

2 X 660 MW SURATGARH STPP, UNIT 7 & 8

VOLUME –IIB

**TECHNICAL SPECIFICATION
FOR
PLATE HEAT EXCHANGERS**

Specification No. : PE-TS-392-179-N001 (Rev 0)



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA-201301**



TITLE :
TECHNICAL SPECIFICATION FOR
PLATE HEAT EXCHANGERS
PREAMBLE

SPEC. NO.: PE-TS-392-179-N001

VOLUME II B

SECTION

REV. NO. 0

DATE 19.07.2013

The tender document contains three (3) volumes. The bidder shall meet the requirements of all the three volumes.

1.1 Volume -I CONDITIONS OF CONTRACT

This consists of four parts as below:

Volume - I A: This part contains instructions to bidders for making bids to BHEL.

Volume - I B: This part contains general commercial conditions of the tender and includes provision that vendor shall be responsible for the quality of item supplied by their sub-vendors.

Volume - I C: This part contains special conditions of contract.

Volume - I D: This part contains commercial conditions for erection and commissioning site work, as applicable.

1.2 Volume - II TECHNICAL SPECIFICATIONS Technical requirements are stipulated in Volume II which comprises of :

Volume - II A: General Technical Conditions

Volume - II B: Technical specification including drawings, if any.

1.2.1 Volume - II B : This volume is sub-divided into following sections:

Section – A: This section outlines the scope of enquiry.

Section – B: This section provides “Project Information”

Section – C: This section indicates technical requirements specific to the contract, not covered in Section-D.

Section – D: This section comprises of technical specifications of equipments complete with data sheet A, B & C.

Data sheet-A specifies data and other requirements pertaining to the equipment.

Data sheet - B specifies data to be filled by the bidder (Data Sheet B is contained in Volume - III)

Data sheet - C indicates data documents to be furnished after the award of contract as per agreed schedule by the vendor (as applicable).

1.2.2 Volume - III: TECHNICAL SCHEDULES - This volume contains technical schedules and Data Sheets - B, which are to be duly filled by the bidder and the same shall be furnished with the technical bid as per instructions given in Volume-III.

2.0 The requirements mentioned in Section C/Data Sheets-A of Section-D shall prevail and govern in case of conflict between the same and the corresponding requirements mentioned in the descriptive portion in Section -D



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1.00.00 SCOPE

This enquiry covers the design, manufacture, assembly, inspection and testing at manufacturer's and/ or his sub-contractors works, painting, proper packing & delivery of the item namely **PLATE HEAT EXCHANGERS** complete with all accessories, commissioning spares (if any), counter flanges with nuts, bolts, gaskets and coatings (wherever necessary), including special tools & tackles (if any) as mentioned in this specification for the 2X660 MW Suratgarh STPP.

2.00.00 GENERAL TECHNICAL INSTRUCTIONS

- 2.01.00 It is not the intent to specify herein all the details of design and manufacture. However the equipment shall conform in all respects to high standards of design, engineering and workmanship, and shall be capable of performing the required duties in a manner acceptable to Engineer/ Owner, who will interpret the meaning of drawing and specifications, and shall be entitled to reject any component or material, which in his judgement is not in full accordance herewith.
- 2.02.00 The omission of specific reference to any component/ accessories necessary for the proper performance of Plate Heat Exchangers shall not relieve the bidder of the responsibility of providing such facilities to complete the supply of heat exchangers at quoted prices.
- 2.03.00 Design/ drawings/ data sheets etc. shall be subject to approval of BHEL as per specification, in the event of order.
- 2.04.00 BHEL's / customer's representative shall be given access to the shop in which the equipment are being manufactured or tested and all test records shall be made available to him.
- 2.05.00 The equipment covered under this specification shall not be despatched unless the same have been finally inspected, accepted and shipping release issued by BHEL.



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SECTION B
PROJECT INFORMATION

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED		VOLUME II SECTION – B
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan GENERAL PROJECT INFORMATION		SHEET 1 OF 3

1.0	Owner	Rajasthan Rajya Vidyut Utpadan Nigam Ltd., Jaipur
2.0	Consulting Engineer	TATA Consulting Engineers Ltd. 73/1, St. Marks Road, Bangalore – 560 001 Tel : 080 – 6622 6000 Fax : 080 – 22274874
3.0	Location of the plant	Prabat Nagar, Suratgarh Sriganganagar district, Rajasthan.
4.0	Latitude and longitude	Latitude : 29 deg. 10 min. N Longitude : 74 deg.01 min. E
5.0	Elevation above mean sea level	186 m (approximate)
6.0	Climatic conditions	
6.1	Temperatures : Monthly basis	
	Mean of daily max.	32.8 deg.C (in the month of May)
	Mean of daily min.	17.6 deg.C (in the month of Jan)
6.2	Temperatures : Annual basis	
	Mean of daily max.	32.3 deg.C
	Mean of daily min.	19.6 deg.C
	Highest temperature recorded	50 deg.C
	Lowest temperature recorded	(-) 2.8 deg.C
	Design Ambient Temperature for Electrical Equipment design	50 deg C
6.3	Relative humidity	Varies between 21% and 81%
6.4	Annual average rain fall	312 mm
6.5	Annual mean wind speed :	4 km / hr.
7.0	Wind load	

ISSUE R1

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED		VOLUME II SECTION – B
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	Calculations for wind effect shall be in accordance with IS:875-1987(Part-3) taking into account the following:	
	a) Basic wind speed = 47 m/sec	
	b) Factor K1 = 1.07	
	c) Category of terrain = Category 2	
	d) K3 – as per IS 875	
8.0	Seismic data (As per IS: 1893 latest issue)	
	a) Zone	Zone II
	Designs & design coefficients shall be based on IS 1893:2002	
	Design condenser cooling water inlet temperature	33 Deg C
9.0	Auxiliary power supply:	
	Auxiliary electrical equipment to be supplied against this specification shall be suitable for operation on the following system:	
	a) For motors rated 160 kW and below.	415V AC, 3-phase, 3-wire effectively earthed.
	b) For motors rated above 160 kW and up to 1500 kW	6600V AC, 3-phase, 3-wire, 50 Hz, non-effectively earthed
	c) For motors rated above 1500kW	11000V AC, 3-phase, 3-wire, 50 Hz, non-effectively earthed
	d) For motor control centres	415V AC, 3-phase, 3/4-wire effectively earthed.
	e) DC motor starters, DC solenoids, DC alarm control and protection	220 V DC, 2-wire unearthed
	f) AC control & protective devices	110 V 1 phase, 50Hz, 2 wire AC supply. The single phase 110V AC supply shall be derived by VENDOR by providing 415V / 110 V Control transformers of adequate rating with MCCB / MCB on both the primary and secondary sides.
	g) Uninterrupted power supply	230 V, 1-phase, 50 Hz, 2-wire, AC

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SECTION C

SPECIFIC TECHNICAL REQUIREMENTS



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1.0 GENERAL :

The Plate heat Exchangers complete with all accessories including special tools and tackles (if any) shall conform to the standard technical specifications and Data Sheet-A of Section-D. In addition, the requirements of this Section C shall also be complied with. However, wherever the details given in Section-D and Data Sheet-A are different, the requirements of Data Sheet - A shall prevail. Similarly in the event of contradictions between Section - C & Section - D/ Data Sheet-A, Section-C shall prevail.

