

TENDER SPECIFICATION

BHEL PSSR SCT 1451

ERECTION, TESTING AND COMMISSIONING OF STEAM
TURBINE, GENERATOR AND ITS AUXILIARIES
FOR 1x500 MWe SET

at

BHAVINI KALPAKKAM PFBR
KALPAKKAM NUCLEAR POWER PROJECT
TAMILNADU

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: 1451

for

Handling at site stores / storage yard, Transportation to site of work, Pre-assembly, Erection, Testing and Commissioning of Steam Turbine, Generator and auxiliaries, and other BOI Including Supply and Application of Final Painting for of 1x500 MWe set at BHAVINI Kalpakkam PFBR, Kalpakkam Nuclear Power Project, TamilNadu

One set of Tender documents consisting of Volume-I and Volume II

BOOK SLNO_____

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

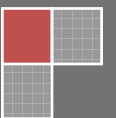
Date:

Rev 00
6th July
2010

NOTICE TENDER

INVITING

Bharat Heavy Electricals Limited



NOTICE INVITING TENDER (NIT)
NOTE: BIDDER MAY DOWNLOAD FROM WEB SITES
OR
PURCHASE TENDERS FROM THIS OFFICE ALSO

=====

BHEL PSSR SCT 1451

DT: 14.03.2011

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 1451	
ii	Broad Scope of job	Handling at site stores / storage yard, Transportation to site of work, Pre-assembly, Erection, Testing and Commissioning of Steam Turbine, Generator and auxiliaries, and other BOI Including Supply and Application of Final Painting for of 1x500 MWe set at BHAVINI Kalpakkam PFBR, Kalpakkam Nuclear Power Project, TamilNadu	
iii	DETAILS OF TENDER DOCUMENT		
a	Volume-IA	<i>Technical Conditions of Contract (TCC) consisting of Scope of work, Technical Specification, Drawings, Procedures, Bill of Quantities, Terms of payment, etc</i>	<i>Applicable</i>
b	Volume-IB	<i>Special Conditions of Contract (SCC)</i>	<i>Applicable</i>
c	Volume-IC	<i>General Conditions of Contract (GCC)</i>	<i>Applicable</i>

d	Volume-ID	<i>Forms and Procedures(F&P)</i>	<i>Applicable</i>
e	Volume-II	<i>Price Schedule (Absolute value).</i>	<i>Applicable</i>
iv	Issue of Tender Documents	<p>1. <u><i>Sale from BHEL PSSR Regional office at :Chennai</i></u> <i>Start : 14.03.2011</i> <i>Closes: 02/04/2011</i></p> <p>2. From BHEL website (www.bhel.com) Tender documents can however be downloaded from website till due date of submission</p>	<i>Applicable</i>
v	DUE DATE & TIME OF OFFER SUBMISSION	<p><i>Date : 04/04/ 2011 , Time :15.00Hrs</i> <i>Place : <u>BHEL PSSR :Chennai</u></i> Tenders can be submitted through representative/in person at SCT Dept, BHEL PSSR, Chennai</p>	<i>Applicable</i>
vi	OPENING OF TENDER	<p><i>Date : 04/04/ 2011, Time :15.30Hrs</i> <i>Notes:</i> (1) <i>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.</i> (2) <i>Bidder may depute representative to witness the opening of tender</i></p>	<i>Applicable</i>
vii	EMD AMOUNT	<i>Rs 2,00,000/- (Rupees Two Lakhs Only)</i>	<i>Applicable</i>
viii	COST OF TENDER	<i>Rs 2000/-</i>	<i>Applicable</i>
ix	LAST DATE FOR SEEKING CLARIFICATION	<p><i>At least 7 days before the due date of offer submission or two days before the scheduled date of prebid meeting whichever is earlier</i> <i>Along with soft version also, addressing to undersigned & to others as per contact address given below</i></p>	<i>Applicable</i>

x	SCHEDULE OF Pre Bid Discussion (PBD)	<i>Date: 28/03/2011,11.00hrs at BHEL PSSR</i>	<i>Applicable.</i>
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	<i>Not Applicable</i>
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><u>Note:</u></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 ph 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.	

	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</p> <p style="text-align: center;"><u>OR</u></p> <p>Documentary evidence for 'One Time EMD' with the Power Sector Region of BHEL floating the Tender</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	
	<u>ENVELOPE-III</u> superscribed as: PART-II (PRICE BID) TENDER NO : NAME OF WORK : PROJECT: DUE DATE OF SUBMISSION: CONTAINING THE FOLLOWING	
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	
	ENVELOPE-IV (MAIN ENVELOPE / OUTER ENVELOPE) superscribed as: TECHNO-COMMERCIAL BID, PRICE BID & EMD TENDER NO: 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 APR 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' = $(X_1 + X_2 + \dots + X_n)$ divided by Ner
- b) PS WR's Rating 'Rwr' = $(X_1 + X_2 + \dots + X_n)$ divided by Nwr
- c) PS SR's Rating 'Rsr' = $(X_1 + X_2 + \dots + X_n)$ divided by Nsr
- d) PS NR's Rating 'Rnr' = $(X_1 + X_2 + \dots + X_n)$ divided by Nnr
- e) Over all Power Sector Region Rating ' R_{BHEL} ' = $(Rer + Rwr + Rsr + Rnr)$ divided by $(Ner + Nwr + Nsr + Nnr)$

(where " $X_1, X_2, X_3, \dots, X_n$ " 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 $\leq 60\%$, "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 Auxilliaries) 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 Price Bids of only those bidders will be opened who will be qualified for the subject job on the basis of 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, Transportation to site of work, Pre-assembly, Erection, Testing and Commissioning of Steam Turbine, Generator and auxiliaries, and other BOI Including Supply and Application of Final Painting for of 1x500 MWe set at BHAVINI Kalpakkam PFBR, Kalpakkam Nuclear Power Project, TamilNadu
TENDER NO	BHEL PSSR SCT 1451

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 APR 2011</u>	
C	Technical The bidders would have executed erection and commissioning of STG works for at least one unit of 190MW or above in any Power Plant in the last seven years preceding the scheduled date of Bid submission. Note: The term executed in the above QR means “the unit is synchronized”.		
D 1	<u>FINANCIAL TURNOVER</u> The bidders should have a minimum average financial turnover of Rs 98.25 Lakhs in last three financial years ending on 31st March 2010		

2	<u>NETWORTH</u> The bidder should have should have positive net worth as on 31.03.2010		
3	<u>PROFIT</u> The bidder should have earned profit in any one of the last three financial years ending on 31.03.2010		
4	Notwithstanding the above, BHEL reserves the right to reject any or all the tenders for the reasons whatsoever beyond our control and the decision of BHEL is final		
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	
	<p>Explanatory Notes for QR 'A'</p> <ol style="list-style-type: none"> 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 		

BIDDER SHALL SUBMIT ABOVE PRE-QUALIFICATION CRITERIA FORMAT, DULY FILLED-IN, SPECIFYING RESPECTIVE ANNEXURE NUMBER AGAINST EACH CRITERIA AND FURNISH RELEVANT DOCUMENT IN THE RESPECTIVE ANNEXURES IN THEIR OFFER INCLUDING THE AUDITED BALANCE SHEET WITH PROFIT AND LOSS ACCOUNT DETAILS FOR THE THREE YEARS PERIOD SPECIFIED ABOVE.

10	Declaration by Authorised Signatory	Applicable	YES/NO
11	Whether No Deviation Certificate submitted	Applicable	YES/NO
12	Whether Declaration confirming knowledge about Site Conditions submitted	Applicable	YES/NO
13	Whether Declaration for relation in BHEL submitted	Applicable	YES/NO
14	Whether Non Disclosure Certificate submitted	Applicable	YES/NO
15	Whether Bank Account Details for E-Payment submitted	Applicable	YES/NO
16	Capacity Evaluation of Bidder for current Tender	Refer SI 9 of NIT	
17	Tie Ups/Consortium Agreement are submitted as per format	Not Applicable	Not Applicable
18	Whether Power of Attorney for Submission of Tender/Signing Contract Agreement submitted	Applicable	YES/NO
19	Whether Analysis of Unit rates submitted	Applicable	YES/NO
20	Unquoted Price bid submitted or not	Applicable	YES/NO

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

AUTHORISED SIGNATORY

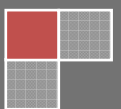
DATE :

(With Name, Designation and Company seal)

Rev 00
6th July
2010

TECHNICAL CONDITIONS OF CONTRACT (TCC)

BHARAT HEAVY ELECTRICALS LIMITED



TECHNICAL CONDITIONS OF CONTRACT (TCC)

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TECHNICAL CONDITIONS OF CONTRACT (TCC)

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TECHNICAL CONDITIONS OF CONTRACT (TCC)

Volume 1A Part-1 Chapter -I PROJECT INFORMATION

BHARATIYA NABHIKIYA VIDYUT NIGAM LTD

1 X 500 MWe STG and Auxiliaries at Kalpakkam

1. Project Name : BHARATIYA NABHIKIYA VIDYUT NIGAM LTD,
(BHAVINI)
2. Project Stage : PFBR, 1X 500 MWe
3. No. of Units x Capacity : 1 x 500 MWe NUCLEAR
4. Project setting up by : BHARATIYA NABHIKIYA VIDYUT NIGAM LTD,
(BHAVINI)
5. LOCATION AND APPROACH : (i) Kalpakkam about 68 KM South of
Chennai on the coast of Bay of Bengal
(ii) Nearest Railway Station Chengelpet about
32 KM from Kalpakkam.
(iii) Nearest Airport Chennai about 47 KM.
(iv) District : KANCHIPURAM
(v) State : Tamil Nadu
6. Nearest Railway Station : i) Chengalpattu on Chennai – Madurai -
Nagercoil route 32 KM from site
ii) Chennai Central Rly Station 68 Kms
7. Nearest Major City & Distance : Chennai 68 KMs.
8. Nearest Airport & Distance : Chennai 47 KMs
9. Nearest Highway & Distance : All weather road from Chennai-Pondicherry
State Highway (ECR) 4 Kms from site.
10. Temperature: (Dry bulb) : Absolute Max. 43.6 °C
: Absolute Min. 17 °C
11. Relative Humidity
Maximum : 100 %
Minimum : 15 %
Average : 80 % (Design)
12. Annual Rainfall : Max. 2112 mm / Average 1312 mm / Min
567 mm.
13. Wind Load : Basic Wind Speed 67 mm/sec. (Max.)
14. Transport:
 - a) By Rail : Broad Gauge Railway line of
Southern Railway
 - b) Road : District High way
15. Seismic Data : Defined as IS: 1893 - 2002

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Volume 1A Part-1 Chapter -II Scope of Works

1.2.0 SCOPE OF WORK

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

- 1.2.1 Handling at site stores / storage yard, Transportation to site of work, Pre-assembly, Erection, Testing and Commissioning of Steam Turbine, Generator and auxiliaries, and other BOI Including Supply and Application of Final Painting for of 1x500 MWe set at BHAVINI Kalpakkam PFBR, Kalpakkam Nuclear Power Project, TamilNadu

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Volume 1A Part-1 Chapter- III

Facilities in the scope of Contractor/BHEL

Sl.No	Description PART I	Scope / to be taken care by		Remarks
		BHEL	Bidder	
1.3.1	ESTABLISHMENT			
1.3.1.1	FOR CONSTRUCTION PURPOSE:			
a	Open space for office (as per availability)	Yes		
b	Open space for storage (as per availability)	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	
1.3.1.2	FOR LIVING PURPOSES OF THE BIDDER			
a	Open space for labour colony (as per availability)		Yes	
b	Labour Colony with internal roads, sanitation, complying with statutory requirements		Yes	
1.3.2.0	ELECTRICITY			On chargeable basis
1.3.2.1	Electricity For construction purposes of Voltage 415/440 V	yes		Refer the relevant clauses for applicable charges
a	Single point source	Yes		
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

SI.No	Description PART I	Scope / to be taken care by		Remarks
		BHEL	Bidder	
c	Duties and deposits including statutory clearances if applicable		Yes	
1.3.2.2	Electricity for the office, stores, canteen etc of the bidder			Refer the relevant clauses for applicable charges
a	Single point source	Yes		
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c	Duties and deposits including statutory clearances if applicable		Yes	
1.3.2.3	Electricity for living accommodation of the bidder's staff, engineers, supervisors etc			
a	Single point source		Yes	
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c	Duties and deposits including statutory clearances if applicable		Yes	
1.3.3.0	WATER SUPPLY			
1.3.3.1	For construction purposes		yes	
a	Making the water available at single point		Yes	
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
1.3.3.2	<u>Water supply for bidder's office, stores, canteen etc</u>			
a	Making the water available at single point		Yes	
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.3.3.3	<u>Water supply for Living Purpose</u>			
a	Making the water available at single point		Yes	
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
1.3.4.0	LIGHTING			
a	For construction work (supply of all the necessary materials) 1. At office/storage area 2. At the preassembly area 3. At the construction site /area		Yes	
b	For construction work (execution of the lighting work/ arrangements) 1. At office/storage area 2. At the preassembly area 3 At the construction site /area		Yes	
c	Providing the necessary consumables like bulbs, switches, etc during the course of project work		Yes	
d	Lighting for the living purposes of the bidder at the colony / quarters		Yes	
1.3.5.0	COMMUNICATION FACILITIES FOR SITE OPERATIONS OF THE BIDDER			
a	Telephone, fax, internet, intranet, e-mail etc		Yes	
1.3.6.0	COMPRESSED AIR wherever required for the work		Yes	
1.3.7.0	Demobilization of all the above facilities		Yes	
1.3.8.0	TRANSPORTATION			
a	For site personnel of the bidder		Yes	
b	For bidder's equipments and consumables (T&P, Consumables etc)		Yes	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

SI.No	Description PART II 1.3.9.0 ERECTION FACILITIES	Scope / to be taken care by		Remarks
		BHEL	Bidder	
1.3.9.1	Engineering works for construction:			
a	Providing the erection drawings for all the equipments covered under this scope	Yes		
b	Drawings for construction methods	Yes	Yes	In consultation with BHEL
c	As-built drawings – wherever deviations observed and executed and also based on the decisions taken at site- example – routing of small bore pipes		YES	”
d	Shipping lists etc for reference and planning the activities	Yes		”
e	Preparation of site erection schedules and other input requirements		Yes	”
f	Review of performance and revision of site erection schedules in order to achieve the end dates and other commitments	Yes	Yes	”
g	Weekly erection schedules based on SI No. e	yes	Yes	”
h	Daily erection / work plan based on SI No. g	yes	Yes	”
i	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	
j	Preparation of preassembly bay		Yes	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

SI.No	Description PART II 1.3.9.0 ERECTION FACILITIES	Scope / to be taken care by		Remarks
		BHEL	Bidder	
k	Laying of racks for gantry crane if provided by BHEL or brought by the contractor/bidder himself			
L	Arranging the materials required for preassembly		YES	

1.3.10 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.

1.3.11 ELECTRICITY:

Electricity will be provided at one point on Chargeable basis at the applicable tariff of BHAVINI-Kalpakkam from the nearest substation. The required energy meter for measuring power consumption will be provided by BHEL and to be installed by the contractor. The contractor shall make his own arrangement for further distribution with necessary isolator / LCB etc., The present tariff rate of BHAVINI-Kalpakkam is

- a. Consumption charges at Rs 3.75 per unit
- b. Fixed charges per month if applicable
- c. Electricity tax as applicable subject to revision from time to time

1.3.11.1 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 and during the initial stages. No separate payment shall be made for this contingency. Any dispute regarding consumption, the BHEL engineer decision will be final.

1.3.11.2 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.

1.3.11.3 Any dispute regarding consumption, the BHEL engineer decision is final.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.3.12 WATER:

Contractor to make his own arrangements for the construction water and further distribution shall be arranged by the contractor at his cost.

1.3.13 CONSUMABLES:

1.3.13.1 Any special electrodes / consumables supplied by the manufacturing units for the respective packages will be issued free of cost. All other consumables, filler wires, electrodes, gas, paint etc. are to be arranged by the contractor at his cost.

1.3.14 WATER DISTRIBUTION:

Distribution of water for construction purpose and as well as drinking purpose to various work-fronts shall be contractor's responsibility at his cost.

1.3.15 ELECTRICITY DISTRIBUTION:

Provision of distribution of electrical power from the given single central point to the required places with proper distribution boards, cables 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. 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.

1.3.16 POSSESSION OF GENERATORS

As there are bound to be interruptions in regular power supply, power cut/ load shedding in any construction sites, suitable extension of time, if found necessary only be given and contractor is not entitled for any compensation. It shall be the responsibility of the tenderer / contractor to provide, and maintain the complete installation on the load side of the supply with due regard to safety requirements at site. It shall be responsibility of the contractor to have at least (2 to 4) diesel operated welding generator sets to get urgent and important work to go on without interruptions. The consumables required to operate the generators are to be provided by tenderers. This may also be noted while quoting.

1.3.17 LIGHTING FACILITY:

Adequate lighting facilities such as flood lamps, hand lamps and area lighting shall be arranged by the contractor at the site of construction, pre assembly yard and contractors material storage area etc. at his cost.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.3.18 POWER REQUIREMENT:

For the purpose of planning, contractor shall furnish along with tender the estimated requirement of power (month wise) for execution of work in terms of maximum KW demand.

1.3.19 CONTRACTOR'S OBLIGATION ON COMPLETION:

On completion of work, all the temporary buildings, structures, pipe lines, cables etc. shall be dismantled and leveled and debris shall be removed as per instructions 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.

1.3.20 GASES:

1.3.20.1 All the required gases like Oxygen / Acetylene / argon / Nitrogen required for construction work shall be supplied by the Contractor at his cost. It shall be the responsibility of the contractor to plan the activities and store sufficient quantity of these gases. Nonavailability of gases cannot be considered as reason for not attaining the required progress.

1.3.20.2 BHEL reserves the right to reject the use of any gas in case required purity is not maintained.

1.3.20.3 The contractor shall submit weekly / fortnightly / monthly statement report regarding consumption of all consumables for cost analysis purposes.

1.3.20.4 The contractor shall ensure safe keeping of the inflammable cylinder at a separate place away from normal habit with proper security etc.

1.3.20.5 All the integral lube and control oil pipelines required TIG welding operations are to be purged with Nitrogen Gas / Argon Gas for the purpose of creating inert atmosphere in the pipelines during the process of TIG welding. Nitrogen, Argon gas required for this purpose shall have to be arranged by the contractor at his cost.

1.3.21 ELECTRODES SUPPLY AND STORAGE

1.3.21.1 It shall be the responsibility of the contractor to obtain prior approval of BHEL, before procurement regarding, suppliers, type of electrodes etc. On receipt of the electrodes at site, it shall be subject to inspection and approval by BHEL. The contractor shall inform BHEL details regarding type of electrodes, batch number and date of expiry etc.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 1.3.21.2 Shortage of any of the electrodes or the equivalent suggested by BHEL shall not be quoted as reason for deficiency in progress or for additional rate.
- 1.3.21.3 Storage of electrodes shall be done in an air conditioned / controlled humidity room as per requirement, at his own cost by the contractor.
- 1.3.21.4 All low hydrogen electrodes shall be baked / dried in the electrode drying oven (range 375 deg. C - 425 deg. C) to the temperature and period specified by the BHEL Engineer before they are used in erection work and each welder should be provided with one portable electrode drying oven at the work spot. Electrode drying oven and portable drying ovens shall be provided by contractor at his cost.
- 1.3.21.5 In case of improper arrangement of procurement of above electrodes BHEL reserves the right to procure the same from any source and recover the cost from the contractor's first subsequent bills at market value plus departmental charges of BHEL communicated from time to time. Postponement of such recovery is not permitted.
- 1.3.21.6 BHEL reserves the right to reject the use of any electrodes at any stage, if found defective because of bad quality, improper storage, date expiry, unapproved type of electrodes etc. It shall be the responsibility of the contractor to replace at his cost without loss of time.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Volume 1A Part-1 Chapter- IV T&Ps provided by BHEL

1.4.0 THE FOLLOWING T & Ps ARE PROVIDED BY BHEL PER UNIT TO MEET THE MILE STONE ACTIVITY

1.4.1 List of Tools & Plants to be made available by BHEL to contractor free of hire charges on sharing basis.

S.No	Description	Qty
01	EOT Cranes at TG Hall (105 T / 15 T) without operator	01
02	Portal Gantry Crane 360T (For Generator Stator Placement without operator)	01*
03	Higher capacity crane (520T/250T/180T/150T/135T/100T) for FST/ Deaerator erection	01**
04	Suitable crane for erection & dismantling of Portal crane	01 *
05	Slings for Stator Lifting	As required
06	Hydro Test pumps(400/600Kg/Cm ² for HP lines)	01

BHEL will provide crane operators for the cranes in the scope of BHEL except EOT & Portal gantry cranes. Trained operators for EOT & Portal gantry cranes to be arranged by the contractor at his cost.

* - Ref Note No 5

** - For Lifting FST/De-aerator and other heavy items outside TG Hall including LSR (Live Steam Reheater)

Note –

1. All the above T&Ps shall be given to the contractor on sharable basis and the allotment is made by BHEL/Site-in charge on need basis and to be shared with other contractors.
2. For handling at store and transportation, contractor shall make his own arrangement

TECHNICAL CONDITIONS OF CONTRACT (TCC)

3. EOT Crane – Allotment will be made only on need basis. Trained operators are to be arranged by the contractor within the quoted rates. Contractor has to plan the activities on item wise where the EOT crane is required to be used and submit to BHEL site for approval. In case the erection can be carried out by using other T&Ps, contractor shall make his own arrangement. The decision of BHEL Site I/c on this will be final and binding.
4. Higher capacity crane will be provided for Pre-assy. & Erection of FST & Deaerator.
5. BHEL may provide either BHEL owned cranes or hired cranes at the discretion of BHEL.

