

TENDER SPECIFICATION

SI No	Tender Specification Number	Unit Number & Project
1	BHE/PW/PUR/PDVT-COND WELD/1231	BECL Bhavnagar 2 x 250 MW Unit 1 & 2

FOR

CONDENSER TUBE TO CONDENSER TUBE PLATE SEAL WELDING JOB OF UNIT#1 & 2 OF 2 X 250 MW BY USING ORBITAL WELDING MACHINE

AT

**BHAVNAGAR ENERGY COMPANY LIMITED
DISTRICT- BHAVNAGAR,
GUJARAT**

VOLUME – I

(TECHNICAL BID SPECIFICATION)

CONSISTING OF:

- **Notice Inviting Tender,**
- **Volume-IA : Technical Conditions of Contract,**
- **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 - Western Region
345-Kingsway, Nagpur-440001

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Volume No	Description	No. of pages	Hosted in website bhel.com as files titled
NIL	Tender Specification Issue Details		(Part of <u>Vol-IA-1231</u>)
NIL	Notice Inviting Tender		(Part of <u>Vol-IA-1231</u>)
I-A	Technical Conditions of Contract		Vol-IA-1231
I-B	Special Conditions of Contract		Vol-IBCD-1231
I-C	General Conditions of Contract		(Part of Vol-1231)
I-D	Forms & Procedures		(Part of Vol-1231)
II	Price Bid Specification		Vol-II-1231

TENDER SPECIFICATION

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AT

BHAVNAGAR ENERGY COMPANY LIMITED

DISTRICT- BHAVNAGAR,

GUJARAT

EARNEST MONEY DEPOSIT: Refer Notice Inviting Tender

LAST DATE FOR Refer Notice Inviting Tender
TENDER SUBMISSION :

THESE TENDER SPECIFICATION DOCUMENTS CONTAINING VOLUME-I AND VOLUME- II ARE ISSUED TO:

M/s.

.....

PLEASE NOTE:
THESE TENDER SPECS DOCUMENTS ARE NOT TRANSFERABLE.

For Bharat Heavy Electricals Limited

AGM (Purchase)

Place: Nagpur

Date :

1231

NOTICE INVITING TENDER

Bharat Heavy Electricals Limited



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

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	BHE/PW/PUR/PDVT-COND WELD/1231
ii	Broad Scope of job	CONDENSER TUBE TO CONDENSER TUBE PLATE SEAL WELDING JOB OF UNIT#1 & 2 OF 2 X 250 MW BY USING ORBITAL WELDING MACHINE AT BHAVNAGAR ENERGY COMPANY LIMITED DISTRICT- BHAVNAGAR, GUJARAT
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> Applicable
b	Volume-IB	<i>Special Conditions of Contract (SCC)</i> Applicable
c	Volume-IC	<i>General Conditions of Contract (GCC)</i> Applicable
d	Volume-ID	<i>Forms and Procedures</i>
e	Volume-II	<i>Price Schedule (Absolute value).</i> Applicable
iv	Issue of Tender Documents	<p>1. <u>Sale from BHEL PS Regional office at :</u> Start : 04/02/2014 , Closes: 24/02/2014 , Time : 16.00 Hrs</p> <p>2. From BHEL website (www.bhel.com) Tender documents will be available for downloading from website till due date of submission</p> Applicable
v	DUE DATE & TIME OF OFFER SUBMISSION	<p>Date : 25/02/2014, Time 15.00 Hrs Place : <u>BHEL PS Regional office at :Nagpur</u></p> <p>Tenders being submitted through representative shall be submitted at dispatch section of of PSWR HQ Office after making entry/registration at the reception. For any assistance on the matter kindly contact following officials:</p> <ul style="list-style-type: none"> • Pratih Gee Varghese/Sr Engineer(Purchase • Shivkesh Meena / Engineer (Purchase) Applicable
vi	OPENING OF	1 hours after the latest due date and time of Offer Applicable

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	TENDER	submission Notes: (1) In case the due date of opening of tender becomes a non-working day, then the due date & time of offer submission and opening of tenders get extended to the next working day. (2) Bidder may depute representative to witness the opening of tender	
vii	EMD AMOUNT	Rs 1,00,000/- (Rupees One Lakhs Only)	Applicable
viii	COST OF TENDER	Rs 2000/-.	Applicable
ix	LAST DATE FOR SEEKING CLARIFICATION	Five days before the due date of offer submission. Along with soft version also, addressing to undersigned & to others as per contact address given below	Applicable
x	SCHEDULE OF Pre Bid Discussion (PBD)		Not applicable.
xi	INTEGRITY PACT & DETAILS OF INDEPENDENT EXTERNAL MONITOR (IEM)		Not applicable.
xii	Latest updates	Latest updates on the important dates, Amendments, Correspondences, Corrigenda, Clarifications, Changes, Errata, Modifications, Revisions, etc to Tender Specifications will be hosted in BHEL webpage (www.bhel.com -->Tender Notifications →View Corrigendums) and not in the newspapers . Bidders to keep themselves updated with all such information	

2.0 The offer shall be submitted as per the instructions of tender document and as detailed in this NIT. Bidders to note specifically that all pages of tender document, including these NIT pages of this particular tender together with subsequent correspondences shall be submitted by them, duly signed & stamped on each page, as part of offer. **Rates/Price including discounts/rebates, if any, mentioned anywhere/in any form in the techno-commercial offer other than the Price Bid, shall not be entertained.**

3.0 Unless specifically stated otherwise, bidder shall remit cost of tender and courier charges if applicable, in the form of Demand Draft drawn in favour of Bharat Heavy Electricals Ltd, payable at Power Sector Regional HQ at Nagpur 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 Nagpur, 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 Nagpur. 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 tender documents 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
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Registered Office : BHEL House, Siri Fort, New Delhi – 110 049, India
Website : www.bhel.com

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Part-I A		
	<p>ENVELOPE – I superscribed as : PART-I (TECHNO COMMERCIAL BID) TENDER NO : NAME OF WORK : PROJECT: DUE DATE OF SUBMISSION:</p> <p>CONTAINING THE FOLLOWING:-</p>	
i.	Covering letter/Offer forwarding letter of Tenderer.	
ii.	<p>Duly filled-in 'No Deviation Certificate' as per prescribed format to be placed after document under sl no (i) above.</p> <p>Note:</p> <p>a. In case of any deviation, the same should be submitted separately for technical & commercial parts, indicating respective clauses of tender against which deviation is taken by bidder. The list of such deviation shall be placed after document under sl no (i) above. It shall be specifically noted that deviation recorded elsewhere shall not be entertained.</p> <p>b. BHEL reserves the right to accept/reject the deviations without assigning any reasons, and BHEL decision is final and binding.</p> <p>i). In case of acceptance of the deviations, appropriate loading shall be done by BHEL</p> <p>ii). In case of unacceptable deviations, BHEL reserves the right to reject the tender</p>	
iii.	<p>Supporting documents/ annexure/ schedules/ drawing etc as required in line with Pre-Qualification criteria.</p> <p>It shall be specifically noted that all documents as per above shall be indexed properly and credential certificates issued by clients shall distinctly bear the name of organization, contact 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>ENVELOPE – II superscribed as: 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 align="center">OR</p> <p>Documentary evidence for 'One Time EMD' with the Power Sector Region of BHEL floating the Tender</p>	

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	2. Cost of Tender (Demand Draft or copy of Cash Receipt as the case may be)	
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PART-II		
	PRICE BID consisting of the following shall be enclosed	
	ENVELOPE-III 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"> o Envelopes I o Envelopes II o 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 Deviation with respect to tender clauses and additional clauses/suggestions in Techno-commercial bid / Price bid shall NOT 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:
Bidders capacity for executing the job under tender shall be assessed 'LOAD' wise and 'PERFORMANCE' wise as per the following:

- I. **LOAD:** Load takes into consideration **ALL** the contracts of the Bidder under execution with BHEL Regions, irrespective of whether they are similar to the tendered scope or not. The 'Load' is the sum of the unit wise identified packages (refer Table-1) for contracts with BHEL Regions. The cut off month for reckoning 'Load' shall be the month, two (2) months preceding the month corresponding to the 'latest date of bid submission', in the following manner:

(Note: For example if latest bid submission is in Aug 2011, then the 'load' shall be calculated upto and inclusive of June 2011)

- i). $\frac{\text{Total number of Packages}}{\text{Total number of Packages in hand}} = P$
Where

- 'P' is the sum of all unit wise identified packages under execution with BHEL Regions as of the cut off month defined above, including packages yet to be commenced, excepting packages which are on HOLD due to reasons not attributable to Bidder..

- II. **PERFORMANCE:** Here 'Monthly Performance' of the bidder for all the packages (**under execution/** executed during the 'Period of Assessment' in all the Power Sector Regions of BHEL) **SIMILAR** to the packages covered under the tendered scope, excepting packages not commenced shall be taken into consideration. The 'Period of Assessment' shall be 6 months preceding the cut off month. The cut off month for reckoning 'Period of Assessment' shall be the month two (2) months preceding the month corresponding to the 'latest date of bid submission', in the following manner:

(Note: For example if 'latest date of bid submission' is in Aug 2011, then the 'performance' shall be assessed for a 6 month period upto and inclusive of June 2011, for all the unit wise identified packages (refer Table I)

- i). Calculation of Overall 'Performance Rating' for 'similar Package/Packages' for the tendered scope under execution at Power Sector Regions for the 'Period of Assessment':
This shall be obtained by summing up the 'Monthly Performance Evaluation' scores obtained by the bidder in all Regions for all the similar Package/packages', divided by the total number of Package months for which evaluation should have been done, as per procedure below:
- a) $P_1, P_2, P_3, P_4, P_5, \dots, P_N$ etc be the packages (**under execution/** executed during the 'Period of Assessment' in all Regions) **SIMILAR** to the packages covered under the tendered scope, excepting packages not commenced. Total number of similar packages for all Regions = P_T (i.e $P_T = P_1 + P_2 + P_3 + P_4 + \dots + P_N$)
 - b) Number of Months ' T_1 ' for which 'Monthly Performance Evaluation' as per relevant formats, should have been done in the 'Period of Assessment' for the corresponding similar package P_1 . Similarly T_2 for package P_2 , T_3 for package P_3 , etc for the tendered scope. Now calculate cumulative total months ' T_T ' for total similar Packages ' P_T ' for all Regions (i.e $T_T = T_1 + T_2 + T_3 + T_4 + \dots + T_N$)
 - c) Sum ' S_1 ' of 'Monthly Performance Evaluation' Scores ($S_{1-1}, S_{1-2}, S_{1-3}, S_{1-4}, S_{1-5}, \dots, S_{1-N}$) for similar package P_1 , for the 'period of assessment' ' T_1 ' (i.e $S_1 = S_{1-1} + S_{1-2} + S_{1-3} + S_{1-4} + S_{1-5} + \dots + S_{1-N}$). Similarly S_2 for package P_2 for period T_2 , S_3 for package P_3 for period T_3 , etc for the tendered scope for all Regions. Now calculate cumulative sum ' S_T ' of 'Monthly Performance Evaluation' Scores for total similar Packages ' P_T ' for all Regions (i.e ' $S_T = S_1 + S_2 + S_3 + S_4 + S_5 + \dots + S_N$).
 - d) **Overall Performance Rating ' R_{BHEL} ' for the similar Package/Packages (under execution/** executed during the 'Period of Assessment') in all the Power Sector Regions of BHEL):