Number of Plate Heat Exchangers for 2 X 660 MW SURATGARH STPP to be supplied shall be as under:

- Total Six (6) nos. PHE for TG Aux Viz. 3 nos [2W + 1S] per Unit
- Total Four (4) nos. PHE for SG Aux viz. 2 nos [1W + 1S] per Unit

2.0 SYSTEM DESCRIPTION :

- 2.1 The Plate Heat Exchanger are intended to be used in closed circuit DM cooling water circuit for Cooling Hot passivated DM Water by Auxiliary Cooling Water (Clarified Water).
- 2.2 Passivated DM Water is circulated through various auxiliary coolers of TG & Boiler, in closed loop by means of pumps. This DM water picks up heat from different cooling equipment's. Heat from DM water is transferred to auxiliary cooling water (Secondary side) thru' the Plate Heat Exchangers covered under this specification.
- 2.3 The analysis of DM Water, Clarified Water (Auxiliary cooling water) to be handled by the Plate Heat Exchangers are given in Data Sheet-A.
- 2.4 A strainer of 2 mm size at ACW inlet lines of PHE is provided and backwashing of PHE's is not envisaged.

3.0 SCOPE OF SUPPLY :

- 3.1 Number of Plate Heat Exchangers to be supplied shall be as under. For design parameters etc. refer Data Sheet-A enclosed herewith.

3.1.1 Total Six (6) nos. PHE for TG Aux Viz. 3 nos [2W + 1S] per Unit

3.1.2 Total Four (4) nos. PHE for SG Aux viz. 2 nos [1W + 1S] per Unit

- 3.1 Each Plate Heat Exchanger (quantity and other details specified in Data Sheet-A) shall be complete with the following accessories and auxiliaries.

- (i) Suitable drain and vent connections for both primary (DMCW) and Secondary Water (Clarified Water) streams complete with isolation valves.
- (ii) Supporting arrangement complete with foundation plate channels, anchor bolts, nuts, sleeves, inserts etc.
- (iii) Lifting arrangement i.e., lifting lugs, eye bolts etc.
- (iv) Matching counter flanges with necessary bolts, nuts, and gaskets for all flanged



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- terminal points, including for DMCW and ACW inlet/outlet nozzles.
- (v) Other accessories as required to make PHE's complete in all respects.
 - (vi) Commissioning spares, if any.
 - (vii) One Ratchet spanner per PHE is included in bidder's scope of supply .
 - (viii) Matching piece (Reducer/Expander), with coatings (as required), to match the PHE nozzle connection with connecting pipe size as indicated in Data Sheet.
 - (ix) Mandatory spares as applicable for each project as per data sheet A.

3.2 Finish paints for touch-up painting of equipment after erection at site in sealed containers.

3.3 Various drawings, datasheets, test reports/ certificates, instruction manuals for erection, operation and maintenance etc., as specified in Data Sheet-A.

3.4 Based on the layout requirement, the nozzle orientation shall be for parallel flow viz. The inlet and outlet of DMCW flow shall be on the same side (vertically). And also the inlet and outlet of ACW flow shall be on same side (vertically).

4 INSPECTION REQUIREMENTS

4.1 Inspection for "pressing of plates to form whole corrugation of the heat transfer plate" shall be from third party like TUV/Lloyd and certificate shall be submitted for review of BHEL.

4.2 10% of Light Box test or equivalent test (Vacuum test / Air Chamber test) shall be witnessed by BHEL/Customer/Third party (TUV/Lloyd or equivalent). However during Contract stage above percentage may vary from 10 to 100 % for BHEL/Customer without any cost implication to BHEL.

4.3 DP Test shall be conducted for 10% of HT plates.

BHEL envisage witness of D.P. Test as follows:

- a. 1% witness by Customer.
- b. 2% witness by BHEL.

However during Contract Stage above percentage may vary from 1% to 10% for Customer & from 2% to 10% for BHEL without any commercial implication. However, in case of defect, entire lot shall be tested & only defect free plates shall be accepted.

4.4 Minimum requirement for quality Plan shall be as per quality plan attached in the Section D of the Vol. IIB. Manufacturing Quality Plan for PHE shall be subject to approval during detail engineering. No price implication shall be admissible to QP approval by BHEL/Customer.

4.5 Hydraulic test for PHE's shall be performed at 1.5 times the design pressure with 30 minutes holding time for each side as per quality plan attached in the Section D of the Vol. IIB.

4.6 100% PMI Inspection for material grade of PHE Heat Transfer plates shall be from third party like TUV/Lloyd & certificate shall be submitted for review of BHEL.

4.7 BHEL reserves the right to conduct random & independent PMI inspection on PHE's Heat Transfer plates to ascertain the plate material.

4.8 Heat transfer area for the PHE as offered by bidder with technical offer shall be measured by White light scanning method during contract stage to ascertain the correctness of heat transfer area as offered by bidder.



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Inspection of plate area measurement for one heat transfer plate per PHE by White Light Scanning shall be from third party like TUV/Lloyd , same shall also be witnessed by BHEL. No type test certificates are acceptable to BHEL for same.

Bidder shall furnish the procedure for White Light Scanning method during detailed engineering viz. after award of contract which shall be subjected to BHEL/Customer approval. The Minimum requirement for White Light Scanning procedure is as per the Annexure-A of the quality plan attached in the Section D of the Vol. IIB.

Bidder to note that Heat Transfer Area measured by White Light Scanning during contract stage should not have negative tolerance more than 3% w.r.t to the heat transfer area indicated by bidder against the offered model of PHE. However in the case of negative tolerance (limited to maximum 3 percent) , bidder has to provide additional plates proportionately, as free issue, assembled into all the applicable PHE's before the Final inspection and "As built Certificate" shall be issued by the bidder accordingly. Bidder to note that negative tolerance beyond three percent shall not be accepted, however no credit shall be given to the bidder for positive tolerance of the plate area measurement.

