be arranged by the contractor at his cost

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PART – I CHAPTER – IV T&PS and MMEs TO BE DEPLOYED BY CONTRACTOR

Relevant clauses in Volume 1A -Special Conditions of Contract (SCC) shall be referred.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

PART – I CHAPTER - V T&Ps AND MMEs TO BE DEPLOYED BY BHEL ON SHARING BASIS

List of T&Ps to be made available by BHEL to contractor free of hire charges on sharable basis.

| Sl. No | Description | Qty |
|--------|--|-------------|
| 1 | EOT Cranes at TG Hall 105/15 T | 1 No |
| 2 | Chemical Cleaning Pumps with Accessories | As Reqd. |
| 3 | High Pressure Hydro test pump | If Required |

Note:

1. EOT crane without operating personnel shall be made available in the T.G. Hall free of charge for erection purposes. The contractor has to arrange operator for EOT Crane. BHEL will arrange operator for other cranes in BHEL Scope (except EOT Crane). The Electric power consumption for the EOT Crane will be charged as mentioned in Cl. no. 1.3.4 of this document. As the above crane is deployed for T.G. & Aux. erection and also for various contractors the decision of BHEL engineers will be final with regard to allotment of crane.
2. Experienced Crane operator for EOT crane to be arranged by the bidder at their cost.
3. Providing manpower assistance required for free movement of Trailing cable of EOT Crane is included in the scope of this contract.
4. The availability of crane is likely to be hampered from time to time due to routine preventive maintenance or breakdown maintenance. Contractor has to make alternative arrangement or plan / modify / alter his activities to suit the above conditions and the contractor will not be liable for any compensation or extension of time due to this non availability, for maintaining the erection schedule.
5. In the event of the crane not available for longer duration due to major breakdown or any other reasons, BHEL will reschedule the work in consultation with bidder and direct the bidder to concentrate on other areas till such time the cranes are made available.
6. Crane operators deployed by the contractor shall be tested by BHEL before he is allowed to operate the cranes.

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7. Depending upon the nature of work and availability of facilities locally, contractor may have to arrange for a temporary workshop for facilitating uninterrupted progress of work.
8. All the distribution boards, connecting cables, hoses etc., and temporary connection work including electrical connections for the BHEL issued T & Ps shall have to be arranged by the contractor at his cost.
9. Cranes are only for erection purpose and shall not be available for material handling or transportation purpose. Contractor shall make their own arrangements for material transportation to erection site.
10. The contractor at his cost shall arrange for grouting of anchor points of T & Ps issued to him. Necessary grout materials are to be arranged by the contractor at his cost.

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PART – I CHAPTER-VI TIME SCHEDULE

1.6.1 TIME SCHEDULE

- 1.6.1.1 The entire work of erection testing and commissioning, LP piping and its associated items / systems, hangers and supports, valves, miscellaneous equipments and other equipments supplied under SG & Aux., TG & Aux. and Common packages etc., as detailed in the Tender Specification shall be completed within **12 (Twelve) months** from the date of commencement of work at site.
- 1.6.1.2 During the total period of contract, the contractor has to carryout the activities in a phased manner as required by BHEL and the program of milestone events.
- 1.6.1.3 The erection work shall be commenced on the mutually agreed date between the bidder and BHEL engineer and shall be deemed as completed in all respect only when the unit is in operation. The decision of BHEL in this regard shall be final and binding of the contractor. The scope of work under this contract is deemed to be completed only when so certified by the site Engineer.

1.6.2 COMMENCEMENT OF CONTRACT PERIOD

The date of commencement of contract period shall be the mutually agreed date between the bidder and BHEL engineer to start the work. In case of discrepancy the decision of BHEL engineer is final.

1.6.3 MOBILISATION FOR ERECTION, TESTING, ASSISTANCE FOR COMMISSIONING ETC.,

The activities for erection, testing etc shall be started as per directions of Construction manager of BHEL.

The contractor has to augment his resources in such a manner that following major milestones of erection & commission are achieved on specified schedules:

| S.No | Major milestone for commissioning | Unit 1 | Unit 2 |
|------|--|------------|-----------|
| 1 | Tentative start of work of LP piping works | Jan' 2011 | Jan' 2011 |
| 2 | Boiler Hydro test | March 2011 | Jan 2011 |
| 3 | Boiler Light up | July 2011 | July 2011 |
| 4 | Synchronisation | Sep 2011 | Aug 2011 |
| 5 | COD | Dec 2011 | Nov 2011 |

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- 1.6.4 In order to meet above schedule in general, and any other intermediate targets set, to meet customer / project schedule requirements, contractor shall arrange & augment all necessary resources from time to time on the instructions of BHEL.
- 1.6.5 In case the project is to be advanced, the erection works in the scope of the contractor is to be advanced to meet the project requirement. No extra payment whatsoever shall be paid on this account.
- 1.6.6 **CONTRACT PERIOD**
The contract period for completion of entire work under scope shall be **12 (Twelve) months** from the “COMENCEMENT OF CONTRACT PERIOD” as specified earlier.
- 1.6.7 **GUARANTEE PERIOD FOR EACH UNIT**
The guarantee period of twelve months shall commence from the date of handing over of the Unit to Customer or six months from the date of first synchronisation of the set, whichever is earlier (Provided all erection, testing, and commissioning works are completed in all respects).

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PART – I CHAPTER-VII TERMS OF PAYMENT

1.7.0 Terms of payment :

1.7.1 Progressive Payment against monthly running bills will be made upto 85 % of the value of the erected tonnage Pro rata as per Cl no 1.7.1.1 to 1.7.1.6 of the following table.

| 1.7.1 | ERECTION | % of payment |
|-----------|---|--------------|
| 1.7.1.1 | ON PRE-ASSEMBLY WHEREVER APPLICABLE. (if not applicable then this portion to be paid along with placement in position) | 15% |
| 1.7.1.1.a | PLACEMENT IN POSITION OF PRE ASSEMBLED | 20% |
| 1.7.1.2 | ALIGNMENT | 15% |
| 1.7.1.3 | WELDING/BOLTING/FIXING / WRAPPING COATING | 20% |
| 1.7.1.4 | COMPLETION OF NON DESTRUCTIVE EXAMINATION & STRESS RELIEVING / HEAT TREATMENT (if not applicable, then this portion to be clubbed with next activity) | 5% |
| 1.7.1.5 | HANGERS & SUPPORTS / BACK FILLING ETC WHEREVER NECESSARY AS PER DRG | 5% |
| 1.7.1.6 | HYDRAULIC TEST / PNEUMATIC TEST WHEREVER APPLICABLE (if not applicable, then this portion to be clubbed with previous activity) | 5% |
| | Total for Prorata (85%) | 85% |

1.7.2 Further 15 % payment on pro-rata basis common to all PG shall be released on achievement of the following stage / milestones events (as per Cl no 1.7. 2.1 to 1.7.2.12 of the following table) for the tonnage erected.

| 1.7.2 | STAGE / MILESTONE PAYMENTS (15%) | |
|----------|---|----|
| 1.7.2.1 | Boiler Light Up | 1% |
| 1.7.2.2 | Steam Blowing | 1% |
| 1.7.2.3 | Rolling and Synchronisation | 1% |
| 1.7.2.4 | Coal Firing | 1% |
| 1.7.2.5 | Full Load | 2% |
| 1.7.2.6 | Trial Operation of Unit | 1% |
| 1.7.2.7 | Painting (including arrow marking, nomenclature, etc) | 3% |
| 1.7.2.8 | Area cleaning, temporary structures cutting/removal and return of scrap | 1% |
| 1.7.2.9 | Punch List points/pending points liquidation | 1% |
| 1.7.2.10 | Submission of 'As Built Drawings' | 1% |
| 1.7.2.11 | Material Reconciliation | 1% |

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| | | |
|----------|---|-------------|
| 1.7.2.12 | Completion of Contractual Obligations | 1% |
| | Total for Milestone / Stage payments (15%) | 15% |
| | Total of 1.7.1 & 1.7.2 | 100% |

Note:

1. Recovery of Retention amount as per Cl. 2.22 of Volume I C (GCC).
2. RA bill payments as per Chapter-X of Volume I B (SCC)
3. Payment for the first running bill will be released only on production of the following.
 - i. PF Regn. No.
 - ii. Labour License No.
 - iii. Workmen Insurance Policy No.
 - iv. Unqualified Acceptance for Detailed L.O.I.
 - v. Initial 50% Security Deposit.
 - vi. Rs 100 /- Stamp Paper for Preparation of Contract agreement.

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PART – I CHAPTER VIII TAXES AND OTHER DUTIES

1.8.0 TAXES

1.8.1 Value Added Tax (VAT) for the works

1.8.1.1 **Price quoted shall be inclusive of VAT except service tax.**

1.8.1.2 Notwithstanding the fact that this is only an erection service contract not involving any transfer of materials whatsoever and not attracting VAT liability, being labour oriented job work, for the purpose of VAT the contractor has to maintain the complete data relating to the expenditure incurred towards wages etc. in respect of the staff/workers employed for this work as also details of purchase of materials like consumables, spares etc., inter alia indicating the name of the supplier, address and VAT Registration No. and VAT paid for the purchases, etc

1.8.1.3 The bidder shall get registered with State VAT authorities and the registration certificate shall be forwarded to BHEL immediately after commencement of work. In case the bidder had already registered under respective State VAT, they must quote their registration Number and forward copy of Registration Certificate while submitting this tender.

1.8.1.4 The monthly/quarterly VAT return, duly incorporating the erection income from BHEL as turnover, should be submitted to BHEL at regular intervals with all annexure and details of payment of VAT (WCT).

1.8.1.5 You have to obtain VAT Clearance Certificate from the on concerned authorities as per the provisions of local VAT act, on completion of the project and submit along with the final bill.

1.8.1.6 The bidder shall quote very competitive price after taking into consideration of above points.

1.8.2.0 Service Tax

1.8.2.1. Price quoted shall be exclusive of Service Tax. The service tax as statutorily leviable and payable by the bidder under the provisions of service tax Law / Act shall be paid by BHEL as per bidder claim through various running bills. The bidder shall furnish proof of service tax registration with Central Excise Department specifying the name of services covered under this contract. Registration Certificate should also bear the endorsement for the premises from where the billing shall be done by the bidder on BHEL for this project. The bidder shall obtain prior consent of BHEL before billing the service tax amount.

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1.8.3.0 **Other Taxes & Levies**

1.8.3.1 Any other taxes and duties (except VAT & Service Tax) if any, as applicable, viz. Entry Tax, Octroi, Licenses, Deposits, Royalty, Stamp Duty, other charges / levies, etc. prevailing / applicable on the date of opening of technical bids and any variation thereof during the tenure of the contract are in the scope of bidder. In case BHEL is forced to pay any such taxes, BHEL shall have the right to recover the same from the bidder either from running bills or otherwise as deemed fit.

1.8.4.0 **New Levies / Taxes**

1.8.4.1 In case Government imposes any new levy / tax after award of the work during the tenure of the contract, BHEL shall reimburse the same at actual on submission of documentary proof of payment subject to the satisfaction of BHEL that such new levy / tax is applicable to this contract..

1.8.5.0 **Statutory variations**

1.8.5.1 Statutory variations are applicable only in the cases of Value Added Tax and Service Tax. The changes implemented by the Central / State Government in the VAT Act / Service Tax during the tenure of the contract viz. increase / decrease in the rate of taxes, applicability, etc. and its impact on upward revision / downward revision are to be suitably paid/ adjusted from the date of respective variation. The bidder shall give the benefit of downward revision in favour of BHEL. No other variations shall be allowed during the tenure of the contract.

1.8.6.0 **Direct Tax**

1.8.6.1 BHEL shall not be liable towards Income Tax of whatever nature including variations thereof arising out of this contract as well as tax liability of the bidder and their personnel. Deduction of tax at source at the prevailing rates shall be effected by BHEL before release of payment as a statutory obligation, unless exemption certificate is produced by the bidder. TDS certificate will be issued by BHEL as per the provisions of Income Tax Act.

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PART – I CHAPTER - IX WEIGHT SCHEDULE

1.9.1 WEIGHT SCHEDULE -SUMMARY OF UNITS 1&2:-

LP PIPING PACKAGE

| SL NO | DESCRIPTION | Approx. Wt. in MT | RATE SCH REF |
|--------------------------------------|---|-------------------|--------------|
| 1 | Stainless steel piping | 150 | SS |
| 2 | Carbon steel piping | 1135 | CS |
| 3 | Galvanized Iron piping | 121 | GI |
| 4 | PVC Piping | 11 | CS |
| 5 | Buried piping with Wrapping including Excavation & Back filling - Carbon Steel | 190 | CS-BR |
| 6 | Buried piping without Wrapping including Excavation & Back filling - GI | 60 | GI-B |
| 7 | Buried piping without Wrapping including Excavation & Back filling - SS | 3 | SS-B |
| 8 | Hangers & Supports and other Structural work | 60 | H&S/OE |
| 9 | Other equipments / Cranes & hoists etc., | 778 | H&S/OE |
| TOTAL WEIGHT OF ABOVE (in MT) | | 2508 | |

1.9.2. WEIGHT SCHEDULE - DETAILS

| PGMA | DESCRIPTION | APPROX. WT in kg / Unit | Total Wt. in MT for both the Units | Category | Rate Sch REF |
|---------------------|--|-------------------------|------------------------------------|-----------|--------------|
| A. LP PIPING | | | | | |
| 80-412 | Condensate transfer (Make-up water - Normal/Emergency) | 30000 (For Both Units) | 30 | SS piping | SS |
| 80-473 | Demineralised water system | 20000 | 40 | SS piping | SS |
| | | 2500 | 5 | CS Piping | CS |
| 80-463 | TG Aux. cooling water | 155000 | 310 | CS Piping | CS |
| 80-463 | ACW Piping (Excluding Buried Piping) | 35000 | 70 | CS Piping | CS |
| | | 10000 | 20 | SS piping | SS |
| 80-477 | Raw water piping | 153000 (For Both Units) | 153 | CS Pipng | CS |
| 80-612 | Service air for individual units | 30000 | 60 | GI Pipng | GI |