Bidder to note the following:-

In the event of providing BHEL Cranes:

Fuel has to be arranged by the bidder.

In the event of providing hired cranes:

The fuel charges shall be recovered as given below:

For 75 T crane: Rs. 120/hr

For 180/150 T/ 135 T/100T crane: Rs 200 /hr

For Heavy duty crane 250T and above capacity: Rs 250 /hr

6. Portal Gantry Crane will be issued in parts/components and are to be assembled at site by the contractor as per the instruction of the BHEL Engineers/Installation manual. The scope includes receipt of the materials from BHEL store, transporting to site, servicing of components/ drives/ pulleys etc., checking, lubricating wire ropes/drives, assembly, preparation of foundation & erection, cabling, pre commissioning and commissioning of drives, load testing/overload protection, etc., It is also the responsibility of the contractor to provide a qualified/experienced operator within the

TECHNICAL CONDITIONS OF CONTRACT (TCC)

quoted rate. The Electric power consumption for the Portal Crane will be charged as mentioned elsewhere in the tender. As soon as the erection of Generator Stator is over, the crane has to be dismantled by the contractor, in the sequence as instructed by BHEL, apply preservatives/touch-up paints wherever required and return the same to store in a good condition. Required consumables, T&Ps including gas, welding M/c shall be provided by the contractor. The following facilities only will be provided by BHEL.

- a) A suitable mobile crane for erection & dismantling of the portal crane on free of hire charges
 - b) Lubricants for drives & wire rope.
 - c) Supervision for servicing / assy./ commissioning
 - d) Required Loads for testing
6. Fill pump shall be arranged by the contractor, wherever required. For testing LP lines necessary Hydraulic Test pumps/ Hand pumps are to be arranged by the contractor
7. Any Loss/Damage of tools by the contractor, the same shall have to be replaced by the contractor or otherwise cost thereof shall be recovered from the contractor.
8. Apart from the above mentioned tools, any other tools and plants including suitable **Jacks / Hydraulics jacks, Bolt stretching fixtures** required for satisfactory completion of the work has to be arranged by the contractor.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Volume 1A Part-1 Chapter V

Time Schedule

1.5.0 TIME SCHEDULE

1.5.1 CONTRACT PERIOD

The contract period is **24 Months for completion of the entire work** from the date of commencement of work. The entire scope of works as detailed in the tender specification shall be completed within Twenty four (24) **months** from the date of start of work. **The contractor is required to refer Form F15 in Volume 1 Book -2 for all the instructions to be taken immediately after receipt of fax LOI.**

1.5.2 COMMENCEMENT OF CONTRACT PERIOD AND TENTATIVE SCHEDULE

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.

TENTATIVE SCHEDULE

Sl.No	Mile stone	From Start of Erection
01	Commencement of Condenser erection	Within One Month
02	Commencement of TG/Pump erection	Within One Month
03	Turbine Box-up	10 Months
04	Generator Boxing-up	12 Months
05	Completion of Oil Flushing	12 Months
06	Barring Gear	14 Months
07	Rolling & Synchronization	18 Months
08	Trail Operation	22 Months
09	Handing over	24 Months

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1.5.3 MOBILIZATION

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

The Contractor has to augment his resources in such a manner that the above tentative major milestones of erection & commission are achieved on specified schedules:

- 1.5.4 During the total period of contract, the contractor has to carry out the activities in a phased manner as required by BHEL Engineer and as per the programme of events / targets fixed by BHEL / Customer.
- 1.5.5 The work under this scope of contract is deemed to be completed in all respects only when all the components / equipments are erected and trial runs, testing and commissioning of all the equipments are completed. The decision of BHEL in this respect shall be final and binding with contractor.
- 1.5.6 In case any requirement is there to compress the schedule of activities to achieve project completion, then the additional expenses if any incurred will be discussed mutually and settled. BHEL decision in this regard is final and the issue is not arbitrable.

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Volume 1A Part-1 Chapter VI

Terms of Payment

1.6.0 The progressive payment for erection, testing and commissioning on accepted price of contract value will be released as per the break up given hereinafter

		COND - (1)	TUR (2)	GEN (3)	PMP & AUX/ EQ (4)	HEATE RS AND DEAER ATORS (5)	MISCEL LANEOU S ITEMS (6)	INTEG RAL PPG (7)	
	Overall weightage for each area out of lumpsum value quoted for STG	20%	18%	15%	13%	11%	7%	16%	
Sl. No.	Activity/Work Description	%							
I	PRO RATA PAYMENTS (85%)								
1.6.1	CONDENSER- (weightage 20%)								
1.6.1.1	PREPARATION OF FOUNDATION	2%			--			--	

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1.6.1.2	PLACEMENT, ALIGNMENT, ASSEMBLY AND WELDING OF BOTTOM PLATE SEGMENTS, HOT WELL, NDT AND SPRING ELEMENTS PLACEMENT & GROUTING.	10%			--			--	
1.6.1.3	ASSEMBLY AND POSITIONING OF WATER CHAMBER, SIDE PLATES, BOTTOM PLATES, WELDING AND NDT INCLUDING HINGE ASSY	12%		--	--			--	
1.6.1.4	ASSEMBLY, ALIGNMENT AND WELDING & NDT OF TUBE SUPPORT PLATES AND INTERNALS LIKE BAFFLE PLATES, AIR EVACUATION PIPES ETC.	13%		--	--			--	

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1.6.1.5	ASSEMBLY, WELDING & NDT OF DOME WALLS AND DOME STIFFENERS, EXTRACTION PIPING AND STEAM THROW DEVICE, LPH-1 SUPPORT ETC.	10%		--	--			--	
1.6.1.6	INSERTION, EXPANSION, CUTTING, COMPLETION OF ORBITAL WELDING ETC. OF CONDENSER TUBES	15%		--	--			--	
1.6.1.9	HYDRO TEST OF STEAM AND WATER SIDE	10%		--	--			--	
1.6.1.10	WELDING OF CONDENSER NECK JOINT AND NDT & COMPLETION OF BALANCE WORKS	10%		--	--			--	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.6.1.11	ERECTION, COMMISSIONING, LOAD TESTING OF CONDENSER WATER BOX HANDLING SYSTEM	3%		--	--			--	
	Subtotal for condenser	85%							
1.6.2	TURBINE (18 %)							--	
1.6.2.1	PREPARATION OF FOUNDATION, PLACEMENT, ALIGNMENT AND GROUTING OF BASE PLATES OF LPC AND BEARING PEDESTALS	--	7%		--			--	
1.6.2.2	PLACEMENT AND ALIGNMENT OF LP OUTER CASING BOTTOM PORTION AND CENTRE GUIDE KEYS	--	5%		--			--	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.6.2.3	PLACEMENT OF LP ROTOR AND ALIGNMENT WITH INNER CASING AND CHECKING OF BLADE CLEARANCE	--	9%		--			--	
1.6.2.4	ASSEMBLY, ALIGNMENT & WELDING OF LP OUTER CASING UPPER HALF	--	9%		--			--	
1.6.2.5	PLACEMENT AND ALIGNMENT OF IP TURBINE OUTER CASING AND INNER CASING (LOWER HALVES)	--	2%		--			--	
1.6.2.6	PLACEMENT AND ALIGNMENT OF IP ROTOR WITH LOWER CASING AND BOXING UP OF INNER & OUTER CASING (UPPER HALVES) & ROLL CHECK	--	5%		--			--	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.6.2.7	FINAL BOX UP OF IP TURBINE	--	0%		--			--	
1.6.2.8	BOXING UP OF LP INNER-INNER & INNER- OUTER AND ROLL CHECK	--	5%		--			--	
1.6.2.9	PLACEMENT OF HP TURBINE, LOWERING OF HP ROTOR ON BEARINGS AND CHECKING OF CLEARANCES, COUPLING, HP TURBINE SWING CHECKS ETC.	--	5%		--			--	
1.6.2.10	ALIGNMENT OF ALL ROTORS INCLUDING REAMING, HONING AND FIXING OF COUPLING BOLTS		9%						
1.6.2.11	ASSEMBLY OF GOVERNING SYSTEM/EQUIPMENT		5%						

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1.6.2.12	INSTALLATION OF ESVS, IVS, LPBP VALVES, MS STRAINERS (INTERNAL), HRH STRAINERS (INTERNAL)	--	9%		--			--	
1.6.2.13	ERECTION, ALIGNMENT AND WELDING OF CROSS AROUND PIPING	--	5%		--			--	
1.6.2.14	FINAL BOX-UP OF LP TURBINE	--	5%		--			--	
1.6.2.15	ASSEMBLY AND PREPARATION OF HYDRO-TEST, STEAM BLOWING DEVICES AND NORMALISATION ETC.	--	0%		--			--	
1.6.2.16	FINAL BOXING UP OF PEDESTALS AFTER OIL FLUSHING COMPLETION	--	5%		--			--	
	Subtotal for Steam Turbine		85%						
1.6.3	TURBO GENERATOR (15%)	--		--	--			--	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.6.3.1	PREPARATION OF FOUNDATION, LEVELLING, MATCHING AND GROUTING OF FOUNDATION PLATES	--		5%				--	
1.6.3.2	LIFTING, LEVELLING AND ALIGNMENT OF STATOR (including erection and dismantling of portal crane if used for stator lifting)			23%				--	
1.6.3.3	FIXING OF END SHIELDS ON TO FOUNDATION BEAMS	--	--	6%				--	
1.6.3.4	ROTOR INSERTION	--	--	6%				--	
1.6.3.5	BOXING UP OF GENERATOR AND ASSEMBLY OF HYDROGEN SEALS	--	--	11%				--	

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1.6.3.6	ALIGNMENT OF GENERATOR ROTOR WITH LP TURBINE ROTOR, RUN-OUT CHECKS AND REAMING, HONING OF COUPLING HOLES AND FIXING OF COUPLING BOLTS	--	--	9%				--	
1.6.3.7	ERECTION OF EXCITATION EQUIPMENTS & ALIGNMENT OF GEN.-EXCITER ROTORS INCLUDING SWING CHECK AND COMPLETION OF BALANCE WORKS	--	--	10%				--	
1.6.3.8	INSTALLATION OF ENCLOSURES OF GENERATOR/EXCITER WITH ALL AUXILIARIES	--	--	5%				--	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.6.3.9	GROUTING OF GEN BEARING PEDESTALS AND EXCITOR	--	--	5%				--	
1.6.3.1	FINAL GAS TIGHTNESS TEST OF STATOR WITH COMPLETE SYSTEM	--	--	5%				--	
	Subtotal for Generator			85%					
1.6.4	PUMPS AND AUXILIARIES (13 %)	--	--		--			--	
1.6.4.1	ERECTION / TESTING and commissioning OF MAIN OIL PUMP, JOP, EOP, AOP, CENTRALISED LUBE OIL PURIFICATION SYSTEM, ALONG WITH ALL AUXILLIARIES	--	--		12%			--	
1.6.4.2	ERECTION / TESTING and commissioning OF ONE MOTOR DRIVEN BFP, ALONG WITH ALL AUXILLIARIES				10%				

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.6.4.3	ERECTION / TESTING and commissioning of TWO NOS TURBINE DRIVEN BFP, ALONG WITH ALL AUXILLIARIES				20%				
1.6.4.5	ERECTION, TESTING, GROUTING ETC. OF ALL DMYs MISC PUMPS WITH MOTORS	--	--	--	13%			--	
1.6.4.6	ERECTION, TESTING, GROUTING ETC. OF CONDENSATE EXTRACTION PUMPS	--	--	--	10%			--	
1.6.4.7	ERECTION OF VACUUM PUMPS WITH MOTORS, DEPR TANK DRAIN PUMPS WITH MOTORS 4NOS & 4NOS OF CENT LUB OIL PUMPS AND OTHER PUMPS				20%				
	Subtotal for pumps and Auxilliaries				85%				

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1.6.5	HEATERS AND DEAERATORS (11%)								
1.6.5.1	ERECTION, TESTING & COMMISSIONING OF HP & LP HEATERS	--	--	--		27%		--	
1.6.5.2	ERECTION, TESTING & COMMISSIONING OF GLAND STEAM CONDENSER, DRAIN COOLERS,CF COOLERS, GENERATOR COOLERS, MAIN OIL TANK,	--	--	--		12%		--	
1.6.5.3	ERECTION, TESTING & COMMISSIONING OF DE-AERATOR, FEED STORAGE TANK AND ASSOCIATED APPROACH PLATFORM WITH LADDERS ETC.	--	--	--		46%		--	
	Subtotal FOR HEATERS AND DEAERATORS	--	--	--		85%		--	

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1.6.6	MISCELLANEOUS ITEMS (7%)								
1.6.6.1	DEBRIS FILTERS, STEAM TRAPS, DIRTY, CLEAN OIL TANKS, TURBINE ENCLOSURES, CO2/H2 CYLINDER RACKS ETC						20%		
1.6.6.2	CHEMICAL DOSINGSYSTEM	--	--	--			10%		
1.6.6.3	ERECTION, TESTING & COMMISSIONING OF CONTROL FLUID TANK, C.F. COOLERS, C.F. PUMPS, OIL PURIFIER/PURIFICATION UNIT ETC.	--	--	--			9%		
1.6.6.4	ERECTION, TESTING & COMMISSIONING OF FLASH TANKS & FLASH VESSELS	--	--	--			8%		

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1.6.6.5	ERECTION, TESTING & COMMISSIONING OF PLATE HEAT EXCHANGER PACKAGE	--	--	--			10%		
1.6.6.6	ERECTION, TESTING & COMMISSIONING OF CONDENSER ON LOAD TUBE CLEANING PACKAGE	--	--	--			12%		
1.6.6.7	ERECTION, TESTING & COMMISSIONING OF SELF CLEANING STRAINER PACKAGE	--	--	--			8%		
1.6.6.8	ERECTION, TESTING & COMMISSIONING OF MISC. HOISTS & CHAIN PULLEY BLOCKS.						8%		
	Subtotal for MISCELLANEOUS ITEMS						85%		
1.6.7	INTEGRAL PIPING (16%)	--	--	--				--	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.6.8	PIPING								
1.6.8.1	ON PRE-ASSEMBLY WHEREVER APPLICABLE (IF NOT APPLICABLE, THIS PORTION TO BE PAID ALONG WITH PLACEMENT IN POSITION)	NA	NA	NA	NA	NA	NA	NA	
1.6.8.2	PLACEMENT IN POSITION	NA	NA	NA	NA	NA	NA	NA	
1.6.8.3	ALIGNMENT	NA	NA	NA	NA	NA	NA	NA	
1.6.8.4	WELDING/BOLTING/FIXING	NA	NA	NA	NA	NA	NA	NA	
1.6.8.5	COMPLETION OF NON DESTRUCTIVE EXAMINATION & STRESS RELIEVING/ HEAT TREATMENT (if not applicable, then this portion to be clubbed with next activity)	NA	NA	NA	NA	NA	NA	NA	

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1.6.8.6	HANGERS & SUPPORTS ETC WHEREVER NECESSARY AS PER DRG	NA	NA	NA	NA	NA	NA	NA	
1.6.8.7	HYDRAULIC TEST/PNEUMATIC TEST WHERE EVER APPLICABLE	NA	NA	NA	NA	NA	NA	NA	
	Total for Prorata (85%)	85%	85%	85%	85%	85%	85%	85%	
1.6.9	STAGE/MILESTONE PAYMENTS (15%)								
1.6.9.1	Boiler Light Up	0%	0%	0%	0%	0%	0%	0%	
1.6.9.2	ABO	0%	0%	0%	0%	0%	0%	0%	
1.6.9.3	Steam Blowing	0%	0%	0%	0%	0%	0%	0%	
1.6.9.4	Safety Valve Floating	0%	0%	0%	0%	0%	0%	0%	
1.6.9.5	Oil Flushing (TG)	1%	1%	1%	1%	1%	1%	1%	
1.6.9.6	Barring Gear (TG)	1%	1%	1%	1%	1%	1%	1%	
1.6.9.7	Rolling and Synchronisation	3%	3%	3%	3%	3%	3%	3%	
1.6.9.8	Coal Firing	0%	0%	0%	0%	0%	0%	0%	

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1.6.10 BHEL at discretion may further split up the above percentage and effect payment to suit the site conditions, cash flow requirements, according to the progress of work.

1.6.11 GUARANTEE PERIOD:-

Guarantee period of 12 months shall commence from the date of handing over of the work to customer or 6 months from the date of first synchronization of the set whichever is earlier, (Provided all erection, testing and commissioning works are completed in all respects.)

1.6.12 In case any requirement is there to compress the schedule of activities to achieve project completion, then the additional expenses if any incurred will be discussed mutually and settled. BHEL decision in this regard is final and the issue is not arbitrable.

Note for terms of payment:

As TG is lumpsum contract, the compensation as per clause 2.12.2 of GCC shall be worked out @ 10% on balance lumpsum value to be executed on the end of original contract period.

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Volume 1A Part-1 Chapter VII

Taxes and Duties

Value Added Tax (VAT) for the works

- 1.7.1 **Price quoted shall be inclusive of VAT except service tax.**
- 1.7.2 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
- 1.7.3 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.
- 1.7.4 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).
- 1.7.5 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.
- 1.7.6 The bidder shall quote very competitive price after taking into consideration of above points.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.7.7 **Service Tax**

1.7.7.1 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.

1.7.8. **Other Taxes & Levies**

1.7.8.1 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.

1.7.9 **New Levies / Taxes**

1.7.9.1 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..

1.7.10 **Statutory variations**

1.7.10.1 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 .

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.7.11 **Direct Tax**

1.7.12 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.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Volume 1A Part-1 Chapter VIII

Other Conditions

1.8.1 IMPORTANT CONDITIONS FOR PAYMENT

It may be noted that the first running bill will be released only on production of the following.

1. PF Regn. No.
2. Labour Licence No.
3. Workmen Insurance Policy No.
4. Un Qualified Acceptance for Detailed L.O.I.
5. Initial 50% Security Deposit as per CL 1.10 of GCC.
6. Rs. 100/- Stamp Paper for Preparation of contract agreement

1.8.2 All payments due to the contractor shall be made only through “e-Payment”, including return of EMD amount to unsuccessful tenderers. The tenderer has to furnish details of his Bank account as certified by the concerned Banker in the format furnished to enable e-payment.

1.8.3 PROVIDENT FUND & MINIMUM WAGES

1.8.3..1 The contractor is required to extent the benefit of Provident Fund to the labour employed by you in connection with this contract as per the Employees Provident Fund and Miscellaneous Provisions Act 1952. For due implementation of the same, you are hereby required to get yourself registered with the Provident Fund authorities for the purpose of reconciliation of PF dues and furnish to us the code number allotted to you by the Provident Fund authorities within one month from the date of issue of this letter of intent. Incase you are exempted from such remittance an attested copy of authority for such exemption is to be furnished. Please note that in the event of your failure to comply with the provisions of said Act, if recoveries therefore are enforced from payments due to us by the customer or paid to statutory authorities by us, such amount will be recovered from payments due to you.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

1.8.3.2 The contractor shall ensure the payments of minimum labour wages to the workmen under him as per the rules applicable from time to time in the state.

1.8.3.3 The final bill amount would be released only on production of clearance certificate from PF/ESI and labour authorities as applicable.

1.8.4.0 OTHER STATUTORY REQUIREMENTS

- 1) The Contractor shall submit a copy of Labour License obtained from the Licensing Officer (Form VI) u/r25 read with u/s 12 of Contract Labour (R&A) Act 1970 & rules and Valid WC Insurance copy or ESI Code (if applicable) and PF code no alongwith the **first** running bill.
- 2) The contractor shall submit monthly running bills along with the copies of monthly wages (of the preceding month) u/r78(1)(a)(1) of Contract Labour Rules, copies of monthly return of PF contribution with remittance Challans under Employees Provident Fund Act 1952 and copy of renewed WC Insurance policy or copies of monthly return of ESI contribution with Challans under ESI Act 1948 (if applicable) in respect of the workmen engaged by them.
- 3) The Contractor should ensure compliance of Sec 21 of Contract Labour (R&A) Act 1970 regarding responsibility for payment of Wages. In case of "Non-compliance of Sec 21 or non-payment of wages" to the workmen before the expiry of wage period by the contractor, BHEL will reserve its right to pay the workmen under the orders of Appropriate authority at the risk and cost of the Contractor.
- 4) The Contractor shall submit copies of Final Settlement statement of disbursal of retrenchment benefits on retrenchment of each workmen under I D Act 1948, copies of Form 6-A(Annual Return of PF Contribution) along with Copies of PF Contribution Card of each member under PF Act and copies of monthly return on ESI Contribution – Form 6 under ESI Act 1948 (If applicable) to BHEL along with the Final Bill.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 5) In case of any dispute pending before the appropriate authority under I D act 1948, WC Act 1923 or ESI Act 1948 and PF Act 1952, BHEL reserve the right to hold such amounts from the final bills of the Contractor which will be released on submission of proof of settlement of issues from the appropriate authority under the act.