$$= \frac{\text{Aggregate of Performance scores for all similar packages in all the Regions}}{\text{Aggregate of months for each of the similar package for which performance should have been evaluated in all the Regions}}$$

$$= \frac{S_T}{T_T}$$

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e) Bidders to note that the risk of non evaluation or non availability of the 'Monthly Performance Evaluation' reports as per relevant formats is to be borne by the Bidder

f) Table showing methodology for calculating 'a', 'b' and 'c' above

Sl no	Item Description	Details for all Regions							Total
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
1	Similar Packages for all Regions → (under execution/ executed during period of assessment)	P ₁	P ₂	P ₃	P ₄	P ₅	...	P _N	Total No of similar packages for all Regions = P_T ie Sum (Σ) of columns (iii) to (ix)
2	Number of Months for which 'Monthly Performance Evaluation' as per relevant formats should have been done in the 'period of assessment for corresponding similar Package (as in row 1)	T ₁	T ₂	T ₃	T ₄	T ₅	...	T _N	Sum (Σ) of columns (iii) to (ix) = T_T
3	Monthly performance scores for the corresponding period (as in Row 2)	S ₁₋₁ , S ₁₋₂ , S ₁₋₃ , S ₁₋₄ , ... S _{1-T1}	S ₂₋₁ , S ₂₋₂ , S ₂₋₃ , S ₂₋₄ , ... S _{2-T2}	S ₃₋₁ , S ₃₋₂ , S ₃₋₃ , S ₃₋₄ , ... S _{3-T3}	S ₄₋₁ , S ₄₋₂ , S ₄₋₃ , S ₄₋₄ , ... S _{4-T4}	S ₅₋₁ , S ₅₋₂ , S ₅₋₃ , S ₅₋₄ , ... S _{5-T5}	S _{N-1} , S _{N-2} , S _{N-3} , S _{N-4} , ... S _{N-TN}	-----
4	Sum of Monthly Performance scores of the corresponding Package for the corresponding period (as in row-3)	S ₁	S ₂	S ₃	S ₄	S ₅	...	S _N	Sum (Σ) of columns (iii) to (ix) = S_T

ii) Calculation of Overall 'Performance Rating' (R_{BHEL}) in case 'similar Package/Packages' for the tendered scope ARE NOT AVAILABLE, during the 'Period of Assessment':

This shall be obtained by summing up the 'Monthly Performance Evaluation' scores obtained by the bidder in all Regions for ALL the packages, divided by the total number of Package months for which evaluation should have been done. 'R_{BHEL}' shall be calculated subject to availability of 'performance scores' for at least.6 'package months' in the order of precedence below:

- 'Period of Assessment.
- 12 months preceding the cut-off month
- 24 months preceding the cut-off month
- 36 months preceding the cut-off month

In case, R_{BHEL} cannot be calculated as above, then Bidder shall be treated as 'NEW VENDOR'. Further eligibility and qualification of this bidder shall be as per definition of 'NEW VENDOR' described in 'Explanatory Notes'

iii) Factor “L” assigned based on Overall Performance Rating (R_{BHEL}) at Power Sector Regions.:

Sl no	Overall Performance Rating (R_{BHEL})	Corresponding value of ‘L’
1	=60	NA
2	> 60 and ≤ 65	0.4
3	> 65 and ≤ 70	0.35
4	> 70 and ≤ 75	0.25
5	> 75 and < 80	0.2
6	≥ 80	NA

III. ‘Assessment of Capacity of Bidder’:

‘Assessment of Capacity of Bidder’ is based on the Maximum number of packages for which a vendor is eligible, considering the performance scores of similar packages, as below:

Max number of packages $P_{Max} = (R_{BHEL} - 60)$ divided by corresponding value of ‘L’
i.e. $(R_{BHEL} - 60)/L$

Note:

- i. In case the value of P_{Max} results in a fraction, the value of P_{Max} is to be rounded off to next whole number
- ii. For $R_{BHEL} = 60$, $P_{Max} = '1'$
- iii. For $R_{BHEL} \geq 80$, there will be no upper limit on P_{Max}

The Bidder shall be considered ‘Qualified’ as per ‘Assessment of Capacity of Bidder’ for the subject Tender if $P \leq P_{Max}$
(where P is calculated as per clause 9.I)

IV. Explanatory note:

- a) Similar package means Boiler or ESP or Piping or Turbine or Civil or Structure or Electrical or CI, etc at the individual level irrespective of rating of Plant, and irrespective of whether the subject tender is a single package or as part of combined/composite packages. Normally Boiler, ESP, Piping, Turbine, Electrical, CI, Civil, Structure, etc is considered individual level of package. For example in case the tendered scope is a Boiler Vertical Package comprising of Boiler, ESP and Power Cycle Piping (i.e the ‘identified packages as per Table-1 below), the ‘PERFORMANCE’ part against sl no II above, needs to be evaluated considering all the identified packages (ie Boiler, ESP and Power Cycle Piping) and finally the Bidder’s capacity to execute the tendered scope is assessed in line with III above
- b) Identified Packages (Unit wise)

Table-1

	Civil	Electrical & CI	Mechanical
	i). Enabling works ii). Pile and Pile Caps iii). Civil Works including foundations iv). Structural Steel Fabrication & Erection v). Chimney vi). Cooling Tower vii). Others (Civil)	i). Electrical ii). CI iii). Others (Elec & CI)	i). Boiler & Aux (All types including CW Piping if applicable) ii). Power Cycle Piping/Critical Piping iii). LP Piping iv). ESP v). Steam Turbine Generator set & Aux vi). Gas Turbine Generator set & Aux vii). Hydro Turbine Generator set & Aux viii). Turbo Blower (including Steam Turbine)

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			ix). Material Handling x). Material Management xi). Material Handling & Material Management xii). Others (Mechanical)
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- c) Bidders who have not been evaluated for at least six package months in the last 36 months in the online BHEL system for contractor performance evaluation in BHEL PS Regions, wef July 2010 shall be considered "NEW VENDOR".

A 'NEW VENDOR' shall be considered qualified subject to satisfying all other tender conditions

A 'NEW VENDOR' if awarded a job (of package/packages identified under this clause) shall be tagged as "FIRST TIMER" on the date of first LOI from BHEL.

The "FIRST TIMER" tag shall remain till execution of work for a period of not less than 09 months, from the commencement of work of first package

A Bidder shall not be eligible for the next job as long as the Bidder is tagged as "FIRST TIMER" excepting for the Tenders which have been opened on or before the date of the bidder being tagged as 'FIRST TIMER'.

After removal of 'FIRST TIMER' tag, the Bidder shall be considered 'QUALIFIED' for the future tenders subject to satisfying all other tender conditions including 'Capacity Evaluation of Bidders'.

- d) In the unlikely event of all bidders shortlisted against Technical and Financial Qualification criteria not meeting the criteria on 'Assessment of Capacity of Bidders' detailed above, OR leads to a single tender response on applying the criteria of 'Assessment of Capacity of Bidders' or due to non-approval by Customer, then BHEL at its discretion reserves the right to consider the further processing of the Tender based on the **Overall Performance Rating 'R_{BHEL}'** only, starting from the upper band.

- e) 'Under execution' shall mean works in progress as per the following:

- i. up to Boiler Steam Blowing in case of Steam Generator and Auxiliaries
- ii. upto Synchronisation in case of all other works excepting sl no (i) and (iii)
- iii. Upto execution of at least 90% of anticipated contract value in case of Civil & Structures (unit wise), Enabling works and upto 90% of material unloading (in tonnage) as per the original contract in case of MM Package.

Note : BHEL at its discretion can extend (or reduce in exceptional cases in line with Contract conditions) the period defined against (i), (ii) and (iii) above, depending upon the balance scope of work to be completed.

- f) Performance evaluation in CL 9 above is applicable to Prime bidder and consortium partner (or Technical tie up partner) for their respective scope of work

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, applicable wage structure, wage rules, 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.

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- 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 of 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 (1) above.**
- 16.0 The Bidder has to satisfy the Pre Qualifying Requirements stipulated for this Tender in order to be qualified. The Price Bids of only those bidders will be opened who will be qualified for the subject job on the basis of satisfying the Pre Qualification Criteria specified in this NIT as per Annexure-I (as applicable), past performance etc. and date of opening of price bids shall be intimated to only such bidders. BHEL reserves the right not to consider offers of parties under HOLD.
- 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) unless specified otherwise.
- 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 Consortium Bidding (or Technical Tie up) shall be allowed only if specified in Pre Qualifying Requirement (PQR) criteria, and in such a case the following shall be complied with:
- 23.1 Prime Bidder and Consortium Partner or partners are required to enter into a consortium agreement with a validity period of six months initially. In case the consortium is awarded the contract, then the Consortium Agreement

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between the Prime Bidder and Consortium Partner or partners shall be extended till contractual completion period including extension periods if any applicable.

- 23.2 'Stand alone' bidder cannot become a **'Prime Bidder' or a 'Consortium bidder' or 'Technical Tie up bidder' in a consortium (or Technical Tie up) 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.
- 23.3 Number of partners for a consortium Bidding (or Technical Tie up) shall be as specified in the PQR
- 23.4 Prime Bidder shall be as specified in the Pre Qualification Requirement, else the bidder who has the major share of work
- 23.5 In order to be qualified for the tender, Prime Bidder and Consortium partner or partners shall satisfy (i) the Technical 'Pre Qualifying Requirements' specified for the respective package, (ii) "Assessment of Capacity of Bidder" as specified in clause 9.0
- 23.6 Prime Bidder shall comply with additional 'Technical' criteria of PQR as defined in 'Explanatory Notes for the PQR'
- 23.7 Prime Bidder shall comply with all other Pre Qualifying criteria for the Tender unless otherwise specified
- 23.8 In case customer approval is required, then Prime Bidder and Consortium Partner or partners shall have to be individually approved by Customer for being considered for the tender.
- 23.9 Prime Bidder shall be responsible for the overall execution of the contract
- 23.10 In case of award of job, Performance shall be evaluated for Prime Bidder and Consortium Partner or partners for their respective scope of work(s) as per prescribed formats
- 23.11 In case the Consortium partner or partners back out, their SDs shall be encashed by BHEL. In such a case, other consortium partner or partners meeting the PQR have to be engaged by the Prime Bidder, and if not, the respective work will be withdrawn and executed on risk and cost basis of the Prime Bidder. The new consortium partner or partners shall submit fresh SDs as applicable.
- 23.12 In case the prime Bidder withdraws, the whole contract shall be considered cancelled and short closed.
- 23.13 After execution of work, the work experience shall be assigned to the Prime Bidder and the consortium partner or partners for their respective scope of work. After successful execution of two similar works with the same consortium partner or partners under direct orders of BHEL, the Prime Bidder shall be eligible for becoming a 'stand alone' bidder for similar works, subject to certification from BHEL about the active involvement of the Prime Bidder for satisfactory execution of the works.
- 23.14 The consortium partner shall submit SD equivalent to 2% of the total contract value in addition to the SD to be submitted by the prime Bidder for the total contract value. In case there are two consortium partners, then each partner shall submit SD equivalent to 1% of the total contract value in addition to the SD to be submitted by the prime Bidder for the total contract value.
- 23.15 In case of a Technical Tie up, all the clauses applicable for the Consortium partner shall be applicable for the Technical Tie up partner also
- 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

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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

It may please be noted that guidelines/rules in respect of suspension of business dealings', 'Vendor evaluation format', 'Quality, Safety & HSE guidelines', etc may undergo change from time to time and the latest one shall be followed

for BHARAT HEAVY ELECTRICALS LTD

AGM Pur

Enclosure

01. Annexure-1: Pre Qualifying criteria.
02. Annexure-2: Check List.
03. Annexure-3: Important Information.
- 03 Other Tender documents as per this NIT.