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| PGMA | DESCRIPTION | APPROX. WT in kg / Unit | Total Wt. in MT for both the Units | Category | Rate Sch REF |
|---|--|-------------------------|------------------------------------|-----------|--------------|
| 80-673 | Lub oil piping system | 5000 (For Both Units) | 5 | CS Piping | CS |
| 80-901 | Valves | 9000 | 18 | CS Piping | CS |
| xxx | R.O. System | | 5 | SS piping | SS |
| xxx | R.O. System | | 11 | PVC | CS |
| | | | 727 | | |
| B. (1) BURRIED PIPING | | | | | |
| 80-477 | Raw water piping | 90000 (For Both Units) | 90 | Buried CS | CS-BR |
| 80-463 | ACW Piping - Buried | 50000 | 100 | Buried CS | CS-BR |
| | | | 190 | | |
| B. (2) BURRIED PIPING (Excluding Wrapping & Coating) | | | | | |
| 80-616 | Inst Air for individual unit | 30000 | 60 | GI Piping | GI-B |
| | | | | | |
| 80-412 | Condensate transfer (Make-up water - Normal/Emergency) | 1500 | 3 | SS piping | SS-B |
| | | | 63 | | |
| C. LP PIPING | | | | | |
| 80-460 | SG Aux Cooling Water Unit System | 43500 | 87 | CS Piping | CS |
| 80-471 | Boiler Wash Water To & From Unit | 11000 | 22 | CS Piping | CS |
| 80-477 | Service Water piping | 400000 (For Both Units) | 400 | CS Piping | CS |
| | | | 55 | SS piping | SS |
| 80-480 | Fire Water-Other Areas | 7070 | 14 | CS Piping | CS |
| 80-901 | Valves | 4000 | 8 | CS Piping | CS |
| 80-905 | Valves | 16000 | 32 | CS Piping | CS |
| 80-612 | Service Air For Unit | 15000 | 30 | GI Piping | GI |
| 80-616 | Inst Air For Unit | 15000 | 31 | GI Piping | GI |
| 80-933 | Hangers & Supports | 30000 | 60 | | H&S |
| 81-036 | C.W. Storage Tank | 8199 | 16 | | OE |
| | PVC Piping | | 11 | | CS |
| | | | 766 | | |

TECHNICAL CONDITIONS OF CONTRACT (TCC)

| PGMA | DESCRIPTION | APPROX. WT in MT/Unit | Total Wt. in MT for both the Units | Category | Rate Sch REF |
|----------------------------|-----------------------------------|-----------------------|------------------------------------|----------|--------------|
| D. OTHER EQUIPMENTS | | | | | |
| C 1.1 | Tanks | 18 | 36 | | OE |
| C 1.2 | Pumps & accessories | 58 | 116 | | OE |
| C 1.3 | Dozing skids | 18 | 36 | | OE |
| C 1.4 | Valves & Others | 16 | 32 | | OE |
| C 1.5 | Butterfly valves | 28 | 56 | | OE |
| C 1.6 | Air Traps | 2 | 4 | | OE |
| C 1.7 | Cranes & Hoists | 61 | 122 | | OE |
| C 1.8 | Control Valves & Flow elements | 10 | 20 | | OE |
| C 1.9 | Other Equipments / Bellows / etc. | 116 | 233 | | OE |
| D 1.10 | LP Dosing Piping | 1 | 2 | | OE |
| D1.11 | Chemicals | 52 | 105 | | OE |
| | | 380 | 762 | | |
| | Total Wt. | | 2508 | | |

NOTE:

1. The weight indicated above is approximate and liable to vary. The payment will be made to the contractor for the tonnage actually erected at the respective category as per the quoted / accepted tonnage rate.
2. There may be variation or addition of PGMA's, description, weights etc., and any additional scope of work supplied under the above package shall be erected by the contractor and payment will be made as per the quoted / accepted rate in the respective category
3. The temporary piping, pumps, tanks, dummy plates & other miscellaneous Components etc., for testing, commissioning activities like Hydro testing, chemical cleaning will be issued as and where conditions in cut pieces. The scope includes cutting and edge preparation and erection as per the site condition & dismantling after the process and to return to stores with identification marks as instructed by BHEL engineer. The quoted rates shall be inclusive of all these activities.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

PART –I CHAPTER -X GENERAL

- 1.10.1 All the works such as cleaning, leveling, aligning, trial assembly, dismantling of certain components for checking and cleaning, surface preparation, fabrication of sheets, tubes and pipes as per general engineering practice and as per BHEL Engineer's instructions at site, cutting, weld depositing, grinding, straightening, chamfering, filing, chipping, drilling, reaming, scrapping, lapping, fitting-up etc., as may be applicable in such erection works and are necessary to complete the work satisfactorily, shall be carried out by the contractor as part of the work with in the quoted rate. Major machining work, which is only to be carried out in workshops, will be arranged by BHEL.
- 1.10.2 The work shall conform to dimensions and tolerances given in various drawings and quality manuals provided by BHEL. If any portion of work is found to be defective in workmanship not conforming to drawings or other stipulations, the contractor shall dismantle and redo the work duly replacing the defective materials at his cost, failing which the job will be carried out by BHEL by engaging other agencies and recoveries will be effected from contractor's bill towards expenditure incurred including BHEL's overhead charges.
- 1.10.3 Contractor shall execute the work as per sequence and procedure prescribed by BHEL at site. The applicable erection manuals which are available with BHEL site office are to be referred for compliance and guidance before taking up the work. Any rework on this failure to comply with will be to account contractor only. BHEL engineer, depending upon the availability of materials, fronts etc, will decide the sequence of erection and methodology. No claims for extra payment from the contractor will be entertained on the grounds of deviation from the method of erection adopted in erection of similar jobs or for any reason whatsoever.
- 1.10.4 Contractor has to work in close co-ordination with other erection agency at site. BHEL engineer will co-ordinate area clearance. In a project of such magnitude, it is possible that the area clearance may be less/more at a particular given time. Activities and erection program have to be planned in such a way that the milestones are achieved as per schedule/ plans. Contractor shall arrange & augment the resources accordingly.
- 1.10.5 The contractor is strictly prohibited from using BHEL's regular components like angles, channels, beams, plates, pipe/tubes, and handrails etc for any temporary supporting or scaffolding works. Contractor shall arrange himself all such materials. In case of such misuse of BHEL materials, a sum as determined by BHEL engineer will be recovered from the contractor's bill. The decision of BHEL engineer is final and binding on the contractor.

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- 1.10.6 The contractor will be responsible for the safe custody and proper accounting of all materials in connection with the work. If the contractor has drawn materials in excess of design requirements, recoveries will be effected for such excess draws at the rate prescribed by manufacturing units.
- 1.10.7 No member of the already erected structure/ platform, pipes, grills, platform, other component and auxiliaries should be cut without specific approval of BHEL engineer.
- 1.10.8 Contractors shall ensure that all their Staff / Employees are exposed to periodical training programme conducted by qualified agencies/ personnel on ISO 9001 – 2000 Standards.
- 1.10.9 Contractor has to clear the front, expeditiously and promptly as instructed by BHEL Engineer for other agencies, like TG/Boiler erection, Cabling, instrumentation etc., to commence their work from / on the equipments coming under this scope. Some time it may be required to re-schedule the activities to enable other agencies to commence / continue the work so as to keep the over all project schedule.
- 1.10.10 **The terminal points decided by BHEL are final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals.**
- 1.10.11 Such of those consumables as indicated as “Consumables provided by BHEL” shall alone be provided to the contractor by BHEL free of charge. **Weight of above BHEL supplied welding consumables will not be considered for any payment.**
- 1.10.12 For the purpose of planning, contractor shall furnish the estimated requirement of power (month wise) for execution of work in terms of maximum KW demand.
- 1.10.13 On Completion of work, all the temporary buildings, structures, pipe lines, cable etc. shall be dismantled and leveled and debris shall be removed as per instruction of BHEL by the contractor at his cost. In the event of his failure to do so, the expenditure towards clearance of the same will be recovered from the contractor. The decision of BHEL Engineer in this regard is final.
- 1.10.14 All the necessary certificates and licenses required to carry out this scope of work are to be arranged by the contractor then and there at no extra cost.
- 1.10.15 The contractor must obtain the signature and permission of the security personnel of the customer for bringing any of their materials inside the site

TECHNICAL CONDITIONS OF CONTRACT (TCC)

premises. Without the Entry Gate Pass these materials will not be allowed to be taken outside.

1.10.16 UTILITY POINTS

1.10.16.1 Number of utility points (Service / plant air, service / plant water, service / washing steam, inert gas (N₂) etc.), shall be indicated in the P & I diagram. Contractor to locate the utility points as advised by site engineer and shall route the piping to these points as per site conditions, and shall submit as built layout with B O M to BHEL for approval.

1.10.16.2 The utility points shall be located at convenient point to handle and to be terminated with brass / bronze valve with suitable connection for hose pipe.

1.10.17 PLATFORMS, CROSSOVERS & CANOPIES

Platforms, ladders crossovers and canopies shall be fabricated and erected by contractor at site as per site engineer's advice. Platforms shall also be provided at places where it has not been shown in drawings but if felt necessary by site engineer. Canopies shall be provided for all out door pumps and motors.

All operating and approach platforms, cross over, canopies, ladder etc, shall have to be fabricated from raw materials supplied by BHEL and erected by contractor as per instruction of BHEL and shall be paid as per accepted tonnage rate for "other structural work" .

1.10.18 SITE INSPECTION

The owner/employer or his authorized agents may inspect various stages of work during the currency of the contract awarded to him. The contractor shall make necessary arrangements for such inspection and carry out the rectification pointed out by the owner/employer without any extra cost to the owner / employer. No cost whatsoever such duplication of inspection of work be entertained.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

PART –I CHAPTER -XI FOUNDATIONS AND GROUTING

- 1.11.1 Foundation for the equipments to be erected shall be provided by BHEL/ clients of BHEL. The dimension of the foundation and anchor bolt pits shall be checked by the contractor for their correctness as per drawings. Further, top elevation of foundations shall be checked with respect to bench mark etc. All adjustments of foundations surfaces, enlarging the pockets in foundations etc. as may be required for the erection of equipments plants shall be carried out by the contractor.
- 1.11.2 Cleaning of foundation surfaces, pocket holes and anchor bolt pits etc., de-watering, making them free of oil, grease, sand and other foreign materials by soda wash, water wash, compressed air or any other approved methods etc., form/shuttering work are within the scope this work.
- 1.11.3 It shall be contractor's responsibility to check the various equipment foundations for their correctness with respect to level, orientation, dimensions etc., and ascertained dimensions shall be measured and submitted to BHEL for approval before erection. Also minor chipping, dressing of foundations up to 25 mm for obtaining proper face for packer plates/shims, and may be required for the erection of the equipment/plants will have to be carried out by the contractor without extra cost.
- 1.11.4 The surface of foundations shall be dressed to bring the surface of the foundations to the required level and smoothness prior to placement of equipments
- 1.11.5 Foundation pockets are to be cleaned thoroughly before placing the columns/equipments. Verticality of foundation bolts to be checked along with correctness of the threads and freeness of the nuts movement. If required cleaning of the threads to be done with proper dies.
- 1.11.6 The concrete foundation, surfaces shall be properly prepared by chipping, as required to bring the top of such foundation to the required level to provide the necessary roughness for bondage and to ensure enough bearing strength. All laitance and surface film shall be removed and cleaned and the packers placed with suitable mortar prior to erection of the equipment. Packer plates should not only be blue matched with foundation but also inter-packer contact surfaces between the packers and foundation frame etc., shall also be blue matched by Prussian Blue match checks and required percentage contact shall be achieved by chipping and scrapping as per BHEL Engineers instructions.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.11.7 The certificates of the grout is to be submitted BHEL. If necessary test cubes are to be made and tested at site to ensure the quality of the grout as per relevant IS standards. In case grouting with Portland cement is approved, necessary cement, sand etc to be arranged by the contractor including the fine aggregates.
- 1.11.8 All the materials required for grouting including special cements like Conbextra GPI,GP2, ACC- Shrinkkomb-N20, Sika Anckor, NSG/ NSG -1, CICO Excem GP, or its equivalent as approved by BHEL and other materials like Portland cement, sand etc., are to be arranged by the contractor at his cost. It shall be the responsibility of the contractor to obtain prior approval of BHEL, regarding suppliers, type of grouting cements before procurement of grouting cements.
- 1.11.9 Certain packer plates and shims over and above the quantity received as part of supplies from manufacturing units of BHEL will have to be cut out from steel plates/sheets at site by the contractor to meet site requirement. However machining of the packers, wherever necessary, will be arranged by BHEL at free of cost.
- 1.11.10 PROCEDURE FOR GROUTING :
- Contractor has to carryout the grouting as per the work instructions for grouting available at site.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

PART –I CHAPTER -XII **MATERIAL HANDLING AND SITE STORAGE**

- 1.12.1 Loading at BHEL/Customer stores and storage yard, transport to site, unloading at site/working area of equipment placement on respective foundation/location, fabrication yard, pre-assembly bay or at working area are in the scope of work. The scope includes taking materials / Equipments from customer stores / storage yard also. Contractors Quoted / Accepted rate shall be inclusive of the same. Required cranes, tractors, trailer or trucks/ slings/ tools and tackles / labour including operators Fuel lubricants etc for loading & unloading of materials will be in the scope of contractor.
- 1.12.2 The equipments / materials from the storage yard shall be moved in sequence to the actual site of erection /location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage/loss of such equipment at site.
- 1.12.3 Sometimes it may become necessary for the contractor to handle certain unrequired components in order to take out the required materials. The contractor has to take this contingency also into account. No extra payment is payable for such contingencies.
- 1.12.4 Materials shall be stacked neatly, preserved and stored in the contractor's shed / work area in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work area/site to enable other agencies to carry out their work, same shall be done by the contractor at no extra cost.
- 1.12.5 All pipe and tube ends shall be covered with plastic caps or will be closed with wooden plugs as the case may be.