5 PERFORMANCE GUARANTEE AND TESTING:

- 5.1 The PHE shall be guaranteed to meet the performance requirements specified in Section-D and also for trouble free operation after commissioning. Schedule of performance guarantees (enclosed in Volume-III) duly filled and signed shall be furnished with the bid.
- 5.2 PG Test are not envisaged as routine, however in the event of performance shortfall at site or if insisted by Customer, same will have to be conducted by bidder without any cost implication. Further in case of any deficiency, the vendor shall rectify the same at site with no additional cost to BHEL. All duly calibrated instruments required for PG testing including for flow measurements shall be arranged by the bidder and taken back after the Test. The computation of flow by characteristics curve of Pumps for PG Testing of PHE's shall not be permitted.
- 5.3 It is clarified that pressure gauges and temperature gauges are provided at each PHE inlet / outlet on both primary / secondary sides and bidder can install their calibrated instruments on these locations. It is further clarified that due to layout constraints flow measuring instruments installation on pipe is not feasible. Bidder shall arrange the Ultra-sonic flow meter / similar type of instrument for PG testing.
- 5.4 At the time of performance testing, cleaning of the plates (if required) and instruments like pressure gauges, temp. gauges, flow measuring instruments etc. shall be arranged by the bidder and no instruments shall be provided by BHEL for performance testing.

6 SPARES :

- 6.1 **Mandatory Spares:** NIL



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7 DOCUMENTS TO BE SUBMITTED ALONG WITH OFFER:

No document other than the following is required to be submitted by bidder with the offer unless bidder considers it absolutely necessary.

- a) Compliance certificate as enclosed in Volume III
- b) Schedule of Deviations if any.
- c) Guarantee Schedule.
- d) Schedules of Price & Unit Price for each project.
- e) GA Drg. of PHE indicating all-important details for Layout purpose, withdrawal space required for plates, weight of assembly, nozzle & matching piece details etc.
- f) Confirmation of plate area of the offered model, duly endorsed from the Head of Engg./R&D of Principal supplier of the plate.
- g) Schedule of declaration.

7.1 Other Drawings/ documents as per Data Sheet-C, etc shall be submitted by successful bidder after the award of contract as per the distribution schedule enclosed as annexure 1 for respective projects.

8 EXCLUSIONS :

The following are excluded from the bidder's scope:


- 8.1 Civil foundation works required for installation of the heat exchangers.
- 8.2 Piping, valves etc., on the external circuit of both primary and secondary water streams.
- 8.3 Erection & Commissioning of equipment at site.

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SECTION - D
PLATE HEAT EXCHANGER
STANDARD TECHNICAL SPECIFICATION
DATA SHEET C
STANDARD QUALITY PLAN

DMS (EHE-FEM)
 6169430-21301024

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1.00.01 GENERAL

This specification covers the Design, Performance requirements, Constructional Features, Materials requirements, manufacture, assembly, Inspection and Testing at Manufacturer's and/ or his subcontractor's works and Painting requirements for delivery of Plate Heat Exchanger complete with all accessories as specified herein-after.

2.00.00 CODES AND STANDARDS:

2.01.00 The design, manufacture and testing of the plate heat exchanger complete with all accessories, shall generally conform to the latest editions of the following appropriate standards.

2.01.01 IS/BS/DIN/US Standards regarding pressure vessels, pressure piping, pipes, valves, flanges and other as necessary.

2.01.02 IS/ BS/ DIN/ ASTM for material specification and testing procedures.


2.02.00 In case of any conflict between the above codes/ standards and this specification, the latter shall prevail and in case of any further conflict in the matter, the interpretation of the specification by the Engineer shall be final and binding

3.00.00 DESIGN AND CONSTRUCTION:

3.01.00 General Requirements:

3.01.01 Unless otherwise necessary, manufacture's standard and proven models of the plate heat exchanger shall be supplied.

3.01.02 The equipment shall be capable of safe, proper and continuous operation at all heat loads and water from up to those corresponding to the operating conditions mentioned in Data Sheet – A furnished a/w project enquiry. Vibration, noise, mechanical and thermal stresses shall be kept

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within allowable units specified by relevant codes/ standards in design. Due attention shall be given to *case of maintenance, repair and cleaning*.

3.01.03 Suitable corrosion allowance shall be provided wherever necessary. The corrosion allowance for the heat exchanger parts such as pressure plates (support plates), nozzles, sliding channels and frame shall be 1.6 mm (minimum).

3.01.04 Each heat exchanger shall be capable of passing a flow of at least 1.1 times the design flow rate on both primary and secondary water sides. Bidder shall indicate maximum pressure drop through the heat exchanger under this condition.

3.01.05 For the purpose of calculating dirty overall heat transfer coefficient, a total fouling factor as given in Data Sheet-A furnished a/w project enquiry shall be assumed. It is expected that the cleaning frequency shall be once in a year with the above fouling factor.

3.01.06 No back wash for the heat exchangers is envisaged.

3.02.00 Performance Requirements:


3.02.01 The pressure drop across plate heat exchanger from inlet to outlet in fouled conditions for primary and secondary sides, shall not be more than those specified in Data Sheet-A furnished a/w project enquiry, for the specified flow rates.

3.02.02 For the specified flow rate and inlet temperature, the primary side (hot fluid) outlet temperature shall not be more than that specified in Data Sheet-A furnished a/w project enquiry.

3.02.03 In the event of failure to meet the above stipulated performance requirements, the equipment will be out rightly rejected.

3.03.00 Construction of Heat Exchanger:

3.03.01 Heat transfer plates shall be packed in a frame consisting of fixed frame plate and movable pressure plate and aligned at top and bottom of carrying bars. Design shall be such that cleaning is possible without dismantling the piping.

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- 3.03.02 Heat transfer plates shall be sealed at their outer edges and around the ports by gaskets in order to prevent leakage and inter-mixing of fluids.

Double sealing arrangement shall be provided at outer edge and around ports. The inter space between the seals shall be vented to atmosphere in order to avoid inter-mixing of liquids in case of gaskets failure.

The gasket arrangement shall be such that it receives continuous support to ensure a long gasket life. The gasket should be able to retain their properties and shape over a life period of 10 years.

- 3.03.03 Heat transfer plates shall be provided with sufficient thickness in order to impart sufficient rigidity to the plates particularly from handling considerations. Plates shall have contact points in order to provide inter-plate supports. The recesses on the plates are suitably strengthened by a reinforcement plate.


Plate thickness shall be adequate to withstand all operating conditions as specified in data sheet A furnished a/w project enquiry.. Flanges shall be as per ANSI 16.5 or equivalent. Thickness of pressure and frame plates shall be as per ASME Sect. VIII div.1.25% extra capacity for additional plates shall be provided in frame.