PRE QUALIFYING CRITERIA

JOB	CONDENSER TUBE TO CONDENSER TUBE PLATE SEAL WELDING JOB OF UNIT#1 & 2 OF 2 X 250 MW BY USING ORBITAL WELDING MACHINE AT BHAVNAGAR ENERGY COMPANY LIMITED DISTRICT- BHAVNAGAR, GUJARAT
TENDER NO	BHE/PW/PUR/PDVT-COND WELD /1231

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. Bidder must fill up this column as per applicability
A	Submission of Integrity Pact duly signed (if applicable) (Note: To be submitted by Prime Bidder & Consortium/Technical Tie up partner jointly in case Consortium bidding is permitted, otherwise by the sole bidder)	NOT APPLICABLE	
B	<u>Technical</u> <u>Bidder must have achieved any one of the following</u> B.1: Executed Erection Testing & Commissioning (E T & C) of One STG job of one unit of 100 MW or higher OR B.2: Bidder must have executed 1 job of Tube/Pipe welding (using orbital welding machine), of atleast 25,100 Joints or of value Rs 16 Lakhs, against single work order OR B.3: Bidder must have executed 2 jobs of Tube/Pipe welding (using orbital welding machine), each of atleast 15,700 Joints or each of value Rs 10 Lakhs, against two work orders OR B.4: Bidder must have executed 3 jobs of Tube/Pipe welding (using orbital welding machine), each of atleast 12,600 Joints or of value Rs 8 Lakhs, against three work orders	APPLICABLE	
C-1	<u>Financial TURNOVER</u> Bidders must have achieved an average annual financial turnover (Audited) of Rs 12 Lakhs or more over last three Financial Years (FY) i.e. 2010-2011, 2011-12 & 2012-13	APPLICABLE	
C-2	<u>NETWORTH</u> (only in case of Companies) Net worth of the Bidder based on the latest Audited Accounts as furnished for 'C-1' above should be positive	APPLICABLE	
C-3	<u>PROFIT</u> Bidder must have earned cash profit in any one of the three Financial Years as applicable in the last three Financial Years defined in 'C-1' above based on latest Audited Accounts.	APPLICABLE	
D	Assessment of Capacity of Bidder to execute the work as per sl no 9 of NIT (if applicable). <u>Assessment shall be carried out by considering 'STG Package' as similar package.</u>	APPLICABLE	By BHEL

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E	Approval of Customer (if applicable) Note: Names of bidders (including consortium/Technical Tie up partners in case consortium bidding is permitted) who stand qualified after compliance of criteria A to D shall be forwarded to customer for their approval.	Not APPLICABLE	BY BHEL
F	Price Bid Opening Note: Price Bids of only those bidders shall be opened who stand qualified after compliance of criteria A to E		BY BHEL
G	Technical Tie up criteria (if applicable)	APPLICABLE	
<p><u>Explanatory Notes for the PQR (unless otherwise specified in the PQR):</u></p> <p>i. Bidder to submit Audited Balance Sheet and Profit and Loss Account for the respective years as indicated against C-1 above along with all annexures</p> <p>ii. In case audited Financial statements have not been submitted for all the three years as indicated against C-1 above, then the applicable audited statements submitted by the bidders against the requisite three years, will be averaged for three years i.e total divided by three.</p> <p>iii. C-2:-NETWORTH : Shall be calculated based on the latest Audited Accounts as furnished for C-1 above. Net worth = Paid up share capital + Reserves. (Net worth is required to be evaluated in case of companies)</p> <p>iv. C-3:- PROFIT : shall be NET profit (PAT + Non cash expenditure viz depreciation) earned during any one of the three financial years as in C-1 above</p> <p>v. 'Additional' Criteria in respect of 'Technical' criteria of PQR (as in 'B' above) for Civil, Electrical, CI, unless otherwise specified :-</p> <p style="margin-left: 40px;">1. Bidder should have executed similar work of any one of the following:</p> <p style="margin-left: 80px;">a. One (1) work of value not less than Rs XXX</p> <p style="margin-left: 40px;">_____OR</p> <p style="margin-left: 80px;">b. Two (2) works of not less than Rs YYY</p> <p style="margin-left: 40px;">_____OR</p> <p style="margin-left: 80px;">c. Three (3) works of not less than Rs ZZZ</p> <p style="margin-left: 40px;">(Value XXX, YYY, ZZZ shall be as indicated by BHEL</p> <p style="margin-left: 40px;">2. 'Similar' work for criteria 5 above means</p> <p style="margin-left: 80px;">a. Civil or Structures or Civil & Structures or Chimney respectively as applicable to the tendered scope in respect of 'CIVIL' Works</p> <p style="margin-left: 80px;">b. Electrical works in respect of 'ELECTRICAL'</p> <p style="margin-left: 80px;">c. CI works in respect of 'CI' Works</p> <p style="margin-left: 80px;">d. Material Handling and/or Management works in respect of 'MM' works</p> <p>vi. Time period for achievement of the 'Technical' criteria of PQR (as in 'B' above) will be the last 7 years ending on the 'latest date' of Bid submission</p> <p>vii. 'EXECUTED' means the Vendor should have achieved the criteria specified in the Technical criteria of PQR (as in 'B' above) even if the Contract has not been completed or closed</p> <p>viii. Unless otherwise specified, for the purpose of 'Technical' criteria of PQR (as in 'B' above), the word 'EXECUTED' means:</p> <p style="margin-left: 40px;">1. "BOILER LIGHT UP" in respect of Boiler & Aux and ESP</p> <p style="margin-left: 40px;">2. "SYNCHRONISATION" in respect of STG/GTG and 'SPINNING' in case of HTG</p> <p style="margin-left: 40px;">3. "STEAM BLOWING COMPLETION" in respect of at least Main Steam Line of Power Cycle Piping</p> <p style="margin-left: 40px;">4. "HYDRAULIC TEST" of the system in respect of Structures, Pressure parts/IBR Piping</p> <p style="margin-left: 40px;">5. "CHARGING" in respect of power Transformers, Bus ducts, HT/LT switchgears</p> <p style="margin-left: 40px;">6. "Completion of RCC Shell and liner (steel or brick as per tendered scope) up to the HEIGHT specified using slip form" in case of RCC Chimney.</p> <p style="margin-left: 40px;">7. Achievement of physical Quantities as per respective PQRs in respect of Civil & Structures and Piling Works</p> <p style="margin-left: 40px;">8. 'Readiness for coal Filling" in respect of Bunker Structure Work.</p> <p>ix. Boiler means HRSG or WHRB or any other types of Steam Generator</p> <p>x. Critical/Power Cycle piping means Main Steam, Hot Reheat, Cold Reheat, HP Bypass, LP Bypass lines</p> <p>xi. For the purpose of evaluation of the PQR, one MW shall be considered equivalent to 3.5TPH where ever rating of HRSG/BOILER is mentioned in MW. Similarly, where ever rating of Gas Turbine is mentioned in terms of Frame size, ISO rating in terms of MW shall be considered for evaluation.</p> <p>xii. In case the experience/POWO certificate enclosed by bidders do not have separate break up prices for the E&C portion of Electrical and CI Works, (i.e. the certificates enclosed are for composite order for supply and erection of Electrical & CI and other works if any), then value of Erection and Commissioning for the Electrical & CI portion</p>			

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	<p>.....</p> <p>shall be considered as 15% of the supply & erection of Electrical & CI, unless otherwise specifically indicated in the PQR.</p> <p>xiii. Scope for capital overhaul of STG shall cover Bearing Inspection work and overhauling of all cylinders of the Turbine unless otherwise specifically indicated in the PQR.</p> <p>xiv. In case the tendered scope is not a Pulverised Fuel Boiler, experience of Oil/Gas Fired Boilers also can be considered unless otherwise specifically indicated in the PQR</p> <p>xv. The value of work (Experience submitted against PQR B) shall be updated as per the PVC indices for "All India Avg. Consumer Price Index for Industrial Workers" with base month as date of execution (completion of contract/work) and indexed upto two months prior to bid opening month.</p>
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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.

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ANNEXURE - 2

CHECK LIST

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

1	Name and Address of the Tenderer		
2	Details about type of the Firm/Company		
3.a	Details of Contact person for this Tender	Name : Mr/Ms Designation: Telephone No: Mobile No: Email ID: Fax No:	
3.b	Details of alternate Contact person for this Tender	Name : Mr/Ms Designation: Telephone No: Mobile No: Email ID: Fax No:	
4	EMD DETAILS	DD No: Date : Bank : Amount: <u>Please tick (✓) whichever applicable:-</u> ONE TIME EMD / ONLY FOR THIS TENDER	
5	Validity of Offer	TO BE VALID FOR SIX MONTHS FROM DUE DATE	
		APPLICABILITY(B Y BHEL)	ENCLOSED BY BIDDER
6	Whether the format for compliance with PRE QUALIFICATION CRITERIA (ANNEXURE-I) is understood and filled with proper supporting documents referenced in the specified format	Applicable	YES / NO
7	Audited profit and Loss Account for the last three years	Applicable/Not Applicable	YES/NO
8	Copy of PAN Card	Applicable/Not Applicable	YES/NO
9	Whether all pages of the Tender documents including annexures, appendices etc are read understood and signed	Applicable/Not Applicable	YES/NO
10	Integrity Pact	Applicable/Not Applicable	NO
11	Declaration by Authorised Signatory	Applicable/Not Applicable	YES/NO
12	No Deviation Certificate	Applicable/Not Applicable	YES/NO
13	Declaration confirming knowledge about Site Conditions	Applicable/Not Applicable	YES/NO
14	Declaration for relation in BHEL	Applicable/Not Applicable	YES/NO
15	Non Disclosure Certificate	Applicable/Not Applicable	YES/NO

Registered Office : BHEL House, Siri Fort, New Delhi – 110 049, India
Website : www.bhel.com

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16	Bank Account Details for E-Payment	Applicable/ Not Applicable	YES/NO
17	Capacity Evaluation of Bidder for current Tender	Applicable/ Not Applicable	YES/NO
18	Tie Ups/Consortium Agreement are submitted as per format	Applicable/ Not Applicable	YES/NO
19	Power of Attorney for Submission of Tender/Signing Contract Agreement	Applicable/ Not Applicable	YES/NO
20	Analysis of Unit rates	Applicable/ Not Applicable	YES/NO

NOTE : STRIKE OFF 'YES' OR 'NO', AS APPLICABLE. TENDER NOT ACCOMPANIED BY THE PRESCRIBED **ABOVE APPLICABLE DOCUMENTS** ARE LIABLE TO BE SUMMARILY REJECTED.