- 6) In case of any dispute prolonged/pending before the authority for the reasons not attributable to the contractor, BHEL reserves the right to release the final bill of the contractor on submission of Indemnity bond by the contractor indemnifying BHEL against any claims that may arise at a later date without prejudice to the rights of BHEL.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Volume 1A **PART –II** **TECHNICAL SPECIFICATIONS** **Chapter -1** **General**

- 2.1.1** The scope of work under this specification covers, but not limited to the following:
- 2.1.2** Handling at stores transporting to site, inspection, preparation of foundation, erection, leveling, centering, alignment, grouting & final alignment of Steam turbine, Turbo generator and auxiliaries including BOI identified, pre-assembly, erection, alignment, welding, NDT, fixing hangers & supports, chemical cleaning/pickling, oil flushing, water flushing, hydro testing, & steam blowing of integral piping/oil piping, H₂/CO₂/Water cooling system, Pre assembly, erection, welding, NDT of water cooled Condenser, feed water storage tank, de-aerator, LP/HP heaters, GSC & other coolers, flash tanks etc., erection and commissioning of Motor Driven & Turbo Driven Boiler feed pumps, Motor driven Condensate Extraction Pumps, surface finish, supply & application of primer & finish paints / Anti corrosive epoxy resin based / chlorinated rubber based / Glass Fiber Reinforced epoxy film / steam wash paints including labeling on equipments, & piping, pre-commissioning, commissioning, trial operation & handing over of **1x500 MWe PFBR –BHAVINI Kalpakkam** project Steam Turbine, Generator and Auxiliaries.
- 2.1.3** 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.
- 2.1.4** Contractor shall erect all the equipments as per the sequence prescribed by BHEL at site. The sequence of erection and methodology will be decided by the BHEL Engineers depending upon the availability of materials, fronts and other inputs etc., No claim for extra payment from contractor will be entertained on the grounds of deviation from the methods of erection adopted in erection of similar STG set in other places.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 2.1.5 The work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, engineering and construction management. The contractor should ensure successful and timely operation of equipment installed. The contractor must have adequate quantity of tools, construction aids, equipments etc., in his possession. He must also have on his rolls adequate trained, qualified and experienced supervisory staff and skilled personnel.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Volume 1A PART –II Chapter -2 Foundations and Grouting

2.2.0 CIVIL WORKS

- 2.2.1 Foundations of all equipments and plants and necessary civil works shall be provided by customer. The dimensions of the foundations 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 minor adjustments upto 25 mm of foundation level, dressing, chipping of foundation surface enlarging the pockets in foundations and grouting of equipments etc. as may be required for the erection of equipments / plants shall be carried out by the Contractor. All the materials like cement and cleaning consumables shall also be arranged by the contractor at his cost. The required special cement like PAGA, CONBEXTRA – GP2 and SHRINKOMP etc or its equivalent grade free flow cement for grouting of all the equipments of Turbine Generator shall also be arranged by the contractor including the required nos. of mixing machines and vibrators at their cost.
- 2.2.2 The contractor shall ensure perfect matching of packer plates with foundation by dressing the foundation and between the packer plates and the base plate of structural column / equipment to the satisfaction of BHEL Engineer. Machining / matching of packer shall be carried out by the Contractor at his cost.
- 2.2.3 The contractor shall arrange for grouting of foundation bolt holes of equipment and final grouting of equipment as per the drawings / specification as advised by the Engineer or BHEL after preparing the foundation surface for grouting. The contractor has to arrange, a representative from the supplier of special cement for witnessing the grouting and other works at their cost including any miscellaneous expenditure for this activity. BHEL will not pay any service and incidental charges for arranging the supplier representative. The contractor to take note of this aspect and quote accordingly.
- 2.2.4 Contractor has to carry out the grouting as per the work instructions for grouting available at site.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Volume 1A PART –II Chapter -3

2.3.0 ERECTION

- 2.3.1 Preparation of foundation: Providing necessary skilled and other labour to BHEL/Customer for checking of dimensional accuracy, axis, elevation, levels etc., with reference to bench marks of foundations and anchor bolts pits. Also adjustments of foundation level, dressing and chipping of foundation surfaces of all equipments, up to 25mm depth, as per BHEL Engineers instructions, should be done by the contractor as a part of work. Contractor should log before taking over the foundations for erection.
- 2.3.2 Contractor shall carry out scrapping and blue matching of embedment plates/packers of rotating equipments so as to achieve prescribed percentage of contact. Chipping and bedding of concrete surfaces, finely dressing up to the extent required to obtain contact between packer and concrete, is also covered in the scope of the work. The fine dressing of concrete shall be with **Prussian** blue matching checks.
- 2.3.3 BHEL will provide only shims and packer plates (either machined or plain), which will go as permanent parts of the equipment at free of cost. Certain packer plates and shims over and above the quantity received as part of supplies have to be cut out from steel plates/sheets at site to meet site requirement. Contractor shall cut and prepare packers and shims by chiseling, grinding, machining and filing the burr in the packers. Machining of Packers to meet the requirement is in their scope of the contractor. Raw materials required for the above will be arranged by BHEL free of cost.
- 2.3.4 Packer plates are to be blue matched with foundation, with foundation frame and inter-packers contact surfaces & etc., by **Prussian** Blue match checks and required percentage contact shall be achieved by chipping and scrapping as per BHEL Engineers instructions. Shims and packer plates required for temporary use are to be arranged by the contractor within the quoted rate.

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- 2.3.5 **Bolt stretching fixtures** for TG anchor bolts are to be arranged by the contractor. All type of suitable Jacks / Hydraulics jacks required in sufficient nos for successful erection / checking / testing of the equipments are also to be arranged by the contractor within the scope of this work
- 2.3.6 Grouting of equipments is included in the scope of contractor. 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. All grouting materials like cement, including special cements such as non-shrinkable **free flow cement** etc. (as recommended by BHEL), sand, gravel etc., shall be arranged by the contractor at his quoted rate.
- 2.3.7 Brief list of equipments/sub-assemblies to be erected by the contractor & approximate weight and size of individual heavy components are given in the appendices/annexure and is meant for giving general idea to the tender only about magnitude of the work involved. The components are sent in parts for convenient transportation. They are to be cleaned, assembled in stage by stage, fastened/welded, erected and aligned as per the drawing dimensions/tolerance and instructions of BHEL Engineers.
- 2.3.8 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 within the quoted rate. Surface Grinder and Lathe m/c required for the above works are to be made available at TG Floor by the contractor at their cost to avoid any delay in completion of works.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 2.3.9 Normally weld neck valves will have prepared edges for welding. It may be occasionally necessary to prepare new edges, re-prepare the edges to suit site conditions, which shall be done by the contractor at no extra cost. All fittings like elbows, tees, reducers, flanges, inserts etc., shall be matched with pipes for welding which may require re-edge preparation, grinding etc., The valves will have to be checked, lapped or overhauled in full or in parts before erection/after chemical cleaning/during commissioning. Experienced technicians for the same shall be arranged by the contractor at his own cost.
- 2.3.10 AOP / JOP/ EOP etc., and their 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.
- 2.3.11 For skid mounted equipment, dismantling if any, for the convenience of erection/commissioning, checking and re-alignment required at site is in the scope of work.
- 2.3.12 All rotating machineries and equipments shall be cleaned, lubricated checked for their smooth rotation, if necessary by dismantling and re-fitting before erection by the contractor. In the opinion of the BHEL engineer, the equipment is to be further checked at any stage of the work, contractor shall provide necessary skilled manpower, complete facilities like T&Ps and consumables etc., for dismantling, cleaning & refitting within the quoted rate.
- 2.3.13 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.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 2.3.14 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 joints assembly and other components as per instruction of BHEL Engineer during erection. The Contractor has to arrange necessary paints within the quoted rates
- 2.3.15 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.
- 2.3.16 The contractor shall take necessary measures to see that all the machined surfaces are preserved and covered.
- 2.3.17 Sand / shot blasting of condenser / turbine components is to be carried out by the contractor wherever necessary as instructed by BHEL Engineer. Contractor has to arrange Sand / shot blasting machine, compressor required consumables, etc. at his cost.
- 2.3.18 Certain instruments like pressure switches, gauges, air filters, 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. Sometime this may have to be handed over to store or instrumentation contractor and accounting of the same has to be maintained by them till handing over of the unit. In case of missing / damage of any item under custody of the contractor the same has to be made good / repaired for perfect functioning during operation.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 2.3.19 All the motors/pumps shall be 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. Replacement of bearings of motors/pumps etc whenever required and as instructed by BHEL due to any reason also to be done by the contractor and treated as within the scope of work.
- 2.3.20 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.
- 2.3.21 For gas tightness test of gas system of stator the contractor has to arrange Mercury Mono-meter at his cost.
- 2.3.22 All the lubricant oil for flushing and during trial run of the equipment including first fill up, chemicals for detergent flushing, acid pickling/cleaning/trial run etc., will be arranged by BHEL at 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 their cost. Care should be taken to avoid any spillage/wastage.
- 2.3.23 The contractor shall also carry out erection, testing, and commissioning of the oil centrifuge within their quoted rate.
- 2.3.24 Transportation of CO₂ & H₂ cylinders from the store and filling of Gas in the generator stator cooling systems, etc., as and when required till the unit is commissioned and handed over shall be the responsibility of the contractor.

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- 2.3.25 **Generator Stator Lifting:** Generator stator will be transported from HARIDWAR works to site on special wagon / Trailer. This will be received at site near TG Hall (near COL NO: 9 on A-row side) and unloaded. The stator has to be shifted manually from COL no: 9 to the lifting point of Portal Gantry Crane (between COL no: 5 and 6 on 'A' row side.). Shifting and lifting of stator from the place of unloading to TG Deck foundation, assembling the terminal box & cooler housing and placing in position using portal gantry crane or any other suitable crane (provided by BHEL) is in the scope of this specification. Portal Gantry crane /or any suitable crane will be issued by BHEL on free of hire charges. It will be in parts / components and the same shall be transported from BHEL store, assembled, erected, commissioned and on completion of stator lifting work, dismantling the same & returning to BHEL Stores as per the instructions of BHEL Engineer are in the scope of the Bidder at his cost. Providing skilled operator for the operation of portal crane is by the contractor at his cost. Necessary T& Ps (including providing M.S plates of thickness 25 / 30 mm for spreading below stator and necessary rails, winches etc) required for shifting of stator from the unloading location to the lifting point of portal crane also has to be arranged by contractor within the quoted rate.
- 2.3.26 Erection, testing & commissioning of BFP along with mechanical seal, end chambers cooling lines, lube oil & working oil lines are also included in the scope of contractor.
- 2.3.27 All the filters in the system are to be cleaned, as and when required during flushing / commissioning till the unit is handed over to customer is within the scope this contract.
- 2.3.28 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.
- 2.3.29 BFP drive turbines & its auxiliaries will be supplied in parts consists of turbine assy, governing valve assy, lube oil console, oil pumps, gear box, couplings, coolers etc., which are to be assembled at site and erected.

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- 2.3.30 Wherever equipment 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.
- 2.3.31 The condenser will be supplied in components / parts and contractor shall have to carry out assembly and erect on the condenser foundation. This includes complete fabrication of shell out of steel plates, welding of hot well with bottom plates, assembly of water chambers and welding with side walls, bottom plates and dome wall, assembly of LP Heater-1etc, assembly of support plates, baffles and stiffening structures etc.. While carrying out the assembly stitch welding shall be done only after the due approval from BHEL Engineer. Final welding shall have to be carried out by step back seam method to ensure minimum deformation within acceptable limits of the welding parts.
- 2.3.32 The condenser will be dispatched to site from works with surface protection. Wherever the surfaces damaged/ rusted and primer got removed / peeled off, the same shall be made good suitably by Sand / shot blasting or with steam mixed with caustic soda and coated with same paint as per the instructions of the BHEL Engineer before erecting the same.
- 2.3.33 All the weld seams shall be properly ground and subjected to radiographic examination as per manufacturer's recommendation. If any paint or rust (other than steam washable paints) noted in the steam side of the condenser parts, are to be removed either by Sand / shot blasting or buffing method.
- 2.3.34 The contractor shall have to carry out the condenser tubes insertion and expansion at site after the installation of condenser on their foundation. Before insertion of tubes the contractor shall check for absence of any dents, mechanical damages or any other defects of tubes caused during storage or transportation. Tube should be thoroughly cleaned. Only fine emery paper shall be used for cleaning the tubes at the ends where expansion has to be carried out.

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- 2.3.35 Before insertion of tubes the contractor shall clean the surface of the holes in the tube plates and tube support plates for paint / corrosion spots, oxide scales etc., using chemical cleaning agent like carbon tetra chloride.
- 2.3.36 The tube shall be inserted such that it shall project 2 to 3 mm beyond the tube plate outer surface. The tube shall be expanded using an automatic electronic torque control tube expanding unit or pneumatic tube expander so as to get the % thinning of the tube walls and elongation of tube ends as recommended by the supplier/ Drg./ Tube expansion procedure. The length of expansion in no case shall exceed a length of 70 to 80% of the tube plate thickness. Finally, proper trimming of the excess length of the tube shall be carried out and flare-up / bell mouthing has to be done by the contractor at his cost.
- 2.3.37 The welding of the expanded joint of the tube end will finally be done with the help of special **ORBITAL** welding method after completion of the expansion. The necessary orbital welding machine and consumables / gases etc including qualified welder has to be arranged by contractor within the quoted rate.
- 2.3.38 The contractor shall carry out the condenser neck welding with LP casing. It shall be ensured that all spring supports are evenly loaded and the gap between the condenser and the different spring supports is within 1.0 mm. The clearance between the condenser neck and the LP exhaust hood should be within 3 mm by suitably lifting the condenser. Machined packers of suitable thickness are to be used under the spring supports and condenser load is to be gradually transferred on these packers. The neck welding shall be subjected to non-destructive testing.
- 2.3.39 The hydrostatic testing of steam space with the condenser vacuum system and hydraulic testing of water space with the circulating water lines after assembly of water boxes are also included in the scope of the contractor.

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- 2.3.40 Water boxes inside Carbon steel surfaces are to be Sand / shot blasted before hydraulic testing. After hydraulic testing of CW side the water boxes and the water chambers are to be thoroughly cleaned for removal of all traces of dirt, grease, oil, rust etc., it shall be dry and free from burns and shall have a metallic surface. The (Sand/shot) Blasting machine and accessories and also the required consumables shall be arranged by the contractor within the quoted rate.
- 2.3.41 Condenser handling equipment (Water box handling arrangement – FS & RS) including Structures shall be erected by the contractor within the quoted rate. The structural material will be supplied by BHEL free of cost.
- 2.3.42 The contractor shall carryout the erection of Debris Filter under TG scope within the quoted rates.
- 2.3.43 The condenser steam space shall be surface protected at least two coats of suitable steam washable paint. Before the painting is taken up, the contractor shall clean the surfaces thoroughly by sand / shot blasting or with steam mixed with caustic soda. Painting should be carried out by the contractor before tube insertion.
- 2.3.44 Supply & application of paints & required consumables etc. are in the scope of contractor and is to be within the quoted rate.
- 2.3.45 The contractor shall carryout the stretching bolt assembly and connected joints within the quoted rate.
- 2.3.46 The De aerator and feed water storage tank will be supplied in three sections with feed pipe, heating steam header, spray nozzles, supports etc., in loose components. These are to be erected, aligned & welded in position. Welding, NDT & heat treatment if required shall be carried out by the contractor within quoted rate. IBR / statutory requirements, if any, shall be in the scope of contractor and necessary drawing/ details only will be given by BHEL.

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- 2.3.47 Erection of platform and supporting structures around FST / De-aerator is covered in the scope of contract and shall be erected by the contractor within the quoted rate.
- 2.3.48 LP Heater No. 1 is to be erected inside the condenser in rear side, for which contractor has to cut open the condenser dome plate already erected. After erection, condenser plates have to be strengthened / stiffened as per the instruction of BHEL Engineer.
- 2.3.49 The foundation deck of BFP's is supported with Vibration Isolation Springs, which will be erected by other contractor. The final adjustments of springs and floating of springs to be done by the contractor within quoted rate by providing required man power, T & P's etc.,. However, the Main TG Deck is without the VIS springs.
- 2.3.50 For other agencies, such as Piping, Cabling, instrumentation etc., to commence their work from/on the equipments coming under this scope, Contractor has to clear the front, expeditiously and promptly as instructed by BHEL Engineer. 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 overall project schedule.
- 2.3.51 All dimensions/elevations refers to centerline of pipe unless otherwise specified, the pipe routing shall be carried out as per the drawing. Wherever the dimensions are not specified / shown as approximate the same may be routed as per site requirement / convenience as per site engineer's advice. 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 size if the routing is shown in layouts it is only for guidance and the same shall be routed and supported as per site requirement / convenience as per site engineer's advice.
- 2.3.52 Slope of 1:500 shall be maintained towards drain point unless otherwise specified.

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- 2.3.53 All site-fabricated pipes will be issued in running meters 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, miter bends, reducers, flanges etc., will be supplied as loose items.
- 2.3.54 Erection of all the piping systems supplied along with turbine, generator, pumps and other auxiliaries covered in this contract, is to be erected by the contractor within the quoted rate.
- 2.3.55 Carrying out piping as per the specification between equipments constituting terminal points, whether the terminal equipments fall within the scope of work/specification or not, 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, welding, 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. IBR/ statutory requirements, if any, shall be in the scope of contractor and necessary drawing/details only will be given by BHEL.
- 2.3.56 Contractor should fabricate bends of $\leq 2''$ diameter size from running meters of pipe. Wherever readymade bends are not supplied and the same are to be made at site by bending M/c as per requirement contractor has to arrange a motor operated hydraulic bending M/c for the above works within quoted rates.
- 2.3.57 Certain adjustments in length may be necessary while erecting pipelines of STG & Auxiliaries and the contractor should remove the extra lengths/add extra lengths to suit the final layout after preparing edges afresh and adopting specified NDT, Heat Treatment procedure, are in the scope of work.

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- 2.3.58 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 within the quoted rate.
- 2.3.59 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. For pipes below 2" diameter, shall be sponge cleaned with air flushing.
- 2.3.60 Contractor shall arrange all the equipments, alignment bolts, tools, consumables like welding electrodes (all type), TIG wires (all type) and argon gas cylinders etc. for welding of pipes at his cost. Consumables like jute, cotton waste, hacksaw blades, petrol, Kerosene oil etc. are in contractor's scope.
- 2.3.61 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., by gouging/ grinding and not by hammering. 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.
- 2.3.62 All the weld joints on equipments and piping shall be ground or filed on completion of welding and before radiography as per instructions of BHEL Engineer so as to achieve smooth surface to avoid of ripples, undulations etc.,
- 2.3.63 Pipelines shall be cleaned off welding slag and burrs by hand files, wire brushes and flexible grinders wherever required and using cloth.
- 2.3.64 Flame cutting of piping shall be strictly done as per BHEL Engineer's instructions and in his presence only.

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- 2.3.65 All piping items including pipes, 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.
- 2.3.66 Wherever elbows of 45 deg or any other angle. (> 2" dia pipe) are required, the same shall be cut from 90 deg. elbow supplied and used. No extra cost shall be paid.
- 2.3.67 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.
- 2.3.68 Flow nozzles, orifice, spray nozzles forming part of the system irrespective of the supplier shall be mounted / erected after chemical and / or steam blowing/ oil flushing at site.
- 2.3.69 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.
- 2.3.70 Contractor shall also weld small length of piping with root valve for pressure, temperature, flow and level tapping points on piping or flow nozzles/orifices/ metering elements fixed on piping as per the instructions of BHEL Engineer.
- 2.3.71 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 and equipments erected by the contractor is completely covered in the scope of work.

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- 2.3.72 Contractor should fabricate bends at site from running meters of piping for the above and cut, edge prepare and lay the piping as per BHEL Engineer's instructions.
- 2.3.73 Fixing / fitting / welding of thermo wells, stubs, hoses, tapping points, root valves and instruments etc. (including PG Test requirements) forming part of the system irrespective of the supplier on different lines / equipments are within the scope of this contract. The instrumentations other than an assembled part of the equipments/items are not included in the scope of this works and shall be carried out by other contractors. However necessary co-ordination and facilitating with other contractors for fixing instruments is in this scope of work. Fixing of Pick-Ups, Probes & Accessories for Turbovisory / vibration monitoring system is within the scope of this specification.
- 2.3.74 The contractor shall conduct non-destructive tests like Radiography, Ultrasonic, Dye penetrant, Magnetic particle tests, etc. on welds, castings, valve bodies & other equipments etc. and Ultrasonic test for finding thickness of materials as per BHEL Engineer's instructions.
- 2.3.75 Plate / Pipe shoes for piping supports shall be fabricated at site by the contractor. Other supports namely Hangers, U-clamps etc. shall be supplied by BHEL duly bent and threaded. Assembly and necessarily cutting work etc. shall be carried out at site by contractor within the quoted rate.
- 2.3.76 Contractor shall arrange the necessary clearance from the statutory authorities (IBR, Electrical Inspectorate, etc.) as required for installation of the plant and equipment and render all assistance, service required in this regard. Inspection fee and any statutory fees will be paid by BHEL.