Each Plate shall be numbered in sequence. The number shall be marked by indelible ink on the plate to permit easy reassembly. The plates shall be pressed from one piece. They shall be pressed in single/ progressive manner.

The corrugation shall be smooth, uniform and identical for every plate. The PHE bottom frame plate and support should have fixing lugs and cleats to keep provision for enabling to fit trough with outlet nozzle fitted underneath to collect and drain out water in the event of leakages.

- 3.03.04 Frame for each heat exchanger shall have extra capacity to accommodate the additional plates, if required in future because of any reason whatsoever. The extra capacity to be provided is indicated in Data Sheet-A furnished a/w project enquiry.

The upper carrying bar and lower guide bar shall be rigid in construction

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without any risk of sagging or buckling, and shall facilitate easy guiding of the plates.

3.03.05 All inlet, outlet and other nozzles shall be flanged type and shall be as specified in Data Sheet-A. Counter flanges complete with gaskets, bolts, nuts and coatings (wherever necessary) shall be supplied for the nozzle connections. The nozzle sizes of primary/ secondary streams of PHE's shall be of adequate size within acceptable range of velocity. The size selection shall be subject to approval in the event of order.

3.03.06 If necessary, relief valves shall be provided on both the streams.

3.04.00 **Materials of construction:**

Material of the heat transfer plates and gaskets shall be consistent with the fluid handled. However, material specification for various parts shall be equal or superior to those specified in Data Sheet - A furnished a/w project enquiry.

4.00.00 **FOUNDATION AND LIFTING ARRANGEMENTS:**

4.01.00 Plate heat exchanger shall be supplied with necessary foundation plates, anchor bolts, sleeves, nuts, inserts etc.


4.02.00 Plate heat exchanger shall be equipped with suitable lifting lugs/ eyebolts to facilitate handling during erection and maintenance.

5.00.00 **PAINTING:**

5.01.00 The surface preparation of all exterior and interior surfaces of plate heat exchanger shall include the following:

- a) Removal of oil, grease, dirt and swarf etc
- b) Removal of rust and scale etc.,
- c) Sand blasting/ shot blasting.

5.02.00 All exterior surfaces of PHE's shall be sand/ shot blasted, painted with

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primer and finish coated with coal tar based epoxy coating of min. 250 microns thickness. Color shade etc. shall be subject to BHEL/ Customer approval.

6.00.00 **SHOP INSPECTION AND TESTS:**

6.01.00 **General:**

6.01.01 Manufacturer shall conduct all tests and stage inspections as per the approved quality plan to ensure that the plate heat exchanger shall conform to the requirements of this specification and of the applicable codes/ standards.

6.01.02 All materials used for manufacture/ fabrication of the plate heat exchanger components shall be of tested quality. Relevant test certificates for chemical analysis, mechanical tests and heat treatment shall be made available before the final shop inspection. In case the relevant test certificates are not available, the manufacturer shall arrange to carry out the necessary tests required as per approved quality plan and applicable codes at his cost, for which samples shall be identified by BHEL's representative.


6.01.03 All shop tests shall be conducted in the presence of BHEL's representative and test certificates for the same shall be furnished to BHEL for approval.

6.01.04 Qualification of welding procedures and welders shall be as per ASME B&PV Code, Section-IX/applicable code.


6.02.00 **Heat Transfer Plates:**

6.02.01 Plate material used for pressing shall be furnished with mill test report showing chemical and physical properties and heat treatment records. Suitable correlating mark shall be available, so that BHEL's inspector can identify the material with test certificates before pressing the plates.

6.02.02 After pressing visual and dimensional checks on the plates shall be made in the presence of BHEL's inspector, on sampling basis.

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- 6.02.03 The heat transfer plates from each lot of the plates shall be tested by liquid/ dye penetrant test in order to check for cracks and other surface defects in presence of BHEL/customer's representative/Third party (Llyods, TUV or equivalent). If any defect is detected in any of these plates, the whole lot shall be tested and plates without defects only shall be accepted. Plate cleaning agent, liquid penetrant and developer shall not contain any halogen .Procedure for light box test and DP test shall be submitted to purchaser's approval. For Quantum of check , Refer Section C.
- 6.02.04 The heat transfer plates shall be tested by light box test in order to check for cracks and other surface defects in presence of BHEL/customer's representative/Third party (Lloyds', TUV or equivalent). The plates without defects only shall be accepted. For Quantum of check , Refer Section C.
- 6.03.00 **Gaskets:**
- 6.03.01 Certificate on Chemical composition of the gasket material shall be furnished to prove the quality. Sample testing in presence of BHEL's inspector shall also be conducted, if desired.
- 6.03.02 Shore hardness test shall be conducted on the gasket and certificate shall be furnished. Sample tests shall also be done in presence of BHEL's inspector.
- 6.03.03 Visual and dimensional check on a sampling basis shall be done. Plates and gaskets assembled together will be inspected for proper assembly.
- 6.04.00 **Frame Assembly:**
- 6.04.01 All materials for various components of frame assembly viz. frame plate, pressure plate, carrying bar, guide bar, tightening/ clamping bolts and nuts etc., shall be of tested quality and test certificates for chemical composition and physical properties shall be furnished.
- 6.04.02 If the thickness of the plates used for frame and pressure plates is 40 mm or more the same shall be checked ultrasonically to demonstrate the absence of lamination and lack of fusion etc.
- 6.05.00 All weld joints used for Fabrication of Heat exchangers shall be subjected to suitable non destructive examination. This shall include 100 % magnetic particle examination or other suitable NDT of all welds.


	TITLE :	SPECIFICATION NO. PE-TS-MOU-179-N001
	TECHNICAL SPECIFICATION	VOLUME : II B
	FOR PLATE HEAT EXCHANGERS	SECTION :
	(FOR MEMORANDUM OF UNDERSTANDING PURPOSE)	REV. NO. 0 DATE : 15.06.12 SHEET Page 8 of 8


7.00.00 **Document submission:**


7.01.00 The tenderer shall submit during contract stage a curve showing expected DM Water (Primary side) temperature at heat exchanger outlet for each one degree centigrade variation in ACW (Secondary side) temperature, all other parameters remaining unchanged. Similar curve for expected DM Water outlet temperature for variation of ACW flow rate with ACW inlet temperature remaining unaltered shall also be furnished. The bidder shall also furnish various curves to enable, apply corrections during site PG testing in the event of any data variation from the stipulated design parameters.