DATE :

**AUTHORIZED SIGNATORY
(With Name, Designation and Company seal)**

IMPORTANT INFORMATION

1. The offers of the bidders who are on the banned list as also the offer of the bidders, who engage the services of the banned firms, shall be rejected. The list of banned firms is available on BHEL web site (www.bhel.com ---> Tender Notification -> List of Banned Firms)
2. All Statutory Requirements as applicable for this project shall be complied with.
3. Please take note of following Revised Tender Clauses:
 - i. Notice Inviting Tender: SI No 9
 - ii. General conditions of Contract: Clause No 1.15.13 (New), Clause No 2.8.3, 2.8.4 and 2.8.5
4. Following Notes are added to Form F- 15 of Volume I D 'Forms & procedures'
 - i. It is only indicative and shall be as per the online format issued by BHEL time to time.
 - ii. No request will be entertained after specified date of the current month w.r.t the changes requested in the scores of immediate previous month.

5. PRICE VARIATION CLAUSE

Price Variation Compensation Clause no. 2.17 of Vol I C GCC shall not be Applicable:

6. OVER RUN COMPENSATION

Over Run Compensation Clause no. 2.12 of Vol I C GCC shall not be Applicable

7 Broad Terms & Conditions of Reverse Auction

In continuation to Clause 19.0 of NIT (Notice Inviting Tender) following are the broad terms and conditions of Reverse Auction is given in Annexure V of NIT:

- 7.1. Against this enquiry for the subject item/ system with detailed scope of supply as per enquiry specifications, BHEL may resort to "REVERSE AUCTION PROCEDURE" i.e., ON LINE BIDDING (THROUGH A SERVICE PROVIDER). The philosophy followed for reverse auction shall be English Reverse (No ties).
- 7.2. BHEL reserves the right to go for Reverse Auction (RA) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. All bidders to give their acceptance for participation

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in RA. Non-acceptance to participate in RA may result in non-consideration of their bids. In case BHEL decides to go for Reverse Auction, only those bidders who have given their acceptance to participate in RA will be allowed to participate in the Reverse Auction. Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit „online sealed bid“ in the Reverse Auction. Non-submission of „online sealed bid“ by the bidder will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.

- 7.3. For the proposed reverse auction, technically and commercially acceptable bidders only shall be eligible to participate.
- 7.4. Those bidders who have given their acceptance for Reverse Auction (quoted against this tender enquiry) will have to necessarily submit ‘online sealed bid’ in the Reverse Auction. Non-submission of ‘online sealed bid’ by the bidder for any of the eligible items for which techno-commercially qualified, will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.
- 7.5. 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.
- 7.6. In case of reverse auction, BHEL will inform the bidders the details of Service Provider to enable them to contact & get trained.
- 7.7. Business rules like event date, time, bid decrement, extension etc. also will be communicated through service provider for compliance.
- 7.8. Bidders have to fax the Compliance form (annexure IV) before start of Reverse auction. Without this, the bidder will not be eligible to participate in the event.
- 7.9. In line with the NIT terms, BHEL will provide the calculation sheet (e.g., EXCEL sheet) which will help to arrive at “Total Cost to BHEL” like Packing & forwarding charges, Taxes and Duties, Freight charges, Insurance, Service Tax for Services and loading factors (for noncompliance to BHEL standard Commercial terms & conditions) for each of the bidder to enable them to fill-in the price and keep it ready for keying in during the Auction.
- 7.10. Reverse auction will be conducted on scheduled date & time.
- 7.11. At the end of Reverse Auction event, the lowest bidder value will be known on auction portal.
- 7.12. The lowest bidder has to fax/e-mail the duly signed and filled-in prescribed format for price breakup including that of line items, if required, (Annexure VII) as provided on case-to-case basis to Service provider within two working days of Auction without fail.
- 7.13. 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’s standard practice.
- 7.14. Bidders shall be required to read the “Terms and Conditions” section of the auctions site of Service provider, using the Login IDs and passwords given to them by the service provider before reverse auction event. Bidders should acquaint themselves of the “Business Rules of Reverse Auction”, which will be communicated before the Reverse Auction.
- 7.15. If the Bidder or any of his representatives are found to be involved in Price manipulation/ cartel formation of any kind, directly or indirectly by communicating

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- with other bidders, action as per extant BHEL guidelines, shall be initiated by BHEL and the results of the RA scrapped/ aborted.
- 7.16. The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party.
- 7.17. In case BHEL decides to go for reverse auction, the H1 bidder (whose quote is highest in online sealed bid) may not be allowed to participate in further RA process.

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TECHNICAL CONDITIONS OF CONTRACT (TCC)

BHARAT HEAVY ELECTRICALS LIMITED



TECHNICAL CONDITIONS OF CONTRACT (TCC) CONTENTS

SI No	DESCRIPTION	Chapter	No. OF PAGES
Volume-IA	Part-I: Contract specific details		
1	Project Information	Chapter-I	2
2	Scope of Works	Chapter-II	3
3	Facilities in the scope of Contractor/BHEL (Scope Matrix)	Chapter-III	8
4	T&Ps and MMDs to be deployed by Contractor	Chapter-IV	1
5	T&Ps to be deployed by BHEL free of hire charges on sharing basis	Chapter-V	1
6	Time Schedule	Chapter-VI	1
7	Terms of Payment	Chapter-VII	1
8	Taxes and other Duties	Chapter-VIII	2
9	Specific Inclusion	Chapter-IX	4
10	Specific Exclusion	Chapter-X	1
Volume-IA	Part-II : Technical Specifications		
11	General	Chapter-XI	5
12	Welding & Heat Treatment	Chapter-XII	
13	Tools & Tackles & MMEs	Chapter-XIII	

Following documents shall be considered as part of Vol IA ‘Technical Conditions of contract’:

1. Document Ref: CDE-13-3326 ‘Procedure of Titanium Tube Seal Welding’
2. Drawing 3 Nos

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter - I : Project Information

	<p>4. Rainfall</p> <p>a. Maximum Recorded : 1856.3</p> <p>b. Average Annual Rainfall; : 1203.90 mm</p> <p>c. Period of Monsoon(Avg.) Showers : June-September</p> <p>5. Wind data:</p> <p>a. Basic wind speed : 55 m/s as per latest revision of IS:875 Part III</p>
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The bidder is advised to visit and examine the site of WORKS and its surroundings and obtain for himself on his own responsibility all information that may be necessary for preparing the bid and entering into the CONTRACT. All costs for and associated with site visits shall be borne by the bidder.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter - II : Scope of Works

2.0 SCOPE OF WORK

The work to be carried out under the scope of these specifications is broadly as under:

A) SCOPE OF WORK FOR CONDENSER TUBE TO CONDENSER TUBE PLATE SEAL WELDING BY USING ORBITAL WELDING MACHINE - UNIT-1&2 AT 2X520 MW BECL BHAVNAGAR PROJECT SITE (GUJARAT)

- 1) Seal welding of condenser tubes (material – titanium) with titanium clad condenser tube plate is required to be done by using orbital welding machine for both Unit#1&2. Drawing of condenser GA (No. 1-16010-40019, Rev 02) and Seal welding procedure (doc. no. CDE – 13 - 3326) are attached for ready reference. The job is to be carried out as per approved documents to be provided by BHEL during execution.
- 2) The scope detailed under this specification is not exhaustive but indicative only. However any activity to be covered under the normal course of subject jobs shall be deemed to be within the scope.
 - a) Vendor has to arrange necessary manpower (Skilled, Semi-skilled & unskilled) for this work. Expert manpower like welders, gas cutter, electrician and Engineer for supervision of this specialized area, as required for the job has to be deployed by the vendor.
 - b) This job is a time bound activity and round the clock work is required to be done by the vendor. Vendor has to abide by the schedule, quality & safety norms either provided by BHEL & BECL or prevailing at Bhavnagar site. Vendor has to complete the job under supervision of BHEL & BECL representative.
 - c) All IR problems have to be resolved by the vendor as per guidelines of BECL. Local Law and order has to be maintained by the vendor so that the progress of work does not suffer on account of this.
 - d) The vendor has to maintain steady manpower at site to take up the work immediately after readiness of the front. No demobilization at site is permitted during the execution of work till satisfactory Water Fill test of the Condenser.
 - e) Water Fill Test will be arranged and performed by the TG Erection agency. However, the vendor has to co-ordinate with the TG erection agency for the test and has to carry out rectification work if required.
 - f) Total no. of condenser tubes for each Unit is around 15664 (i.e. 31328 no. of joints/ends).

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter - II : Scope of Works

g) All statutory labour laws are to be followed as framed by the Govt .

h) All safety norms are to be followed as per BHEL OHSAS policy.

3) Brief description of condenser:

- Condenser tube OD: 28.575 mm
- Condenser Tube Thickness: 0.558 mm
- Number of tubes / joints per condenser: 15664 nos / 31328 nos.
- Material of condenser tube plate cladding & tube: Titanium
- Seal welding is between condenser tube OD to condenser tube plate

4) Tentative time lag between U#1 and U#2 condenser tube seal welding job is approximately 3 months from completion of Unit # 1 Job.

B) MAJOR INPUTS TO BE ARRANGED BY THE CONTRACTOR BUT NOT LIMITED TO THE FOLLOWING:

1. All kinds of T&P' in sufficient number as required for carrying out the job under the scope has to be arranged by the vendor within his quoted rate. Tentative list is mentioned in Chapter - IV.
2. All measuring instruments like micrometer of different types etc. has to be arranged by the vendor with necessary calibration certificate within his quoted rate.
3. Necessary consumables like welding electrode and other consumables, Argon gas, Nitrogen gas, DPT consumables, cleaning consumables etc. are to be arranged by the contractor.
4. Necessary scaffoldings to facilitate the progress of work is to be arranged by Contractor.
5. Service engineer for the welding machine, if required will be arranged immediately by the vendor as and when required. **The delay on this account shall be attributable to the contractor.**
6. Contractor has to arrange for necessary labour license, insurance etc. for their workmen and other necessary statutory requirements are to be fulfilled.
7. Contractor has to provide necessary skilled, semiskilled and unskilled manpower and supervision for the total job under the technical guidance of BHEL. **Contractor has to provide experienced supervision staff** excluding site in-

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter - II : Scope of Works

charge for close supervision of work as well as providing inputs for uninterrupted progress of the job.

Note: Lack of supervision/resource mobilization will be viewed seriously.