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- 2.3.77 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. The above work is within the scope of this contract.
- 2.3.78 All Operating/ Approach platforms, cross over, canopies, ladders etc., shall have to be fabricated from raw materials supplied by BHEL and are to be erected as per instruction of BHEL, by the contractor within the quoted rate.
- 2.3.79 Contractor shall be supplied with two extra blue prints of the layout & isometrics. Contractor to incorporate in one of the blue prints with red ink all the changes/deviations/alterations etc. carried out at site due to various reasons, with site engineer's endorsement. Marked up drawings shall be submitted to BHEL for approval.

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Volume 1A **PART –II Chapter -4** Preservation and Touch painting

2.4.0 PRESERVATION OF COMPONENTS

- 2.4.1 It shall be the responsibility of the contractor to apply touch up painting on all equipments before erection. All Paint and thinner shall be arranged by the bidder and it shall be contractor's responsibility to arrange for required labour, brush etc. for carrying out touch up painting. The quoted rates shall be inclusive of above work.
- 2.4.2 The contractor shall effectively protect the finished work from action of weather and from damage or defacement and shall cover the finished parts, then and there for their protection.
- 2.4.3 Any failure on the part of contractor to carry out work according to above clauses will entail BHEL to carry out the job from any other party and recover the cost from contractor.
- 2.4.4 Due to atmospheric conditions erected materials are likely to get rusted more frequently. It is the responsibility of the contractor to preserve the erection materials drawn from stores for erection till these are commissioned and handed over to customer. The required consumables for this purpose like paint, thinner, rust converter compound (Ruskill or Ferropro) or any other equivalent shall be arranged by bidder. However, the contractor should also arrange other consumables like wire brushes, emery paper, cotton waste, cloth etc. at their cost. The contractor should ensure that the materials are not rusted on any account till they are handed over to customer. The decision of the BHEL Engineer is final with regard to frequency of application of paint and rust converter compound.

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Volume 1A **PART –II Chapter -5 Progress of Work**

2.5.0 PROGRESS OF WORK

- 2.5.1 Refer forms F14,F15,F16,F17,F18 in volume I Book II. Plan and review will be done as per the formats
- 2.5.2. 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.
- 2.5.3 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.
- 2.5.4 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 as per the format enclosed with this tender document.
- 2.5.5 The monthly report ending on 24th of every month shall be submitted in a spiral bounded book and shall contain the following details:-
- a) Colour Progress photographs to accompany the report should be submitted.
 - b) Erection progress in terms of tonnage and welding joints, radiography and stress relieving completed as relevant to the respective work areas against planned.

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- 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
- 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.

2.5.6 The manpower reports shall clearly indicate the manpower deployed, category wise specifying also the activities in which they are engaged.

2.5.7 During the course of erection, if the progress is found unsatisfactory, or if the target dates fixed from time to time for every milestone are to be advanced, or in the opinion of BHEL, if it is found that the skilled workmen like fitters, operators, technicians employed are not sufficient BHEL will induct required additional workmen to improve the progress and recover all charges incurred on this account including all expenses together with BHEL overheads from contractor's bills.

2.5.8 The contractor must obtain the signature and permission of the security personnel of the customer for bringing any of their materials inside the site premises. Without the Entry Gate Pass these materials will not be allowed to be taken outside.

2.5.9 The contractor shall maintain a record in the form as prescribed by BHEL for all operations carried out on each weld and maintain a record indicating the number of welds, the name of welders who welded the same, date and time of start and completion, preheat temperature, radiographic results, rejections if any, percentage of rejection, etc. and submit copies of the same to the BHEL Engineer as required.

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Volume 1A **PART –II Chapter -6** Welding and NDT

2.6.0 WELDING, HEAT TREATMENT, RADIOGRAPHY AND NON-DESTRUCTIVE TESTING

- 2.6.1 The contractor has to establish the WPS (Welding Procedure Specification) and PQR (Procedure Qualification Requirement) applicable for the scope of work for all the materials involved at his own cost. However Test Materials for the same will be given by BHEL free of cost.
- 2.6.2 All necessary preheating, post heating of welds and stress relieving operation of welds are part of the erection work and shall be performed by the contractor in accordance with the relevant regulations and standards of BHEL practice and to the satisfaction of BHEL Engineer and in accordance with the drawings and specifications.
- 2.6.3 Erection of equipment involves good quality of Welding, Heat treatment and Non Destructive Testing. Wherever required, 100% dye penetration tests have to be carried out as per instructions of BHEL Engineer. Contractor's Engineers, Supervisors, Technicians and workers engaged should have adequate knowledge on the above works.
- 2.6.4 The pressure parts piping's shall be erected in conformity with the provision of Indian Boiler Regulations and as may be directed as per any other standard/specification in practice in BHEL. The method of welding (viz.) Arc, Gas, TIG or other methods are indicated in the detailed drawings. BHEL Engineer will have the option of changing the method of welding as per site requirements.
- 2.6.5 Welding of high pressure parts shall be done by certified High Pressure Welders who possess valid certificate of CIB of the State in which the equipment is erected as per provision of IBR. The high pressure welders who possess necessary certificate shall appear well in advance before the expiry of the validity of their certificate for

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re-qualification test as per relevant provision of IBR and keep the certificate valid till the completion of work. The services of such welders, the validity of whose certificates has expired shall have to be suspended forthwith.

- 2.6.6 All welders deployed on this work shall be tested and approved by BHEL Engineer before they are actually engaged on work though they may possess the IBR certificate. BHEL reserves the right to reject any welders without assigning any reason.
- 2.6.7 BHEL Engineer is entitled to stop any welder from the work, if his work is unsatisfactory for any technical reasons or there is a high percentage of rejection of joints welded by him, which in the option of the BHEL Engineer will adversely affect the quality of the welding, though the welder has earlier passed the tests prescribed by BHEL Engineer. The welders having passed qualification tests does not relieve the contractor of a contractual obligation to check on the welder's performance.
- 2.6.8 All charges towards testing of welders for destructive and non-destructive testing and approval of welders for engaging in the erection work shall be borne by the contractor.
- 2.6.9 All radiographs shall be free from mechanical / chemical process marks to the extent they shall not confuse the radiographic image and defect finding penetrometer. As per ASME / SI shall be used for all exposures.
- 2.6.10 All welded joints shall subject to acceptance by BHEL Engineer.
- 2.6.11 Preheating, post weld heating and stress relieving after welding are part of erectors work and shall be performed by the contractor in accordance with the instructions of BHEL Engineer. Contractor shall arrange to supply heating equipment with automatic recording devices. Also the contractor shall have to arrange for labour, all heating elements thermocouples etc. insulating materials like mineral wool, asbestos, clothes, ceramic beads, asbestos ropes etc., required for heat treatment and stress relieving works.

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- 2.6.12 The contractor shall maintain a record in the format as prescribed by BHEL of all operations carried out on each weld and maintain a record indicating the number of welds, the names of welders who welded the same, date and time of start and completion, preheat temperature, radiographic results, rejection if any, percentage of rejection etc. and submit copies of the same to the BHEL Engineer as required. Interpretation of the BHEL Engineer regarding acceptability or otherwise of the welds shall be final. All site welds shall be subject to acceptance of BHEL / Customer Engineers.
- 2.6.13 The contractor shall carry out the edge preparation of weld joints at site in accordance with details acceptable to BHEL Engineer. Wherever possible machining or automatic flame cutting will be allowed only for edge preparation. Some extra lengths in various fabricated pipes given as erection allowance shall have to be cut and edges prepared to suit the site conditions at no extra cost.
- 2.6.14 Lead numbers, letters (Generally of 6 mm size) are to be used for identification of radiographs. Contract number, joint identification, source used, welders identification, SFD used are to be noted down on the paper cover of radiograph. Lead intensifying screens for front and back of the film shall be used as per the instruction of BHEL Engineer.
- 2.6.15 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 downstream side of the weld. For multiple exposures on pipes an overlap of about 25 mm of film shall be provided.
- 2.6.16 Heat treatment 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 arrangements including labour required for the work as per directions of BHEL.
- 2.6.17 All the data such as heating temperatures, heating rate, soaking time, maximum temperature reached during heat treatment shall be properly recorded and documented which will be property of BHEL.

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- 2.6.18 Oxy-acetylene flame heating or exothermic chemical heating for stress relieving is not permitted. Heating shall be by means of Electric Induction coil or Electric resistance coil. Potentiometric type recorders shall only be used for temperature recording purposes.
- 2.6.19 Radiography work of the welds connected with this contract shall be arranged by the contractor including provisions of services of technicians and necessary equipment and consumables like Isotope camera, X-Ray films, chemicals and other dark room facilities etc. Also contractor has to provide necessary labour required such as Riggers, Helpers etc. to assist the technicians for carrying the above radiography work and making other arrangements. Such as providing scaffolding, approaches, platform lighting arrangements at his cost as per the instructions of BHEL. It may please be noted that invariably the radiography will be carried out after the normal working hours only.
- 2.6.20 Radiography inspection of welds shall be performed in accordance with the requirements and recommendation of BHEL Engineer. The Minimum extent of radiographic inspection shall be as per BHEL Drgs / provision of IBR Regulations. They may however be increased depending upon the performance of the individual welder at the discretion of BHEL Engineer/Boiler inspection authority.
- 2.6.21 If the contractor does not carry out radiography work in time due to non-availability of film, chemicals etc. BHEL shall get the work done departmentally or through some other agency at the risk and cost of the contractor.
- 2.6.22 Wherever radiographs are not accepted on account of exposure, joints shall be re-radiographed and new films submitted for evaluation. Radiographs shall be taken again on joints after carrying out repairs. However, if the defects persist 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 contractors cost.

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- 2.6.23 Contractor has to make his own arrangements for air conditioned dark room to process the radiographs.
- 2.6.24 Quantum of radiography (percentage of joints) shall be enforced as per specifications and as per the drawings.
- 2.6.25 BHEL Engineer reserves the right to alter the quantum of radiography of joints. The decision of the BHEL Engineer in this regard is fixed and final and binding on the contractor. Any defects as pointed out by BHEL Engineer shall have to be rectified by the contractor at his cost. All X-Ray films of joints radiographed at site in connection with work shall be properly preserved in air-conditioned rooms and shall become the property of BHEL.
- 2.6.26 All field joints shall be subjected to dye penetrant examination as specified in the respective drawings and shall have to be accepted by BHEL Engineer. Any rectifications required shall have to be done by the contractor at his cost.
- 2.6.27 For carrying out ultrasonic testing of welds including large size tubes and pipes it will be necessary to prepare the surface by grinding to a smooth finish and contour as desired by BHEL Engineer. The contractor's scope of work includes such preparation and no extra charges are payable to this.
- 2.6.28 It may also become necessary to adopt inter layer Radiography / MPT/ UT depending upon the site / technical / requirement necessitating interruptions in continuity of the work and making necessary arrangements for carrying out the above work. The tenderers shall take all this into account and quote the price inclusive of all such work and radiography.
- 2.6.29 The welded surface irrespective of place of welding shall be cleaned of slag and painted with primer paint to prevent corrosion at no extra cost towards this.

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- 2.6.30 The contractor shall have to do root run by TIG process, wherever required as per the instruction of BHEL Engineer.
- 2.6.31 Welding of Hangers, supports, stubs and impulse pipings to be carried out by the contractor as per drawing specification and as per BHEL Engineer's instructions. According to drawing specifications and as per BHEL Engineer's instructions preheating, post-heating, stress relieving, etc. have to be carried out by the contractor wherever necessary.

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2.7.0 HYDRAULIC TEST, PRE-COMMISSIONING & COMMISSIONING:

- 2.7.1 Hydraulic testing pumps for HP lines shall be provided by BHEL free of hire charges. The servicing, installation, electrical connection, erection, testing and dismantling and returning to BHEL Stores, etc., shall be carried out by the contractor as part of this work without any extra charges. For LP lines contractor has to arrange Hydraulic Test pump / Hand Pump for HT at his cost. The Electric power consumption for the operation of HT Pumps will be charged as per relevant clause elsewhere in this tender.
- 2.7.2 All pressure parts and some of the Low Pressure parts shall be subjected to hydraulic test as per the Standard / statutory requirements. The contractor shall supply necessary labour and other services and make necessary arrangements to carry out the required tests as per the instructions and directions of the BHEL Engineers.
- 2.7.3 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.
- 2.7.4 The hydraulic testing of the equipment and piping, covered under this scope of work including vacuum system testing by water filling has to be carried out by the contractor as per instructions of BHEL Engineer. The contractor shall provide all facilities required for hydraulic testing.
- 2.7.5 All the above tests shall be repeated till all the equipment satisfy the requirement of BHEL to their 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.

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- 2.7.6 Lube oil, seal oil, governing oil, pipelines to ST, STG, Pumps, etc. shall be oil flushed. Contractor will have to lay temporary piping to connect the entire system irrespective of whether the equipment/system connected has been erected by the contractor or not. Decisions of BHEL Engineer in this regard will be final and binding on the contractor.
- 2.7.7 Cleaning of oil tank by sand/shot blasting or other method as per instructions of BHEL Engineer before and after oil flushing is the responsibility of the contractor.
- 2.7.8 Replacing/changing of mechanical seal/other seals and removal, cleaning or replacing of filters etc. during pre-commissioning / commissioning stage is within the scope of work.
- 2.7.9 Overhauling, Cleaning, Servicing of tanks, pumps, equipments, barring gear, valves, governing system during erection and commissioning stages are in the scope of work. Gaskets, packing for replacement will be provided by BHEL free of cost.
- 2.7.10 Contractor shall lay the temporary pipelines with fittings, accessories and erection & commission of 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 are within the scope of work. Necessary materials for this will be provided by BHEL. Overhauling / cleaning / revisioning /servicing of valves, fittings in temporary system and acid cleaning tanks for re-commissioning activities / operation like water flushing / steam blowing / washing / flushing / passivation / chemical cleaning etc. and also over hauling / revisioning of the pumps & equipments and also to carry out the repairs to attend leaks etc. in the temporary piping & equipments, prior & while carrying out the above operations/activities. All the above works are within the scope of work. All the chemicals will be supplied by BHEL free of cost.

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- 2.7.11 Chemical cleaning (Acid cleaning of piping/alkali flushing) will involve the installation of temporary piping, valves, cutting of some of the existing valves, placing the rubber, wedges in the valves, gagging of valves, and installation of temporary tanks 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 carried out by the contractor. Required materials will be provided by BHEL free of cost. Chemicals for chemical Cleaning will be provided by BHEL. All other consumable are to be provided by the contractor.
- 2.7.12 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 centrifuge bowl for sediments and laboratory tests of the oil samples taken from the system. After declaration of complete oil flushing of system, oil tank, coolers & the system shall be completely drained, thoroughly cleaned and refilled with fresh oil for putting the system in operation. The contractor shall provide requisite Man-power like skilled/semi skilled workmen in three shifts during oil flushing as a part of this contract without any extra charges. Before commissioning of oil system the pipelines should be hydraulically tested using the hydraulic test pump to the required pressure.
- 2.7.13 Contractor shall lay all necessary electric cables, switches, etc. required for the hydraulic tests and other tests, flushing etc., and maintain the system till the tests are completed satisfactorily.
- 2.7.14 Steam blowing of system piping if required will involve laying of temporary pipe lines, valves, etc and dismantling & restoration of piping. The required steam shall be provided at a central point by BHEL.
- 2.7.15 During the initial stages of work, trenches for draining water may not be available after Leak test, Hydro test, Flushing or mass flushing. For discharging/ emptying the equipment, system and piping, necessary low point drains and temporary piping upto safe location are be erected by the contractor at his cost. The materials will be provided by BHEL.

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- 2.7.16 After acid cleaning / pickling of lubricating system (including oil piping, oil tank and other fittings) of rotating machines, oil flushing of lubricating systems as per instructions of BHEL Engineer shall be carried out. Cleaning of all tanks of lubricating oil system of ST, STG and rotating machineries before and after oil flushing is in the scope of work.
- 2.7.17 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.
- 2.7.18 The contractor as per BHEL requirements will suitably make preservation of cleaned surfaces. All shaft journals and bearings of ST, STG, motor and other rotating machines shall be periodically inspected and preserved as per BHEL Engineer's instructions/BHEL quality instruction manuals.
- 2.7.19 Raw materials for all temporary piping necessary for conducting Hydraulic test, Chemical cleaning, Steam blowing, Flushing, effluent disposal, etc. will be provided by BHEL free of cost. However, fabrication, servicing, erection and dismantling the same and return of the temporary piping, flanges, valves etc. to BHEL stores is the responsibility of the contractor without any extra charges.
- 2.7.20 The contractor shall carryout the required tests on the equipments & pipelines, such as gas tightness test/air tightness test, kerosene test, hydrostatic test and rectify all the defects caused due to contractor's fault at his own cost. Contractor may have to replace old/damaged gaskets / packing etc. of equipments and the same shall be carried out by contractor as per requirement. Compressed air for pneumatic testing is to be arranged by contractor. 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 dry out to be done by the contractor to improve the IR value at no extra cost.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 2.7.21 In case any erection defect is detected during various tests / operations, trial runs as detailed above, such as loose components, undue noises, vibration, strain on connected equipment, steam/oil/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.
- 2.7.22 Welding and stress relieving of temporary blanks or suitably fixing temporary blank flanges with gaskets and fasteners and welding and providing suitable de-aeration / venting / draining points with valves as per BHEL Engineer's instructions, for performing hydro-test of piping and other equipments is within the scope of work. Gaskets, valves, fasteners will be provided free of cost by BHEL. Contractor shall cut steel blanks from steel provided without charging extra. After completion of hydraulic test, welded blanks shall be cut and removed and weld burrs ground finished and cavities/scars of cutting weld filled and ground as per BHEL Engineer's instructions.
- 2.7.23 Necessary scaffolding and approaches for conducting the above shall also be within the scope of the contract.
- 2.7.24 Main Steam Line & Hot Reheat Line Strainers bodies are erected first before steam blowing of the lines. After Hydraulic Test, the strainer elements are fixed. During trial operation, if required the strainers are removed for inspection of derbies & cleaning. Contractor has to carry out the work as part of his work without any extra cost.
- 2.7.25 For conducting Hydro test of MSL, HRH, LP BP & CRH Lines, ESV, IV & LP BP Valves & CRH NRV internals are to be removed, Hydro Test devices are to be fixed and after Hydro Test the internals are to be re-assembled by the contractor as instructed by BHEL without any additional cost.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 2.7.26 For steam blowing of MSL, HRH, LP BP & CRH Lines, ESV, IV & LP BP Valves & CRH NRV internals are removed and Hydro Test devices are fixed by the contractor. After Hydro Test the internals are to be reassembled as instructed by BHEL without any additional cost.
- 2.7.27 The Contractor shall carry out the air tightness test on generator stator to the satisfaction of BHEL Engineers. The necessary arrangements for testing with dry clean air shall be made by the contractor. Also the contractor has to arrange the mercury manometer and mercury at his cost.
- 2.7.28 The contractor shall assist to carry out the following tests in generator within the quoted value:
- a. High voltage test of bushings
 - b. Measurement of DC resistance of rotor and stator.
 - c. Impedance test of rotor.
 - d. Measurement of IR values of stator – rotor – RTD Thermocouples etc.
- 2.7.29 The contractor shall carryout kerosene test of all the bearing housing of turbine, generator, pumps & other equipments and do the repair work if any. The contractor at his cost shall also arrange kerosene.
- 2.7.30 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.
- 2.7.31 Temporary blinds/lugs/caps of piping and associated equipments like tanks, pumps etc required for oil flushing / alkali cleaning / acid cleaning of piping & other equipments during erection & pre-commissioning shall be erected by contractor within the quoted rate.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 2.7.32 In case any malfunctioning and/or defect is found during tests/trials runs such as loose components, undue noise or vibrations, strains etc. on equipment, the contractor shall immediately attend to these defects/malfunctioning and take necessary corrective measures. If any readjustment and re-alignment are necessary the same shall be done as per BHEL Engineer's instructions as part of work at no extra cost.
- 2.7.33 During the stages of pre-commissioning / commissioning / post commissioning, if any part of the ST, STG, and auxiliaries need repair/rectification/rework/replacement, the same shall be done expeditiously and promptly by the contractor.
- 2.7.34 During this period, though BHEL's and customer's staff also be associated in the work, it is the contractor's responsibility to make available the resources in his scope till such time the commissioned units are taken over by the customer/BHEL.
- 2.7.35 Contractor shall cut open the 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. During commissioning, opening of valves, changing of gaskets, attending to leakages, minor modification/ rectification works may arise. The contractor has to carry out these works at his cost by providing required manpower in all the three shifts. In case any rework is required because of contractor's faulty erection and which is noticed during commissioning the same has to be rectified by the contractor at his cost.
- 2.7.36 Contractor to provide necessary commissioning assistance from pre-commissioning stage onwards and up to continuous operation of Steam turbine, STG and Auxiliaries. The category of personnel to be deployed shall be as per site requirement and to meet the various pre-commissioning and commissioning program made to achieve the schedule agreed with customer.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

2.7.37 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 till handing over of sets to customer.

2.7.37 After rolling of turbine, the commissioning activities and trial operations will continue upto handing over. It shall be the responsibility of the contractor to provide various categories of workers in sufficient numbers as per the work requirement along with supervisors including necessary consumables, tools, etc. during this period. The rate quoted shall include all these contingencies also. The various categories of workers required for pre-commissioning, commissioning and post-commissioning activities are as follows.