7.02.00 Bidder shall also furnish thermal design calculations at contract stage to justify the no. of plates offered.

DMS (BHEL-PEM)
6169430-2013/07/04

	TECHNICAL SPECIFICATION FOR			Technical specification no	PE-TS-392-179-N001 (Rev 0)
	PLATE HEAT EXCHANGER			Vol/Section	IIB/D
	DATASHEET - A			Rev	0
				date	19.07.2013
	PROJECT			2 X 660 MW SURATGARH STPP	
1.0	General			(TG AUX.)	
1.1	Number of Plate Heat Exchanger		Nos	Total Six (6) nos for Station[2W+1S Per Unit]	
1.2	Arrangement			3 x 50% per unit	
1.3	Location			Indoor	
1.4	Primary side (Hot) Fluid			Passivated DM water (Refer enclosed water analysis)	
1.5	Secondary side (Cold) fluid			Clarified Water (Refer enclosed water analysis)	
1.6	Connecting Pipe size	(Primary Side)	NB	400	
		(Secondary Side)	NB	400	
2.0	Design				
2.1	Design Pressure		Kg/cm ² (g)	10	
2.2	Operating Pressure	(Primary Side)	Kg/cm ² (g)	About 6 Kg/sq. cm	
		(Secondary Side)	Kg/cm ² (g)	About 3.2 Kg/sq. cm	
2.3	Mechanical Design Temp.		°C	60	
2.3	Heat Transfer per Sq.Mtr. Of Heat Transfer Plate		Kcal/Hr./m ²	8500 (Max.)	
2.4	Minimum Heat Transfer Area		Sq. M.	-	
2.5	Specific Heat of Fluid	(Primary Side)	Cal/gmDeg.C	1.0	
		(Secondary Side)	Cal/gmDeg.C	1.0	
2.6	Density of Fluid	(Primary Side)	gm/cc	1.0	
		(Secondary Side)	gm/cc	1.0	
3.0	Guaranteed Performance Requirements for each Heat Exchangers in fouled condition:				
3.1	Flow rate	(DMCW Side)	M ³ /hr	940	
		(ACW Side)	M ³ /hr	940	
3.2	Inlet temperature	(DMCW Side)	°C	45.9	
		(ACW Side)	°C	36	
3.3	Outlet temp	(DMCW Side)	°C	38	
		(ACW Side)	°C	43.9	
3.4	* Allowable pressure drop across heat exchanger from inlet to outlet in fouled conditions at design flow	(DMCW Side)	MWC	7	
		(ACW Side)	MWC	7	
	* High pressure drop than the specified figure will not be accepted, no credit shall be, however, given for lower pressure drop in bid evaluation. Pressure drop mentioned shall be calculated against flow mentioned at S. No 3.1				
4.0	Additional HT plates on Design Plates		%	NIL	
5.0	Heat Transfer Coefficient/Margin				
5.1	Overall fouling resistance	Hr m ² deg C/Kcal		0.00008	
5.2	Minimum corrosion allowance (refer note 1)		mm	1.6	
6.0	Material of Construction :				
6.1	Heat Transfer Plates (Minimum acceptable plate thickness 0.6 mm). Refer Note no. 3			SS-AISI-316	
6.2	Plate Gasket			Nitrile Rubber	

	TECHNICAL SPECIFICATION FOR		Technical specification no	PE-TS-392-179-N001 (Rev 0)
	PLATE HEAT EXCHANGER		Vol/Section	IIB/D
	DATASHEET - A		Rev	0
			date	19.07.2013
	PROJECT		2 X 660 MW SURATGARH STPP	
6.3	Compression/ Pressure plates		Carbon steel to IS-2062 Gr. B, Epoxy painted	
6.4	Guide Rails/ bar		Carbon steel to IS-2062 Gr. B, Epoxy painted	
6.5	Support Beam/ column		Carbon steel to IS-2062 Gr. B, Epoxy painted	
6.6	Nozzle		Carbon steel to IS-2062 Gr. B	
6.7	Nozzle flanges		Carbon steel to IS-2062 Gr. B, ANSI B16.5	
6.8	Flange/ Counter flanges		Carbon Steel as per IS 2062 Gr. B (Confirming to ANSI B 16.5 class, Min.-150 lb	
6.9	Tie Bolts & Nuts		SA 193 B7/ SA 194 2 H	
6.10	Nozzle flange bolt and nut		SA 193 B7/ SA 194 2H	
6.11	Nozzle flange gasket		3mm wire inserted Red Rubber	
6.12	Name Plate		18-8 SS (3 mm thick)	
6.13	Painting		All surface other than stainless steels shall be epoxy painted (Total DFT = min. 200 µm)	
7.0	Extra Carrying capacity to be provided on frame assembly.	%	15	
8.0	Mandatory Spares		NIL	
9.0	Available space (L x W x H)	mm	----- Bidder to indicate -----	
10.0	Weight of Assembly	Kg	----- Bidder to indicate -----	
11.0	Performance Testing		PG Test are not envisaged as routine, however in the event of performance shortfall at site or if insisted by Customer, same will have to be conducted by bidder without any cost implication.	
12.0	Performance curves and figures to be furnished during contact stage			
12.1	Primary side water outlet temperature vs. Secondary side water inlet temperature.			
12.2	Primary side water flow (80% to 115%) vs. Pressure drop and outlet temperature (Secondary side flow – 100%)			
12.3	Secondary side water flow (80% to 115%) vs. Secondary side pressure drop and primary side outlet temp (Primary side flow – 100%)			
12.4	Primary side water outlet temperature vs. Primary side inlet temp.			
12.5	Film heat transfer coefficient curve			
12.6	Correction Curves.			
Note:	1	Minimum Corrosion allowance on thickness (as per ASME Sec. VIII Div. I)		
	2	Metallurgy shall be suitable for type of water handled for various plates.		
	3	Minimum plate thickness of 0.6 mm is without any negative tolerance.		