8. Contractor has to follow necessary safety regulations.
9. Cleaning, housekeeping and security arrangement for the equipment, T&P and materials is the responsibility of the contractor.
10. PERT network / BAR chart for the job is to be submitted prior to start of the job.

TECHNICAL CONDITIONS OF CONTRACT (TCC)
Chapter – III: Facilities in the scope of Contractor/BHEL

Sl.No	Description	Scope / to be taken care by		Remarks
		BHEL	Bidder	
3.1	PART I ESTABLISHMENT			
3.1.1	FOR CONSTRUCTION PURPOSE:			
a	Open space for office (as per availability)	Yes		Location will be finalized after joint survey with owner
b	Open space for storage (as per availability)	Yes		Location will be finalized after joint survey with owner
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	
3.1.2	FOR LIVING PURPOSES OF THE BIDDER			

TECHNICAL CONDITIONS OF CONTRACT (TCC)
Chapter – III: Facilities in the scope of Contractor/BHEL

Sl.No	Description PART I	Scope / to be taken care by		Remarks
		BHEL	Bidder	
a	Open space for labour colony (as per availability)		Yes	
b	Labour Colony with internal roads, sanitation, complying with statutory requirements		Yes	
3.2.0	ELECTRICITY			
3.2.1	Electricity For construction purposes of Voltage 415/440 V	YES		Free; however, bidder shall be required to pay for electricity duty and taxes as levied by the Govt at the prevailing rates
a	Single point source	Yes		At a distance of 500 M from site (Distance is only estimated, it may vary upto an extent depending on site condition)
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c	Duties and deposits including statutory clearances if applicable		Yes	
3.2.2	Electricity for the office, stores, canteen etc of the bidder			Chargeable as per standard rates

TECHNICAL CONDITIONS OF CONTRACT (TCC)
Chapter – III: Facilities in the scope of Contractor/BHEL

Sl.No	Description PART I	Scope / to be taken care by		Remarks
		BHEL	Bidder	
a	Single point source	Yes		At a distance of 500 M from site (Distance is only estimated, it may vary upto an extent depending on site condition)
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c	Duties and deposits including statutory clearances if applicable		Yes	
3.2.3	Electricity for living accommodation of the bidder's staff, engineers, supervisors etc		Yes	
a	Single point source		Yes	Power may be drawn from owner's given point within plant boundary.
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c	Duties and deposits including statutory clearances if applicable		Yes	
3.3.0	WATER SUPPLY			

TECHNICAL CONDITIONS OF CONTRACT (TCC)
Chapter – III: Facilities in the scope of Contractor/BHEL

Sl.No	Description PART I	Scope / to be taken care by		Remarks
		BHEL	Bidder	
3.3.1	For construction purposes	Yes		Free; duty & taxes, if levied by the Govt, shall be payable by the bidder
a	Making the water available at single point	Yes		In case of inadequate supply / non-availability of construction water from customer, contractor shall have to arrange construction water at his own expenses.
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.3.2	<u>Water supply for bidder's office, stores, canteen etc</u>			FREE
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	
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	
3.4.0	LIGHTING			

TECHNICAL CONDITIONS OF CONTRACT (TCC)
Chapter – III: Facilities in the scope of Contractor/BHEL

Sl.No	Description PART I	Scope / to be taken care by		Remarks
		BHEL	Bidder	
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	
3.5.0	COMMUNICATION FACILITIES FOR SITE OPERATIONS OF THE BIDDER			
a	Telephone, fax, internet, intranet, e-mail etc		Yes	
3.6.0	COMPRESSED AIR wherever required for the work		Yes	
3.7.0	Demobilization of all the above facilities		Yes	
3.8.0	TRANSPORTATION			

TECHNICAL CONDITIONS OF CONTRACT (TCC)
Chapter – III: Facilities in the scope of Contractor/BHEL

Sl.No	Description PART I	Scope / to be taken care by		<i>Remarks</i>
		BHEL	Bidder	
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)
Chapter – III: Facilities in the scope of Contractor/BHEL

SI. No	Description PART II 3.9.0 ERECTION FACILITIES	Scope / to be taken care by		Remarks
		BHEL	Bidder	
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		
c	As-built drawings – where ever deviations observed and executed and also based on the decisions taken at site- example – routing of small bore pipes		Yes	In consultation with BHEL
d	Shipping lists etc for reference and planning the activities	Yes		
e	Preparation of site erection schedules and other input requirements		Yes	In consultation with BHEL
f	Review of performance and revision of site erection schedules in order to achieve the end dates and other commitments	Yes	Yes	In consultation with BHEL
g	Weekly erection schedules based on SI No. e		Yes	In consultation with BHEL
h	Daily erection / work plan based on SI No. g		Yes	In consultation with BHEL

TECHNICAL CONDITIONS OF CONTRACT (TCC)
Chapter – III: Facilities in the scope of Contractor/BHEL

Sl. No	Description PART II 3.9.0 ERECTION FACILITIES	Scope / to be taken care by		Remarks
		BHEL	Bidder	
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	
k	Laying of racks for gantry crane if provided by BHEL or brought by the contractor/bidder himself		Yes	
L	Arranging the materials required for preassembly		Yes	

TECHNICAL CONDITIONS OF CONTRACT (TCC)
Chapter – IV: T&Ps and MMDs to be deployed by Contractor

A: MAJOR TOOLS AND PLANTS & MMDs TO BE DEPLOYED BY THE CONTRACTOR

S.N.	DESCRIPTION	QUANTITY
1	Orbital welding machine	As required
2	DPT Kit	As required
3	Emery WHEELS	As required
4	Hand Files of different types and sizes	As required
5	Electrode Holder	As required
6	Man-Drills	As required
7	Glass	As required
8	Insulator	As required
9	Hack-shaw of diff sizes	As required

B: MEASURING AND MONITORING DEVICES (MMD):

To be finalized at site as per requirement.

NOTE:

The above list at A & B is only indicative and neither exhaustive nor limiting. Quantities indicated above are only the minimum required. Contractor shall deploy all necessary T&P to meet the schedules & as prescribed by BHEL engineer and required for

TECHNICAL CONDITIONS OF CONTRACT (TCC)
**Chapter – V: T&Ps to be deployed by BHEL free of hire charges on
sharing basis**

1. Mock up plate with condenser tube for mock testing. However, expansion of the tube in the mock up plate is in the scope of the vendor.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter – VI: Time Schedule

6.1 MOBILIZATION, TIME SCHEDULE & CONTRACT PERIOD

6.1.1

INITIAL MOBILIZATION

Contractor shall reach site, make his site establishment and be ready to commence the erection work within two weeks from the date of issue of Fax Letter of Intent or as per the directions of Construction Manager/ Project Manager of BHEL.

6.1.2

MOBILIZATION FOR ERECTION, TESTING, ASSISTANCE FOR COMMISSIONING ETC

The activities shall be started as per the directions of construction manager of BHEL. Contractor shall mobilize further resources (in addition to those required for activities under clause no. 6.1.1) as per the requirement to commence the work of erection, testing etc and progressively augment the resources to match the schedule.

6.1.3

COMMENCEMENT OF CONTRACT PERIOD AND TENTATIVE SCHEDULE

Welding of 1st joint of tube to support plate as covered in the scope of these specifications shall be recognized as "start of contract period".

Phase Difference 03 months

In order to meet above schedule in general, and any other intermediate targets set, to meet customer/ project schedule requirements, contractor shall arrange & augment all necessary resources from time to time as per the instructions of BHEL.

6.1.4

DURATION

The total contract period for completion of entire work of each Unit shall be **1.5 (One & half month)** months from the start of erection as specified earlier. Idle and demobilization charges will not be applicable. Tentative time for readiness of Unit # 1 condenser for seal welding is Mid March'2014 and Unit # 2 is end Jul'2014.

However the contractor shall have to mobilize his resources earlier than the start of contract period for preparatory works.

The contractor shall complete all the works in the scope of this contract within the contract period. Pending points identified by the customer/BHEL during the execution of the contract are to be liquidated during the contract period itself.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-VII: Terms of Payment

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

FOR EACH CCONDENSER

I	PRO RATA PAYMENTS (85%)	
1.1	WELDING	45
1.2	COMPLETION OF NON DESTRUCTIVE EXAMINATION & STRESS RELIEVING / HEAT TREATMENT	40
	TOTAL FOR PRO RATA PAYMENTS (TOTAL 85%)	85
II	STAGE/MILESTONE PAYMENTS (15%)	
2.1	WATER FILL TEST	15
	TOTAL FOR STAGE/MILESTONE PAYMENTS (15%)	15
	TOTAL I + II	100

	OPTIONALS	
	% from every RA Bill to be paid only after satisfactory completion otherwise forfeited	
1	COMPLIANCE OF HOUSE KEEPING OF VENDOR'S WORKING AREA AND STORE/ OFFICE AREAS	1%
2	COMPLIANCE OF GENERAL ILLUMINATION OF VENDOR'S WORKING AREA AND STORES, OFFICE AREA.	1%
3	COMPLIANCE OF APPLICABLE OHSAS & SAFETY REQUIREMENT AS PER GUIDELINES OF BHEL/ PSWR AND AS SPECIFIED IN THE TENDER.	1%

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-VIII: Taxes and Other Duties

8.0 TAXES, DUTIES, LEVIES (Consolidated Rev 03 dated 09/04/2013)

8.1. For All types of works excepting works covered under sl no 8.2

8.1.1

The contractor shall pay all (save the specific exclusions as enumerated in this contract) taxes, fees, license charges, deposits, duties, tools, royalty, commissions or other charges which may be levied on the input goods & services consumed and output goods & services delivered in course of his operations in executing the contract. In case BHEL is forced to pay any of such taxes, BHEL shall have the right to recover the same from his bills or otherwise as deemed fit.

However, provisions regarding Service Tax and Value Added Tax (VAT) on output services and goods shall be as per following clauses.

8.1.2 Service Tax & Cess on Service Tax

Contractor's price/rates shall be exclusive of Service Tax and Cess on Services. In case, it becomes mandatory for the contractor under provisions of relevant act/law to collect the Service Tax & Cess from BHEL and pay the same to the concerned tax authorities, such applicable amount will be paid by BHEL at the prevailing Service Tax Rate (presently 12.36 %) on the admitted bill value.

Contractor shall submit to BHEL documentary evidence of Service Tax registration certificate specifying name of services covered under this contract. Contractor shall submit serially numbered Service Tax and Cess Invoice, signed by him or a person authorized by him in respect of taxable service provided, and shall contain the following, namely,

1. The name, address and the registration number of the contractor,
2. The name and address of the party receiving taxable service,
3. Description, classification and value of taxable service provided and,
4. The service tax payable thereon.

All the Four conditions shall be fulfilled in the invoice before release of service tax payment.

Wherever, more than one route/option are available for discharge of service tax liability under a particular service, (e.g. "works contract Service"), contractor shall obtain prior written consent from BHEL site before billing the amount towards Service Tax.