- a. Pipe fitters
- b. Mill Wright Fitters
- c. HP / Structural welders
- d. Riggers
- e. Unskilled workers
- f. Supervisors
- g. Electricians
- h. Any other category of workers as may be required

Further in addition to the above, contractor has to arrange the following manpower exclusively for assisting BHEL commissioning engineers during stabilization and trial operation period. This manpower will be directly controlled by BHEL commissioning engineers only.

1. One supervisor per shift for three shifts
2. Two fitters per shift for three shifts
3. Two helpers per shift for three shifts.

It shall be specifically noted that the contractor may have to work round the clock during the pre-commissioning, commissioning and post-commissioning period along with BHEL Engineers and hence considerable overtime payment is involved. The contractor's quoted rates shall be inclusive of all these factors.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 2.7.40 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.
- 2.7.41 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, commissioning of STG and the other equipments, even though the delay reasons are not attributable to the contractor.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Volume 1A Part II Chapter -8

2.8.0 FINAL PAINTING

- 2.8.1 The scope of work shall include supply and application of final painting as required and specified for the components of TG and its auxiliaries, TG Integral piping erected under your scope.
- 2.8.2 For details, refer Painting scheme/schedule enclosed.
- 2.8.3 Support tube plates, shell internals, dome internals, steam throw off device (steam side), air extraction piping etc., inside the condenser shall be painted with steam washable paints if required.
- 2.8.4 The interior surfaces of water boxes & water side surface of water chambers excluding tube plates are to be painted as per the procedure /approved painting schedule given by BHEL Engineer/ Mfg. unit. The condenser is to be painted at site as follows: External surface to be painted with 2 coats of polyurethane finish paints. Total DFT (final)-180microns and the interior surfaces of water box, water chamber with 3mm thick glass fibre reinforced epoxy lining.
- 2.8.5 Required paints, thinner other consumable such as wire brush, brush etc shall have to be arranged by the contractor at their own cost.
- 2.8.6 In the case of steel fabricated items, raw steel after fabrication has to be cleaned by Sand / shot blasting by and subsequent painting to be carried out. Sand / shot blasting equipment as required has to be arranged by the contractor at his cost.
- 2.8.7 All the exposed metal parts of the equipments including piping, structures, hangers etc., wherever applicable after installation unless otherwise specified the surface to be protected, are to be first painted with at least one coat of suitable primer, 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 painted with intermittent and final coating as specified in the Painting Specification and as per the instructions of BHEL / Customer official. If needed and insisted either by BHEL engineer or the BHEL client, in certain cases, spray painting has to be done wherever brush painting is not accessible, by the contractor, within the quoted rates. Contractor has to carryout painting as per the procedure lay down by the customer.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- 2.7.8 Before applying the subsequent coats as per specification the thickness of each coat shall be measured and recorded with BHEL/Customer. The instrument for checking the thickness of coat is to be procured by the contractor and should be calibrated after periodical intervals.
- 2.7.9 The quality of the finish paint shall be as per the standards of ISI or equivalent and the colors as approved by BHEL/Customer.
- 2.7.10 The actual color to be applied shall be intimated to the contractor before starting of actual painting work. The quoted rate shall include final painting also. The scope of painting includes application of color 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.
- 2.7.11 Primer & finish coat shall be of reputed paint supplier approved by BHEL/Customer. The batch certificates of paints to be submitted to BHEL Engineer before using the same.
- 2.7.12 GI, Stainless steel, brass, aluminum, copper and other non-ferrous materials shall not be painted unless otherwise specified.
- 2.7.13 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 un-coated spots. Each coat (Primer, intermediate, finish) shall have a minimum thickness of 70, 70 & 60 microns respectively and total thickness of 200 microns unless otherwise specified. 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%.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Annexure-1

BRIFE LIST OF EQUIPMENTS/COMPONANTS TO BE ERECTED

1. STEAM TURBINE

- Steam Turbine Consisting of 3 cylinders (HP/IP/LP) including the following
- Base plates & Foundation Holding Bolts
- Bearing Pedestals
- ESV&CV, IV&CV, LPBP Valves with servomotors & Suspensions
- LP BP water injection Valves
- Steam Strainer Housing & Strainer Elements for Main Steam & Re-Heat Steam Lines
- Hydraulic Turning Gear
- Electro-Hydraulic Governing System backed-up with mechanical System
- Governing Rack, LP By-Pass racks and solenoid, test Valve racks & Pr transducers rack.
- Cross around Piping between IP&LP Casing with spring supports
- Blanking Device/Fixtures for ESVs, IVs LPBP, CRH NRVs etc., for hydraulic testing and steam blowing
- Oil Supply Units & Oil piping for HPBP and Spray Valves (Trichy Supply Under PG 22)
- Lube Oil System consists of oil tanks, injector assy, centrifuge, AOP, JOP, EOP, Leak & Dirty oil tank with pumps, Duplex Filter, vapour fans and auxiliaries, clean oil tank, oil unloading tank, connected oil piping, valves, H&S etc.,
- Control Fluid tank, Oil equipment, Pumps ,piping, Valves, H&S etc.,

2. TURBO GENERATOR

- Hydrogen Cooled Main Generator Consisting of the following
- Stator
- Rotor
- End Shields & Bearing
- Exciter
- Seal Oil System
- Primary Water System
- H₂ Cooling System
- CO₂ System
- Seal Oil Tank
- PW Tank & Alkaliser Unit
- Generator package piping
- Other Accessories

TECHNICAL CONDITIONS OF CONTRACT (TCC)

3. HEAT EXCHANGERS

- Condenser mainly comprising of the following parts
 - Bottom Plate
 - Hot Well
 - Turbine & Generator end Side Wall plate
 - Upper and Lower Dome Walls
 - Front & Rear Water Chambers and Water boxes
 - Tube Support Plates
 - Springs assemblies
 - Steam Through device
 - Air Extraction Pipe & Baffle
 - Stiffening/Support Pipes/Rods, Bars etc.,
 - Misc Fittings & Loose items
 - Instruments

- Gland Steam Cooler
- LP Heater 1, 2 & 3
- HP Heaters 5(A&B), 6(A&B)
- Live steam reheaters.
- Drain Coolers
- FST & Deareators

(FST in Sections)

- Lube Oil & Seal Oil Coolers
- Primary Water Coolers
- Hydrogen Coolers
- Exciter Air Coolers
- CF Coolers

4. PUMPS & MOTORS

- Boiler Feed Pumps (1 Motor Driven & 2 Turbo Driven)
- 2 Drive Turbine for TD BFP Consists of
 - Turbine Assembly
 - Governing Valve Assembly, governing rack assly
 - Oil Pumps, oil centrifuge
 - Lube Oil Console, Dump well tanks
 - Gear Box
 - Connecting Couplings
 - Oil Coolers etc.,
- Motor for MD BFP
- Booster Pumps for BFP
- Lube Oil Piping, Cooling Systems & other Accessories for BFP, Drive Turbine & Motor-2nos
- Condensate Extraction Pump-3nos
- Motors for CEP-3nos

TECHNICAL CONDITIONS OF CONTRACT (TCC)

5. BOUGHT OUT ITEMS

- Turbine Integral Piping Consists of
 - Lube Oil Piping
 - Control Oil Piping
 - Seal Oil Piping
 - Gland Seal Piping
 - Equipment Drains & Vents
 - Air & Gas System Piping
 - ACW piping for H₂ Coolers
 - Other Misc System Piping Etc.,

- Condenser Tubes
- Vacuum Pumps & Air evacuation System
- Condenser Water Box Handling Equipment
- Oil Centrifuge & Associated System
- CF Purification Unit with pumps, Vapour exhauster etc.,
- 3 Way Temperature Control Valves
- Drain Valves
- Hangers & Supports
- Pumps with Accessories (JOP, AOP, EOP)
- Springs and Hangers supports
- Dampers(Vacuum Breaking Device)
- H₂ & CO₂ Cylinders, N₂ Cylinders
- Fixing of Pick-Ups, Probes & Accessories for Vibration Monitoring System
- Dynamic Shaft Grounding Device
- Bearing Vapour Exhauster
- Coupling Covers
- Flash Tanks
- Depressurisation Tanks & LSR emerg.& normal drain tanks.
- Butterfly Valves
- ME Bellows
- DM Cooling Water Pumps
- Centralised purification system tanks.
- Priming Pumps-3nos
- LP dosing sys for ECW
- Portable Lube Oil Purification Unit
- Condenser On Load Tube Cleaning System(COLT)
- Misc pumps
- Control valves
- Rota meter
- Debris filter

TECHNICAL CONDITIONS OF CONTRACT (TCC)

6. OTHER EQUIPMENTS

- DM water Transfer Pumps with Motor - 2 nos.
- Emergency Hot well Make up Pump with Motor - 2 nos.
- Misc.DM water Pumps with motor - 2 nos.
- Depressurisation Tank Drain Pump with Motor - 2nos.
- Cent .Lub. Oil pumps - 4 nos.
- OGDHR Heat exchangers - 4 nos.
- OGDHR - H. E - Cooling Fans with motors - 8 nos .
- OGDHR Recirculation pumps with Drive - 2nos.

CONDENSER CW Piping:

CW piping between Puddle Flange to Condenser Water box inlet and outlet including RE joints, butterfly valves and associated equipments generally included in the scope of work is however NOT INCLUDED IN THE SCOPE OF SUPPLY / ERECRTION FOR THIS PROJECT.

Note:

1. The Information furnished in this section is only a description regarding the item to be erected by the contractor. BHEL reserves the right of adding or excluding any components/ items / systems according to the site requirements/ customer requirements to complete various systems in all respects.
2. Any other systems / components which are the integral to equipment supplied by the manufacturing units shall also be erected and commissioned by the contractor within the quoted /accepted rate.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Volume 1A PART –II ANNEXURE – 2

WEIGHT SCHEDULE IN MT

<u>SL NO</u>	<u>HARDWAR -ITEMS.</u>	<u>WEIGHT(MT).</u>	
1	Turb.packages	879	
2	Gen.packages	521.9	
3	Cond & H .Exangers packages.	483.7	
4	Bought out items.	150	
	Total Weight:	2154.6	
<u>SL NO</u>	<u>BHOPAL - ITEMS</u>	<u>WEIGHT.</u>	
1	Live Steam Reheaters&accessaries. LHS & RHS	144	
2	Clean oil Tank & Its accessaries .	9.5	
3	Dirty Oil Tank & Its accessaries..	9.5	
4	Depressurisation Tanks A & B & its accessaries. .	10	
5	Reheater Drain vessal & its accessaries.	24.3	
6	HP.Drain Flash Tank & Its accessaries.	11.29	
7	L.P.Drain Flash Tank & Its accessaries.	4.88	
8	Unit Flash Tank & Its accessaries.	1.41	
9	Steam Drain Flash Tank & Its accessaries.	3.1	
10	Reheater Drain Flask Tanks A&B & its accessaries.	0.95	
11	Reheater Alternate Drain Flash Tank & its accessaries.	0.9	
12	Feed Water Heater Safety Valve Drain Flash Tank.	2	
	and its accessaries.		
	Total Weight.	221	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

<u>SL NO</u>	<u>HYDERABAD - ITEMS.</u>	<u>Weight.</u>	
1	MDBFP- MOTOR.	25	
2	CEP - MOTORS 3 NOS.	24	
3	PUMPS,HEATERS & DEAERATOR.	600	
	Total weight.	645	
<u>SL NO</u>	<u>PEM ITEMS.</u>	<u>Weight.</u>	
1	DM water Transfer Pumps with Motor - 2 nos.	2	
2	Emergency Hot well Make up Pump with Motor - 2 nos.	2	
3	Misc.DM water Pumps with motor - 2 nos.	2	
4	Depressurisation Tank Drain Pump with Motor - 2nos.	3	
5	Debris Filters - 2 nos..	40	
6	Cent .Lub. Oil pumps - 4 nos.	1	
7	Condensor on load Tube cleaning system - 1set.	10	
8	OGDHR Heat exchangers - 4 nos.	50	
9	OGDHR - H. E - Cooling Fans with motors - 8 nos .	6	
10	OGDHR Recirculation pumps with Drive - 2nos.	10	
	Total weight.	126	
	TOTAL COMBINED WEIGHT	3146.5 TONS	

Note:

1. The weight indicated above is approximate and there may be a variation in weight of equipment/Package.



BHARAT HEAVY ELECTRICALS LIMITED,RANIPUR,HARIDWAR
SUMMARY LIST OF PACKAGES(10570P11101)

Workorder Number	10570P11101	Rev. Date	06.02.2010
Project	PFBR,KALPAKKAM:500MW	CCN	MS1070010
Rating	500MW	Std	HW0232899 :: Standard Packing

SNO	PKG. NO/SL	NET WT	GROSS WT	DESCRIPTION	PKG SIZE
1	75001/0	3881	4940	EMBEDMENT FOR ANCHOR POINTS	4400X1600X1000
2	75001/5	0	0		0X0X0
3	75003/0	5597	6350	COMPONENTS FOR BASE PLATEASSEMBLY	4900X1200X600
4	75004/0	3123	3700	COMPONENTS OF BASE PLATE	2800X1700X600
5	75101/0	6403	7200	BASE PLATE FOR LP CASING	1850X1400X500
6	75102/0	15400	15520	LP OUTER CASING PARTS	9000X2187X3460
7	75103/0	15400	15520	LP OUTER CASING PARTS	9000X2190X3460
8	75104/0	4380	4600	LP OUTER CASING PARTS	5670X3290X1140
9	75105/0	4380	4600	LP OUTER CASING PARTS	5670X3290X1140
10	75106/0	1055	1255	LP OUTER CASING PARTS	3400X1200X1200
11	75107/0	21322	21412	LP LONGITUDINAL GIRDER (LEFT)	8200X1680X1950
12	75108/0	21322	21412	LP LONGITUDINAL GIRDER (RIGHT)	8200X1680X1950
13	75109/0	18130	18300	LP FRONT WALL (TS)	8760X3850X1150
14	75110/0	18130	18300	LP FRONT WALL (GS)	8760X3850X1150
15	75111/0	1835	2300	LP SHAFT SEALING (FRONT)LP SHAFT SEALING (FRONT)	1800X1700X740
16	75112/0	1835	2300	LP SHAFT SEALING (REAR)	1800X1700X740
17	75113/0	225	350	LP SHAFT SEAL COMPENSATOR (TS)	1500X1500X650
18	75114/0	225	350	LP SHAFT SEAL COMPENSATOR (GS)	1500X1500X650
19	75115/0	2150	2850	AUXILIARIES OF LP TURBINE	2300X1200X1000
20	75201/0	12100	13275	HP/IP BRG.PED.ASSLY.	4080X2005X2126
21	75202/0	300	400	HP/IP BRG.PED.PARTS	1000X600X600
22	75301/0	210	300	ASSEMBLY DEVICES	1000X750X750
23	75302/0	1130	1430	INSPECTION SHAFT FOR IPC	4050X600X900
24	75304/0	6395	6860	COMPONENTS OF ASSEMBLY FIXTURE FOR HPT	3800X2500X1300
25	75305/0	1510	1800	COMPONENTS OF ASSEMBLY FIXTURE FOR HPT	2300X2100X900
26	75306/0	2852	3350	COMPONENTS OF ASSLY FIXTUREFOR HPT	3300X1800X1300
27	75307/0	2566	3400	COMPONENTS FOR ASSLY FIXTUREFOR HPT	5450X4050X400
28	75308/0	1510	1680	AUXILIARIES OF LP TURBINE	3750X1000X1000
29	75309/0	1141	1145	AUXLIARIES OF LP TURBINE	2000X1000X1550
30	75310/0	1141	1145	AUXLIARIES OF LP TURBINE	2000X1000X1550
31	75311/0	580	1020	ASSEMBLY TOOLS	1700X800X400
32	75312/0	205	260	AUXILIARIES OF IP TURBINE	1200X500X550
33	75313/0	205	210	AUXILIARIES OF IP TURBINE	1100X500X650
34	75314/0	205	210	AUXILIARIES OF IP TURBINE	1100X500X650
35	75315/0	90	150	BOLT HEATING EQUIPMENT AND BREECH NUT HEATING DEVICE	1700X900X700
36	75316/0	548	625	GROMMET SLINGS	1700X1700X300
37	75318/0	150	250	OIL FLUSHING AND PRESSURE TEST DEVICE	750X550X400
38	75319/0	3910	4650	STEAM BLOWING & HYDRAULIC TESTDEVICES	2900X2100X1200
39	75320/0	900	1500	TOOLS FOR GOV.SYST.&VALVES	1750X1200X1000
40	75321/0	705	905	VALVE SUPPORT FOR HPT OVERHALL	1500X750X750
41	75401/0	13500	14500	IP-LP BEARING PEDESTAL ASSLY	3700X1860X2100
42	75501/0	8478	9370	LP/GEN. PEDESTAL ASSEMBLY	3200X2280X2070
43	75502/0	1030	1150	BEARING PEDESTAL (PARTS)	1600X800X600

Total Net Weight:	879058	Rev. Date:	06.02.2010
Total Gross Weight:	972530	Approved By:	steskb



BHARAT HEAVY ELECTRICALS LIMITED,RANIPUR,HARIDWAR

SUMMARY LIST OF PACKAGES(10570P11101)


44	75601/1	11058	12386	FRONT BEARING PEDESTALFRONT BEARING PEDESTAL	3140X3140X2050
45	75601/2	630	750	HYDRAULIC TURNING GEAR	2100X1000X600
46	75601/3	380	550	MAIN OIL PUMP ASSEMBLY.	1400X1200X1000
47	75704/1	2800	3000	LP CASING ASSEMBLYLP CASING ASSEMBLY	2250X1350X750
48	75704/2	100	120	PARTS OF LP OUTER CASING ASSLY	500X500X400
49	75705/0	1358	1985	LP EXTRACTION A1	4575X1620X870
50	75706/0	1358	1985	LP EXTRACTION A1	4575X1620X850
51	75707/1	712	1200	LP EXTRACTION A1	3420X1620X870
52	75707/2	290	330	LP EXTRACTION A1	950X750X750
53	75708/0	1405	1860	LP EXTRACTION A2	3200X2300X1370
54	75709/0	842	1350	LP EXTRACTION A2	3420X1220X1120
55	75710/0	355	755	LP EXTRACTION A3	2700X1000X1000
56	75711/0	530	930	LP EXTRACTION A3	2200X1700X1000
57	75716/0	1365	1700	LP EXTRACTION PIPE SHEATHINGLP EXTRACTION PIPE SHEATHING	2900X2050X1200
58	75717/0	1861	2485	INNER GUIDE PLATE OF DIFFUSER(TS)	2650X2650X1100
59	75718/0	7360	7400	DIFFUSER (TS)	5800X2900X2050
60	75719/0	7360	7400	DIFFUSER (GS)	5800X2900X2050
61	75720/0	33500	34000	LP INNER OUTER CASING (U/H)	8640X3650X2550
62	75721/0	44000	51840	LP INNER CASING (L/H)	9100X3890X3180
63	75722/0	12100	13300	LP INNER INNER CASING (U/H)	4600X1900X2350
64	75723/0	5510	5910	LP CASING ASSEMBLYLP CASING ASSEMBLY	5000X1900X1000
65	75724/0	1850	2050	LP INNER CASING ASSLY/FASTENERLP INNER CASING ASSLY/FASTENER	2350X1250X750
66	75725/0	1861	2485	INNER GUIDE PLATE OF DIFFUSER(GS)	2650X2650X1100
67	75728/0	1289	1700	STEAM INLET PIPE (LPT)	3200X1500X1500
68	75801/0	83550	89800	LP ROTOR	8735X3800X4170
69	75901/0	21765	23132	IP ROTOR	4800X2120X1995
70	75902/0	25450	25850	IP OUTER CASING (U/H)	4050X3800X2650
71	75903/0	25450	25870	IP OUTER CASING (L/H)	3400X5250X2600
72	75904/0	14150	15200	IP INNER CASING (U/H)	2900X3200X1850
73	75905/0	14150	15200	IP INNER CASING (L/H)	2900X3200X1850
74	75906/0	13500	13550	IP INLET ASSEMBLY	4500X3725X1300
75	75907/0	765	950	IP SHAFT SEALING	1400X1200X900
76	75908/0	2750	3125	IP TURBINE (PARTS)	2000X1900X1000
77	75909/0	365	475	I.P. TURBINE PARTS	1000X1000X750
78	76001/1	86350	88650	HP TURBINE	5675X3400X2900
79	76001/2	48	57	EMERGENCY GOVERNOR	495X395X695
80	76002/0	35	80	HP INLET ASSLY. & HP EXHAUSTASSLY. (PARTS)	1200X1200X500
81	76003/0	1810	2000	HP EXHAUST ASSEMBLY	1650X1400X900
82	76004/0	120	200	HPT RELATED PARTS	1300X1300X700
83	76104/0	20276	23146	ESV & CV CASING WITH VALVES	3360X3360X2590
84	76105/1	3849	4250	ESV SERVOMOTOR WITH LIMIT SWITCHES	2300X1200X1200
85	76105/2	3849	4250	ESV SERVOMOTOR WITH LIMIT SWITCHES	2300X1200X1200
86	76107/0	2680	3280	HP CONTROL VALVE SERVOMOTOR	2800X1200X2100
87	76108/0	20276	23146	ESV & CV CASING WITH VALVES	3360X3360X2590
88	76112/0	2688	3288	HP CONTROL VALVE SERVOMOTOR	2800X1200X2100
89	76201/0	6618	8078	SUSPENSION OF VALVE (IV)	4250X2640X750
90	76202/0	28276	33276	IV & CV CASING WITH VALVES	5040X4690X2770
91	76203/1	3385	3965	IV SERVOMOTOR WITH LIMIT SW. MOUNTIGS	2700X1450X1400
Total Net Weight:		879058		Rev. Date:	06.02.2010
Total Gross Weight:		972530		Approved By:	steskb