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PART – I CHAPTER- XIII ERECTION

The scope of the work will comprise of but not limited to the following

- 1.13.1 The work on piping systems (air, water, oil, steam, gas etc.,) will include laying, edge preparation, fixing and welding of the elbows / fittings / valves etc., welded on the lines, fixing and adjustment of supports / hangers / shock absorbers and carrying out all other activities / works to complete the erection and also carrying out all pre-commissioning/commissioning operations mentioned in the specification as per BHEL Engineer's instructions and/or as per approved drawings / documents.
- 1.13.2 Carrying out erection of piping as per the specification between equipments constituting terminal points, whether the terminal equipments fall within the scope of work / specification, contractor shall carry out the terminal joints at either end. Also where the piping connection to the terminal points involve flanged joints, matching of flanges, fixing gaskets, bolting and tightening as per BHEL Engineers instructions is in the scope of work. In case piping connected to equipment, matching of flanges for achieving the parallelism and alignment at the equipment end by suitably resorting to heat correction or other method as instructed by BHEL Engineer, within the quoted rate. Statutory requirements, if any, shall be in the scope of contractor and necessary drawings / details only will be given by BHEL.
- 1.13.3 Erection of all the piping systems supplied along with PEM / **BAP supplied auxiliaries** covered in this contract, is to be erected by the contractor as per the accepted tonnage rate.
- 1.13.4 Erection of all drains / vents / relief / escape / safety valve, piping to various tanks sewage / drain canal / flash box/ flash tank / condenser / sump / atmosphere etc. from the stubs on the piping to the equipments erected by the contractor is completely covered in the scope of work.
- 1.13.5 Contractors has to carryout fabrication works such as welding of stubs / nipples, attachments etc., preparation of surface for rust preventive coating and application of rust preventive within the quoted / accepted rate.
- 1.13.6 Contractor has to arrange required fire retardant covering material at their cost to protect the machined components / assembled parts drawn from BHEL before and after erection.

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- 1.13.7 The contractor shall provide any fixtures, concrete blocks / wooden sleepers, etc., which are required for temporary supporting / preassembly of the components at site.
- 1.13.8 Prior to erection of any components, inspection to be done for any foreign materials and damages and they are to be removed / attended as per BHEL engineer.
- 1.13.9 Normally the valves will have prepared edges for welding. But if it becomes necessary the contractor shall prepare new edges or recondition the edges by grinding or chamfering to match the corresponding tubes and pipes. All fittings like "T" pieces, weld neck flanges, reducers, elbows, flanges, inserts etc., shall be suitably edge prepared and matched with pipes for welding. No extra cost shall be paid for this.
- 1.13.10 Attachment, welding of necessary instrumentation tapping points, thermocouple pads, root valves, condensing vessels, flow nozzles and control valves etc., also be the responsibility of the contractor and the same will be done as per the instructions of BHEL Engineer. The erection and welding of all above items will be contractor's responsibility even if, the items are supplied by an agency other than BHEL if they are integral to the scope envisaged under this package. Payment will be regulated as per the settled terms and conditions.
- 1.13.11 The valves will have to be checked, cleaned or overhauled in full or in part before erection, after chemical cleaning and during commissioning. All the valves, after chemical cleaning, have to be checked, cleaned or overhauled in full or part before erection if called for as part of scope.
- 1.13.12 All the dampers, valves, lifting equipments, power cylinders, etc., shall be serviced and lubricated to the satisfaction of BHEL engineer before erecting the same and also during pre commissioning. The bearings of dampers shall be properly cleaned, serviced and lubricated before commissioning at no extra cost. Even after commissioning in the equipments, if there are problems in the operation they have to be attended by the contractor during the tenure of the contract.
- 1.13.13 In case of any class of work for which there is no such specifications as laid down in the contract such as blue matching, welding of stainless steel parts etc., the work shall be carried out in accordance with instructions and requirements of the BHEL engineer at the quoted rates only.
- 1.13.14 In the case of structural members / ducts in certain cases, the raw material will be supplied in random lengths and the contractor will have to make

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up the length / prepare the edges to suit the matching profiles, weld / bolt connect the joints at no extra cost.

- 1.13.15 The contractor shall fabricate piping, install lub oil systems, if any and carry out the acid cleaning of fabricated piping. The contractor shall also service the lub oil system, carry out the hydraulic test of oil coolers. etc.,
- 1.13.16 All the tubes and pipes shall be cleaned and blown with compressed air and shown to the Engineer before lifting. Pipes above 2" diameter have to be cleaned by means of wire brush as per the instruction of BHEL Engineer and subsequently flushed with air before lifting them into position. Pipes below 2" diameter, shall be sponge cleaned with air flushing. After cleaning is over, the end caps shall be put back in tube openings till such time they are welded to other tubes. Required compressors shall be arranged by the contractor at his cost.
- 1.13.17 All the equipments / material to be taken inside the plant building shall be cleaned thoroughly before taking them inside and erect. The contractor shall clean, wherever necessary and paint inside surfaces of the equipments like coolers, oil tanks, Rubber expansion joint assemblies and other components as per instruction of BHEL Engineer during erection at the quoted rate. The necessary compressor for air cleaning is to be arranged by contractor at his cost.
- 1.13.18 All attachment welding including those for insulation and refractory work coming on the pressure parts shall have to be done by the contractor. The hooks are suitable for stud welding machines. Contractor's quoted rate shall include all these contingencies. Attachment welding on pressure parts shall be done by qualified and certified welders only.
- 1.13.19 Fine fittings, oil system and other small bore piping have to be routed according to site conditions and hence shall be done only in position as per the site requirement. Necessary sketch for routing these lines should be got approved from BHEL by the contractor. There is a possibility of slight change in routing the above pipelines when after completion, to suit the site conditions. The contractor should absorb this cost in his quoted rate.
- 1.13.20 Additional platforms for approaching different equipments as per the site requirement, which may not be indicated in drawings, shall be assembled and erected by contractor. However, the contractor shall be paid for this work on accepted tonnage rate for "other structural work". The steel materials required for these works shall be supplied by BHEL free of cost and the contractor will have to install them to suit the requirement.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.13.21 Erection of platform and supporting structures around the equipments / valves / filters/ **in the R.O. Plant area**, etc., is covered in the scope of contract and shall be erected by the contractor as per accepted tonnage rate for “other structural work”.
- 1.13.22 The Contractor shall carry out the reaming and honing of coupling holes with his own reamers, honing machine and honing accessories etc at his own cost.
- 1.13.23 Work such as minor rectification of foundation bolts, reaming of holes, drilling of dowels, matching of bolts and nuts, making new dowel pin, etc. are covered in the scope of work.
- 1.13.24 Assistance for calibrating / testing the power cylinders / valves, gauges, instruments, etc. and setting to actuators shall be provided by contractor within the quoted rates.
- 1.13.25 HSFG Bolts are to be tightened by turn of nut method / Torque Wrench, as per the instruction of BHEL Engineer. The bolted joints shall be jointly checked by BHEL/Customer and contractors personnel for the required tightness and retightened wherever necessary. The tightened bolts shall be identified by color paints. Facility for random checking with calibrated Torque Wrench shall also be provided by contractor.
- 1.13.26 D.S.L / equivalent system for hoisting equipments are also to be erected and commissioned including load testing by the contractor within the quoted rates. Required manpower including electricians are to be arranged by the contractor for carrying out commissioning of electrical hoist and load testing of the above electrical hoist. Required loads will be provided by BHEL free of cost.
- 1.13.27 The temporary structures / items welded to permanent members / pipes are to be cut and removed without any damage. Any damage so to be made good by the contractor at his cost.
- 1.13.28 Before lifting the heavy components, soft materials like gunny bags to be used while lashing the rope to avoid dents, rubbing marks etc. The capacity, number of sheave pulleys, size of the rope, guide pulley locations are to be decided at site with respect to the capacity and positioning of the winch. The end caps provided at shop for various stubs are to be removed during final fit up only.
- 1.13.29 Before erecting the valves and other mountings, check for the tag for correct rating with valve schedule. Ensure correct flow direction. Ensure easy accessibility for operation and maintenance of valves.

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- 1.13.30 Slope of 1:500 shall be maintained towards drain point unless otherwise specified.
- 1.13.31 All the drain lines should have sufficient slope towards drain. Provide expansion loops in all the vents and drains as per the drawings.
- 1.13.32 For skid mounted equipment, the checking and re-alignment required at site is in the scope of work.
- 1.13.33 All Rotating machineries and equipment shall be cleaned, lubricated, checked for their smooth rotation, if necessary dismantling and refitting before erection. If in the opinion of BHEL Engineer, the equipment is to be checked for clearance, tolerance at any stage of work or during commissioning period, all such works are to be carried out by contractor at his cost.
- 1.13.34 All the shafts of rotating equipment shall have to be properly aligned to those of matching equipment to perfection, accuracy as required and the equipment shall be free from excessive vibration so as to avoid overheating of bearings or other conditions which may tend to shorten the life of the equipment.
- 1.13.35 Wherever pipes / bends / equipments are supplied in pre-fabricated / assembled packages, there may be necessity to make minor changes, including strengthening by additional welds. This shall be treated as part of the contractor's scope.
- 1.13.36 All the bearings, Gearboxes etc., of the equipment and electrical motors to be erected are provided with protective greases only. Contractor shall arrange as and when required by the engineer for cleaning the bearing/gear boxes etc., with kerosene or some other agent if necessary by dismantling some of the parts of the equipment during erection and shall arrange for re-greasing/lubricating them with recommended lubricants and assembling back. Lubricants will however be supplied by BHEL at free of cost.
- 1.13.37 All the motors / pumps shall be stripped opened, thoroughly serviced with proper care and re-assembled properly before erection by the contractor. During servicing, pre-commissioning & commissioning, if any deficiency is observed the same should be taken up with BHEL Engineer at site and rectified at site without any delay.
- 1.13.38 All the pumps & motors will be supplied in loose parts, contractor shall have to match / assemble and align at site as per instructions of BHEL Engineer including placement on foundation.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.13.39 All the valve packing with asbestos base to be lubricated once in 6 months till handing over. Necessary gland packing will be supplied by BHEL.
- 1.13.40 All the oil & gas piping flanges, wherever provided are to be blue matched using surface plates for at least 80% contact area to attain leak proof of joints.
- 1.13.41 The contractor shall also carry out erection, testing, and commissioning of the oil centrifuge with in their quoted rate.
- 1.13.42 Fabricated pipes are sent in standard length and will be cut to suit the site conditions and the layouts. Tubes or pipes wherever deemed to be convenient will be sent in running lengths with sufficient bends. Bends less than or equal to NB 65 mm will have to be fabricated at site adopting specified heat treatment procedures, wherever required at no extra cost.
- 1.13.43 All piping will be supplied in running metres, contractor has to cut and edge prepare as per the standards / drawings and as per the instruction of BHEL Engineer within the quoted rate.
- 1.13.44 All site-fabricated pipes will be issued in running metres as straight. These are to be cut and edge prepared at site to required length to suit layout as given in the erection drawing. All the attachments like lugs, stoppers, cleats etc., will be supplied as loose items and to be cut and welded to the pipes at site as per erection drawing necessary drilling of holes on main pipe for welding stubs shall also be done at site by the contractor. Fittings like bends, tees, elbow, mitre bends, reducers, flanges, thruster blocks, etc., will be supplied as loose items and edge preparation if required shall be carried out by the contractor.
- 1.13.45 Certain extra lengths of portions / parts of various site fabricated components / parts / bellows / piping etc. are provided as erection allowance and they shall have to be cut to suit site conditions and layout. Certain small length of portions / components / bellows / piping casing etc., may have to be added to suit conditions and layouts. Preparing edges afresh and adopting specified heat treatment procedure, are in the scope of work. No extra payment will be admitted for such works.
- 1.13.46 For any mismatch while matching the joints in tubes, the cutting, adjusting, re welding, addition of spool pieces should be done by the contractor to match site conditions without any extra payment.
- 1.13.47 For pipes nominal size 2" and below routing shall not be shown in piping layouts or in isometrics and the same to be routed / connected as shown in schematics. For the above sizes if the routing is shown in layouts it is only for guidance and

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the same shall be routed and supported as per site requirement/ convenience as per site engineer's advice.

- 1.13.48 Piping below size 2", valves, flanges, fittings etc. shall be supplied as commercially available. Hence fit-ups, edge preparation including welding of stubs, shall be included in the contractor's scope.
- 1.13.49 Wherever drawings indicate site routing and site fabrication, such pipes (in general equal to and less than 2" dia) will be issued in running meters as straight length. These are to be cut and edge prepared at site to required length to suit layout as given in the erection drawing. In some cases attachments like lugs, stoppers, cleats etc., will be supplied as loose items and to be cut and welded to the pipes at site as per erection drawing necessary drilling of holes on main pipe for welding stubs shall also be done at site by the contractor.
- 1.13.50 Minor adjustment like removal of ovalities in pipes and opening or closing of the fabricated bends by process of heat correction or any other method approved by BHEL Engineer to suit the layout, with specified heat treatment procedure with in the quoted rate.
- 1.13.51 Contractor shall use only bolted clamps for achieving alignment of piping. Wherever "L" shaped stoppers and wedges are to be used for aligning piping and equipments, the same shall be subject to the approval of BHEL Engineer. Contractor shall remove the bridge, stopper etc., and not by hammer. Any burrs left on the equipments/piping, after welding, shall be ground off or any scar or cavity made good by welding and grinding. NDT tests shall be carried out if necessary to detect surface and sub-surface cracks in these ground areas.
- 1.13.52 **Flame cutting of piping and other equipment shall be strictly done as per BHEL Engineer's instructions and in his presence only.**
- 1.13.53 In case of piping connected to equipment, matching of flanges for achieving the parallelism and alignment at equipment end by suitably resorting to heat correction or other method as instructed by BHEL Engineer is within scope of work.
- 1.13.54 The surface of the pipes to be joined shall be suitably prepared as per instructions of BHEL Engineers. Edge preparation shall be done by chamfering machine, whenever required and all welding surfaces must be cleaned thoroughly. All works due to the mistake of the contractor shall be repaired / redone at contractor's cost. Instrumentation drains, stubs which are sent in loose from manufacturing units are to be welded at site as per BHEL Engineer's instructions.