8.1.3 VAT (Sales Tax /WCT)

As regards Value Added Tax (VAT)/CST on transfer of property in goods involved in Works Contract (previously known as Works Contract Tax) applicable as per local laws, the price quoted by the contractor shall be inclusive of the same and in no case input or output VAT/CST will be reimbursed extra.

In any case the Contractor shall register himself with the respective Sales Tax authorities of the state and submit proof of such registration to BHEL along with the first RA bill. Contractor will submit all the details of VAT/CST paid for the contract in the prescribed format of the respective state VAT laws. Also, the

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-VIII: Taxes and Other Duties

contractor will issue the tax Invoices to BHEL as per the Tax laws of respective state on monthly basis. Contractor shall also be required to furnish to BHEL necessary proof of VAT remittance on monthly basis.

Deduction of tax at source shall be made as per the provisions of law and is to be construed as an advance tax paid by the contractor and no reimbursement thereof will be made.

Further, if BHEL, at the instance of customer or otherwise adopts the specific route for discharging output VAT liability itself, benefit of the reduction in liability of the contractor will be passed on to BHEL.

In case, BHEL is forced to pay any VAT liability on behalf of contractor, the same will be recovered from contractor's bill or otherwise as deemed fit

8.2 'Enabling Works'

~~The contractor shall pay all (save the specific exclusions as enumerated in this contract) taxes, fees, license charges, deposits, duties, tools, royalty, commissions or other charges which may be levied on the input goods & services consumed and output goods & services delivered in course of his operations in executing the contract. In case BHEL is forced to pay any of such taxes, BHEL shall have the right to recover the same from his bills or otherwise as deemed fit. (i.e. rates quoted by bidder shall be inclusive of Service Tax, VAT/WCT and all other taxes and duties)~~

~~However, Since the proposed work is in the nature of 'Works Contract service' as per Service tax law, Hence, For non-corporate contractors being Individual, HUF, Proprietary Firm, Partnership Firm or Association of Persons (AOP), BHEL shall recover the applicable Service Tax under reverse charge mechanism from the contractor and remit the same with the Government as per the provisions of Law. Necessary advice/confirmation of remittance shall be issued to the contractor. The contractor shall not be eligible for any refund/reimbursement of such service tax from BHEL. It shall be the responsibility of the contractor to submit proper invoice giving all the requisite details as per Service Tax Law for the determination of the service tax liability of BHEL under reverse charge mechanism. BHEL reserves the right to determine such liability based on the invoice submitted by the contractor or otherwise independently and remittance of the same with the Government.~~

8.3 New Taxes/Levies

In case the Government imposes any new levy/tax on the output service/ goods/work after award of the contract, the same shall be reimbursed by BHEL at actual.

In case any new tax/levy/duty etc. becomes applicable after the date of Bidder's offer, the Bidder/Contractor must convey its impact on his price duly substantiated by documentary evidence in support of the same **before opening of Price Bid**. Claim for any such impact after opening the Price Bid will not be considered by BHEL for reimbursement of tax or reassessment of offer.

No reimbursement/recovery on account of increase/reduction in the rate of taxes, levies, duties etc. on input goods/services/work shall be made. Such impact shall be taken care of by the Price Variation/Adjustment Clause (PVC) if any. In case PVC is not applicable for the contract, Bidder has to make his own assessment of the impact of future variation if any, in rates of taxes/duties/ levies etc. in his price bid.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-IX : SPECIFIC INCLUSIONS

INTENT OF THIS SPECIFICATION:

The work to be carried out under the scope of this specification is as detailed out under the scope of work in technical. Even though the work shall be carried out under the supervision of BHEL personnel, the sub-contractor shall have to undertake the total responsibility for seal welding of condenser tubes with condenser tube plate of both the units including rectification if any as required after water Fill Test of the respective condenser (water fill test is excluded from the scope and will be performed by TG erection vendor). It is not the intent to specify all and every scope of work in this specification, the contractor has to be well experienced in tackling any situation that may arise during the period of this contract.

9.1

It may be specifically noted that it should not be construed or claimed by the contractor that with the technical specification and "exclusions and/or inclusions" detailed in this tender specification, BHEL has covered the entire scope of work and/or the details thereof to be executed by the contractor.

9.2

MANPOWER:

- i) For carrying out the job, the contractor has to deploy adequate no. of expert/skilled/semiskilled/unskilled manpower as per requirement of site.
- ii) The contractor shall engage proper skilled / qualified / obligate personnel and ensure the expected quality of work. If any of their personnel is found to be unsuitable, by BHEL / or their client, the contractor shall withdraw them and provide suitable replacement immediately, failing which BHEL reserves full rights to get the job done by alternate suitable persons at risk and cost of the contractor. The delay on this account is attributable to the contractor.
- iii) The contractor has to tackle all labour related issues and maintain smooth IR relation at site so that the job can progress uninterruptedly.
- iv) The sub-contractor shall always engage adequate Engineer/ Supervisor/ Operators / workmen and having experiences in similar type of work.

9.3

CONSUMABLES

The contractor shall provide all consumables required eg welding electrodes, cleaning agents (like acetone DPT cleaner etc), diesel oil, etc., argon gas, Nitrogen gas etc. for carrying out the work covered under these specifications excepting those which are specifically indicated as BHEL scope.

Filler wires, if required for tig welding shall be arranged by the Contractor at his cost.

All the T&Ps, consumables etc. must be mobilized at site at least three days prior to actual start of the job.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-IX : SPECIFIC INCLUSIONS

All consumables to be used for the work shall have prior approval of BHEL engineer with regard to brand and quality specifications. Test reports / certificates in respect of these consumables, wherever applicable, shall be submitted to BHEL engineer.

9.4

WELDING ELECTRODES, FILLER WIRES FOR TIG WELDING AND GASES

All welding consumables including filler wires are in the contractor's scope.

9.5

All the required welding electrodes as approved by BHEL shall be arranged by contractor at his cost. It shall be the responsibility of the contractor to obtain prior approval of BHEL, before procurement, regarding manufacturer, type of electrodes etc. on receipt of the electrodes at site, it shall be subject to inspection and approval by BHEL regarding type of electrodes, batch number, date of expiry etc. Batch test certificates shall be made available for verification & record before the actual use of the welding consumables.

BHEL reserves the right to reject the use of any electrodes, if found non-acceptable because of bad quality, deterioration in quality due to improper storage, shelf life expiry, unapproved type / brand etc.

The contractor shall provide all consumables required for carrying out the work covered under this scope of work including TIG wires.

All the required gases like argon, oxygen, and acetylene etc shall be arranged by the contractor at his cost.

9.6

WELDING

All welders/operators shall be tested and approved by BHEL engineer/Customer before they are actually engaged on work though they may possess the requisite experience certificate. BHEL reserves the right to reject any welder without assigning any reasons.

All expenses for welders qualification testing of contractor's welders including destructive and non-destructive tests conducted by BHEL at site shall have to be borne by the contractor. BHEL will provide the mock up plates and condenser tube for the test free of charges.

BHEL Engineer is entitled to stop any welder from his work if his work is unsatisfactory for any technical reason or if there is a high percentage of rejection of joints welded by him, which in the opinion of BHEL Engineers, will adversely affect the quality of welding though the welder has earlier passed the tests prescribed. The facts that the welders have passed the test, does not relieve the contractor from his contractual obligations to check the performance of the welders. Contractor shall submit a monthly performance record of all welders.

All welded joints shall be subject to acceptance by BHEL Engineer whose decision will be final and binding.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-IX : SPECIFIC INCLUSIONS

Dye penetrant check shall be carried out on 100% welded joints.

Welding electrodes have to be stored in enclosures having temperature and humidity control arrangement. This enclosure to be provided by the vendor shall meet BHEL specifications.

9.7 DOCUMENTATION

All the checks are to be carried out as per BHEL Quality plan and results to be recorded in the prescribed log sheets.

It is the responsibility of the contractor to maintain all proper documentation of activities / records on day-to-day basis as per the proforma mutually agreed with BHEL. Submitting daily/weekly progress reports as well as any such document as and when desired by BHEL/BECL. The report shall be submitted in clear legible form through computer. Based on such documents, regular review meeting with BHEL / BECL shall be held.

9.8 STORAGE, SPACE / ACCOMMODATION:

Any loss or damage of the components caused due to the lapses attributable to the contractor or his personnel shall be chargeable to the contractor.

The contractor executing the work shall effectually protect the works from injury or defacement and shall cover components / parts wherever required for their thorough protection.

The contractor will be allowed to have his site office, stores etc. by erecting temporary partitions / chambers / sheds etc. near to the work spot according to the availability of space, which will have to be vacated and dismantled at the end of the jobs to restore the space to the client. The contractor should make his own arrangements for the security / watch and ward. Residential accommodation for contractor's staff / workmen will not be provided by BHEL.

9.9 HOUSEKEEPING

Any debris, rubbish at the work spot must be cleared every day by the contractor using his own resources and cost, and disposed off at a place, as indicated by BHEL site-in-charge Contractor has to maintain day to day housekeeping of work area / equipment.

9.10 GENERAL:

The contractor shall follow BHEL FQA checklist / Quality Plan / Other documents pertaining to work, as per instruction of engineer.

No claim shall be entertained for idle labour due to strike, lock-out, legal proceedings etc.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-IX : SPECIFIC INCLUSIONS

Any other requirement or activity not envisaged / covered in the specification but essentially required for completeness of successful execution of the contract shall be done by contractor without any extra cost to BHEL.

The contractor shall have to arrange local transportation for his staff and labours, deployed for the tendered scope of work without any additional cost to BHEL.

TECHNICAL CONDITIONS OF CONTRACT (TCC)
Chapter-X : SPECIFIC EXCLUSIONS

10.0 EXCLUSIONS

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-XI General

11 GENERAL

11.0.1

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

11.0.2

The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The Bidder and his personnel shall co-operate with the personnel of other agencies, co-ordinate his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.

11.0.3

All the work shall be carried out as per the instructions of BHEL engineer. BHEL engineer's decision regarding the correctness of the work and method of working shall be final and binding on the Bidder.

11.0.4

The Bidder shall at his cost perform any services, tests etc, although not specified but nevertheless required for the completion of work.

11.0.5

Contractor shall weld all the joints as per sequence prescribed by BHEL at site. The sequence of welding, methodology will be decided by the BHEL engineers depending upon the availability of material, work fronts etc. No claims for extra payment from the Contractor will be entertained on the grounds of deviation from the methods and sequence of erection adopted in erection of similar TG sets or for any reasons whatsoever.

11.0.6

All the necessary certificates and licenses required to carry out this work are to be arranged by the Contractor expeditiously at his cost.