BHARAT HEAVY ELECTRICALS LIMITED,RANIPUR,HARIDWAR
SUMMARY LIST OF PACKAGES(10570P11101)

92	76203/2	3385	3965	IV SERVOMOTOR WITH LIMIT SW. MOUNTIGS	2700X1450X1400
93	76204/0	2403	3019	IP CONTROL VALVE SERVOMOTOR	3240X1240X1950
94	76205/1	2026	2026	FRAME FOR SUSPENSION (IV)	3400X3150X750
95	76205/2	2026	2026	FRAME FOR SUSPENSION (IV)	3400X3150X750
96	76205/3	17	20	LOOSE ITEMS FOR FRAME FORSUSPENSION(IV)	300X200X200
97	76206/0	28276	33276	IV & CV CASING WITH VALVES	5040X4690X2770
98	76210/0	2387	3003	IP CONTROL VALVE SERVOMOTOR	3240X1240X1950
99	76301/1	1850	2700	SUSPENSION OF VALVES (LPB)	3600X1700X800
100	76301/2	1850	2700	SUSPENSION OF VALVES (LPB)	3600X1700X800
101	76303/0	716	1377	WATER INJECTION VALVE	XX
102	76305/0	11929	13300	CHEST LPB WITH STOP & CONTROLVALVE	XX
103	76306/0	11929	13300	CHEST LPB WITH STOP & CONTROLVALVE	XX
104	76307/1	1103	1410	LPB STOP VALVE SERVOMOTOR	XX
105	76307/2	1103	1410	LPB STOP VALVE SERVOMOTOR	XX
106	76308/1	2650	3200	LPB CONTROL VALVE SERVOMOTOR	XX
107	76308/2	2650	3200	LPB CONTROL VALVE SERVOMOTOR	XX
108	76402/0	338	588	INJECTOR FOR SUC. PIPE NB 350	3300X800X800
109	76403/0	499	999	INJECTOR FOR SUC. PIPE NB 300	3300X1750X1200
110	76404/0	10697	10697	MAIN OIL TANK & NOZZLE ARRGT.ASSY.	6180X3260X2650
111	76405/0	327	402	MAIN OIL TANK & NOZZLE ARRGT.ASSY.	4200X1200X900
112	76406/0	168	228	OIL STRAINERS	1500X1000X1200
113	76407/0	168	228	OIL STRAINERS	1500X1000X1200
114	76409/0	170	470	OIL STRAINERS	2050X1200X1410
115	76412/0	515	515	LEAKAGE OIL TANK	1000X1000X3000
116	76413/0	515	515	WASTE OIL TANK	1000X1000X3000
117	76414/0	165	255	VAR.ORIFICES THR.VALV.&FLUSH.PARTS	1700X700X760
118	76415/0	30	50	VARIABLE ORIFICE 125	400X300X200
119	76504/0	11	13	DAMPING DEVICE	XX
120	76601/0	2090	2150	CROSS AROUND PIPE (PARTS)	3500X1750X1800
121	76602/0	2090	2150	CROSS AROUND PIPE (PARTS)	3500X1750X1800
122	76603/0	2490	3190	COMPENSATOR ASSEMBLY (CAP)	1900X1950X1750
123	76604/0	2490	3190	COMPENSATOR ASSEMBLY (CAP)	1900X1950X1750
124	76605/0	2490	3190	COMPENSATOR ASSEMBLY (CAP)	1900X1950X1750
125	76606/0	2490	3190	COMPENSATOR ASSEMBLY (CAP)	1900X1950X1750
126	76607/0	2570	3270	COMPENSATOR ASSEMBLY (CAP)	1900X1950X1750
127	76608/0	2570	3270	COMPENSATOR ASSEMBLY (CAP)	1900X1950X1750
128	76609/0	222	242	REDUCER ASSEMBLY (CAP)	1250X1250X500
129	76610/0	222	242	REDUCER ASSEMBLY (CAP)	1250X1250X500
130	76611/0	1830	2030	CROSS AROUND PIPE (PARTS)	2000X1150X600
131	76612/0	1830	2030	CROSS AROUND PIPE (PARTS)	2000X1150X600
132	76613/0	2200	2240	MITRE BEND ASSEMBLY (CAP)	3640X1540X2040
133	76614/0	2200	2240	MITRE BEND ASSEMBLY (CAP)	3640X1540X2040
134	76701/0	77	97	CHANGE OVER VALVE	800X500X200
135	76702/1	8990	10528	CRH NRV WITH SERVOMOTOR	3200X2300X2600
136	76702/2	2600	5600	STEAM BLOWING DEV.FOR NRV CRHLINE	2500X1600X1200
137	76703/0	418	808	GLAND STM.& LEAKAGE STM. VALVEWITH SERVOMOTOR & PR.INDICATOR	1750X1400X850
138	76801/0	36	55	RATING,COLLABORATION&COMPANY'SMONOGRAM PLATE	850X550X200
139	76901/0	83	133	OIL STRIPPER	600X600X850

Total Net Weight:	879058	Rev. Date:	06.02.2010
Total Gross Weight:	972530	Approved By:	steskb

		BHARAT HEAVY ELECTRICALS LIMITED,RANIPUR,HARIDWAR SUMMARY LIST OF PACKAGES(10570P11101)			
140	76902/0	83	133	OIL STRIPPER	600X600X850
141	76903/0	2370	2370	HOUSING FOR M.S STRAINER	1725X1250X730
142	76904/0	2370	2370	HOUSING FOR M.S STRAINER	1725X1250X730
143	76912/1	412	520	BLANKING ARRANGEMENT FOR MSSTRAINER HOUSING	1000X900X500
144	76912/2	1110	1390	BLANKING ARRANGEMENT FOR HRHSTEAM STRAINER HOUSING	1600X1200X600
145	76912/3	412	520	BLANKING ARRANGEMENT FOR MSSTRAINER HOUSING	1000X900X500
146	76912/4	1110	1390	BLANKING ARRANGEMENT FOR HRHSTRAINER HOUSING	1600X1200X600
147	76913/0	17	37	GASKETS FOR MS & HRH STRAINERHOUSINGS	1000X1000X600
148	76914/0	27	50	COMPENSATORCOMPENSATOR	600X600X900
149	76915/0	464	564	ASSY. & DISASSY. DEVICES FORMS & HRH STEAM STRAINERS	2140X1400X500
150	76917/0	282	350	STEAM STRAINER (MS)	1200X900X500
151	76919/0	282	350	STEAM STRAINER (MS)	1200X900X500
152	77001/0	1300	1847	GOV.SYSTEM CONTROL RACK ASSLY.& TRANSPORT DEVICE	2800X1360X2750
153	77002/0	767	1797	SUPPLY RACK HP VALVE-2 (RIGHT)	2300X1400X2550
154	77003/0	767	1797	SUPPLY RACK HP VALVE-1 (LEFT)	2300X1400X2550
155	77004/0	1050	2080	SUPPLY RACK FOR IP VALVES 1 &2	2300X1400X2550
156	77006/0	1182	1622	GOVERNING SYSTEM PROTECTIONRACK & TRANSPORT DEVICE	2450X1300X2250
157	77101/0	1265	2609	LP BYPASS CONTROL RACK WITHFRAME & TRANSPORT DEVICE	XX
158	77201/0	2250	2600	TURBINE INSTRUMENTS RACKS(FRAMES)	2750X1500X800
159	77202/0	600	750	TEMP. AND PRESSURE CONNECTIONS	1700X750X750
160	77203/0	1025	1225	IMPLUSE PIPES (CARBON STEEL)	6900X650X500
161	77204/0	785	1035	GAUGES AND SENSORS	2800X1250X1250
162	77205/0	68	118	TRANSMITTERS & J.B.OF BEARINGS	500X300X200
163	77206/0	986	1136	IMPULSE PIPES (ALLOY STEEL ANDS.S.)	6900X500X500

Total Net Weight:	879058	Rev. Date:	06.02.2010
Total Gross Weight:	972530	Approved By:	steskb




BHARAT HEAVY ELECTRICALS LIMITED,RANIPUR,HARIDWAR

SUMMARY LIST OF PACKAGES(10570P12901)

Workorder Number	10570P12901	Rev. Date	06.02.2010
Project	PFBR,KALPAKKAM:500MW	CCN	MS1070010
Rating	500MW	Std	HW0232899 :: Standard Packing


SNO	PKG. NO/SL	NET WT	GROSS WT	DESCRIPTION	PKG SIZE
1	501/0	258000	258000	STATORSTATOR	8830X4100X4120
2	502/0	68504	73159	ROTOR WITH TOOLS AND TACKLES	14000X1850X1750
3	503/0	28593	31473	END SHIELD LOWER HALF (TE)	6000X2296X2640
4	504/0	25867	28747	END SHIELD UPPER HALF (TE)	6000X2296X2640
5	505/0	11012	12847	END SHIELD LOWER HALF (EE)	4700X1500X2420
6	506/0	2771	3006	GENERATOR BEARING (2 NOS.).	1250X1150X1250
7	508/0	177	347	BAFFLE RING,BAFFLE RING CARIER& AIR GAP SEAL ASSLY	1682X1688X1095
8	509/0	1062	1427	TERMINAL BUSHING (6 NOS.)	2200X1830X610
9	510/0	9654	11580	TERMINAL BUSHING BOX WITHCOVER	3600X2500X1940
10	511/0	1139	1560	SHAFT SEALS (EE & TE) AND OILCATCHER (INNER & OUTER)	2140X1140X840
11	512/0	1177	1745	COMPRESSOR BAFFLE RING ASSLY.	1920X1920X1340
12	515/0	3094	3464	GENERATOR END SHIELD BASE EE & TE (2 NOS. EACH)	1940X1550X980
13	516/0	1840	2000	PRIMARY WATER TANK	8100X2000X1200
14	517/0	418	818	P.W.TANK PIPE LINES	6800X2100X500
15	518/0	2745	3030	FOUNDATION PLATES	2895X760X840
16	519/0	1268	1485	ANCHOR BOLTS	2740X655X600
17	520/0	1024	1558	CHANNELS,ANGLES,PIPES & STUDS	4800X1120X520
18	521/0	2465	2952	ROTOR & GENERAL ASSY.DEVICESROTOR & GENERAL ASSY.DEVICES	2460X1170X1240
19	524/0	216	289	WIRE ROPE FOR ROTOR (2 NO.)	1800X1800X400
20	530/0	1016	1608	GENERATOR ACCESSORIES	2140X2140X1240
21	530/1	372	472	GENERATOR ACCESSORIES	1350X850X300
22	531/0	1180	1525	GENERATOR ACCESSORIES	2240X940X1220
23	532/1	52	80	DRY AIR BLOWER	1100X1000X700
24	532/2	1174	1649	GENERATOR MAINTENANCE DEVICES	2550X1180X1140
25	533/0	2471	2781	ERECTION DEVICES/FOUNDTN ITEMS	1640X1140X1240
26	534/0	29928	32928	BRUSHLESS EXCITER SET WITH COVCOVERS	5750X2350X3400
27	535/0	1663	4478	BRUSHLESS EXCITER FRONT COVERWITH PACKING	4400X3400X3100
28	536/0	2150	4978	BRUSHLESS EXCITER REAR COVERWITH PACKING	4400X3400X3100
29	537/0	860	1741	EXCITER BED PLATE ACCESSORIES & RACK ASSEMBLY	3900X1250X1150
30	539/0	1100	1532	SEAL OIL STORAGE TANK	3700X1400X1260
31	540/0	3894	5294	PW PUMP AND FILTER UNIT	3450X2750X2815
32	541/0	414	831	MEASURING INSTRUMENT RACK	1550X910X1715
33	542/0	2649	3272	SEAL OIL MOTOR PUMP UNIT	3600X2100X1600
34	543/0	6490	7890	SEAL OIL UNIT	3100X3000X3400
35	544/0	1435	1935	SEAL OIL VALVE RACK	2700X1140X2440
36	545/0	630	1205	GAS UNIT	1980X1640X2420
37	547/0	170	250	CO2 VAPOURISER	1520X840X840
38	549/0	1815	2925	EXCITER BED PLATE ACCESSORIES(NON TEST BED)	5800X1140X1240
39	550/0	611	1111	EXCITER ACCESSORIES	2200X1200X1100
40	551/0	7518	9353	END SHIELD UPPER HALF (EE)	4700X1500X2420
41	556/0	354	454	P.W.TANK PIPE LINESP.W.TANK PIPE LINES	3000X600X500
42	557/0	52	87	SPECIAL TOOLS & TACKLES	800X700X300
43	558/0	778	928	EMBEDMENTS	800X800X300

Total Net Weight:	521934	Rev. Date:	06.02.2010
Total Gross Weight:	566440	Approved By:	tgeag

	BHARAT HEAVY ELECTRICALS LIMITED,RANIPUR,HARIDWAR				
	SUMMARY LIST OF PACKAGES(10570P12901)				

44	559/0	600	869	SEALING FOR TRANSPORT	3950X2420X150
45	561/0	60	80	SEAL RING	700X700X200
46	562/0	712	862	CONNECTION PIECE ASSEMBLY	1650X1100X450
47	563/0	85	140	GENERATOR ACCESSORIESGENERATOR ACCESSORIES	1700X1200X250
48	564/0	26	51	COOLER AIR VENT ASSEMBLY	5100X200X150
49	565/0	150	333	H2 DISTRIBUTOR	3480X1540X440
50	566/0	163	353	CO2 DISTRIBUTOR	4860X1240X440
51	567/0	60	143	N2 DISTRIBUTOR	1400X1240X440
52	568/0	3010	3410	TG SYSTEM INTEGRAL PIPINGTG SYSTEM INTEGRAL PIPING	6200X800X800
53	569/0	2076	2576	TG SYSTEM INTEGRAL PIPINGTG SYSTEM INTEGRAL PIPING	3500X1700X1000
54	570/0	4252	4502	TG SYSTEM INTEGRAL PIPING	7000X1100X900
55	571/0	8780	9380	TG SYSTEM INTEGRAL PIPING (STRAIGHT PIPES)	6600X1500X2000
56	572/0	2076	2176	TG SYSTEM INTEGRAL PIPING	1000X1000X500
57	573/0	1305	1555	TG SYSTEM INTEGRAL PIPING	2500X1200X1000
58	574/0	3299	3799	TG SYSTEM INTEGRAL PIPING	2750X1400X1400
59	575/0	77	177	TG SYSTEM INTEGRAL PIPING (INSTRUMENTS)	1000X940X900
60	576/0	530	630	TG SYSTEM INTEGRAL PIPING (FASTENERS & SEALINGS)	1000X1000X500
61	577/0	695	775	EXCTR. BED PLATE ACCESSORIES(NON TEST BED ITEMS)	1000X800X800
62	578/0	56	100	RESINS	1200X600X600
63	580/0	1391	1651	EMBEDMENTS FOR PORTAL CRANEEMBEDMENTS FOR PORTAL CRANE	1400X1000X400
64	581/0	127	267	ALKALYSER UNIT	1150X780X1900
65	582/0	452	852	PLATFORM FOR P W TANK	5000X1000X500
66	583/0	1238	1338	TG SYSTEM INTEGRAL PIPING (STRAIGHT PIPES)	7000X800X600
67	584/0	872	1572	RR WHEEL AIR GUIDE COVER	2800X1500X2000
68	585/0	40	55	CONSUMABLES CONSUMABLES	800X400X200

Total Net Weight:	521934	Rev. Date:	06.02.2010
Total Gross Weight:	566440	Approved By:	tgeag

	BHARAT HEAVY ELECTRICALS LIMITED,RANIPUR,HARIDWAR	
	SUMMARY LIST OF PACKAGES(10570P16901)	

Workorder Number	10570P16901	Rev. Date	06.02.2010
Project	PFBR,KALPAKKAM:500MW	CCN	MS1070010
Rating	500MW	Std	HW0232899 :: Standard Packing

SNO	PKG. NO/SL	NET WT	GROSS WT	DESCRIPTION	PKG SIZE
1	78001/0	11410	11410	HOT WELL	11180X3300X1820
2	78004/0	8954	8954	BOTTOM PLATE(FRONT/REAR PART)	8760X3652X720
3	78005/0	8954	8954	BOTTOM PLATE (FRONT/REAR PART)	8760X3652X720
4	78006/0	9022	9022	BOTTOM PLATE (MIDDLE PART)	8760X3876X686
5	78010/0	226	276	LOOSE ITEMS (BOTTOM PLATE)	2405X700X234
6	78012/0	6500	6800	SPRING ELEMENT(COND.SUPPORT)	2400X1300X1400
7	78013/0	6500	6800	SPRING ELEMENT(COND.SUPPORT)	2400X1300X1400
8	78014/0	4330	4530	SPRING ELEMENT(COND.SUPPORT)	2400X900X1400
9	78018/0	4283	4583	LOOSE ITEMS(CONDENSER SUPPORT)	1920X1000X660
10	78019/0	4288	4538	LOOSE ITEMS(CONDENSER SUPPORT)	1600X1100X600
11	78020/0	8503	8603	FRONT WATER CHAMBER (GS)	6014X4460X360
12	78022/0	19330	19630	FRONT WATER BOX (GEN.END)	5460X4450X2850
13	78023/0	8503	8603	FRONT WATER CHAMBER (TS)	6014X4460X360
14	78025/0	19330	19630	FRONT WATER BOX (TUR.END)	5460X4450X2850
15	78026/0	8503	8603	REAR WATER CHAMBER (GS)	6014X4460X360
16	78028/0	19290	19590	REAR WATER BOX (GEN.END)	5460X4450X2850
17	78029/0	8503	8603	REAR WATER CHAMBER (TS)	6014X4460X360
18	78031/0	19290	19590	REAR WATER BOX (TUR.END)	5460X4450X2850
19	78032/0	10220	10220	PLATES(SIDE WALL-TUR.SIDE)	6029X2480X100
20	78040/0	10220	10220	PLATES(SIDE WALL-GEN.SIDE)	6029X2480X100
21	78048/0	3080	3280	RODS(SHELL INTERNALS)RODS(SHELL INTERNALS)	3580X660X250
22	78049/0	3080	3280	RODS(SHELL INTERNALS)	3580X660X250
23	78050/0	3080	3280	RODS(SHELL INTERNALS)	3580X660X250
24	78051/0	3080	3280	ROD (SHELL INTERNAL DETAILS)	3580X660X250
25	78052/0	3940	4140	RODS(SHELL INTERNALS)	3730X520X360
26	78053/0	3940	4140	RODS(SHELL INTERNALS)	3730X520X360
27	78056/0	3080	3280	ROD (SHELL INTERNAL DETAILS)	3580X660X250
28	78057/0	3080	3280	ROD (SHELL INTERNAL DETAILS)	3580X660X250
29	78058/0	1858	2108	AIR EXTRACTION PIPE	6150X1000X700
30	78059/0	5976	6301	TUBE SUPPORT PLATE	5480X4235X208
31	78060/0	5976	6301	TUBE SUPPORT PLATETUBE SUPPORT PLATE	5480X4235X208
32	78061/0	5976	6301	TUBE SUPPORT PLATE	5480X4235X208
33	78062/0	5976	6301	TUBE SUPPORT PLATE	5480X4235X208
34	78063/0	5976	6301	TUBE SUPPORT PLATE	5480X4235X208
35	78064/0	5976	6301	TUBE SUPPORT PLATE	5480X4235X208
36	78065/0	5976	6301	TUBE SUPPORT PLATE	5480X4235X208
37	78066/0	5976	6301	TUBE SUPPORT PLATE	5480X4235X208
38	78069/0	5297	5497	SHELL INTERNAL DETAILS	1204X624X3044
39	78070/0	3986	4186	LOOSE ITEMS(SHELL INTERNALS)	5118X278X3160
40	78071/0	410	410	LOOSE ITEMS(SHELL INTERNALS)	5118X278X40
41	78075/0	11670	11670	LOWER DOME WALL (TUR. END)	10085X4091X990
42	78076/0	7470	7470	LOWER DOME WALL (TUR.SIDE)	10884X2484X200
43	78077/0	656	806	LOOSE ITEMS(LOWER DOME WALL-T)	4450X850X500
44	78103/0	12050	12050	LOWER DOME WALL (GEN.SIDE)	10085X4091X990

Total Net Weight:	483717	Rev. Date:	06.02.2010
Total Gross Weight:	500900	Approved By:	hxemkl



BHARAT HEAVY ELECTRICALS LIMITED,RANIPUR,HARIDWAR

SUMMARY LIST OF PACKAGES(10570P16901)