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- 1.13.55 All the weld joints on equipments and piping shall be ground or filed after completion of welding and before radiography as per instructions of BHEL Engineer so as to achieve smooth surface to avoid of ripples, undulations etc.,
- 1.13.56 Wherever elbows of 45 deg or any other angle are required, the same shall be cut from 90 deg. elbow supplied and used. No extra cost shall be paid.
- 1.13.57 Flow nozzles, orifice, spray nozzles etc., shall be mounted / erected after chemical cleaning / flushing / or steam blowing at site.
- 1.13.58 Erection of flow switches, steam traps, filters, flow meters, other metering elements, flow orifices, flow indicators, control valves supplied either by BHEL or customer forming part of the system is in the scope of work. This will include collecting from BHEL/Customer stores, transport to site, suitably cutting the erected piping, cleaning, erection, welding, radiography and stress relieving and commissioning.
- 1.13.59 Certain instruments like pressure switches, gauges, air sets, regulators, filters, junction boxes, power cylinders, dial gauges, thermometers, flow meters, valve actuators, flow indicators etc., are received in assembled conditions as integral part of equipments. Contractor shall dismantle such instruments and re-erect whenever required prior to commissioning. Some time this may have to be handed over to store or instrumentation contractor.
- 1.13.60 The contractor has to fabricate stainless steel orifice plate within the quoted rate. No extra payment will be made for fabrication of above orifice plates. The required stainless steel plate will be supplied by BHEL.
- 1.13.61 Fixing / fitting / welding of thermo wells, stubs, hoses, tapping points, root valves and instruments etc., on different lines / equipments (which will be supplied by BHEL) is within the scope of work. Fixing of Pick-Ups, Probes & Accessories for vibration monitoring system is the scope of this specification.
- 1.13.62 Welding of all thermo wells, draft, pressure and temperature instrumentation points and all other instrumentation points on piping and auxiliaries and welding of thermocouple pads are in the scope of work.
- 1.13.63 Contractor shall also weld small length of piping with root valve to the pressure, flow and level tapping points on piping or flow nozzles / orifices / metering elements fixed on piping as per the instructions of BHEL Engineer.

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- 1.13.64 The contractor shall also weld all thermo wells, small length of pipes to all pressure, flow and level tapping points, isolating valves and root valves on all equipment under scope of erection of this contract. All embedded temperature measuring elements provided in the bearings will have to be terminated at the junction box by the contractor. Thermo wells tapping point connections incorporated shall be plugged during the pressure testing and steam blow out of piping systems. Upon completion of blow out operation all thermo wells and flow elements with branch pipes be installed and welded.
- 1.13.65 Suspension for piping etc., will be supplied in running lengths and shall be cut to suitable sizes and adjusted as required. Hangers' components which are being supplied in loose shall be assembled at site and erected as part of the work.
- 1.13.66 All hangers, supports and anchors (including concreting or welding) shall be installed as per drawing and complete installation as per instructions of BHEL Engineer. Normally supports are issued in running meters. Any additional supports as called for by BHEL Engineer shall be fabricated by the contractor and provided at no extra cost. However, the raw material required for fabrication of such supports shall be supplied by BHEL free of cost. (Any machining or threading is involved will only be done by BHEL).
- 1.13.67 For hangers and supports the instruction given in the drawings and documents must be followed for handling, erection and setting of cold / Hot valves and locking etc..
- 1.13.68 Wherever hanger and support materials of piping are not received from manufacturing unit in time to suit the erection schedule, contractor shall erect the piping system on temporary supports to ensure the progress of work. The required structural steel materials will be issued on free of charges by BHEL, either from scrap/spare materials. The same shall be removed and returned to BHEL store after erection of permanent supports.
- 1.13.69 The contractor shall conduct non destructive tests like radiography ultrasonic test for weld defects etc., ultrasonic test for finding thickness, dye penetrant tests, magnetic particle test etc., on weld joints, castings, valve bodies and other equipments etc., as per BHEL Engineer's instructions.
- 1.13.70 All welded joints should be painted with anti corrosive paint, once radiography and stress relieving works are over.
- 1.13.71 Contractor has to fabricate and erect temporary spool pieces wherever required due to non receipt of valves in time and after receipt of valves the spool pieces

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are to be replaced with regular valves at free of cost. For spool pieces materials will be supplied free of cost by BHEL.

1.13.72 Plate / Pipe shoes for piping supports shall be fabricated at site by the contractor at no extra cost. Other supports namely Hangers, U-clamps etc., shall be supplied by BHEL duly bent and threaded. Assembly and necessary cutting work etc., shall be carried out at site by contractor within the quoted rate.

1.13.73 GALVANISED STEEL PIPING

1.13.73.1 Galvanized pipe shall be joined by screwing in to socket and screwed ends of GI pipes shall be thoroughly cleaned and painted with a mixture of red and white lead before joining. The exposed threaded portion on either side of the socket joint shall be applied with Zinc Silicate Paste. All these consumables are in the scope of contractor and shall carry out within the quoted rate.

1.13.73.2 GI pipe with flanged joints shall have screwed flanges. Flanged joints faces shall be painted with red lead and bolting up evenly on all sides with compressed asbestos gaskets in between two flanges.

1.13.73.3 Teflon tapes shall be used to seal out screwed joints and shall be applied to the male threads only. Threaded parts shall be wiped clean of oil or grease with appropriate solvent if necessary and allowing proper time for drying before applying the sealant. Pipe ends shall be attached by screwing the pipe through the flange and pipe and flange shall be refaced accurately. Required Teflon tapes are to be arranged by the contractor at his cost.

1.13.73.4 Required threading should be done by the contractor at site as specified in the drawing. The pipes shall be cut only by Hacksaw / Machining. Required Teflon tapes are to be arranged by the contractor within the quoted rate.

1.13.73.5 ALL THE SCREWED JOINTS ARE TO BE SEAL WELDED IF REQUIRED BY CUSTOMER, SUITABLE ELECTRODES FOR FULL SEAL WELDING ARE TO BE ARRANGED BY THE CONTRACTOR AT HIS COST.

1.13.74 BURIED PIPING

1.13.74.1 The pipe in general shall be laid with the bottom of the pipe maximum approx. 3 Mtr below P.H. Finished ground floor level or as specified in the drawing. Anti corrosive treatment for buried pipes as specified in the drgs. including supply & application of anti corrosive treatment, required consumables for the same are in the scope of contractor and shall carry out as per drawing within the quoted rate.

1.13.74.2 Buried GI pipes shall not have flanged joints. All the joints shall be screwed with socket. Screwed ends of GI pipes shall be thoroughly cleaned and painted with a mixture of red and white lead before joining. Threaded portion on either

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side of the socket joint shall be applied with Zinc Silicate Paste. All these consumables are in the scope of contractor and shall carry out within the quoted rate.

- 1.13.74.3 The civil works like excavation, compaction, sand filling & etc. for the buried piping identified in this contract are included in the scope of work. The contractor has to ensure that the width of the trench shall be sufficient to give free working space on each side of the pipe.
- 1.13.74.4 Free access is to be provided for the welding of the circumferential joints by increasing the width and depth of the trench at these points. There should be no obstruction to the welder from any side so that good welded joint is obtained. This type of incidental works are to be carried out by the contractor within quoted rates.
- 1.13.74.5 Prior to lowering and laying pipe in any trench, the contractor shall ensure for the backfill and compact the bottom of the trench or excavation in accordance with IS 5822 / as per drawing to provide an acceptable bed for placing the pipe.

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PART – I CHAPTER - XIV PROGRESS OF WORK

- 1.14.1 Refer forms F -14 to F-18 of volume I D (Forms & Procedure) of volume -I book-II. Plan and review will be done as per the formats.
- 1.14.2 Contractor is required to draw mutually agreed monthly erection programs in consultation with BHEL well in advance. Contractor shall ensure achievement of agreed program and shall also timely arrange additional resources considered necessary at no extra cost to BHEL.
- 1.14.3 Progress review meetings will be held at site during which actual progress during the week vis-a-vis scheduled program shall be discussed for actions to be taken for achieving targets. Contractor shall also present the program for subsequent week. The contractor shall constantly update / revise his work program to meet the overall requirement. All quality problems shall also be discussed during above review meetings. Necessary preventive and corrective action shall be discussed and decided upon in such review meetings and shall be implemented by the contractor in time bound manner so as to eliminate the cause of nonconformities.
- 1.14.4 The contractor shall submit daily, weekly and monthly progress reports, manpower reports, materials reports, consumables (gases / electrodes) report, cranes availability report and other reports as per Performa considered necessary by the Engineer.
- 1.14.5 The contractor shall submit weekly / fortnightly / monthly statement report regarding consumption of all consumables for cost analysis purposes.
- 1.14.6 The monthly report ending on 24th of every month shall be submitted as a booklet and shall contain the following details :-
- a) Colour Progress photographs to accompany the report should be submitted.
 - b) Erection progress in terms of tonnage, welding joints, radiography, stress relieving, etc., completed as relevant to the respective work areas against planned.
 - c) Site Organization chart of engineers & supervisors as on 24th of the month with further mobilization plan
 - d) Category- wise man hours engaged during the previous month under the categories of fitters, welders, riggers, khalasis, grinder-men, gas-cutters, electricians, crane operations and helpers. Data will be spilt up under the work area of Boiler

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- e) Consumables report giving consumption of all types of gases and electrodes during the previous month.
 - f) Availability report of cranes
 - g) Safety implementation report in the format
 - h) Pending material and any other inputs required from BHEL for activities planned during the subsequent month.
- 1.14.7 The manpower reports shall clearly indicate the manpower deployed, category wise specifying also the activities in which they are engaged.
- 1.14.8 The contractor must obtain the signature and permission of the security personnel of the customer for bringing any of their materials inside the sit premises. Without the Entry Gate Pass these materials will not be allowed to be taken outside.

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PART – I CHAPTER - XV WELDING, HEAT TREATMENT & RADIOGRAPHY AND NON-DESTRUCTIVE TESTING

- 1.15.1 The equipments and piping shall be erected in conformity with the standard / specification in practice in BHEL. The method of welding (viz) ARC, TIG or other methods as indicated in the detailed drawing or as instructed by BHEL Engineer shall be followed. BHEL Engineer will have the option to change the method to suit site conditions. All the prepared / patched edges will have to be suitably protected to prevent rusting or foreign material ingress.
- 1.15.2 All welders including tack welders, structural and high pressure welder shall be tested and approved by BHEL Engineer before they are actually engaged on work even though they may possess a valid certificate. BHEL reserves the right to reject any welder if the welder's performance is not found to be satisfactory. The contractor shall maintain the records of qualification AND performance of welders. BHEL Engineer will issue all the welders qualified for the work, an identity card. The welder will keep the same with him at work place at all times. He may be stopped from work if he is not found in possession of the same.
- 1.15.3 Engineer may stop any welder from the work if his performance is unsatisfactory for any technical reason or if there is a high percentage of rejection in the joints welded by him. The welders having passed qualification tests does not absolve the contractor of contractual obligation to continuously check the welder's performance.
- 1.15.4 Faulty welds caused by the poor workmanship shall be cut and re-welded at the contractor's expense. The Engineer prior to any repair being made shall approve the procedure for the repair of defective welds. After the repair has been carried out, the compliance shall be submitted to the quality engineer.
- 1.15.5 The contractor shall carry out the root run welding of all LP piping, valves by TIG welding method as specified in the Drg./EWS. The contractor shall have to carry out full TIG welding of butt weld joints of tubes / pipes of lesser thickness if required. During the root runs of stainless steel joints, the contractor shall carry out purging the pipes with inert gas before and during welding.
- 1.15.6 The regulators used on welding machines shall be calibrated before putting these into use for work. The Contractor at his cost shall also arrange periodic calibration for the same.
- 1.15.7 Pre -heating, radiography and other NDT tests, post heating and stress relieving after welding of tubes, pipes, including attachment welding wherever necessary are

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part of erection work and shall be carried out by the contractor in accordance with the instructions of the Engineer and as specified in Erection Welding Schedule, Welding, Heat Treatment & NDT manuals and FQP. Contractor at his cost shall arrange all equipment and consumables essential for carrying out the above process.

- 1.15.8 Contractor shall arrange all necessary stress relieving equipment with automatic recording devices. The contractor shall arrange for labour, heating elements, thermocouples, compensating cables, thermo-chalks, temperature recorders, thermocouple attachment units, graph sheets, insulating materials like asbestos cloth, ceramic beads, asbestos ropes etc. required for heat treatment/ stress-relieving operations. The contractor should take a note of the following,
- Temperature shall be measured by thermocouple and recorded on a continuous printing type recorder. All the recorded graphs for heat treatment works shall be the property of BHEL.
 - All stress relieving equipment will be used after due calibration and submission of test certificate to BHEL. Periodic calibration from Govt. Approved / accredited Test Houses traceable to National / International standards will also be arranged by the contractor for such equipment at his cost.
 - The contractor shall obtain the signature of Engineer or his representative on the strip chart of the recorder prior to the starting of SR operations.
- 1.15.9 The contractor shall also be equipped for carrying out other NDT like LPI /MPI / Hardness test etc. as required as per welding schedules / drawings within the finally accepted price / rates. Ultrasonic testing, wherever required also has to be arranged by the contractor.
- 1.15.10 All arrangements for carrying out radiography work including radiography source & equipments and consumables, dark room and air conditioner and other accessories shall be provided by contractor within the space allotted for office at his cost. As an alternative the contractor may deploy an agency having all above facilities and who are duly approved / accredited by BARC and / or other Regulatory authorities. Detailed particulars of such agencies will be submitted and got approved by BHEL Engineer before the actual deployment of agency for radiography work.
- 1.15.11 Contractor shall note that 100% radiography will be done at the initial stages on the piping welding joints. Subsequently radiographic inspection will be done on the basis of quality of welding. However minimum percentage of joints to be radiographed shall not be less than the requirement of BHEL welding schedule /

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Customer's requirements. The percentage may be increased depending upon the quality of joints and at the discretion of BHEL. For LP Piping, as per site engineer's instructions, NDT method and other tests to be carried out.

- 1.15.12 Heat treatment and radiography may be required to be carried out at any time (day and night) to ensure the continuity of the progress. The contractor shall make all necessary arrangements including safety, labour, supervisors/ Engineer required for the work as per directions of BHEL.
- 1.15.13 All expenses for testing of contractor's welders (pre production test) including destructive and Non- destructive tests conducted by BHEL or by the inspecting authority at site or at laboratory shall have to be borne by the contractor only. Limited quantity of tube and pipe material required for making test pieces will be supplied by BHEL free of cost and all testing facility shall be made available by the contractor.
- 1.15.14 All welded joints shall be subjected to acceptance by BHEL Engineer.
- 1.15.15 The technical particulars, specifications and other general details of work shall be in accordance with ASME/IBR /BHEL welding, Heat treatment and NDE manuals or equivalent as decided by BHEL Engineer.
- 1.15.16 The Contractor shall carryout Radiography as per welding Manual booklet applicable as per IBR, enclosed. However percentage radiography shown in the respective drawings shall be final and binding on the contractors.
- 1.15.17 Low speed high contrast fine grain films (D7 or equivalent) in 10 cm width only should be used for weld joint radiography. Film density shall be between 1.5. to 2.00
- 1.15.18 All radiographs shall be free from mechanical, chemical or process marks to the extent they shall not confuse the radiographic image and noticed.
- 1.15.19 Penetrameter as per ASME/ISO shall be used for all exposures.
- 1.15.20 Lead numbers and letters (generally of 6mm size) are to be used for identification of radiographic contract No., joints identification, sources used, welders identification, SFD used are to be noted down in the paper cover of radiography. Lead intensifying screens for front and back of the film shall be used as per the instructions of BHEL Engineer.
- 1.15.21 The weld joint is to be marked with permanent mark A, B, C, etc. to identify the segments. For this a low stress stamp shall be used to stamp the pipe on the

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down stream side of the weld. For multiple exposures on pipes, an overlap of about 25 mm of film shall be provided.