11.0.7

The work to be carried out under the scope of these specifications covers the complete work of collection from ~~stores/storage yard, handling, transporting, unloading at erection site, pre-assembly, erection, alignment, hot alignment, bolting, fastening, welding, radiography, leveling, cold pulling, adjusting, Non-destructive testing, Post weld heat treatment, hydraulic test, chemical cleaning, passivation, steam blowing, oil flushing, water flushing, air flushing, pre-commissioning tests, trial running of auxiliaries~~ covered under these specifications, ~~commissioning and all other activities till handing over of the unit.~~ The work shall conform to dimensions and tolerances specified in the various drawings, documents etc. That will be provided during the course of installation. If any portion of the work is found to be defective in workmanship or not conforming to drawings or other specifications, the Contractor shall dismantle and re-do the work duly replacing the defective materials at his cost failing which the

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-XI General

work will be got done by BHEL at the cost and risk of the contractor. ~~Contractor may please note that the loading of materials at storage yard/Stores in contractor's Trailer / Carriers while collecting materials will be done by material handling agency deployed by BHEL.~~

11.0.8

The terminal points as decided by BHEL shall be final and binding on the Contractor.

11.0.9

~~The indicative schedule of weight of major equipments given in relevant appendices is meant for providing a general idea to the Contractor about the magnitude of the work involved.~~

11.0.10

During the course of execution of this work, certain rework/ modification/ rectification/ repairs/ fabrication etc will be necessary on account of feedback from various thermal power stations on units already commissioned and/or units under erection and commissioning and also on account of design discrepancies and manufacturing defects and site operation/maintenance requirements. Contractor shall carryout such rework/ modification/ rectification/ fabrication/ repairs etc promptly and expeditiously. Daily log sheets indicating the details of work carried out, man hours; consumables used etc, shall be maintained by the Contractor and got signed by BHEL engineer every day. Claims of contractor, if any, for such works will be dealt as per relevant clauses of General Conditions of Contract.

11.0.11

All tools and tackles, fixtures, equipment, materials, manpower, supervisors/ engineers, consumables etc required for this scope of work shall be provided by the Contractor. All expenditure including taxes and incidentals in this connection will have to be borne by him unless otherwise specified in the relevant clause.

11.0.12

The contractor shall make adequate security arrangements including employment of security personnel and ensure protection from theft, fire, pilferage, damage and loss of materials/equipment issued to him for the work. Special care will have to be taken to guard against pilferage / theft of copper tubing, brass fittings, brass valves and other costly materials.

11.0.13

All equipment shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings etc, shall be used for handling of the equipment without the specific permission of the engineer.

11.0.14

Contractor shall ensure proper housekeeping and remove all scrap materials periodically from various work area covered in the scope and deposit the same at the place earmarked for this purpose. In case of contractor's failure to do the same, BHEL reserves the right to remove scrap at contractor's cost and risk.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-XI General

11.0.15

Access to site for inspection by BHEL and customer engineers shall be made available by the contractor at all times.

11.0.16

~~Contractor shall mobilize sufficient quantity of sleepers for stacking of materials in his custody.~~

11.0.17

No temporary supports should be welded on to the piping.

11.0.18

The Contractor's scope of work is further described in the following clauses:

11.2 TEST TAPPING POINTS

11.2.1

All Measuring and Monitoring Devices (MMD) used for the work in scope of these tender specifications shall be calibrated by the accredited agencies that are approved by BHEL or calibration tractability is established upto National Physical Laboratory.

11.2.2

Contractor shall furnish the consumption details of chemicals, lubricants, TIG welding filler wire, welding electrodes and other consumables on monthly basis.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-XII WELDING, HEAT TREATMENT, RADIOGRAPHY

19.1 WELDING AND HEAT TREATMENT

19.1.1

Removal of welding slag and burrs by hand files, with brushes and/or flexible grinders will be carried out simultaneously.

19.1.2

~~On all steam, oil, instrument, gas, air (Instrument air/services air) piping, Cooling water Piping, DM water piping etc. both TIG welding and subsequent arc welding or total TIG welding process is to be adopted as instructed by BHEL engineer.~~

19.1.3

All weld joints on piping shall be ground / filed / dressed on completion of welding and before NDE as per instructions BHEL engineer.

19.1.4

The Contractor shall procure all electrodes and filler wires of approved quality / brand as per the standards and specifications of BHEL and instruction of BHEL Engineer.

19.1.5

Contractor should purchase the electrodes as per the recommendations of BHEL engineer, welding manual, welding schedule and other relevant documents. The electrodes shall be purchased only from BHEL approved manufacturers.

19.1.6

The purchase of electrodes shall be accompanied by proper test certificate and these certificates should be submitted regularly for the scrutiny of BHEL engineer.

19.1.7

All electrodes shall be stored in a clean dry area. The storage room shall be of permanent nature and damp proof, and the room shall be exclusively meant for storage of welding electrodes and filler wires. Excepting for a vent in the top, it is not preferred to have any other opening like windows or ventilators. The temperature inside the room has to be kept in the range of 8-10⁰ c above atmospheric temperature and humidity should be less than 50%. This is to be accomplished by using electric heaters or infrared lamps. The storage room must be provided with hygrometer and thermometer. Temperature and humidity are to be monitored regularly. 15-20 holders, welding cables, connecting cables to equipments and other welding accessories including temporary electrical connection from construction power point to individual equipment like winches, hoisting equipment, welding generators, transformers, heat treatment equipment and other construction equipment shall be arranged by contractor.

19.1.8

All racks and other items used for storage of electrodes shall be of steel and not of wood.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-XII WELDING, HEAT TREATMENT, RADIOGRAPHY

12.1.9

All electrodes soon after purchase shall be offered for inspection to the BHEL engineer. Contractor shall be strictly prohibited from using electrodes not inspected/approved by BHEL engineer.

12.1.10

All welding consumables shall be issued to the welders only by authorized person who is controlled by contractor's welding engineer. The necessary baking requirements are to be ensured by Contractor's welding engineer.

12.1.11

All welders shall be tested and approved by BHEL engineer/customer before they are actually engaged on work though they may possess the requisite certificate. BHEL reserves the right to reject any welder without assigning any reasons. Statutory requirements like IBR approval for welders are to be complied with before starting of the work. If required, the welders may have to undergo Procedure Qualification test also. The decision of BHEL Engineer will be final in this regard.

12.1.12

All charges for testing of contractor's welders including destructive and non-destructive tests conducted by BHEL at site shall have to be borne by the contractor. However for initial testing of welders the test will be provided by BHEL. However, if deployed welders fails in initial testing due to lack of experience OR frequent testing of new welders, due to non-availability/non-deployment of earlier qualified/tested welders, it shall be the responsibility of Contractor to provide necessary test plates at his cost for above testing.

12.1.13

BHEL engineer is entitled to stop any welder from his work if his work is unsatisfactory for any technical reason or if there is a high percentage of rejection of joints welded by him, which, in the opinion of BHEL engineers, will adversely affect the quality of welding though the welder has earlier passed the tests prescribed. The fact that the welders have passed the test does not relieve the contractor from his contractual obligations to check the performance of the welders. Contractor shall submit a monthly performance record of all welders.

12.1.14

All welded joints shall be subject to acceptance by BHEL engineer whose decision will be final and binding.

12.1.15

Pre-heating and stress relieving before and after welding are part of erection work and shall be performed by the contractor in accordance with instructions of BHEL engineer. Contractor has to arrange for the recorders along with accessories and suitable technicians for heat treatment purpose. The temperature recorders and thermocouples shall be duly calibrated. During preheat and stress relieving operations the temperature shall be measured as per the instructions of BHEL engineers by thermocouples and recorded graphs for the heat treatment works carried out shall be the property of BHEL.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-XII WELDING, HEAT TREATMENT, RADIOGRAPHY

12.1.16

For the purpose of stress relieving, thermocouples have to be attached to the weld joint. The number of temperature measuring points and locations are as per the standards of BHEL. Thermocouples have to be attached using battery operated portable thermocouple attachment unit and not by manual arc welding. Contractor shall arrange sufficient number of thermocouple attachment units.

12.1.17

Wherever necessary, contractor should provide temperature indicator/temperature recorder as required by BHEL engineer for measuring preheat temperature for welding or for controlling temperature of metal for hot correction etc. Decision of BHEL engineer on method and of checking preheat temperature or controlling temperature for hot correction and welding shall be final and binding on contractor.

12.1.18

Heat treatment may be required to be carried out at any time (day or night) to ensure the continuity of the process. The contractor shall make all necessary arrangements including labour required for the same as per directions of BHEL.

12.1.19

Heat treatment requirements shall be as per the Welding Schedules of BHEL

12.1.20

For weld joints of heavy structural items like beams, I-sections, if heat treatment is required, the same shall be carried out as part of the work.

12.1.21

Checking effectiveness of stress relieving by hardness tests (either by Poldi Hardness Tester or other approved test methods as per BHEL engineer's instruction) including necessary testing equipments is within the scope of the work/specification.

12.1.22

TIG welding process is to be used for all root pass welds in pipes. Subsequent welding after root pass can be carried out by manual metal arc welding with basic coated electrodes. For the pipe of thickness less than 6mm, the entire welding has to be carried out by TIG welding. However, BHEL site engineer will have the option of changing the method adopted. For manual arc welding shall be done as per weaving technique and the width of weaving shall not exceed 1.5 times of the dia of the electrodes.

12.1.24

Joint fit up will be a stage for inspection.

12.1.25

All joints shall be offered for visual inspection after root run. Subsequent welding should be made only after the approval of root run. NDT activity shall be carried out as per FQP and

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document ref: CDE-13-3326 'Procedure of Titanium Tube Seal Welding' which is part of this specification

TECHNICAL CONDITIONS OF CONTRACT (TCC)
Chapter-XIII TOOLS AND TACKLES, MEASURING AND MONITORING
DEVICES

13 TOOLS AND TACKLES, MEASURING AND MONITORING DEVICES

~~13.1~~

~~The contractor shall provide all (except those indicated in BHEL scope) required tools and plants, monitoring and measuring devices (MMD) and handling & transportation equipments for the scope of work covered under these specifications. Contractor has to provide suitable cranes for material handling at BHEL/client's stores/storage yard. BHEL's crane will not be available for this purpose. Please refer relevant appendix for the list of T&P being provided by BHEL free of charges on sharing basis.~~

13.2

All tools and tackles to be deployed by the contractor for the work shall have the prior approval of BHEL engineer with regard to brand, quality and specification. Indicative list of major T&P to be arranged by contractor has been furnished in relevant appendix. Contractor shall also mobilize all other T&P necessary for timely and satisfactory completion of the work in scope.

~~13.4~~

~~Contractor shall provide all required suitable cranes and trailers for materials handling during collection from BHEL/ client's stores/ storage yard, transportation to site of work and at work site for all equipments and consignments including heavy and voluminous equipments/ components/ consignments like HP turbine module, LP turbine inner outer casing, LP turbine inner casing, LP rotor, generator rotor, brushless exciter, HP heaters, etc. BHEL/customer shall not provide any T&P other than mentioned in relevant appendix for the purpose identified. The contractor shall make suitable arrangements/arrange crane well in advance for lifting and placement to final position of sections at required elevation/ location with utmost care.~~

~~13.5~~

~~Contractor shall provide the complete operating crew like operator, helpers for handling trailing cable for EOT. It may be specifically noted that the EOT crane shall be shared by many other agencies working within the TG hall. The contractor shall have to extend the services of the EOT crane operation to all such other agencies as instructed by BHEL; the operation cost (for crew) will be shared proportionately amongst the beneficiary agencies on mutually agreed terms and rate.~~

13.6

Contractor has to provide spanners of all sizes for carrying out the complete erection / commissioning works. No spanners will be provided by BHEL to the contractor.