45	78104/0	7790	7790	LOWER DOME WALL (GEN. SIDE)	10884X2484X650
46	78105/0	916	1086	LOWER DOME WALL (GEN. SIDE)	4450X1300X900
47	78109/0	5106	5106	DOME WALL (FWB SIDE)	6545X3205X750
48	78110/0	3530	3530	DOME WALL (FWB SIDE)	6545X2350X1381
49	78111/0	5118	5118	DOME WALL (FWB SIDE)	6545X3205X600
50	78112/0	166	206	DOME WALL (FWB SIDE)LOOSE ITEMS	1700X1100X730
51	78115/0	4005	4005	DOME WALL	8757X1757X600
52	78116/0	9397	9397	DOME WALL	8213X3694X1440
53	78117/0	1867	1867	DOME WALL DOME WALL	7068X996X539
54	78118/0	860	910	LOOSE ITEMS LOWER DOME WALL(RWB SIDE)	1800X1800X1500
55	78121/0	3545	3895	PIPES(DOME INTERNAL STIFFENING)	1840X1350X1535
56	78122/0	4590	4940	PIPES(DOME INTERNAL STIFFENING)	2176X1500X1285
57	78123/0	5900	6300	PIPES(DOME INTERNAL STIFFENING)	2766X1500X1120
58	78124/0	1963	1963	PIPES(DOME INTERNAL STIFFENING)	5250X2270X220
59	78125/0	2730	2930	PIPES(DOME INTERNAL STIFFENING)	1470X750X850
60	78126/0	1963	1963	PIPES(DOME INTERNAL STIFFENING)	5250X2270X220
61	78129/0	2565	2965	LOOSE ITEMS(LP HEATER SUPPORTS)	2250X1700X1070
62	78130/0	3370	3665	LOOSE ITEMS(LP HEATER SUPPORTS)	7125X1125X580
63	78132/0	3417	3417	UPPER DOME WALL (TURBINE SIDE)	8700X1500X214
64	78133/0	3417	3417	UPPER DOME WALL(GEN.SIDE)	8700X1500X214
65	78136/0	5667	5667	UPPER DOME WALL (FWB SIDE)	7180X3000X407
66	78137/0	756	756	LOOSE ITEMS(UPPER DOME WALL -	3500X450X64
67	78139/0	5727	5727	UPPER DOME WALL (RWB SIDE)	7180X3000X407
68	78140/0	817	860	LOOSE ITEMS(UPPER DOME WALL	3500X486X200
69	78154/0	2070	2120	STEAM THROW DEVICE	1850X1040X860
70	78155/0	2070	2120	STEAM THROW DEVICE	1850X1040X860
71	78157/0	1805	1955	LOOSE ITEMS(CONDENSER)	4500X1000X1000
72	78158/0	83	103	LOOSE ITEMS(CONDENSER)	800X600X500
73	78159/0	2527	2737	FASTENERS (CONDENSER)	1200X1100X850
74	78160/0	2527	2737	CONDENSER LOOSE ITEMS	1200X1100X850
75	78166/0	100	150	CONDENSER STAND PIPES NO.1,2	3500X600X600
76	78167/0	572	647	LOOSE ITEMS (CONDENSER STANDPIPES)	3650X550X300
77	78175/0	633	733	INSTRUMENTATION-NON FRAGILE(CONDENSER)	1500X1300X700
78	78176/0	202	252	INSTRUMENTATION-FRAGILE(CONDENSER)	1500X600X600
79	78301/0	1510	1610	GLAND STEAM CONDENSER	1750X1200X1700
80	78304/0	34	60	LOOSE ITEMS OF GSC	700X300X200
81	78305/0	10	35	LOOSE ITEMS OF GSC (FRAGILE)	600X500X350
82	78315/0	23000	23100	LP HEATER NO. 1	14500X2100X2000
83	78316/0	100	150	STAND PIPES (LPH NO.1)	2800X350X350
84	78317/0	110	135	LOOSE ITEMS (LPH NO.1)	500X400X400
85	78318/0	50	75	LOOSE ITEMS-FRAGILE(INSTRUMENTATION-LPH NO.1)	1000X800X600
86	78319/0	120	170	LOOSE ITEMS (N/FRAGILE-INSTRUMENTATION-LPH NO.1)	2100X500X400
87	78320/0	664	664	TROLLEY FOR LP HEATER NO.1	1350X800X200
88	78401/0	13030	13830	TURBINE OIL COOLER	5850X1700X2300
89	78402/0	13030	13830	TURBINE OIL COOLER	5850X1700X2300
90	78406/0	120	130	LOOSE ITEMS OF TOC	800X800X500
91	78417/0	1970	2220	PRIMARY WATER COOLER	4300X1350X1350
92	78418/0	1970	2220	PRIMARY WATER COOLER	4300X1350X1350
93	78420/0	28	38	LOOSE ITEMS (PWC)	400X300X300

Total Net Weight:	483717	Rev. Date:	06.02.2010
Total Gross Weight:	500900	Approved By:	hxemkl

**BHARAT HEAVY ELECTRICALS LIMITED,RANIPUR,HARIDWAR****SUMMARY LIST OF PACKAGES(10570P16901)**

94	78424/0	2230	2665	HYDROGEN COOLER	4600X1450X800
95	78425/0	2230	2665	HYDROGEN COOLER	4600X1450X800
96	78426/0	2230	2665	HYDROGEN COOLER	4600X1450X800
97	78427/0	2230	2665	HYDROGEN COOLER	4600X1450X800
98	78428/0	1940	2140	LOOSE ITEMS (HYDROGEN COOLERS)	1520X1100X840
99	78431/0	1450	1980	EXCITER AIR COOLER	3780X920X830
100	78432/0	1450	1980	EXCITER AIR COOLER	3780X920X830
101	78436/0	1315	1506	CONTROL FLUID COOLER	3300X850X1030
102	78437/0	1315	1506	CONTROL FLUID COOLER	3300X850X1030
103	78438/0	86	103	LOOSE ITEMS (CFC)	600X600X500

Total Net Weight:	483717	Rev. Date:	06.02.2010
Total Gross Weight:	500900	Approved By:	hxemkl



BHARAT HEAVY ELECTRICALS LIMITED,RANIPUR,HARIDWAR

SUMMARY LIST OF PACKAGES(10570P55401)

Workorder Number	10570P55401	Rev. Date	06.02.2010
Project	PFBR,KALPAKKAM:500MW	CCN	MS1070010
Rating	500MW	Std	HW0232899 :: Standard Packing

SNO	PKG. NO/SL	NET WT	GROSS WT	DESCRIPTION	PKG SIZE
1	10001/0	450	675	STARTER CABINET FOR DC S.OILMOTOR	1230X1060X2550
2	10002/0	450	675	GEN INSTRUMENTATION CABINET	1230X1060X2550
3	10003/0	15	20	LOOSE INSTRUMENTS	600X600X400
4	10004/0	26	76	LOOSE INSTRUMENTS	1000X800X400
5	10005/0	450	675	STARTER CABINET FOR DC JOPMOTOR	1230X1060X2550
6	10006/0	450	675	STARTER CABINET FOR DC EOPMOTOR	1230X1060X2550

Total Net Weight:	1841	Rev. Date:	06.02.2010
Total Gross Weight:	2796	Approved By:	tgesk

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Volume 1A PART –II ANNEXURE –3

CONSTRUCTION POWER SUPPLY CLEARANCE/ PERIODIC INSPECTION CHECK LIST

SL.NO	CHECKS TO BE CARRIED OUT	OBSERVATIONS
01	Whether switch fuse isolators and other accessories are of suitable rating to match the connected load	YES/ NO
02	Whether suitable earthing is provided	YES/ NO
03	Whether double earthing is provided for DB, Motor, Motorstarter, welding machine etc.	YES/ NO
04	Whether surrounding area of the installation is clear and easily accessible	YES/ NO
05	Whether the installation is covered properly with a shed or canopy	YES/ NO
06	IR value of cable	SATISFACTORY/ UNSATISFACTORY
07	Operation of ELCB	SATISFACTORY/ UNSATISFACTORY
08	Operation of Isolators	SATISFACTORY/ UNSATISFACTORY
09	Whether any live part is exposed	YES/ NO
10	Whether all cable entry holes/openings are plugged	YES/ NO
11	Whether Neutral link is provided	YES/ NO
12	Whether industrial plug and sockets are used wherever applicable	YES/ NO
13	Whether the cable is of proper size and without any cuts in insulations	YES/ NO
14	Whether the proper cable termination is done using suitable lugs.	YES/ NO
15	Whether the cable termination is done using suitable lugs.	YES/ NO
16	Is Earth resistance of the earth pit is within permissible limit	YES/ NO

TECHNICAL CONDITIONS OF CONTRACT (TCC)

17	Whether danger tag is provided	YES/ NO
18	Whether HRC fuses are provided	YES/ NO
19	Whether ELCB's of suitable ratings are provided in outgoing feeders.	YES/ NO

TECHNICAL CONDITIONS OF CONTRACT (TCC)

CONSTRUCTION POWER SUPPLY SYSTEM DO'S AND DON'TS

DO's

- i. Use Personal Protective equipments like Helmet, Safety Belt, hand gloves, Rubber boots etc. while working on electrical installation.
- ii. Check yourself that the installation on which you are going to work is electrically isolated.
- iii. Use proper tools for carrying out the work. Ensure that the tools and measuring equipments are of good quality.
- iv. Check the healthiness of T & P and test equipments regularly.
- v. Use protective devices like fuse, MCB, ELCB of proper rating.
- vi. Use 24 v supply for carrying out work in enclosed area.
- vii. Use 3-pin plug and socket for power hand tool.
- viii. Ensure double earthing of all the installations.
- ix. Cover the installation properly to avoid ingress of water.
- x. Identify the source of supply clearly.
- xi. Use appropriate starters for starting and stopping motors.
- xii. Insulate joints properly with good quality insulation tapes.
- xiii. Allow only qualified electrician to carry out maintenance work.
- xiv. Educate the people about the electrical hazards.
- xv. Use only insulated cables for supply extension.
- xvi. Use only wooden bullies for fixing the light fixtures.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- xvii. Electrically operated mixture machine to be earthed locally by driving earthing spikes.
- xviii. Cables shall be either buried or supported on bullies/other suitable structures above ground.
- xix. Only industrial type plug top and socket shall be used in the system.

DON'T'S

- xx. No cable should be laid on the surface.
- xxi. Don't use wires for extension of supply.
- xxii. Do not keep live wires/ joints open.
- xxiii. Do not use copper wires as fuse wires.
- xxiv. Don't fix any light fixture on scaffolding pipe / reinforcement rod.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Volume 1A PART -II

ANNEXURE -4

PAINTING SCHEME

WEIGHTS (APPROX.)

1. EMPTY CONDENSER (WITHOUT SPRINGS) WITH LP HEATER NO.1	= 535000 KG
2. OPERATING WEIGHT (CONDENSER + LP HEATER NO.1)	= 930000 KG
3. FLOODED WEIGHT (WATER FILLED UP TO LP TURBINE BLADE TIP OF LAST STAGE OF LPT) WITH CW SIDE & LP HEATER-1 EMPTY.	= 1550000 KG
4. WEIGHT OF COOLING WATER	= 320000 KG
5. WEIGHT OF SPRING ELEMENTS	= 32000 KG
6. WEIGHT OF HEAVIEST PART (FRONT WATER BOX)	= 30000 KG

PAINTING:

1. THE CONDENSER IS PAINTED AT WORKS AS FOLLOWS: -
 STEAM SIDE SURFACES - STEAM WASABLE PAINT
 CW SIDE SURFACES ANTI CORROSIVE PRIMING PAINT
 OUTSIDE SURFACES EPOXY BASE ZINC RICH PRIMER AND INTERMEDIATE PAINT
2. THE CONDENSER IS TO BE PAINTED AT SITE AS FOLLOWS: -
 EXTERNAL SURFACE: - TO BE PANTED WITH 2 COATS OF POLYURETHANE FINISH PAINTS. TOTAL DFT (FINAL) - 180 MICRONS
 C.W.SIDE SURFACE: - AFTER TUBING & BEFORE HYDRAULIC TESTING THE INTERIOR OF WATER BOXES AND WATER SIDE SURFACE OF WATER CHAMBER EXCLUDING TUBE PLATES SHALL BE PROVIDED WITH 3mm THICK GLASS FLAKE FILLED POLYESTER COATING.
3. DECONSERVATION: - 02
 STEAM SIDE SURFACES OF THE CONDENSER SHOULD BE THOROUGHLY CLEANED WITH THE APPLICATION OF STEAM. SINCE THEY HAVE BEEN SUPPLIED COATED WITH STEAM WASHABLE RUST PREVENTIVE PAINT.

BHAVINI DRAWING NO: PFBR/42111/GA/7100													
GMS NO./GR.SP.NO.			STATUS OF DRG.	TYPE OF PRODUCT BHARATIYA NABHIKIYA VIDYUT NIGAM LIMITED									
APPROVED DEPT.			NAME	SIGN	DATE	OR		NAME OF CUSTOMER/PROJECT PROTOTYPE FAST BREEDER REACTOR					
								1X500MW KALPAKKAM					
0230208						BHARAT HEAVY ELECTRICALS LTD. HARDWAR		DRN. NAME	SIGN.	DATE	NO.OF		
MA_0621104								CHD. MANOJ	Sd/-	05.11.07	VAR.		
21101								APPD. DKY	Sd/-	05.11.07			
C.SINGH			REV.	DATE	ALTERED MANOJ	DEPT. HXE		SCALE	WEIGHT (KG)	REF. TO NTPC DRG.		ITEM	NO.OF
K.LAHOTI			01	04.02.08	CHECKED MK LAHOTI	CODE 4222		N.T.S.	-		NO.	ITEMS	
PER COMMENTS			ZONE	DRAWING UPDATED AS PER INTERACTION WITH PEM.									
ID INTERACTION													
TITLE CONDENSER ASSEMBLY								CARD CODE	DRAWING NO. 01601070056C134			REV. 04	
(GENERAL ARRANGEMENT)									SHEET NO. 02	NO OF SHEETS 02			

3.45.00 All machinery, equipment, piping etc. shall receive surface preparation and painting according to the following general guideline.

3.46.01 Surface Preparation

- i) All steel surfaces shall be free from all mill scales, rust, oil, grease or any foreign matters. Cleaning shall be done as per the procedures laid down in SSPC SP6.
- ii) For dry sand blasting procedure, the abrasive shall be chloride free siliceous sand (marine sand excluded).
- iii) Surface preparation by cleaning of rust or mill scale by using wire brush, carborundum tips etc. may only be allowed with prior approval from the Purchaser, for parts where sand blasting can not be carried out.
- iv) All welded areas shall be given special attention for removal of welding flux in crevices.

3.46.02 Painting

- a) Surface Preparation : Sand Blasting
- b) Primer Coat
 - i) Type : Epoxy based zinc phosphate primer suitable for corrosive environment and 65°C dry heat; such as 'Epilux 610' of Berger Paints or 'Epilac Zinc Phosphate' of Jenson & Nicholson or equivalent.
 - ii) No. of coat : Two (2)
 - iii) Dry film thickness : 30 micron per coat
- c) Finish Coat
 - i) Type : Corrosion resistant polyurethane enamel suitable for dry heat upto 65°C and coastal environment; such as 'Bergerthane Enamel' of Berger Paints or equivalent.
 - ii) No. of coat : Two (2)

iii) Dry film thickness : 35 micron per coat

3.46.00 Salient design parameters have been furnished in Data Sheets given under clause 9.00.00

3.47.00 For design requirements of Drives, refer Part-D Section SE of this specification

सामग्री सूची संख्या को अधिकृतित करता है INVENTORY NO.	BASED ON BHEL EXPERIENCE
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INSTRUCTIONS FOR PAINTING AND PRESERVATION


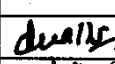
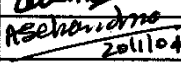
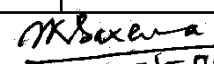
OF

CONDENSERS

(KWU DESIGN)

AT

HARDWAR

सामग्री सूची संख्या INVENTORY NO.	हस्ताक्षर एवं दिनांक SIGN & DATE						
P-5550	 27/11/04	TSX	S.NATH		निर्माणकर्ता WORKED BY	R.RAWAT	12-01-04
		QAX	A.S.CHANDNA	 20/11/04	परीक्षणकर्ता CHECKED BY	R.RAWAT	12-01-04
		सहमत विभाग AGREED DEPTT.	नाम NAME	दिनांक एवं हस्ताक्षर DATE & SIGNATURE	पर्यवेक्षणकर्ता SUPERVISED BY	K.N.MEHTA	14-01-04
						स्वीकृति : APPROVED :	HE
						 22-1-04 V.K.SAXENA / AGM (HXE)	6.20
		Rev No. 01			निर्माण : PREPARED	जारी : ISSUED	दिनांक : DATE
		24-01-04			HXE	HXE, HARDWAR	04-12-01

स्वाधिकार एवं गोपनीय

सूचना में दी गई सूचना भारत की प्रोपर्टी है। इसका प्रकाश एवं प्रसारण बिना लिखी गई अनुमति के बिना कठिनाई हो सकती है।

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सामग्री सूची संख्या
को अधिकृतित करता है | INVENTORY NO.

BASED ON BHEL EXPERIENCE

सामग्री सूची संख्या को अधिकाधिक करता है
SUPERSEDES INVENTORY NO.

INSTRUCTIONS FOR PAINTING AND PRESERVATION OF CONDENSERS (KWU DESIGN)

CONTENTS

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4.	PAINTING AND PRESERVATION	4
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6.	TECHNOLOGICAL PROCESS OF PAINTING	6
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

स्वाधिकार एवं गोपनीय

एक प्रतिलिपि को भी स्वयं कम्पनी के अधिकार हैं। इसका प्रयोग एवं आकांक्षा एवं से बिना कम्पनी के लिखित अनुमति के बिना नहीं किया जाना।

हस्ताक्षर एवं दिनांक
SIGN & DATE
[Signature] 27/11/04

सामग्री सूची संख्या
INVENTORY NO.
P-5550

Rev No. 01		निर्माणकर्ता Worked by R.RAWAT	<i>[Signature]</i>	12/01/09
		जांचकर्ता Checked by K.N.MEHTA	<i>[Signature]</i>	14/01/09

दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक PRODUCT STANDARD HEAT EXCHANGER ENGINEERING		HE 77001	
				पृष्ठ 13 का 03 Page 03 of 13	
सामग्री सूची संख्या को अतिरिक्त करना है	SUPERSIDES INVENTORY NO.	<p>1.0 General : These instructions provide standard guidelines towards painting and preservation of all components / assemblies of KWU design condensers manufactured in the shops or by sub-contractors.</p> <p>The treatment prescribed shall be adopted as normal practice and in case where customers desire specific deviations, these shall be done as per the instructions of Engineering.</p> <p>1.1 The final painting of the condenser and its assemblies is to be done after its complete erection at site.</p> <p>2.0 Preservation materials: The list of preservatives and other materials to be used for condenser in HEEP are given as under:</p> <p>2.1 Anti corrosive priming paint as per AA56101. Code no's : Primer - AA 5610001013 ; Thinner – AA 5670001001/AA 56701</p> <p>2.2 Temporary rust preventive paint as per AA 55151 (Steam washable paint) (HE 1712) Code no's : HW 5510051000 .</p> <p>2.3 Mobilux Grease – 2 from M/S IOC Code no. : HW 5740099005</p> <p>2.4 Waxed paper as per AA 51407 Code no.: HW 5141507998</p> <p>2.5 Mineral turpentine oil as per IS: 1745 Code no. : HW 5670095014</p> <p>2.6 Water proof abrasive paper grit 220</p> <p>2.7 Cellulose stopper as per AA 55306 Code no. : AA 5530006000</p> <p>2.8 DTE Medium oil as per AA 5710004006/ AA 57104</p> <p>2.9 Epoxy based Zinc rich primer paint as per AA 56114 Code no. : HW 5610014000</p> <p>2.10 High Build Intermediate epoxy paint as per AA 56112 Code no. : HW 5610012996</p> <p>2.11 Polyurethane finishing paint as per AA 56142 Code no. : HW 5610042992</p> <p>2.12 High build black coal tar epoxy paint as per AA 5610035554 Code no. : Base - AA 5610035554 Accelerator - AA 5610035600 Thinner - AA 5670008006 / AA 56708</p>			
सामग्री सूची संख्या INVENTORY NO.	P-5550	Rev No. 01	निर्माणकर्ता Worked by R.RAWAT		12/01/09
दिनांक एवं हस्ताक्षर SIGN & DATE	20/07/11/04		जांचकर्ता Checked by K.N.MEHTA		14/01/09

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स्वसाधिकार एवं गोपनीय

इस प्रलेख में दी गई सूचना भारत भारती भारतीभारत की संपत्ति है। इसका प्रयोग एवं प्रसारण के बिना भारत भारती भारतीभारत की अनुमति के बिना नहीं किया जा सकता है।

सामग्री सूची संख्या
को अधिस्तुतित करना है
INVENTORY NO.