- 1.15.22 The contractor shall be fully equipped with radiography equipments,, films, chemicals and other dark room facilities. There must be a number of radiographic personnel with sufficient experience and certified by BARC for field radiographic inspection. Further, the contractor must follow strictly the safety rules laid down by BARC, from time to time, contractor's radiographers shall also be registered with BARC for film badge service.
- 1.15.23 Contractor shall provide all skilled, unskilled work men required for the job, which will include Engineers, supervisors, operators, as required for timely and satisfactory execution of radiography work.
- 1.15.24 If the contractor does not carry out radiography work in time due to non-availability of film, chemical etc. BHEL shall get the work done through some other agency at the risk and cost of the contractor.
- 1.15.25 All the radiographs shall be properly preserved in air-conditioned rooms and shall become the property of BHEL. They are to be reconciled with the work done, joints radiographed and submitted to BHEL/customer.
- 1.15.26 Radiography of joints shall be so planned after welding that the same is done either on the same day or next day of the welding to assess the performance of high pressure welders. If the performance of the welder is unsatisfactory, he shall be replaced immediately.
- 1.15.27 The defects as pointed out by the Engineer shall be rectified immediately to the satisfaction of Engineer and Re-radiographed. The decision of Engineer regarding acceptance or otherwise of the joint shall be final and binding on the contractor.
- 1.15.28 Wherever radiographs are not accepted on account of poor exposure, joints shall be re-radiographed and new film submitted for evaluation. Radiographs shall be taken again on joints after carrying out repairs. However, if the defect persists after first repair as per radiograph, carrying out radiography shall be repeated till the joint is made acceptable. In case the joint is not repairable, the same shall be cut, re-welded and re-radiographed at contractor's cost.
- 1.15.29 For carrying out ultrasonic testing of welded joints of 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 include such preparation and no extra charges are payable for this.

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- 1.15.30 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 including supply of Paint for this purpose. All welds shall be painted with primer as specified in the painting schedule, once radiography and stress relieving works are over.
- 1.15.31 Welding of pressure parts, high tensile structural steel, Piping shall be done by certified high pressure welders who possess valid certificate and who are approved by BHEL Engineer.
- 1.15.32 The equipments and piping shall be erected in conformity with the standard / specification in practice in BHEL. The method of welding (viz) ARC, TIG or other methods as indicated in the detailed drawing or as instructed by BHEL Engineer shall be followed. BHEL Engineer will have the option to change the method to suit site conditions. All the prepared / patched edges will have to be suitably protected to prevent rusting or foreign material ingress.
- 1.15.33 The contractor shall carry out the root run welding of all LP piping, valves by TIG welding method as specified in the Drg./ EWS. The contractor shall have to carry out full TIG welding of butt weld joints of tubes / pipes of lesser thickness if required.
- 1.15.34 Faulty welds caused by the poor workmanship shall be cut and re-welded at the contractor's expense. The Engineer prior to any repair being made shall approve the procedure for the repair of defective welds. After the repair has been carried out, the compliance shall be submitted to the quality engineer.
- 1.15.35 For Stainless Steel pipe, welding procedure will be as per BHEL site Engineers directive. During the root runs of stainless steel joints, if required, the contractor shall carry out purging the pipes with inert gas before and during welding.
- 1.15.36 The thermostat and thermometer of electrode drying oven shall be also calibrated. All welders shall have electrodes drying portable oven at the work spot.
- 1.15.37 Such of those consumables as indicated as “**Consumables provided by BHEL**” shall alone be provided to the contractor by BHEL free of charge. Any excess requirement shall be arranged by the contractor/BHEL at contractor's cost. Other indigenous alloy steel, stainless steel and carbon steel filler wires and all electrodes are to be arranged by the contractor at his cost. Other consumables, filler wires, electrodes, gas etc. are to be arranged by the contractor at his cost. **Weight of above BHEL supplied welding consumables will not be considered for any payment.**

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PART – I CHAPTER – 16 COATING & WRAPPING

1.16.0 COATING & WRAPPING shall be done as follows.

- 1.16.1 The external surfaces of the buried pipes shall be thoroughly cleaned by shot blasting method for free of rust, weld scales, burns etc., before start application of anti corrosive coats. Kerosene, solvent or other cleaning material should not be used for external cleaning of the pipes. The above work shall be carried out to the satisfactory of BHEL engineers or as instructed by BHEL engineers.
- 1.16.2 The entire length of pipe shall be cleaned and coated leaving the end about 230 mm for joints, which shall be coated manually after laying in the trench, welding and testing the pipe.
- 1.16.3 Coating & Wrapping of site joints shall be done after completion of weld and / or flanged connections and after completion & approval of Hydro testing. Materials required for coating, wrapping and consumables required for cleaning operations are to be arranged by the contractor within the quoted rate.
- 1.16.4 The materials used for coating and wrapping are
 - a. Coating Primer (Coal Tar Primer)
 - b. Coating Enamel (Coal Tar Enamel)
 - c. Wrapping Materials
- 1.16.5 All primer / Coating / Wrapping materials and method of application shall conform to IS 10221 & AWWA –C–203.
- 1.16.6 Number of coats and wraps, minimum thickness for each layer of application shall be as per IS-10221 and shall be decided based on soil corrosive / resistivity. However the total thickness of completed coating shall not be less than 4.0 mm, including anti corrosive tape of 4 mm thick.
- 1.16.7 Alternatively the anti-corrosive protection can consist of anticorrosive protection tapes. Material and application of tapes shall conform to AWWA – C – 203. These tapes shall be applied hot over the coal tar primer. The total thickness of the finished protective coating shall be 4 mm minimum. The required above mentioned tapes are to be provided by the contractor at his cost.
- 1.16.8 **Tests to be carried out after application – (a) Bond / Adhesion test (b) Holiday test. The preservative paint, anti corrosive tape, all the required consumables, T&Ps and the instruments required for the above application and testing are to be arranged by the contractor at his cost.**
- 1.16.9 All the provisions for bed preparation / laying the pipe / application of primer / coating / wrapping with tapes etc., as indicated above are applicable for buried galvanized steel (GI) pipes also.

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PART – I CHAPTER – XVII HYDRAULIC TEST FOR PIPING

- 1.17 HYDRAULIC TEST FOR PIPING:
- 1.17.1 For LP lines contractor has to arrange Hydraulic Test pump / Hand Pump for HT at his cost.
- 1.17.2 Contractor shall lay all necessary electric cables and switches etc. required for the hydraulic tests and other tests, flushing etc., and maintain the system till the tests are completed satisfactorily.
- 1.17.3 Contractor at his cost shall lay all necessary temporary piping, install the pumps, blanks, valves required for the test, pressure gauges etc. Required pipes, valves, plates etc., will be given by BHEL. Temporary piping, pumps, valves, flanges, blanks etc shall be removed by him and returned to BHEL. All thermo well points are to be seal welded, with plug in position. All Temperature Element points are to be provided with blanks and welded. Necessary blanks will be provided by BHEL.
- 1.17.4 All the tests shall be repeated till all the pipelines to satisfy the requirements / obligation of BHEL to their customer. As far as the hydraulic pressure test is concerned, the same shall be conducted to the satisfaction of BHEL / Customer Engineers. Any rectifications required shall have to be done / redone by the contractor at his cost.
- 1.17.5 In general HT of piping shall be performed after all eventual pipe branches have been completed and valves installed. Should it be required to hasten erection work, pressure tests may be performed by sections. For this scope of work, the erected pipe lines shall be hydraulically tested as per site requirement in segments. For conducting hydraulic test, both ends of pipe lines shall be blanked by welding of plates. Only one or two set of plates and structural materials for blanking required for one segment will be provided by BHEL free of charge. After completion of hydraulic test in one segment, the same plates are to be cut and removed and utilized / welded on the other segment of the pipe lines, to carry out the hydraulic test for the respective segments. No separate plates for blanking for each segment will be provided. After completion of Hydraulic test, the required edge preparations shall be carried out on the end of pipe lines and to be welded with the respective pipe lines. In such cases joint connection shall be checked during a final and additional test, if required. The contractor shall note this aspect and quote accordingly.

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- 1.17.6 During hydraulic test, the pipes being tested shall be isolated from the equipments to which they are connected.
- 1.17.7 Openings on piping for pressure / temperature impulse connections shall be fully closed during the test to prevent dust or foreign matter entering into the instrument piping inadvertently.
- 1.17.8 Test records shall be made for pressure testing of above piping system. These records shall contain the following information:
- Date of test
 - Identification of piping tested
 - Test fluid
 - Test pressure
 - Approval of the Engineer.

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PART - I CHAPTER- XVIII TESTING AND COMMISSIONING

1.18 TESTING , PRE – COMMISSIONING & COMMISSIONING AND POST COMMISSIONING

- 1.18.1 The Contactor shall carry out all the required tests and pre-commissioning and commissioning activities required for their successful and reliable operation.
- 1.18.2 The scope of pre-commissioning activities cover installation of all necessary equipment including temporary piping, supports, valves, blanking, pumps, tanks, with access platforms valves, along with accessories required for hydro test, chemical cleaning (Acid cleaning of piping / alkali flushing), steam blowing or for any other tests. The scope also covers the off site disposal of effluents.
- 1.18.3 All items / materials required for conducting pre-commissioning and commissioning tests will be supplied by BHEL. However fabrication, servicing, erection, dismantling and returning of the same to stores are the responsibility of the contractor who is erecting the equipment / piping. The contractor may note that no separate payment shall be released for any temporary works that are to be carried out for conducting pre-commissioning and commissioning tests. Bidders are advised to include expenses on temporary works along with the rates being quoted by them. Broadly the work on temporary systems will be as under erection etc. of all temporary piping including valves, tanks, effluent pumps, electrical control panel and cabling along with insulation and supports are to be carried out as part of work. Contractor will be responsible for their operation and any servicing required during the pre-commissioning activities. He will also service the equipment and handover the equipment to the other agency for further erection / commissioning activities. All the pumps, motors and electrical control panels/ switch gear, valves and actuators will be furnished to the contractor after due servicing.
- 1.18.4 It shall be the responsibility of the contractor to provide various categories of workers in sufficient numbers along with Supervisors during pre commissioning, commissioning and post commissioning of equipment and attending any problem in the equipment erected by the contractor till handing over. The contractor will provide necessary consumables, T&Ps, IMTEs etc., and any other assistance required during this period. Association of BHEL's / Client's staff during above period will not absolve contractor from above responsibilities.
- 1.18.5 In case, any rework is required because of contractor's faulty erection, which is noticed during pre-commissioning and commissioning, the same has to be rectified by the contractor at his cost. If any equipment / part is required to be

TECHNICAL CONDITIONS OF CONTRACT (TCC)

inspected during pre-commissioning and commissioning, the contractor will dismantle / open up the equipment / part and reassemble / redo the work without any extra claim.