	TECHNICAL SPECIFICATION FOR		Technical specification No.	PE-TS-392-179-N001 (Rev 0)
	PLATE HEAT EXCHANGER		Vol/Section	IIB/D
	DATASHEET - A		Rev	0
			date	19.07.2013
SL. NO.	DESCRIPTION		UNIT	
	PROJECT			2 X 660 MW SURATGARH STPP
1.0	General			(SG AUX.)
1.1	Number of Plate Heat Exchanger		Nos	Total Four (4) nos for Station [1W+1S Per Unit]
1.2	Arrangement			2X100% per unit
1.3	Location			Indoor
1.4	Primary side (Hot) Fluid			Passivated DM water (Refer enclosed water analysis)
1.5	Secondary side (Cold) fluid			Clarified Water (Refer enclosed water analysis)
1.6	Connecting Pipe size	(Primary Side)	NB	350
		(Secondary Side)	NB	350
2.0	Design			
2.1	Design Pressure		Kg/cm ² (g)	12
2.2	Operating Pressure	(Primary Side)	Kg/cm ² (g)	About 8 Kg/sq. cm
		(Secondary Side)	Kg/cm ² (g)	About 3.2 Kg/sq cm
2.3	Mechanical Design Temp.		°C	60
2.3	Heat Transfer per Sq.Mtr. Of Heat Transfer Plate		Kcal/Hr./m ²	8500 (Max.)
2.4	Minimum Heat Transfer Area		Sq. M.	-
2.5	Specific Heat of Fluid	(Primary Side)	Cal/gmDeg.C	1.0
		(Secondary Side)	Cal/gmDeg.C	1.0
2.6	Density of Fluid	(Primary Side)	gm/cc	1.0
		(Secondary Side)	gm/cc	1.0
3.0	Guaranteed Performance Requirements for each Heat Exchangers in fouled condition:			
3.1	Flow rate	(DMCW Side)	M ³ /hr	700
		(ACW Side)	M ³ /hr	700
3.2	Inlet temperature	(DMCW Side)	°C	46.1
		(ACW Side)	°C	36
3.3	Outlet temp	(DMCW Side)	°C	38
		(ACW Side)	°C	44.1
3.4	* Allowable pressure drop across heat exchanger from inlet to outlet in fouled conditions at design flow	(DMCW Side)	MWC	7
		(ACW Side)	MWC	7
* High pressure drop than the specified figure will not be accepted, no credit shall be, however, given for lower pressure drop in bid evaluation. Pressure drop mentioned shall be calculated against flow mentioned at S. No 3.1				
4.0	Additional HT plates on Design Plates		%	NIL
5.0	Heat Transfer Coefficient/Margin			
5.1	Overall fouling resistance	Hr m ² deg C/Kcal		0.00008
5.2	Minimum corrosion allowance (refer note 1)		mm	1.6
6.0	Material of Construction :			
6.1	Heat Transfer Plates (Minimum acceptable plate thickness 0.6 mm). Refer Note no. 3			SS-AISI-316
6.2	Plate Gasket			Nitrile Rubber
6.3	Compression/ Pressure plates			Carbon steel to IS-2062 Gr. B, Epoxy painted
6.4	Guide Rails/ bar			Carbon steel to IS-2062 Gr. B, Epoxy painted
6.5	Support Beam/ column			Carbon steel to IS-2062 Gr. B, Epoxy painted
6.6	Nozzle			Carbon steel to IS-2062 Gr. B
6.7	Nozzle flanges			Carbon steel to IS-2062 Gr. B, ANSI B16.5

	TECHNICAL SPECIFICATION FOR		Technical specification No.	PE-TS-392-179-N001 (Rev 0)
	PLATE HEAT EXCHANGER		Vol/Section	IIB/D
	DATASHEET - A		Rev	0
			date	19.07.2013
SL. NO.	DESCRIPTION	UNIT		
	PROJECT		2 X 660 MW SURATGARH STPP	
6.8	Flange/ Counter flanges		Carbon Steel as per IS 2062 Gr. B (Confirming to ANSI B 16.5 class, Min.-150 lb)	
6.9	Tie Bolts & Nuts		SA 193 B7/ SA 194 2 H	
6.10	Nozzle flange bolt and nut		SA 193 B7/ SA 194 2H	
6.11	Nozzle flange gasket		3mm wire inserted Red Rubber	
6.12	Name Plate		18-8 SS (3 mm thick)	
6.13	Painting		All surface other than stainless steels shall be epoxy painted (Total DFT = min. 200 µm)	
7.0	Extra Carrying capacity to be provided on frame assembly.	%	15	
8.0	Mandatory Spares		NIL	
9.0	Available space (L x W x H)	mm	----- Bidder to indicate -----	
10.0	Weight of Assembly	Kg	----- Bidder to indicate -----	
11.0	Performance Testing		PG Test are not envisaged as routine, however in the event of performance shortfall at site or if insisted by Customer, same will have to be conducted by bidder without any cost implication.	
12.0	Performance curves and figures to be furnished during contact stage			
12.1	Primary side water outlet temperature vs. Secondary side water inlet temperature.			
12.2	Primary side water flow (80% to 115%) vs. Pressure drop and outlet temperature (Secondary side flow – 100%)			
12.3	Secondary side water flow (80% to 115%) vs. Secondary side pressure drop and primary side outlet temp (Primary side flow – 100%)			
12.4	Primary side water outlet temperature vs. Primary side inlet temp.			
12.5	Film heat transfer coefficient curve			
12.6	Correction Curves.			
Note: 1	Minimum Corrosion allowance on thickness (as per ASME Sec. VIII Div. I)			
2	Metallurgy shall be suitable for type of water handled for various plates.			
3	Minimum plate thickness of 0.6 mm is without any negative tolerance.			

CLARIFIED WATER ANALYSIS

SL. NO.	Constituent	Unit	Value
1.	pH	-	8.5
2.	Color and Odor		
3.	Oil and grease	mg/l	ND
4.	BOD		3
5.	COD		20
6.	Suspended solids	mg/l	<15
7.	Turbidity	NTU	<15
8.	Calcium hardness as CaCO ₃	mg/l	74
9.	Magnesium hardness as CaCO ₃	mg/l	52
10.	Sodium as Na	mg/l	61
11.	Potassium	mg/l	-
12.	Chloride as cl	mg/l	39
13.	Sulphate as So ₄	mg/l	48
14.	Sulphide	mg/l	-
15.	M- Alkalinity as CaCO ₃	mg/l	140
16.	P-Alkalinity as CaCO ₃	mg/l	Nil
17.	Nitrates as No ₃	mg/l	17
18.	Nitrite	mg/l	Nil
19.	Silica as SiO ₂ – Dissolved	mg/l	15
20.	Silica as SiO ₂ – Colloidal	mg/l	0.6
21.	Iron as Fe-dissolved	mg/l	0.5
22.	Iron as Fe-suspended	mg/l	0.1
23.	Total dissolved solids	mg/l	393
24.	Conductivity at 250C	-mho/cm	500
25.	Dissolved Oxygen as O ₂	mg/l	5.0
26.	Carbon dioxide free	mg/l	5