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स्वत्वाधिकार एवं गोपनीय
 इस दस्तावेज में दी गई सूचना भारत भारी उपकरणों की संपत्ति है। इसका प्रयोग एवं
 अनुकरण इसकी लिखित स्वीकृति के बिना न किया जाए।

हस्ताक्षर एवं दिनांक
SIGN & DATE


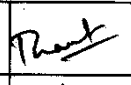

सामग्री सूची संख्या
INVENTORY NO.
P-5550



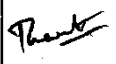

3.0 Tools and equipments: For operations on these instructions the following tools and equipments are required:


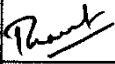
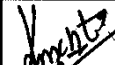
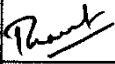
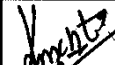
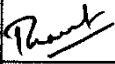
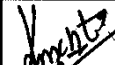
- 3.1 Shot blasting equipment.
- 3.2 Hoses for blowing the air.
- 3.3 Steel brushes, files, portable grinder.
- 3.4 Hand lamp
- 3.5 Viscosity- meter
- 3.6 Stop watch
- 3.7 Spray gun
- 3.8 Metallic or rubber knife for filling putty
- 3.9 Different brushes
- 3.10 Gloves
- 3.11 Gas mask
- 3.12 Containers and buckets
- 3.13 Sieve (metallic or nylon)
- 3.14 Funnels
- 3.15 Thickness meter/ coat gauge



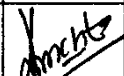
4.0 Painting and preservation:

- 4.1 Proper painting and preservation of sub-assemblies and parts of condenser and heat exchangers is very much essential to protect the surfaces against corrosion.
- 4.2 Proper preparation of the surfaces before applying the coating is of vital importance in order to have effective protection of parts against corrosion. The surface of the part to be painted should be uniform, clean from corrosion, oil, and dirt. It should be dry and free from burns. Even the slight dirt left over the surface may later on cause destruction of the coating fills and subsequent corrosion of metals.
- 4.3 The surface of the parts prepared for painting should be prevented from the atmospheric action of moisture and dirt etc. and shall have metallic shine.
- 4.4 Painting or preservation of parts must be done not later than 8-10 hrs after cleaning and degreasing.
- 4.5 The parts to be painted should be at room temperature and painting should be done in well ventilated room.

Rev No.	01	निर्माणकर्ता Worked by	R.RAWAT		12.01.09
		जांचकर्ता Checked by	K.N.MEHTA		14.01.09

दिनांक एवं हस्ताक्षर SIGN & DATE		<p align="center">उत्पाद मानक</p> <p align="center">PRODUCT STANDARD</p> <p align="center">HEAT EXCHANGER ENGINEERING</p>	HE 77001
सामग्री सूची संख्या को अतिरिक्तित्व करता है SUPERSEDES INVENTORY NO.			पृष्ठ 13 का 05 Page 05 of 13
<p align="center">कॉपीराइट एंड कॉन्फिडेंशियल</p> <p align="center">The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company.</p>	<p align="center">स्वातंत्र्यकार एवम् गोपनीय</p> <p align="center">यह प्रस्ताव मे को संश्लेषण करता है कि स्वतंत्रता के हित में अतिरिक्तित्व को न किया जाए।</p>	<p>4.6 The paints and primer should be diluted to working viscosity with the thinner as given in the suppliers catalogues or as mentioned under clause 6.2.</p> <p>4.7 Surfaces can be coated with paint/ varnish by spray gun, brush or by dipping.</p> <p>4.8 Conservation grease can be put on the surface either in cold or hot condition by hair brush or spatula.</p> <p>4.9 The parts conserved by grease should be additionally protected by waxed paper.</p> <p>4.10 The protective surface coat must be applied very carefully so as to have a uniform layer thickness without any pores. Discontinuity or break in layer and air inclusions are not permitted.</p> <p>4.11 Each individual coating will be well dried before applying the next coat. Before applying the second/ subsequent coat it should be ensured that the surface is free from paint cracks, molten pearls and other foreign impurities.</p> <p>4.12 Quality of painted surfaces should be checked by visual inspection. Any observed defect should be immediately rectified. Special attention should be paid for painting of those parts which are inaccessible.</p> <p>4.13 All anticorrosive materials (paints, varnishes, grease etc.) are inflammable and therefore it is necessary to store them in special places which are reliably fire-proof.</p> <p>4.14 Freshly painted parts should not be stored immediately before drying. These should not press against the floor and in no case rain water is allowed to drop.</p> <p>4.15 All the paints prepared should be consumed before the expiry of its pot life. Outaged paints should never be applied. The primer is to be utilised within the time specified in the container by the manufacturer of the primer.</p> <p>4.16 All pipes which can not be painted from inside should be thoroughly cleaned and dried from inside and blanked by plastic or wooden plugs.</p> <p>5.0 Special instructions:</p> <p>5.1 Machined surfaces as well as threads are not to be painted. These are to be given a coat of Mobilux grease.</p> <p>5.2 Edges requiring welding later are to be left unpainted upto 80 mm from the edges.</p> <p>5.3 Surfaces damaged during the storage and handling in plant should be checked immediately and coated with the same paint after preparation of the damaged surface.</p>	
हस्ताक्षर एवं दिनांक SIGN & DATE	 20/11/04		
सामग्री सूची संख्या INVENTORY NO.	P-5550		
Rev No. 01		निर्माणकर्ता Worked by R.RAWAT	 12/01/09
		जांचकर्ता Checked by K.N.MEHTA	 14/01/09

दिनांक एवं हस्ताक्षर SIGN & DATE		<p style="text-align: center;">उत्पाद मानक</p> <p style="text-align: center;">PRODUCT STANDARD</p> <p style="text-align: center;">HEAT EXCHANGER ENGINEERING</p>	HE 77001						
सामग्री सूची संख्या INVENTORY NO	SUPERSEDES INVENTORY NO	5.4 Loose items of the assemblies/ sub-assemblies mentioned in table-1 are to be painted as per the instructions given on the respective drawings. 5.5 Both the primer and its thinner should be compatible to each other. 6.0 Technological process of painting: 6.1 Surface preparation: It is necessary that the surface to be painted is free from loose dust, mill scale, rust, grease, oil, old film etc. Surface cleaning and preparation is to be done as per CS AA 0674101. 6.2 Preparation of paint (AA 56101) : Before application, any skin formed on the paint in the tin shall be carefully removed and any settled pigment broken up and loosened. The paint shall be thoroughly stirred to ensure complete and uniform mixing of the constituents. Care shall be taken to avoid entraining air into the paint while stirring. The priming paint (AA 56101) shall be used at the consistency given below if not specified by the paint supplier. <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;"><u>Process</u></td> <td style="text-align: center;"><u>Flow time of the paints in Ford Cup no. 4 (IS: 101)</u></td> </tr> <tr> <td style="text-align: center;">Spraying</td> <td style="text-align: center;">30 ± 2 sec.</td> </tr> <tr> <td style="text-align: center;">Brushing</td> <td style="text-align: center;">60 – 70 sec</td> </tr> </table> These consistencies shall be adjusted using thinner and these flow times shall be maintained independently of temperature within normal shop variations. 6.3 Application of paints: 6.3.1 <u>Application of first coat AA 56101:</u> Over the cleaned surface one coat of Anticorrosive priming paint to AA 56101 at the appropriate consistency shall be applied by spraying or brushing as specified. 6.3.2 <u>Drying:</u> The painted surface shall be allowed to air dry for a minimum period of 12 hours. 6.3.3 <u>Repair of damage to the first coat:</u> Any local damage which has been caused to the first primer coat shall be repaired by cleaning with water proof abrasive paper and then by applying a coat of primer AA 56101 and allow it to dry for a minimum period of 12 hours.	<u>Process</u>	<u>Flow time of the paints in Ford Cup no. 4 (IS: 101)</u>	Spraying	30 ± 2 sec.	Brushing	60 – 70 sec	पृष्ठ 13 का 06 Page 06 of 13
<u>Process</u>	<u>Flow time of the paints in Ford Cup no. 4 (IS: 101)</u>								
Spraying	30 ± 2 sec.								
Brushing	60 – 70 sec								
हस्ताक्षर एवं दिनांक SIGN & DATE सामग्री सूची संख्या INVENTORY NO P-5550	COPYRIGHT AND CONFIDENTIAL The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company.	स्लाइडकार एवं गोपनीय इस दस्तावेज में दी गई सूचना भारत भारती इलेक्ट्रिकल्स की संपत्ति है इसका प्रयोग एवं आशय इस से किसी भी तरह प्रयोग, जो कि कंपनी के हित में सहायक हो न किया जाए।	दिनांक एवं हस्ताक्षर SIGN & DATE 14/10/04						
सामग्री सूची संख्या INVENTORY NO P-5550	Rev No. 01	निर्माणकर्ता Worked by R.RAWAT जांचकर्ता Checked by K.N.MEHTA	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;"></td> <td style="width: 20%; text-align: center;">  R.RAWAT </td> <td style="width: 20%; text-align: center;">  K.N.MEHTA </td> <td style="width: 20%; text-align: center;"> 14/10/04 14/10/04 </td> </tr> </table>		 R.RAWAT	 K.N.MEHTA	14/10/04 14/10/04		
	 R.RAWAT	 K.N.MEHTA	14/10/04 14/10/04						

दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक PRODUCT STANDARD HEAT EXCHANGER ENGINEERING	HE 77001 पृष्ठ 13 का 07 Page 07 of 13	
सामग्री सूची संख्या को अतिरिक्त संख्या & SUPERSEDES INVENTORY NO.	<p>6.3.4 <u>Application of cellulose stopper</u>: Cellulose stopper shall be applied if required, to fill up dents and scratches and allowed to air dry for a period of 4 to 5 hours. The cellulose surface shall then be rubbed down with water proof abrasive paper no. 220. Loose dust shall be washed with water where ever possible and the surfaces allowed to dry completely. Usually this takes about 2 to 3 hours. Where water washing is not possible the loose dust shall be wiped off by a blast of air or dry clean cloth.</p> <p>6.3.5 <u>Application of second primer coat AA56101</u>: Immediately before the application of second coat, the surface shall be cleaned with mineral turpentine oil where necessary. The priming paint AA 56101 shall be then applied over the surface in accordance with clause 6.3.1 .</p> <p>6.3.6 <u>Application of High Build Black Coal Tar Epoxide paint AA56135</u>: Process of application of this primer shall conform to AA 0674104.</p> <p>6.3.7 <u>Application of Priming Paint AA 56114</u>: Process of application of this primer shall conform to AA 0674123.</p> <p>6.3.8 <u>Application of High Build Intermediate Epoxy paint AA56112</u>: Process of application of this primer shall conform to AA 0674123.</p> <p>6.3.9 <u>Application of Polyurethane finish paint AA56142</u>: Process of application of this primer shall conform to AA 0674123</p> <p>6.3.10 <u>Drying</u>: The painted surface shall be allowed to air dry for a minimum period of 12 hours.</p> <p>7.0 Quality checks:</p> <p>7.1 Quality control should inspect the various paints and putties received in stores according to relevant specifications.</p> <p>7.2 The QC/shop should ensure that complete technological process of painting is followed and all the operations are carried out fully.</p> <p>7.3 The viscosity of the paints/ primers should be checked after adding the solvent/ thinner for each mixture in viscosity meter.</p>			
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सामग्री सूची संख्या INVENTORY NO. P-5550	Rev No. 01	निर्माणकर्ता Worked by R.RAWAT	जांचकर्ता Checked by K.N.MEHTA	 12/10/04  12/10/04

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- 7.4 The QC department shall visually inspect the finished component for various paint film defects such as gloss, uniformity of shade, wrinkles, orange peel effect, blistering etc.
- 7.5 The thickness of the dried painted film, when measured by using suitable instruments for the non-destructive measurement of the coats as detailed in IS: 6012, shall be as follows:

<u>Paint (coat)</u>	<u>No. of coats</u>	<u>Dry Film thickness</u>
Primer as per AA 56114	2	70 microns
Intermediate as per AA 56112	1	70 microns
Final as per AA 56142	2	60 microns
Primer as per AA 56101	2	70 microns
Final as per AA 56135	2	200 microns

8.0 List of cross referred specifications/standards :

AA 56101, AA 55151, AA 56112, AA 56114, AA 56135, AA 56708, AA 57104,
AA 55306, AA 0674101, AA 0674104, AA 0674123, IS 101, IS 6012

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स्वत्वधिकार एवं गोपनीय

यस दस्तावेज में दी गई सूचना भारत भारती इलेक्ट्रिकल्स लिमिटेड की संपत्ति है। इसका प्रयोग एवं प्रसारण बिना लिखित अनुमति के कठिनाई का कारण बनेगा, जो कि भारत भारती इलेक्ट्रिकल्स लिमिटेड के हितों में है।

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Rev No.
01

निर्माणकर्ता Worked by	R.RAWAT	<i>RR</i>	12.01.04
जांचकर्ता Checked by	K.N.MEHTA	<i>KN</i>	14-01-04

सामग्री सूची संख्या INVENTORY NO. P-5550	हस्ताक्षर एवं दिनांक SIGN & DATE [Signature] 29/11/04	स्वात्मिकार एवं गोपनीय The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company	सामग्री सूची संख्या को अतिरिक्त करता है SUPERSEDES INVENTORY NO.	दिनांक एवं हस्ताक्षर SIGN & DATE			
Rev No. 01		 <p style="text-align: center;">उत्पाद मानक PRODUCT STANDARD HEAT EXCHANGER ENGINEERING</p> <p style="text-align: right;">HE 77001</p>					
1	2	3	4	5	6	7	8
1.0	Bottom Plate, Dome walls, Side walls, Hot well				160-11 to 160-17 160-21 160-22 160-25 160-26 160-45	Spray or Brush	Edges subjected to welding after painting should be left uncoated (Approx. 80 mm)
1.1	Outer Surface Priming paint coat Intermediate paint coat Finish paint coat	- Epoxy based Zinc rich primer paint - High build intermediate epoxy paint - Polyurethane finish paint (Total DFT of primer, intermediate & finish paint shall be at least 180 microns)	AA56114 AA56112 AA56142	2 1 2		--do -- --do -- --do --	Process application AA0674123 Finish paint coat to be done at site.
1.2	Inner Surface (steam space)	Steam washable paint	AA55151	2		--do --	
2.0	Main tube plate blanks (before drilling). All over	DTE Medium oil & covered with polythene sheet	AA57104	1	160-18 160-19 160-23 160-24	--do -- --do --	DTE Medium Oil to be sprayed after shot blasting.
3.0	Support tube plate blanks (before drilling) All over	DTE Medium oil & covered with polythene sheet	AA57104	1	160-28	--do --	DTE Medium Oil to be sprayed after shot blasting.
निर्माणकर्ता Worked by	जांचकर्ता Checked by	R.RAWAT	K.N.MEHTA	[Signature]	[Signature]	[Signature]	[Signature]

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Rev No.	01	निर्माणकर्ता Worked by R.RAWAT		जांचकर्ता Checked by K.N.MEHTA		Raj		20/10/04		
Item No.	1	Assemblies/Sub assemblies/Surface	Paints/preservatives required	BHEL Sp. No.	No. of coats	PGMA No.	Mode	Remarks	 <p style="text-align: center;">उत्पाद मानक PRODUCT STANDARD HEAT EXCHANGER ENGINEERING</p> <p style="text-align: right;">HE 77001</p>	
4.0	2	Support tube plate blanks (after drilling) All over	Steam washable paint	AA55151	2	160-28	Spray or Brush	Paint should cover all tube holes	पृष्ठ 13 का 10 Page 10 of 13	
5.0		Front and Rear water chambers (end sections)	- Epoxy based Zinc rich primer paint	AA56114	2	160-18	--do--	Process of application AA0674123		
5.1		Outer surfaces	- High build intermediate epoxy paint	AA56112	1	160-24	--do--	Finish paint coat to be done at site		
		Priming paint coat	- Polyurethane finish paint	AA56142	2	160-29	--do--	Steam washable paint should cover tube holes also.		
		Intermediate paint coat	(Total DFT of primer, intermediate & finish paint shall be at least 180 micron)					Specific instructions to be given in the drawing for sea water application.		
5.2		Inner surfaces (steam space side) including tube plate on both sides	Steam washable paint	AA55151	2		--do--	Process of application AA0674123		
5.3		Inner surface (Cooling water side) excluding tube plate	Anti corrosive Priming paint	AA56101	2		--do--			
5.3.1		Sea water applications	- Epoxy based zinc rich primer paint	AA56114	2		--do--			
5.3.2		Inland water	- High build black coal tar epoxide paint. (Total DFT of the primer & final paint shall be at least 250 microns)	AA56135	2		Brush	Process of application AA0674104		
5.4		Machined flanges	Mobilux grease -2 with waxed paper	M/s IOC HW57400 99005						

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1		2		3		4		5		6		7		8	
Item No.	Assemblies/Sub assemblies/Surface	Paints/preservatives required		BHEL Sp. No.	No. of coats	PGMA No.	Mode	Remarks							
6.0	Water boxes, CW inlet/outlet nozzles.	- Epoxy based Zinc rich primer paint - High build intermediate epoxy paint - Polyurethane finish paint (Total DFT of primer, intermediate & finish paint shall be at least 180 microns)		AA56114 AA56112	2 1	160-31 160-32 160-34 160-35	Spray or Brush	Process of application AA0674123 Finish paint coat to be done at site							
6.1	Outer surfaces excluding machined surfaces Priming paint coat Intermediate paint coat Finish paint coat	Anti corrosive Priming paint		AA56101	2	--do--	--do--	Specific instruction to be given in the drawing for liming.							
6.2	Inner surfaces excluding machined surfaces. Sea water applications	- Epoxy based zinc rich primer paint - High build black coal tar epoxide paint. (Total DFT of the primer & final paint shall be at least 250 microns)		AA56114 AA56135	2 2	--do--	--do--	Process of application AA0674123							
6.2.1	Inland water	Mobilux grease -2 with waxed paper		M/s IOC HW57400 99005	--	--do--	--do--	Process of application AA0674104							
6.2.2	Machined flanges including the threaded/ unthreaded holes on it	Steam washable paint		AA55151	2	160-36	--do--								
6.3.	Air suction piping (outer surfaces)	Steam washable paint		AA55151	2	160-28	--do--								
7.0	Shell internals & baffles including stiffening rods & pipes. (outer surfaces)														
8.0															
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Item No.	Assemblies/Sub assemblies/Surface	Paints/preservatives required	BHEL Sp. No.	No. of coats	PGMA No.	Mode	Remarks
1	2	3	4	5	6	7	8
9.0	Dome internals. (outer surfaces)	Steam washable paint	AA55151	2	160-29	Spray or Brush	
10.0	LP Heater support structure. (All over)	Steam washable paint	AA55151	2	160-38	--do--	
11.0	Steam throw device.						
11.1	Outer surfaces Priming paint coat	- Epoxy based Zinc rich primer paint	AA56114	2	160-49	--do--	Process of application AA0674123
	Intermediate paint coat	- High build intermediate epoxy paint	AA56112	1			
	Finish paint coat	- Polyurethane finish paint	AA56142	2			Finish paint coat to be done at site.
11.2	Inner surfaces.	(Total DFT of primer, intermediate & finish paint shall be at least 180 micron)					
12.0	Hinge and Hinge support assembly.	Steam washable paint	AA55151	2	--do--	--do--	
12.1	Unmachined surfaces Priming paint coat	- Epoxy based Zinc rich primer paint	AA56114	2	160-51	--do--	Process of application AA0674123
	Intermediate paint coat	- High build intermediate epoxy paint	AA56112	1	160-37		
	Finish paint coat	- Polyurethane finish paint	AA56142	2			Finish paint coat to be done at site.
12.2	Machined surfaces	(Total DFT of primer, intermediate & finish paint shall be at least 180 micron)					
		Mobilux grease-2 with waxed paper	M/s IOC HW57400 99005				

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SIGN & DATE

निर्माणकर्ता
Worked by
R.RAWAT

जांचकर्ता
Checked by
K.N.MEHTA

12/11/09

19/11/09

सामग्री सूची संख्या INVENTORY NO. P-5550		हस्ताक्षर एवं दिनांक SIGN & DATE [Signature] 11/04		स्वातंत्र्यकार एवं गोपनीय The information on this document is the property of Bharat Heavy Electrical Limited It must not be used directly or indirectly in any way detrimental to the interest of the company		सामग्री सूची संख्या SUPERSEDES INVENTORY NO.		दिनांक एवं हस्ताक्षर SIGN & DATE	
Rev No. 01								<div style="text-align: center;">  <p>उत्पाद मानक</p> <p>PRODUCT STANDARD</p> <p>HEAT EXCHANGER ENGINEERING</p> </div>	
								HE 77001	
								पृष्ठ 13 का 13 Page 13 of 13	
Item No.	Assemblies/Sub assemblies/Surface	Paints/preservatives required	BHEL Sp. No.	No. of coats	PGMA No.	Mode	Remarks		
1	2	3	4	5	6	7	8		
13.0	Sole plate and packers for spring assemblies. All over	Stream washable paint	AA55151	2	160-71	Spray or Brush	Process of application AA0674123		
14.0	Springs . All over	--	--	--	160-71	--	Finish paint coat to be done at site.		
15.0	Springs cages. All over. Priming paint coat Intermediate paint coat Finish paint coat	- Epoxy based Zinc rich primer paint - High build intermediate epoxy paint - Polyurethane finish paint (Total DFT of primer, intermediate & finish paint shall be at least 180 microns)	AA56114 AA56112 AA56142	2 1 2	160-71	Spray or Brush	Process of application AA0674123		
16.0	Stand pipes. Outer surfaces Priming paint coat Intermediate paint coat Finish paint coat	- Epoxy based Zinc rich primer paint - High build intermediate epoxy paint - Polyurethane finish paint (Total DFT of primer, intermediate & finish paint shall be at least 180 microns)	AA56114 AA56112 AA56142	2 1 2	160-72	--do	Process of application AA0674123		
17.0	Stay rods and similar other components. All over.	Stream washable paint	AA55151	2	160-51 160-28	--do	Finish paint coat to be done at site.		
								निर्माणकर्ता Worked by R.RAWAT [Signature] 12/01/04 जांचकर्ता Checked by K.N.MEHTA [Signature] 12/01/04	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Volume 1A **PART –II** **ANNEXURE –5**

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.

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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.
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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