- 1.18.6 During commissioning, opening / closing of valves, changing of gaskets, Re-alignment of rotating and other equipment, attending to leakage and adjustments of erected equipment may arise. The contractor has to carry out these works at his cost by providing required manpower in all the three shifts. The finally accepted price / rates shall also include all such work.
- 1.18.7 The valves will have to be checked, cleaned or overhauled in full or in part before erection, after acid cleaning, steam blowing and during commissioning as may be necessary.
- 1.18.8 The contractor shall carry out cleaning and servicing of valves and valve actuators prior to pre-commissioning tests and / or trial operations of the plant. A system for recording of such servicing operations shall be developed and maintained in a manner acceptable to BHEL Engineer to ensure that no valves and valve actuators are left un-serviced. Wherever necessary as required by BHEL Engineer, the contractor shall arrange to lap / grind valve seats.
- 1.18.9 Transportation of oil drums from customer's BHEL's stores, filling of lubricants and filling of oil for flushing and first filling and subsequent topping up during commissioning and post commissioning is included in the scope of this contract. The contractor shall have to return all the empty drums to the customer / BHEL stores. Similarly transport of chemicals for various pre-commissioning activities / processes mentioned in the above clauses and returning of remaining and / or the empty containers of the chemicals to customer / BHEL stores is the responsibility of the contractor.
- 1.18.10 During the initial stages of work, trenches for draining water may not be available for alkali flushing or mass flushing for discharging and draining the system and piping. Necessary low point drains and temporary piping for this will have to be erected by contractor from materials provided by BHEL.
- 1.18.11 Overhauling, cleaning, Servicing of tanks, pumps, equipments, valves, during erection and commissioning stages are in the scope of work.
- 1.18.12 Contractor may have to replace old / damaged gaskets / packing etc. for equipments and the same shall be carried out by contractor as per requirement. Gaskets packing required for replacement will be provided free of cost by BHEL.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.18.13 In case any erection defect is detected during tests, trial runs and commissioning such as loose components undue noises or vibration strain on connected equipment steam or oil or water leakage etc. the contractor shall immediately attend these defects and take necessary corrective measures. The parts to be replaced shall be provided by BHEL free of cost. If the insulation is to be removed to attend any of the defects the cost of removal and reapplication of insulation should be borne by the contractor.
- 1.18.14 All temporary supports shall be removed in such ways that pipe supports are not subjected to any sudden load. During hydraulic testing of pipes, all piping having variable spring type supports shall be held securely in place by temporary means while constant spring type support hangers shall be pinned or blocked solid during the test.
- 1.18.15 The contractor shall carryout the required tests on the equipments and the pipelines such as gas tightness test / air tightness test, kerosene test, hydrostatic testing of the equipment/piping etc., and rectify all the defects caused due to contractor's fault at his own cost. Compressed air for pneumatic testing is to be arranged by contractor.
- 1.18.16 The contractor shall carryout any other test as desired by BHEL Engineer on erected equipment covered under the scope of this contract during testing, pre-commissioning, commissioning, and operation, to demonstrate the completion of any part or whole work performed by the contractor.
- 1.18.17 All the tests shall be repeated till all the equipment satisfy the requirement of BHEL / Customer. As far as the hydraulic pressure test is concerned and same shall be conducted to the satisfaction of Boiler Inspector wherever applicable. Any rectifications required shall have to be done / redone by the contractor at his cost.
- 1.18.18 All required tests (Mechanical and electrical) indicated by BHEL and their clients for successful commissioning are included in the scope of these specifications. These tests / activities may not have been listed in these specifications. Specialized test equipment, if any, shall be provided by BHEL/ its client free of hire charges. However contractor has to take proper care of the equipment issued to him.
- 1.18.19 All the tests may have to be repeated till all the equipment satisfy the requirement / obligation of BHEL at various stages. The contractor shall do all the repairs for site-welded joints arising out of the failure during testing.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.18.20 Contractor shall cut / open works if needed, as per BHEL engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over. This contingency shall be included within the quoted value.
- 1.18.21 Contractor to provide necessary commissioning assistance from pre-commissioning state onwards and up to continuous operation of the unit & handing over to customer. The category of personnel to be as per site requirement and to meet the various pre-commissioning and commissioning programmes made to achieve the schedule agreed with customer.
- 1.18.22 It is the responsibility of the contractor to provide necessary manpower, tools, tackles and consumable till the completion of work under these specifications including for trial operation, even if commissioning of Unit and the other equipments is delayed due to reasons not attributable to the contractor.
- 1.18.23 After synchronization, the commissioning activities will continue. It shall be the responsibility of the contractor to provide manpower including necessary consumables, hand tools and supervision as part of commissioning assistance for a period of six months or till handing over of sets to customer, which ever is earlier.
- 1.18.24 It shall be specifically noted that the contractor and employees of the contractor may have to work round the clock during the pre-commissioning, commissioning and post-commissioning period along with BHEL Engineers / customer officials. Hence contractor's quoted rate shall take into consideration of all expenses that will be incurred for such arrangement of personnel including engineers / supervisors.
- 1.18.25 The valves, dampers, actuators etc. will have to be checked cleaned and overhauled in full or in part before erection, after acid cleaning, steam blowing and during commissioning as maybe necessary.
- 1.18.26 During commissioning any improvement / repair / rework / rectification / fabrication / modification due to design improvement / requirement is involved, the same shall be carried out by the contractor promptly and expeditiously.
- 1.18.27 Contractor at his cost shall lay all necessary temporary piping, install the pumps, blanks ,valves pressure gauges etc required for the test,. Contractor shall also lay the temporary pipelines with fittings, accessories and erection / commission pumps, tanks and other installations as instructed by BHEL Engineer for the purpose of chemical cleaning / alkali flushing / steam blowing / steam washing / steam flushing / water flushing / water washing / oil flushing etc., of piping and other equipments. Necessary, materials for this will be provided by BHEL.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Temporary piping, fittings, accessories, pumps, valves, flanges, blanks etc shall be removed by him and returned to BHEL.

- 1.18.28 Chemical cleaning will involve the installation of temporary piping, valves, cutting of some of the existing valves, placing the rubber for chemical and for mixing. Necessary temporary access platforms to mixing tank are to be made by the contractor. The dissolving tank, neutralizing tank etc. required for acid pickling will have to be fabricated by the contractor. Required materials will be provided by BHEL free of cost.
- 1.18.29 After the chemical cleaning has been successfully completed, removing all temporary piping, fittings of tanks etc., Checking all the valves for any accumulation of foreign materials, welding the valves, pipes which were cut and cleaning, re-fixing as per BHEL Engineer's instructions is within the scope of work/ specification.
- 1.18.30 Overhauling / cleaning / servicing of valves, pumps, fittings in temporary system and acid cleaning tanks etc prior to the above operations / activities will also be carried by the contractor at his cost.
- 1.18.31 Replacing / changing mechanical / other seals, removal and cleaning / replacing of filters etc. during pre-commissioning / commissioning stage is within the scope of work.
- 1.18.32 Replacing / Cleaning and servicing of all the filters / strainers of the erected equipments during pre-commissioning / commissioning stage, in the system shall be done by the contractor within the accepted price.
- 1.18.33 The contractor shall make all necessary arrangements including making of temporary closures / dummy on piping / equipment for carrying out the hydrostatic testing on all piping, equipment covered in the specification at no extra cost.
- 1.18.34 Hanger adjustment / re adjustment during erection, before and after Hydraulic Test, before and after steam blowing, during and after full load operation, are to be carried out by the contractor within Quoted Rate.
- 1.18.35 Cleaning of oil tank as per the instructions of BHEL Engineer before and after oil flushing is responsibility of the contractor.
- 1.18.36 Pre commissioning of oil lines includes oil flushing of the pipelines till the entire system and the pipelines are accepted as satisfactorily cleaned after inspection of sediments in the centrifuge bowl and laboratory tests of the oil samples taken

TECHNICAL CONDITIONS OF CONTRACT (TCC)

from the system. After declaration of complete oil flushing of system including oil tank and coolers shall be completely drained thoroughly cleaned and refilled with fresh oil for putting the set on operation. Before commissioning of oil system the pipelines should be hydraulically tested using the hydraulic test pump to the required pressure.

- 1.18.37 All shaft journals and bearings shall be periodically inspected and preservation shall be done as per BHEL Engineer's instructions.
- 1.18.38 The contractor shall carry out the trial run of motors including checking the direction of rotation in the uncoupled condition checking aligning and coupling the motor to the respective driven equipment. Before starting the motor, IR values of insulation shall be recorded and if found necessary the contractor shall dry out to improve the IR value at no extra cost.
- 1.18.39 In case any erection defect is detected during various tests / operations trial runs as detailed above such as loose components undue noises or vibration strain on connected equipment steam or oil or water leakage etc. the contractor shall immediately attend these defects and take necessary corrective measures. If any readjustment and realignments are necessary the same shall be done as per BHEL Engineer's instructions. If any part needs repairs rectification and replacement the same shall be done by the contractor at no extra cost. The parts to be replaced shall be provided by BHEL free of cost. If insulation is to be removed to attend any of the defects the cost of removal and reapplication of insulation should be borne by the contractor.
- 1.18.40 All the lubricant oils for flushing and during trial run of the equipment including first fill up, chemicals for detergent flushing, acid pickling / cleaning / trial run, **Chemicals required for R.O. System, etc.**, will be arranged by BHEL free of cost. Required manpower shall be provided by the contractor for handling, filling, emptying and re-filling etc., as part of the work without any extra cost, till the unit is handed over. Transportation of all the above shall be arranged by the contractor from BHEL store / yard to work site and returning of the empty barrels / drums to stores at his cost. Care should be taken to avoid any spillage / wastage.
- 1.18.41 Necessary scaffolding and approaches for carrying out / conducting all the above shall also be within the scope of the contract.

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PART- I CHAPTER-XIX PAINTING

The scope of the work will comprise of but not limited to the following:

1.19 FINAL PAINTING

- 1.19.1 The scope of work shall also include supply and application of final painting of all the piping, components, other equipments etc., erected under the scope of this tender. The painting shall be as required and specified in the **painting schedule** for power plant equipment, structures, piping etc. which forms the part of this tender book.
- 1.19.2 In the case of steel fabricated items, raw steel after fabrication has to be cleaned and subsequent painting to be carried out.
- 1.19.3 All the exposed metal parts of the equipments including piping, structures, hangers etc., wherever applicable after installation unless otherwise specified the surface protected, are to be first painted with at least one coat of suitable primer and required number of finish coats as indicated in the Painting Specification which matches the shop primer paint used, after thoroughly cleaning the dust, rust, scales, grease oil, and other foreign materials by wire brushing scrapping and chemical cleaning and the same being inspected and approved by BHEL engineers for painting. Afterwards the above parts shall be finished with as per the instructions of BHEL/Customer official.
- 1.19.4 All welded joints should be painted with anti-corrosive paint, once radiography and stress relieving works are over.
- 1.19.5 Paint shall be applied by brushing or by spray painting as per the instruction of BHEL Engineer. It shall be ensured that brush marks are minimal.
- 1.19.6 If needed and insisted either by BHEL / Customer in certain cases, spray painting has to be carried out within the Quoted rates. Spray painting gun and compressed air arrangement has to be made by the contractor himself.
- 1.19.7 Before applying the subsequent coats the thickness of each coat shall be measured and recorded with BHEL / Customer.
- 1.19.8 Paint used shall be stirred frequently to keep the pigment in suspension. Paint shall be of the ready mix type in original sealed containers as packed by the paint manufacturer. No thinners shall be permitted. Paint manufacturers instructions shall be followed in method of application, handling, drying time etc.,
- 1.19.9 The scope of painting includes application of colour bands, lettering the names of the systems equipments; tag Nos of valves, marking the directions of flow and other data required by BHEL within the quoted rate.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.19.10 All surfaces shall be thoroughly cleaned, free from scales, dirt and other foreign matter. Each coat shall be applied in an even & uniform film free from lumps, streaks, runs, sags and uncoated spots. Each coat (Primer, intermediate, finish) shall have a minimum thickness of dry film thickness (DFT) in microns and the DFT of finish paint shall not be less than the specified. Necessary instrument for measuring the thickness of paint applied is to be arranged by the contractor.
- 1.19.11 Finish coat paint, No of coat and DFT shall be as indicated in the painting specification enclosed in this tender / relevant BHEL document/ customer's specifications. The painting specification which is forming part of this tender as in TCC shall be used as guidelines to be followed.
- 1.19.12 The actual colour to be applied shall be approved by the customer before starting of actual painting work.
- 1.19.13 Primer & finish paint shall be of reputed paint supplier approved by BHEL / Customer. Contractor has to procure paints from the **BHEL / Customer approved agencies** only, and the paints should be as per the customer painting specification. The quality of the finish paint shall be as per the standards of IS or equivalent as approved by BHEL / Customer. Before procurement of paint the contractor has to obtain the clearance from BHEL authorities.
- 1.19.14 No paint shall be applied when the surface temp is above 55 deg. Centigrade or below 10 deg. Centigrade, and when the humidity is greater than 90% to cause condensation on the surface or frost / foggy weather.
- 1.19.15 Before commencement of final painting, contractor has to obtain written clearance from BHEL / Customer for effective completion of surface preparation.
- 1.19.16 Before applying the subsequent coats, the thickness of each coat shall be measured and recorded with BHEL / Customer.
- 1.19.17 PRESERVATION / TOUCH UP PAINTING
- 1.19.17.1 Contractor shall carryout cleaning and preservation / touch up painting for the materials / equipments under this tender specification right from pre-assembly stage to till the equipment is cleared for final painting.
- 1.19.17.2 Any equipment which has been given the shop coat of primer shall be carefully examined after its erection in the field and shall be treated with touch up coat of red oxide primer wherever the shop coat has been abraded, removed or damaged during transit / erection, or defaced during welding.
- 1.19.17.3 Mostly the equipment / items/ components will be supplied as finish painted. However during storage and handling, the same may get peeled off / deteriorate. All such surfaces are to be thoroughly cleaned and to be touch up painted with suitable approved primer and finish paint matching with shop paint / approved final colour.

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PART- II CHAPTER -1 REVERSE AUCTION PROCEDURE

GENERAL TERMS AND CONDITIONS OF REVERSE AUCTION

Against this NIT for the subject work, tender shall be processed through “REVERSE AUCTION PROCEDURE” i.e. ON LINE BIDDING on INTERNET.

1. For the proposed reverse auction, technically and commercially acceptable bidders only shall be eligible to participate.
2. BHEL will engage the services of a service provider who will provide all necessary training and assistance before commencement of on line bidding on Internet.
3. BHEL will inform the vendor in writing in case reverse auction, the details of service provider to enable them to contact and get trained.
4. Business rules like event date, time, start price, bid decrement, extensions, etc. also will be communicated through service provider for compliance.
5. Vendors have to fax the compliance form in the prescribed (provided by service provider) before start of Reverse auction. Without this the vendor will not be eligible to participate in the event.
6. BHEL will provide the calculation sheet (e.g.: EXCEL sheet) which will help to arrive at “Total Cost to BHEL”.
7. Reverse auction will be conducted on schedule date & time.
8. At the end of reverse auction event, the lowest bidder value will be known on the network.
9. The lowest bidder has to fax the duly signed filled-in prescribed format as provided on case-to-case basis to BHEL through service provider within 24 hours of action without fail.
10. During Reverse Auction, the process of reverse auction is unsuccessful then BHEL at its discretion may decide to call the L1 bidder of reverse auction for further negotiation.
11. Sealed bid reverse auction: The opening bid (in the initial auction) of the bidders shall be same as that quoted in their final sealed price submitted to BHEL. The bidder shall confirm in writing to BHEL that their opening bid in both cases shall be same as that quoted in their final sealed price bids submitted to BHEL against this NIT along with Technical bid.
12. BHEL reserves the right to cancel Reverse Auction (RA) without assigning any reasons and resort to considering the sealed bids submitted by vendor for processing and finalizing the tender.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

13. Any variation between the on-line bid value and signed document will be considered as sabotaging the tender process and will invite disqualification of vender to conduct business with BHEL as per prevailing procedure.
14. In case BHEL decides not to go for Reverse auction procedure for this tender enquiry, the price bids and price impacts, if any already submitted and available with BHEL shall be opened as per BHEL standard practice.
15. Bids given by the bidders during the reverse auction process will be taken as an offer to execute the work. Bids once made by the bidder, cannot be cancelled/withdrawn and bidders shall be bound to execute the work as mentioned above at the final bid price. BHEL shall take appropriate action as the lowest bidder do not execute the contract as per the rates quoted by him.

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PART – II CHAPTER 2 PAINTING SCHEDULE

2.2.1 SCOPE

This section covers the painting requirements for the power plant equipment, structures, piping etc. and any other surface required to be painted.

2.2.2 CODES AND STANDARDS

Painting of equipment shall be carried out as per the specifications indicated below and shall conform to the relevant IS specification for the material and workmanship.