CLAUSE NO.	PROJECT SYNOPSIS																			
	<div>DM water Analysis</div>																			
	<table><thead><tr><th>Sl.No.</th><th>Characteristics</th><th>Value</th></tr></thead><tbody><tr><td>1.</td><td>Silica (Max.)</td><td>0.02 ppm as SiO₂</td></tr><tr><td>2.</td><td>Iron as Fe</td><td>Nil</td></tr><tr><td>3.</td><td>Total hardness</td><td>Nil</td></tr><tr><td>4.</td><td>pH value</td><td>6.8 to 7.2</td></tr><tr><td>5.</td><td>Conductivity</td><td>Not more than 0.1 μs/cm excluding the effects of free CO₂</td></tr></tbody></table>	Sl.No.	Characteristics	Value	1.	Silica (Max.)	0.02 ppm as SiO ₂	2.	Iron as Fe	Nil	3.	Total hardness	Nil	4.	pH value	6.8 to 7.2	5.	Conductivity	Not more than 0.1 μ s/cm excluding the effects of free CO ₂	
Sl.No.	Characteristics	Value																		
1.	Silica (Max.)	0.02 ppm as SiO ₂																		
2.	Iron as Fe	Nil																		
3.	Total hardness	Nil																		
4.	pH value	6.8 to 7.2																		
5.	Conductivity	Not more than 0.1 μ s/cm excluding the effects of free CO ₂																		
	PASSIVATED DM WATER pH = 8.5 to 9.5																			



TITLE :
TECHNICAL SPECIFICATION FOR
PLATE HEAT EXCHANGERS

SPECIFICATION NO. PE-TS-392-179-N001

VOLUME II B

SECTION D

REV. NO. 0

DATE 19.07.2013

SHEET 1 OF 1

DATA Sheet-C

Drawings / documents distribution schedule to be followed by successful bidder:

1.0 Within 2 weeks from the date of LOI, the successful bidder shall submit following drawings/ documents.

- a) Data Sheet-B duly filed in along with heat transfer calculations.
- b) G.A./ installation drawings, indicating principal dimensions and heights of equipment being supplied, size and location of various nozzles, connection supporting arrangement, withdrawal space & scope of supply etc.
- c) Foundation arrangement drawings, showing load data on supports, size and location of anchor bolts etc.
- d) Quality Plan.
- e) Area & Heat Load Calculations.
- f) Various performance curves as listed in our specification.
- g) Cross-Sectional drawing indicating bill of quantities and materials of construction.
- h) Performance test procedure.

2.0 Within the stipulated time period as per vendor's drawings/ documents schedule, the following shall be submitted but not later than one month before 1st dispatch.

- a) Drawings of components & details as deemed necessary.
- b) Instruction manual for erection, operation & maintenance.
- c) Storage instruction.

3.0 Before despatch of the equipment the bidder shall furnish the following.

- a) Material test certificates.
- b) Shop test reports & certificates.

4.0 Distribution of drawings / documents for all projects:

The successful bidder, after the award of the contract shall furnish the drawings/ documents as per the following distribution schedule.

Sl. No.	Type of Document	No of Hard copies	No. of Soft copies
1	Documents submitted for Approval	18 Nos.	2 Nos.
2	Final Distribution(Approved Documents)	18 Nos.	2 Nos.
3	O&M Manuals	18 Nos.	2 Nos.

<div style="background-color: black; width: 50px; height: 30px; margin: 0 auto;"></div>	STANDARD QUALITY PLAN		CUSTOMER: PROJECT TITLE: SPECIFICATION NO. :	
	BIDDER/VENDOR: SYSTEM:		QUALITY PLAN NO.:	
			ITEM: PHE	
SHEET OF		SPECIFICATION TITLE : SECTION :		

SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CAT	TYPE/ METHOD OF CHECK	EXTENT OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS	
1.	2.	3.	4.	5.	2/3	1	6.	7.	8.	9.	D*	**	10.	11.	
1.0	RAW MATERIAL INSPECTION														
1.1	Frame Plates & Pressure Plates, Counter Flanges, Connection Lining Material. Top And Bottom Carrying Bar.	Physical Properties	MA	Physical Test	1/ Heat/He -at Batch	1/ Heat/He -at Batch	App. Drg / Data Sheet	Relevant material spec.	Mill TC Or Lab Test Report	✓	2,3	-	1	If co-related mill TCS are not available then check testing carried out by reputed lab	
		Chemical Properties	MA	Chemical Analysis	1/ Heat/He -at Batch	1/ Heat/He -at Batch	-do-	-do-	-do-	✓	2,3	-	1		-do-
		Dimensions	MA	Measurement	100%	100%	Approved Drawings		Inspection Reports	✓	2,3	-	1		
		Workmanship And Finish	MA	Visual	100%	100%	-do-	-do-	-do-		2,3	-	1		
		Lamination (Applicable For Frame And Pressure Plate Only)	CR	Ultrasonic Test	100%	100%	SA 435	SA 435	-do-	✓	2,3	-	1		Applicable for plate thickness more than 25 mm only
1.2	Heat Transfer Plates	Physical Properties	MA	Physical Test	1/ Heat	1/ Heat	App. Drg. / Data Sheet	App. Drg. / Data Sheet	Mill TC Or Lab Test Report	✓	2,3	-	1	Co-related mill TCS to be provided See Remark 1	
		Chemical Properties	MA	Chemical Analysis	1/ Heat	1/ Heat	-do-	-do-	-do-	✓	2,3	-	1	-do-	
		Dimensions	MA	Measurement	100%	Sample	Approved Drawings		Inspection Reports	✓	2,3	-	1		
1.3	Gaskets	Dimensions	MA	Measurement	100%	Sample	Approved Drawings		Inspection Reports		2,3	-	1	Co-related mill TCS to be provided See Remark 1	
		Workmanship And Finish	MA	Visual	-do-	-do-	No damage, No Surface defects.		-do-		2,3	-	1		
		Contour	MA	Visual	-do-	-do-	Mfg. Drgs / specification		-do-		2,3	-	1		

<div style="display: flex; justify-content: space-between;"> <div> MANUFACTURER/ SUB-SUPPLIER </div> <div> MAIN-SUPPLIER </div> </div>		<div style="display: flex; justify-content: space-between;"> <div> Cust. Logo </div> <div> FOR CUST. USE </div> </div>		DOC. NO.:		REV.		CAT-	
				<div style="display: flex; justify-content: space-between;"> <div>REVIEWED BY</div> <div>APPROVED BY</div> </div>		<div style="display: flex; justify-content: space-between;"> <div>APPROVAL SEAL</div> </div>			
<div> <div> <div>LEGEND: * RECORDS IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.</div> <div>** 1: BHEL 1* SHALL BE CLEARED BY BHEL 2: VENDOR, 3: SUB VENDOR</div> <div>P: PERFORM W: WITNESS AND V: VERIFICATION, AS APPROPRIATE</div> <div>CHP: CUSTOMER SHALL IDENTIFY IN COLUMN "N" AS 'W'</div> </div> </div>									