13.7

Contractor has to arrange slings of all sizes for completing the works covered under these specifications except the special slings for generator stator lifting/handling, which will be provided by BHEL free of charges on returnable basis.

13.8

All tools and tackles to be deployed by the contractor for the work shall have the prior approval of BHEL engineer with regard to brand, quality and specification.

13.9

TECHNICAL CONDITIONS OF CONTRACT (TCC)

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Timely deployment of adequate quantity of T&P is the responsibility of the contractor. The contractor shall be prepared to augment the T&P at short notice to match the planned program and to achieve the milestones.

13.11

~~Complete set of hydraulic jacks of 50 tonnes and 100 tonnes capacity shall be arranged by the contractor for use during erection and commissioning of turbine. Also, the contractor shall arrange hydraulic jacks of 100 tonnes and 63 tonnes capacity along with long high pressure hoses of suitable length for generator erection and alignment. These jacks shall be of internationally reputed make, highly reliable and maintained in excellent working condition. They shall be tested for safe working before deploying in actual work. These jacks shall not be permitted for use anywhere other than steam turbine/ generator area.~~

13.12

~~All jack bolts that are required during erection for carrying out roll check etc will have to be arranged by the contractor. No jack bolts will be provided by BHEL.~~

13.13

Contractor shall maintain and operate his tools and plants in such a way that major breakdowns are avoided. In the event of major breakdown, contractor shall make alternative arrangements expeditiously so that the progress of work is not hampered.

13.14

In the event of contractor failing to arrange the required tools, plants, machinery, equipment, material or non-availability of the same owing to breakdown, BHEL will make the alternative arrangement at the risk and cost of the contractor.

13.15

The T&P to be arranged by the contractor shall be in proper working condition and their operation shall not lead to unsafe condition. Contractor shall obtain prior approval of BHEL for all the T&P before deploying in actual work. The movement of cranes and other equipment should be such that no damage / breakage occur to foundations, other equipments, material, property and men. All arrangements for the movement of the T&P etc shall be the contractor's responsibility.

13.16

Normally, use of welding generators only is permitted for welding. The use of welding transformers will be subject to prior approval of BHEL.

13.17

The contractor at his cost shall carry out periodical testing of his construction equipments and calibration of measuring & monitoring devices (MMD). Test / calibration certificates shall be furnished to BHEL. MMD shall be calibrated only at accredited laboratory as per the list available with BHEL or any other laboratory approved by BHEL. All calibration shall be traceable to national or international standards.



Condenser & Heat Exchanger Engg. Division

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PROCEDURE

FOR

TITANIUM TUBE SEAL WELDING

SURFACE CONDENSER 2 x 250 MW BHAVNAGAR




BHARAT HEAVY ELECTRICALS LIMITED BHOPAL

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1. INTRODUCTION:

Seal welding of condenser **Titanium Tubes** shall be performed in accordance with this procedure.

2. APPLICABILITY:

The procedure applies to condenser for seal welding of Titanium tubes after tube expansion.

3. PURPOSE:

The purpose of this procedure is to develop a step by step procedure to carry out seal welding of Titanium Tube to tube sheet joints in condenser.

4. SCOPE :




Scope of work includes seal welding of Titanium tubes with Titanium Cladded tube plate of condenser and testing of weld joint.

5. REFERENCE :

- a. Condenser General Assembly Drg. No. 1-16010-40019
- b. Tube Expansion Procedure No. HE 07001.


6. RESPONSIBILITY :

The responsibility of implementation of this procedure lies with BHEL / PSWR Site Incharge – Bhavnagar

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7. PRE- REQUISITE FOR COMMENCING WELDING:




- a. Availability of mock up plate and tubes for conducting mock up for expansion and welding process.
- b. Qualified operators for Tube Expansion.
- c. Availability of 5 roller tube expanding machine.
- d. Availability of Orbital/ manual TIG welding machine (pre tested) - as applicable.
- e. Availability of Tube end trimmer and tube end facer.
- f. Availability of precision calibrated three pin micrometer.
- g. Availability of "Go gauge".
- h. DPT kit for checking the healthiness of tube to tube plate welding.
- i. Check for cleanliness:
The following tests are to be conducted on surface.

i. Visual Examination :

Tube plate faces and tube ends shall undergo visual examination. Foreign matter of whatever nature, burrs etc. shall be removed.


ii. Clean Area :

The area in which welding of tubes to the tube plates is carried out shall be adequately protected from dust and draughts.

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8. WELDING PROCEDURE QUALIFICATION FOR SEAL WELDING OF TUBE WITH TUBE PLATE BY ORBITAL TIG WELDING MACHINE AND WELDER QUALIFICATION FOR MANUAL TIG WELDING (AS APPLICABLE).

8.1 General Data:

Mock up plate : As supplied by BHEL Bhopal
 ASTM A516 Gr70 + ASTM B 265 Gr 1 clad (**34+6mm thick**)




Tube: Titanium tube **ASTM B 338 Gr 2**
 Tube OD **28.575**, Thickness **0.56** mm

Process : GTAW (Automatic, without filler wire)

Machine : Orbital TIG welding Machine (if applicable).


8.2 Mock up plate and machine preparation

1. The mock up plate internal and external surface are cleaned with acetone to remove oil, grease and any foreign matter that would affect welds.
2. The surfaces are also cleaned with SS wire brush.
3. Cleanliness to be checked by visual examination and with white lint free cloth.
4. The area in which welding is to be conducted is adequately protected from dust or any other contamination.
5. The tubes are first fitted up in the holes by expansion.
6. The tubes are to be fitted flush.

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8.3. Acceptance Criteria for mock up tube welding.

8.3.1 Non-destructive examination : Visual 100% & DPT 100%

1. On visual examination, the weld shall show uniform contour without excessive reinforcement, with the bore of the tube free from any spatter or burn through. All types of cracks, surface pores, burn through of tube wall are not accepted.
2. Weld spillage (projection) into the bore shall not exceed **0.6** mm.
3. Undercut greater than **0.1 t** is not acceptable.
4. Indication of any size is not acceptable, on subjecting the joint to Liquid Penetrant Examination.
5. The weld color shall be the acceptable colors as per **Welding color comparison chart**.

8.3.2 Destructive Examination: metallographic examination.

The metallographic examination of the weld connecting tube and tube plate shall be carried out.

8.3.3 Dimensional check.

Plug gauge shall be passed through tubes to assess bore protrusion. If it passes through, then the weld joint is OK.

The following information shall be recorded.

Mock up block No.
Joint no.
Operator no.
Equipment no.
Letter R for repair / Letter A for acceptance
Date

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9. PRODUCTION WELD TEST SAMPLES

1. Production welds shall be started only after getting the acceptance of mock up welds.
2. Mock up test shall be conducted after any repair of machine.

10. PRODUCTION WELDING OF TUBE TO TUBE PLATE

1. Expand tube ends in tube plate holes.
2. Perform facing of tube ends for welding after the completion of initial expansion so as to maintain the tube edge flush with tube sheet.
3. For facing, Electronic controlled end trimmer will be used.
4. After facing, blow compressed air through trimmed tubes.
5. The orbital TIG welding machine is tested separately and qualified for fitness for use. Welder's qualification certificate in case of manual TIG welding.
6. For the welding of the Titanium Tube to Main Tube Plate, the welding process specification is established and qualified beforehand.
7. The WPS parameters are programmed in the machine and trial welding of specimen tubes in mock up plate is carried out. The operator for the process is also qualified before the work is taken up on main tube sheet.
8. Experience of welding tube to tube plate joint at least for one project/not less than 5000 joints.
9. Wipe the tubes to a depth of 100 mm using a lint free cloth moistened with suitable solvent like acetone to clean and degrease the welding area.

11. ACCEPTANCE OF PRODUCTION WELDS

1. Production job shall be subjected to visual inspection. Acceptance criteria shall be as in 8.3.1 The results shall be recorded in weld inspection report for condenser tube test / production welding.
2. Liquid penetrant inspection of production welds shall be done and no indications are permitted.


12. WELDING MACHINE QUALIFICATION

The procedure is same as above for welding procedure qualification and the number of joints to be welded per machine for qualification is 2. If there is

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change in the make of machine or the discontinuity of welding > 6 months the machine has to be qualified again. The acceptance of joint is as per the detail described for welding procedure qualification. For manual welding, 2 holes joints on mock-up plate to be done by welder.




13. CHECK LIST FOR ORBITAL/ MANUAL TIG WELDING MACHINE OPERATOR/ WELDER.

Ensure that

1. The mock up plate's internal and external surface are cleaned with acetone to remove oil, grease and any foreign matter that would affect welds.
2. The surfaces are also cleaned with SS wire brush.
3. Cleanliness is checked by visual examination and with lint free cloth.
4. The area in which welding is to be conducted is adequately protected from dust or any other contamination.
5. The tube ends are expanded in the tube plate holes.
6. The tube ends are flushed.
7. The tungsten electrode tip performance shall be observed during welding. The inspection shall be carried out after completion of every 15 welds and changed after every 30 welds.
8. The concentric movement of the electrode, electrode position and the distance between the tungsten tip and the tube plate are checked.


14. REPAIR OF DEFECTIVE WELD JOINT

1. The defects like surface pores shall be removed. One layer of welding shall be carried out. If any other type defects are observed during the course of welding, separate repair procedure shall be established by welder/ operator. The repaired weld shall be subjected to NDT similar to original weld as specified in "Acceptance of production welds" Sl. No. 11.
2. The repair process shall be qualified in mock up piece before carrying out in production welds .

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CONDENSER TUBE TO TUBE SHEET WELDING REPAIR PROCEDURE

The following types of defects are arising during condenser tube to tube sheet welding.

- 1) Surface pores / Porosity /Pinholes
- 2) Weld ruptures
- 3) Color change
- 1) **Repair weld qualification**

The repair weld qualification shall be demonstrated by introducing the weld defects as stated above in the mock up Titanium tube to tube sheet block and repair shall be carried out as given below. After repair, the weld shall be subjected to LPE and metallographic examination.

- 2) **Surface pores / Porosity /Pinholes**




By introducing localized area fusion it can be rectified. If the defect is not removed after first welding cycle, the defective portion will be removed by filling/ grinding to required depth and then re-welding by Automatic TIG welding cycle.

- 3) **Weld Ruptures**

The ruptured and the protruded portions of the weld shall be removed by filling or facing or by any other suitable operation, and then welded the local area by orbital welding machine (Automatic Welding)


- 4) **Color change**

The weld color shall be acceptable color as per approved color comparison chart. The unacceptable weld color of weld area shall be removed up to the fusion depth by suitable operations, taking care that Titanium cladding should not get damaged. Subsequently welding shall be performed by automatic orbital welding.

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Acceptable criteria

After repairing the weld, no indication is acceptable on subjecting the joint to visual examination and Liquid penetration inspection.

Documentation

The results of the repair shall be recorded in the weld inspection report.

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