The following Indian Standards may be referred to for carrying out the painting job:

| | |
|-----------|--|
| IS : 5 | Colours for ready mixed paints and enamels |
| IS : 1303 | Glossary of terms relating to paints |
| IS : 2379 | Colour code for identification of pipelines |
| IS : 1477 | Code of practice for painting of ferrous metals in buildings (Parts I & II) |
| IS : 2524 | Code of practice for painting of non-ferrous metals in buildings (Parts I & II) |
| IS : 2395 | Code of practice for painting of concrete, masonry and plaster surfaces (Parts I & II) |
| IS : 2338 | Code of practice for finishing of wood and wood based materials (Parts I & II) |
| IS : 6278 | Code of practice for white washing and colour Washing |
| IS : 3140 | Code of practice for painting asbestos cement building Products |
| IS : 158 | Ready mixed paint, brushing, bituminous, black , lead-free, acid, alkali, water and heat resisting |
| IS : 2074 | Ready mixed paint, air drying, red Oxide Zinc Chrome priming |
| IS : 104 | Ready mixed paint, brushing, Zinc Chrome, priming |
| IS : 2932 | Enamel, synthetic, exterior (a) undercoating (b) finishing |

2.2.3 PREPARTION OF SURFACES

All surfaces to be painted shall be thoroughly cleaned of all grease, oil, loose mill scale, dust, rust and any other foreign matter. Mechanical cleaning by power tool and scrapping with steel wire brushes shall be adopted to clear the surfaces. However, in certain locations where power tool cleaning cannot be carried out,

TECHNICAL CONDITIONS OF CONTRACT (TCC)

sand scrapping may be permitted with steel wire brushes and/or abrasive paper. Cleaning with solvents shall be resorted to only in such areas where other methods specified above have not achieved the desired results. Cleaning with solvents shall be adopted only after written approval of the **OWNER / OWNER REPRESENTATIVE**.

2.2.4 PRIMER PAINT

After the surface is prepared, one coat of Zinc Phosphate primer conforming to IS: 2074 shall be applied. After this first coat is dried up completely, second coat of red oxide primer shall be applied. Primer shall be applied by brushing to ensure a continuous film without 'holidays'. The dry film thickness of each coat shall be minimum 30 microns.

2.2.5 FINISH PAINT

Synthetic enamel paint conforming to IS:2932 shall be used for finish coats. The colour/shade shall be as approved by the **OWNER**. After cleaning the dust on the dried up primer, first coat of synthetic enamel shall be applied. After this first coat dries up hard, the surface is wet scrubbed cutting down to a smooth finish and ensuring that at no place the first coat is completely removed. After allowing the water to get evaporated completely, the second finish coat of synthetic enamel paint shall be applied.

2.2.6 SUGGESTED COLOUR CODES FOR PAINTING

| Sl. No. | ITEM/SERVICE | COLOUR | IS-5 Grade | COLOUR (BAND) | IS-5 |
|---------|---|------------|------------|---------------|------|
| 1.0 | Tanks (with out insulation and cladding) | | | | |
| 1.1 | Outdoor | Aluminium | - | - | - |
| 1.2 | Indoor | Light grey | 631 | - | - |
| 2.0 | Vessels & all other proprietary equipment (without insulation & cladding) | Light grey | 631 | - | - |
| 3.0 | Piping (without insulation and cladding) | | | | |
| 3.1 | Water System | | | | |
| | Boiler feed | Sea green | 217 | - | - |
| | Condensate | Sea green | 217 | Light brown | 410 |
| | D M Water | Sea green | 217 | Light orange | 557 |
| | Soft water | Sea green | 217 | French blue | 166 |
| | Bearing cooling water | Sea green | 217 | French blue | 166 |

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| Sl. No. | ITEM/SERVICE | COLOUR | IS-5 Grade | COLOUR (BAND) | IS-5 |
|---------|---------------------------|---------------|------------|-----------------|------|
| | Potable & filtered water | Sea green | 217 | French blue | 166 |
| | Service & clarified water | Sea green | 217 | French blue | 166 |
| | Raw water | Sea green | 217 | White | - |
| | Cooling water | Sea green | 217 | French blue | 166 |
| 3.2 | Air system | | | | |
| | Station air | Sky blue | 101 | - | - |
| | Control air | Sky blue | 101 | White | - |
| 3.3 | Oil system | | | | |
| | Fuel oil | Light brown | 410 | French | 166 |
| | Light oil | Light brown | 410 | Brilliant green | 221 |
| | Lubricating oil | Light brown | 410 | Light grey | 631 |
| | Transformer oil | Light brown | 410 | Light orange | 557 |
| 3.4 | Gas system | | | | |
| | Carbon dioxide | Canary yellow | 309 | Light grey | 631 |
| | Hydrogen | Canary yellow | 309 | Signal red | 537 |
| 3.5 | Fire services | Fire red | 536 | - | |
| 3.7 | Vaccum pipes | Sky blue | 101 | Black | |
| 3.9 | Drainage | Black | - | - | |

Notes:

1. This colour code basically refers to IS 2379 for piping with necessary modifications.
2. wherever band colour is specified ,the same shall be provided at 30 metre intervals on long uninterrupted lines and also adjacent to valves and junctions.

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PART – II CHAPTER 3 to 4

In the next 07 pages as below

| | |
|---------------------------|----------|
| Erection Welding Schedule | 05 pages |
| WPS, HT, NDT FOR EWS | 02 pages |



ERECTION WELDING SCHEDULE

PROJECT : NORTH CHENNAI 2 X 600 MW.

PGMA : 80-463

CUST. No. : 6996 & 7016

PGMA DESC : TG AUX COOLING WATER

ASSY. DRG. NO. : 0-80-463-XXXXX

| SL No. | MATERIAL SPECN.1 | PIPE SIZE | | TOTAL No. OF JOINTS | WELD SPECN. | TOTAL LENGTH OF WELD (in m) | RECOMMENDED ELECTRODE / WIRE | | | | REMARKS |
|--------|--------------------------|------------|-------------|---------------------|-------------|-----------------------------|------------------------------|--------------|-----------|-----------|---------|
| | MATERIAL SPECN.2 | OD (in mm) | THK (in mm) | | | | SPECN. (ATTEST) | ARC/GAS/TIG. | SIZE (mm) | QUANTITY | |
| 1 | SA312TP321 | 273.0 | 9.27 | 27 | 9.27√ | -- | RT347 | TIG | Ø2.50 | 2349.0gms | |
| | SA312TP321 SA403WP321 | | | | | | ARC | Ø2.50 | 540No's | | |
| 2 | SA312TP321 | 168.3 | 7.11 | 46 | 7.1√ | -- | RT347 | TIG | Ø2.50 | 2438.0gms | |
| | SA312TP321 SA403WP321 | | | | | | ARC | Ø2.50 | 690No's | | |
| 3 | SA312TP321 | 73.0 | 5.16 | 28 | 5.2√ | -- | RT347 | TIG | Ø2.50 | 442.4gms | |
| | SA312TP321 SA403WP321 | | | | | | ARC | Ø2.50 | 336No's | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED/CHECKED

APPROVED

APPROVED BY QA

DATE

DRAWING No.:

REV.

VENKAT

K.V.RAMANI

06/08/10

4-80-463-71423

SHEET: 1 of 1

00



DD01

ERECTION WELDING SCHEDULE

PROJECT : NORTH CHENNAI THERMAL POWER STATION
2X600MW STAGE-II UNIT 1&2

PGMA : 80-463

CUST. No. : 6996 & 7016

PGMA DESC : SERVICE WATER PIPING

ASSY. DRG. NO. : -

| SL No. | MATERIAL SPECN.1 MATERIAL SPECN.2 | PIPE SIZE | | TOTAL No. OF JOINTS | WELD SPECN. | TOTAL LENGTH OF WELD (in m) | RECOMMENDED ELECTRODE / WIRE | | | REMARKS | |
|--------|--------------------------------------|------------|-------------|---------------------|-------------|-----------------------------|------------------------------|--------------|----------------|------------------------|----------|
| | | OD (in mm) | THK (in mm) | | | | SPECN. (ATTEST) | ARC/GAS/TIG. | SIZE (mm) | | QUANTITY |
| 01 | IS3589 | 610 | 8 | 341 | 8 ∇ | -- | E7018 E7018 | ARC ARC | ∅2.50 ∅3.15 | 47058No's 24552No's | |
| | IS3589 | | | | | | | | | | |
| 02 | IS3589 | 813 | 8 | 16 | 8 ∇ | -- | E7018 E7018 | ARC ARC | ∅2.50 ∅3.15 | 1440No's 1536No's | |
| | IS3589 | | | | | | | | | | |
| 03 | IS3589 | 115 | 5.4 | 168 | 5.4 ∇ | -- | E6013 | ARC | ∅2.50 | 3024No's | |
| | IS3589 | | | | | | | | | | |
| 04 | IS3589 | 457.2 | 6.30 | 74 | 6.3 ∇ | -- | E7018 E7018 | ARC ARC | ∅2.50 ∅3.15 | 3774No's 1628No's | |
| | IS3589 | | | | | | | | | | |
| 05 | IS3589 | 219.1 | 6.3 | 446 | 6.3 ∇ | -- | E7018 | ARC | ∅2.50 | 40140No's | |
| | IS3589 | | | | | | | | | | |

NOTE : FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

| | | | | | |
|--------------------------------|-----------------------------|---------------------------|------------------|---------------------------------|------------|
| PREPARED BY <i>JITENDRA</i> | CHECKED BY <i>VENKAT</i> | APPROVED BY K.V.RAMANI | DATE 17/08/10 | DRAWING No. : 4-80-463-71423 | REV. 00 |
| | | | | SHEET: 1 of 3 | |



DD01

ERECTION WELDING SCHEDULEPROJECT : NORTH CHENNAI THERMAL POWER STATION
2X600MW STAGE-II UNIT 1&2

PGMA : 80-463

CUST. No. : 6996 & 7016

PGMA DESC : SERVICE WATER PIPING

ASSY. DRG. NO. : -

| SL No. | MATERIAL SPECN.1 MATERIAL SPECN.2 | PIPE SIZE | | TOTAL No. OF JOINTS | WELD SPECN. | TOTAL LENGTH OF WELD (in m) | RECOMMENDED ELECTRODE / WIRE | | | REMARKS | |
|--------|--------------------------------------|------------|-------------|---------------------|-------------|-----------------------------|------------------------------|--------------|-----------|-----------|----------|
| | | OD (in mm) | THK (in mm) | | | | SPECN. (ATTEST) | ARC/GAS/TIG. | SIZE (mm) | | QUANTITY |
| 06 | IS3589 | 323.9 | 5.60 | 262 | 5.6√ | --- | E7018 | ARC | Ø2.50 | 6288No's | |
| | IS3589 | | | | | | E7018 | ARC | Ø3.15 | 6288No's | |
| 07 | IS3589 | 406.4 | 6.3 | 75 | 6.3√ | --- | E7018 | ARC | Ø2.50 | 3375No's | |
| | IS3589 | | | | | | E7018 | ARC | Ø3.15 | 1575No's | |
| 08 | IS3589 | 273 | 6.3 | 80 | 6.3√ | --- | E7018 | ARC | Ø2.50 | 2400No's | |
| | IS3589 | | | | | | E7018 | ARC | Ø3.15 | 720No's | |
| 09 | IS1239 | 168.3 | 7.11 | 220 | 7.11√ | --- | E7018 | ARC | Ø2.50 | 3300No's | |
| | IS1239 | | | | | | E7018 | ARC | Ø3.15 | 2420No's | |
| 10 | IS1239 | 76.6 | 4.5 | 1016 | 4.5√ | --- | E7018 | ARC | Ø2.50 | 10160No's | |
| | IS1239 | | | | | | | | | | |

NOTE : FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

| | | | | | |
|--------------------------------|-----------------------------|---------------------------|------------------|--------------------------------|------------|
| PREPARED BY <i>JITENDRA</i> | CHECKED BY <i>VENKAT</i> | APPROVED BY K.V.RAMANI | DATE 17/08/10 | DRAWING No.: 4-80-463-71423 | REV. 00 |
| | | | | SHEET: 2 of 3 | |



DD01

ERECTION WELDING SCHEDULE

PROJECT : NORTH CHENNAI THERMAL POWER STATION
2X600MW STAGE-II UNIT 1&2

PGMA : 80-463

CUST. No. : 6996 & 7016

PGMA DESC : SERVICE WATER PIPING

ASSY. DRG. NO. : -

| SL No. | MATERIAL SPECN.1 MATERIAL SPECN.2 | PIPE SIZE | | TOTAL No. OF JOINTS | WELD SPECN. | TOTAL LENGTH OF WELD (in m) | RECOMMENDED ELECTRODE / WIRE | | | REMARKS | |
|--------|--------------------------------------|------------|-------------|---------------------|-------------|-----------------------------|------------------------------|--------------|----------------|----------------------|----------|
| | | OD (in mm) | THK (in mm) | | | | SPECN. (ATTEST) | ARC/GAS/TIG. | SIZE (mm) | | QUANTITY |
| 11 | IS1239 | 34.2 | 4.0 | 70 | 4.0√ | -- | E6013 | ARC | Ø2.50 | 153No's | |
| | IS1239 | | | | | | | | | | |
| 12 | IS1239 | 60.8 | 4.5 | 66 | 4.5√ | -- | E6013 | ARC | Ø2.50 | 990No's | |
| | IS1239 | | | | | | | | | | |
| 13 | IS3589 | 355.6 | 5.6 | 87 | 5.6√ | -- | E7018 E7018 | ARC ARC | Ø2.50 Ø3.15 | 2349No's 2349No's | |
| | IS3589 | | | | | | | | | | |
| 14 | SA312TP304H | 48.26 | 3.28 | 52 | 3.28√ | -- | RT347 E347 | TIG ARC | Ø2.40 Ø2.50 | 289gms 223No's | |
| | SA312TP304H | | | | | | | | | | |
| | SA312TP304H | | | | | | | | | | |

NOTE : FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED BY

JITENDRA

CHECKED BY

VENKAT

APPROVED BY

K.V.RAMANI

DATE

17/08/10

DRAWING No.:

4-80-463-71423

REV.

00

SHEET: 3 of 3



ERECTION WELDING SCHEDULE

PROJECT : NORTH CHENNAI 2 X 600 MW.

PGMA : 80-477

CUST. No. : 6996 & 7016

PGMA DESC : SERVICE WATER PIPING

ASSY. DRG. NO. : 0-80-477-XXXXX

| SL No. | MATERIAL SPECN.1 | PIPE SIZE | | TOTAL No. OF JOINTS | WELD SPECN. | TOTAL LENGTH OF WELD (in m) | RECOMMENDED ELECTRODE / WIRE | | | | REMARKS |
|--------|--------------------------|------------|-------------|---------------------|-------------|-----------------------------|------------------------------|--------------|-----------|-----------|---------|
| | MATERIAL SPECN.2 | OD (in mm) | THK (in mm) | | | | SPECN. (ATTEST) | ARC/GAS/TIG. | SIZE (mm) | QUANTITY | |
| 1 | SA312TP321 | 323.9 | 4.57 | 76 | 4.57√ | -- | RT347 | TIG | Ø2.50 | 8132.0gms | |
| | SA312TP321 SA403WP321 | | | | | | ARC | Ø2.50 | 1824No's | | |
| 2 | SA312TP321 | 219.1 | 3.76 | 13 | 3.76√ | -- | RT347 | TIG | Ø2.50 | 923.0gms | |
| | SA312TP321 SA403WP321 | | | | | | ARC | Ø2.50 | 481No's | | |
| 3 | SA312TP321 | 168.3 | 3.4 | 19 | 3.4√ | -- | RT347 | TIG | Ø2.50 | 1026.0gms | |
| | SA312TP321 SA403WP321 | | | | | | ARC | Ø2.50 | 513No's | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

FOR WPS, HEAT TREATMENT AND NDT REQUIREMENTS, THE STANDARD DOCUMENT ISSUED VIDE STANDARD DRG. NO. 4-80-999-93172 AND 4-80-999-93173 SHALL BE REFERRED.

PREPARED/CHECKED

APPROVED

APPROVED BY QA

DATE

DRAWING No.:

REV.

VENKAT

K.V.RAMANI

06/08/10

4-80-477-71422

SHEET: 1 of 1

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ALL DIMENSIONS ARE IN MILLIMETRES

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| REV | DATE | ALTERED | REV | DATE | ALTERED | REV | DATE | ALTERED | | | | | | | |
|-----|------|----------------------------|-----|------|-----------------|--------------|--------------|----------------------|-----------------|--------------|-------------|-----------------|-------------------|-------------------------------------|--------------------------------|
| 01 | | APPROVED | | | APPROVED | | | APPROVED | | | | | | | |
| | | Material Spec 1 | | | Material Spec 2 | OD (Minimum) | OD (Maximum) | Thick ness (Minimum) | Thick (Maximum) | Type of Weld | WPS No. | Pre heat Deg. C | PWHT Temp. Deg. C | Holding time per mm thick (minutes) | Holding time minimum (minutes) |
| | | SA106 Gr B | | | SA106 Gr B | Unl | Unl | 1.6 | 19 | G | 1003 | NIL | NIL | NIL | NIL |
| | | SA106 Gr B | | | SA106 Gr B | Unl | Unl | 20 | 25 | G | 1004 | NIL | 610+15 | 2.5 | 30 |
| | | SA106 Gr B | | | SA106 Gr B | Unl | Unl | 26 | 74 | G | 1004 | 100 | 610+15 | 2.5 | 30 |
| | | SA106 Gr B | | | SA106 Gr B | Unl | Unl | 75 | 200 | G | 1004 | 150 | 610+15 | 2.5 | 30 |
| | | SA106 Gr B | | | SA106 Gr C | Unl | Unl | 1.6 | 19 | G | 1003 | NIL | NIL | NIL | NIL |
| | | SA106 Gr B | | | SA106 Gr C | Unl | Unl | 20 | 25 | G | 1004 | NIL | 610+15 | 2.5 | 30 |
| | | SA106 Gr B | | | SA106 Gr C | Unl | Unl | 26 | 74 | G | 1004 | 100 | 610+15 | 2.5 | 30 |
| | | SA106 Gr B | | | SA106 Gr C | Unl | Unl | 75 | 200 | G | 1004 | 150 | 610+15 | 2.5 | 30 |
| | | SA106 Gr B | | | SA335P11 | Unl | Unl | 4.8 | 200 | G | 1033 | 150 | 655+15 | 2.5mts | 120 |
| | | SA106 Gr B | | | SA335 P22 | Unl | Unl | 5 | 46 | G | 1041 | 150 | 695+15 | 2.5 | 30 |
| | | SA106 Gr C | | | SA106 Gr C | Unl | Unl | 1.6 | 19 | G | 1003 | NIL | NIL | NIL | NIL |
| | | SA106 Gr C | | | SA106 Gr C | Unl | Unl | 20 | 25 | G | 1005 | NIL | 635+15 | 2.5 | 30 |
| | | SA106 Gr C | | | SA106 Gr C | Unl | Unl | 26 | 74 | G | 1005 | 100 | 635+15 | 2.5 | 30 |
| | | SA106 Gr C | | | SA106 Gr C | Unl | Unl | 75 | 200 | G | 1005 | 150 | 635+15 | 2.5 | 30 |
| | | SA106 Gr C | | | SA335 P11 | Unl | Unl | 4.8 | 50 | G | 1018 | 150 | 665+15 | 2.5 | |
| | | SA106 Gr C | | | SA335 P22 | Unl | Unl | 5 | 46 | G | 1041 | 150 | 695+15 | 2.5 | 30 |
| | | SA335 P11 | | | SA335P11 | | 127 | 1.6 | 13 | G | 1009 | 125 | NIL | NIL | NIL |
| | | SA335 P11 | | | SA335P11 | >127 | Unl | 14 | 200 | G | 1010 | 150 | 655+15 | 2.5mts | 30 |
| | | SA335 P11 | | | SA335P22 | Unl | Unl | 1.6 | 8 | G | 1011 | 150 | NIL | NIL | NIL |
| | | SA335 P11 | | | SA335 P22 | Unl | Unl | 9 | 200 | G | 1012 | 150 | 700+20 | 2.5 | 60 |
| | | SA335 P22 | | | SA335 P22 | Unl | Unl | 1.6 | 8 | G | 1013 | 150 | NIL | | |
| | | SA335 P22 | | | SA335 P22 | Unl | Unl | 9 | 13 | G | 1014 | NIL | 725+25 | 2.5 | 60 |
| | | SA335 P22 | | | SA335 P22 | Unl | Unl | 14 | 200 | G | 1014 | 150 | 725+25 | 2.5 | 60 |
| | | SA335 P91 | | | SA335 P91 | Unl | Unl | 20 | 200 | G | 1034 | 220 | 760+10 | 2.5 | 120 |
| | | SA335 P91 | | | SA335 P22 | Unl | Unl | 20 | 200 | G | 1035 | 220 | 745+15 | 2.5 | 60 |
| | | GX 12Cr Mo W V Nb N 10-1-1 | | | SA335 P91 | Unl | Unl | 20 | 200 | G | 1034 | 220 | 760+10 | 2.5 | 120 |
| | | GS 17 CrMoV 511 | | | SA335 P22 | ≥110 | | >30 | | G | MSW 72 / 97 | 300 TO 350 | 690+10 (Note3) | | 240 |
| | | GS 22 Mo 4 | | | SA335 P22 | ≥ 88.9 | | 7 | 10 | G | MSW 75 / 97 | 200 | 610+10 | 2.5 | 15 |
| | | G17 CrMo 9 10 | | | SA335 P22 | ≥110 | | >30 | | G | MSW 74 / 97 | 300 TO 350 | 690+10 (Note3) | | 240 |
| | | 21 Cr Mo Ni V47 | | | SA335 P22 | ≥110 | | >30 | | G | MSW 83 / 97 | 300 TO 350 | 690+10 (Note3) | | 240 |
| | | SA312 TP 304H | | | SA312 TP 304H | Unl | Unl | 1.6 | 50 | G | 1032 | NIL | NIL | | |
| | | AISI 321 | | | SA106 Gr B | Unl | Unl | 4.8 | 25 | G | 1025 | NIL | 610+15 | 2.5 | 30 |
| | | AISI 321 | | | SA106 Gr B | Unl | Unl | 26 | 40 | G | 1025 | 150 | 610+15 | 2.5 | 30 |
| | | AISI 321 | | | SA106 Gr C | Unl | Unl | 4.8 | 25 | G | 1025 | NIL | 610+15 | 2.5 | 30 |
| | | AISI 321 | | | SA106 Gr C | Unl | Unl | 26 | 40 | G | 1025 | 150 | 610+15 | 2.5 | 30 |
| | | AISI 321 | | | SA335 P22 | Unl | Unl | 5 | 40 | G | 1024 | 150 on AS side | 700+20 | 2.5 | 60 |
| | | IS 1239 | | | IS 1239 | Unl | Unl | 1.6 | 9 | G | 1001 | NIL | NIL | NIL | NIL |
| | | IS 3589 | | | IS 3589 | Unl | Unl | 4.8 | 25 | G | 1213 | NIL | NIL | | |
| | | IS 3589 | | | IS 3589 | Unl | Unl | 26 | 38 | G | 1213 | 150 | NIL | | |
| | | SA106 Gr B | | | SA106 Gr B | Unl | Unl | - | 19 | F | 1021 | NIL | NIL | | |
| | | SA106 Gr B | | | SA106 Gr C | Unl | Unl | - | 19 | F | 1021 | NIL | NIL | | |
| | | SA106 Gr B | | | SA335 P22 | Unl | Unl | - | 8 | F | 1108 | 150 | NIL | | |
| | | SA106 Gr C | | | SA106 Gr C | Unl | Unl | - | 19 | F | 1021 | NIL | NIL | | |
| | | SA106 Gr C | | | SA335 P22 | Unl | Unl | - | 8 | F | 1108 | 150 | NIL | | |
| | | SA335 P11 | | | SA335 P22 | Unl | Unl | - | 8 | F | 1108 | 150 | NIL | | |
| | | SA335 P22 | | | SA335 P22 | Unl | Unl | 14 | Unl | F | 1023 | 150 | 725+25 | 2.5 | 60 |
| | | SA335 P22 | | | SA335 P22 | Unl | Unl | - | 13 | F | 1020 | 150 | NIL | | |
| | | SA312 TP 304H | | | SA182 F 304H | Unl | Unl | Unl | Unl | F | 1029 | NIL | NIL | | |

---Continued in drg 4-80-999-93173



BHARAT HEAVY ELECTRICALS LIMITED
PIPING CENTRE, CHENNAI 600 017

| | | | |
|----------|---------------|-------------|------------|
| PREPARED | CHECKED | APPROVED | DATE |
| R.ANANTH | M.N.VASUDEVAN | P.ELANGOVAN | 15-12-2008 |

WPS,HT,NDT FOR EWS STANDARD 4-80-999-93172 00

Contd in drg 4-80-999-93173 Size A4

| | | | | | | | | |
|-----------|------|---------------------|-----|------|---------------------|-----|------|---------------------|
| REV 01 | DATE | ALTERED APPROVED | REV | DATE | ALTERED APPROVED | REV | DATE | ALTERED APPROVED |
|-----------|------|---------------------|-----|------|---------------------|-----|------|---------------------|

---Continued from drg 4-80-999-93172

Notes:-

- 1 Material specification for pipes is indicated. However, the requirements are applicable to other specification of same P group. (eg.) SA 335 P 91 is to be applied for SA 182 F 91, SA 234 WP 91.
- 2 For SA 335 P91, PWHT shall be done immediately after welding.
- 3 Rate of heating 50 Deg. C per hour; Rate of cooling 30 Deg. C per hour. This is as per BHEL HEEP - Hardwar recommendation.
- 4 OD - "Unl" means unlimited.
- 5 Type of weld: G = Groove (Butt); F = Fillet.
- 6 Groove (Butt) welding WPS may be used for Fillet welding of higher thickness.

| Sl. no | Material Specification (Note 1) | Nb/ thickness mm | Temp.> 400 ^o C or Press > 71 bar \$\$ | IBR Class I Piping (other than than \$\$) @@ | IBR Class II piping ## | Piping other than \$\$, @@, ## |
|--------|---------------------------------|-------------------|--|--|--|--|
| 1 | SA 335 P 91 (Note 2) | All | 100 % UT 100 % MT 100 % Hardness | 100 % UT 100 % MT 100% Hardness | 100 % UT 100 % MT 100 % Hardness | 100 % UT 100 % MT 100 % Hardness |
| 2 | SA 335 P 22/ P11 / P12 | Nb > 50 | 100 % RT 3% Hardness | 100 % RT 3% Hardness | 100 % RT 3% Hardness | 10 % RT 3% Hardness |
| | | Nb ≤ 50 | 100 % RT (Note 7) | 100 % RT (Note 7) | 100 % RT (Note 7) | 10 % RT (Note 7) |
| 3 | SA 106 Gr C/ Gr. B | Thickness > 19 mm | 100 % RT | 100 % RT | 100 % RT | 10 % RT |
| | | Thickness ≤ 19 mm | 100 % RT (Note 7) | 10 % RT | 10 % RT | 10 % RT |
| 4 | SA 312 TP 304 H | All | 100 % RT | 100 % RT | 10 % RT 100 % LPT | 10 % RT 100 % LPT |
| 5 | IS 3589 | All | Not applicable | Not applicable | Not applicable | 10 % RT |
| 6 | IS 1239 | All | Not applicable | Not applicable | Not applicable | 10 % RT |

Notes :-

- 1 Material specification for pipes is indicated. However, the requirements are applicable to other specification of same P group. (eg.) SA 335 P 91 is to be applied for SA 182 F 91, SA 234 WP 91.
- 2 For SA335 P 91, NDE (UT,MT) shall be done after PWHT.
- 3 Additional 100% MT / PT has to be done - when hydrotest could not be carried out for a part of piping (eg. Main steam from ESV to turbine, Lines connected to condenser...).
- 4 Thermowell joints for all systems : 100% RT is applicable.
- 5 MT / PT is applicable for fillet welds and socket welds. Quantum shall be as per RT / UT.
- 6 IBR class I: Temperature > 218 deg C or steam pressure >17.6 kg/sq.cm or Feed Water pressure >24.6 kg/sq.cm. IBR class II: Not exceeding above values.
- 7 Drains & vents piping: 100% RT upto the last root valve. Beyond the last root valve, 10% RT is applicable.



BHARAT HEAVY ELECTRICALS LIMITED
PIPING CENTRE, CHENNAI 600 017

| | | | |
|----------|---------------|-------------|------------|
| PREPARED | CHECKED | APPROVED | DATE |
| R.ANANTH | M.N.VASUDEVAN | P.ELANGOVAN | 15-12-2008 |

WPS,HT,NDT FOR EWS STANDARD 4-80-999-93173 00

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