FORMAT NO.: QS-01-QAI-P-09/F1-R1

STANDARD QUALITY PLAN		CUSTOMER:		PROJECT TITLE:		SPECIFICATION NO. :							
		BIDDER/VENDOR:		QUALITY PLAN NO.:		SPECIFICATION TITLE :							
SHEET OF		SYSTEM:		ITEM: PHE		SECTION :							
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CAT	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
					2/3	1			P	W	V		
1.	2.	3.	4.	5.	6.		7.	8.	9.	10.		11.	
		Hardness	CR	Measurement	-do-	-do-	Approved Drawings		-do-	✓	2,3	- 1	
1.4	Tightening Bolts & Nuts. (Tie Rod)	Physical Properties	MA	Physical Test	1/ Heat	1/ Heat	App. Drg / data sheet	Relevant Material Spec.	Mill Tc Or Lab Test Report	✓	2,3	- 1	Manufacturer test certificate will be submitted for review.
		Chemical Properties	MA	Chemical Analysis	1/ Heat	1/ Heat	-do-	-do-	-do-	✓	2,3	- 1	-do-
		Dimensions	MA	Measurement	100%	100%	Approved Drawings		IR	✓	2,3	- 1	
		Workmanship and Finish	MA	Visual	100%	100%	-do-	-do-	-do-	✓	2,3	- 1	
		Internal Soundness (For diameter >= 40 mm)	CR	UT	100%	100%	ASTM A 388	See Remark - 3	-do-	✓	2,3	- 1	UT will be carried on raw material stage.
2.0 IN PROCESS INSPECTION													
		Area Measurement	NA	White Light Scanning	1 per Type	1 per Type	Approved drawing/ data sheet	Approved drawing/ data sheet	IR	✓	2,3	- 1	Refer Point No. 3 of remarks
		Physical Properties	MA	Physical Test	1 Sample per Heat	1 Sample per Heat	Approved drawing/ data sheet	Relevant Material Spec.	Mill TC or Lab Test Report	✓	2,3	- 1	Manufacturing test certificates will be submitted for review.
HT PLATES		Chemical Properties	MA	Chemical Analysis	1 Sample per Heat	1 Sample per Heat	Approved/ data sheet	Relevant Material Spec.	Mill TC or Lab Test Report	✓	2,3	- 1	Manufacturing test certificates will be submitted for review.
		Dimension	MA	Measurement	1 Sample per Heat	1 Sample per Heat	Approved drawing/ data sheet	Approved drawing/ data sheet	Inspection Report	✓	2,3	- 1	

MANUFACTURER/ SUB-SUPPLIER		SIGNATURE	MAIN-SUPPLIER	LEGEND: * RECORDS IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** 1: BHEL 1* SHALL BE CLEARED BY BHEL 2: VENDOR, 3: SUB VENDOR P: PERFORM W: WITNESS AND V: VERIFICATION, AS APPROPRIATE CHP: CUSTOMER SHALL IDENTIFY IN COLUMN "N" AS 'W'		DOC. NO.:		REV. CAT-	
				Cust. Logo	FOR CUST. USE	REVIEWED BY	APPROVED BY		
FORMAT NO.: QS-01-QAI-P-09/F1-R1				2 / 5		ENGG. DIV./QA&I			

<div> <div></div> <div>STANDARD QUALITY PLAN</div> <div>SHEET OF</div> </div>		CUSTOMER:		PROJECT TITLE:			SPECIFICATION NO. :							
		BIDDER/VENDOR:		QUALITY PLAN NO.:			SPECIFICATION TITLE :							
		SYSTEM:		ITEM: PHE			SECTION :							
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CAT	TYPE/METHOD OF CHECK	EXTENT OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
					2/3	1				P	W	V		
1.	2.	3.	4.	5.	6.		7.	8.	9.	D*	10.		11.	
		Workmanship And Finish	MA	Visual	100%	100%	Approved drawing/ data sheet	No scratches, cracks etc.	-do-	2,3	-	1		
		Surface Defects And Cracks	CR	DP test	Refer Sect. C , Clause No. 4.2	Refer Sect. C , Clause No. 4.2	Manufacturer's DP test procedure (to be reviewed and approved by BHEL/Customer during contract stage)		DPT Report	✓	2,3	1	-	See Remark 1
				Light Box Test/ Vacuum chamber test	100%	10%	Manufacturer's Light Box/Vacuum test procedure (to be reviewed and approved by BHEL/Customer during contract stage)		Vacuum Test Report	✓	2,3	1	-	See Remark 1
2.1	Welding Procedures Specification (WPS)	Correctness	MA	Verification	100%	100%	ASME SEC-IX.	ASME SEC-IX.	QW 482 ASME SEC-IX	✓	2,3	-	1	Customer /BHEL/ TPI (NPCIL, EIL, LLYODS & BVIS) approved WPS shall be used for welding
2.2	Procedure Qualification Records (PQR)	Suitability	MA	Visual & Mechanical Test	100%	100%	-do-	-do-	QW 483 ASME SEC-IX.	✓	2,3	-	1	
2.3	Welders Performance Qualification	Welder's Performance Soundness Of Welds	MA	Visual / RT & Mechanical	100%	100%	-do-	-do-	QW 484 ASME SEC-IX	✓	2,3	-	1	Only customer / BHEL/ TPI (NPCIL, EIL, LLYODS & BVIS) approved welder shall be engaged for welding.
2.4	Weld joint of expander/reducer.	Welding Of Outer Flange To Reducer/Expander	MA	Visual	100%	100%	Approved Drawings		Inspection Report	✓	2,3	-	1	
				DPT	100%	100%	Manufacturer's DP test procedure (to be reviewed and approved by BHEL/Customer during contract stage)		DPT Report	✓	2,3	1	-	

MANUFACTURER/ SUB-SUPPLIER		SIGNATURE		MAIN-SUPPLIER		VENDOR	

LEGEND: * RECORDS IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.		DOC. NO.:		REV.		CAT-	
** 1: BHEL 1* SHALL BE CLEARED BY BHEL 2: VENDOR, 3: SUB VENDOR		Cust. Logo		APPROVED BY		APPROVAL SEAL	
P: PERFORM W: WITNESS AND V: VERIFICATION, AS APPROPRIATE CHP: CUSTOMER SHALL IDENTIFY IN COLUMN "N" AS "W"		FOR CUST. USE		REVIEWED BY			

STANDARD QUALITY PLAN SHEET OF		CUSTOMER:		PROJECT TITLE:		SPECIFICATION NO. :							
		BIDDER/VENDOR:		QUALITY PLAN NO.:		SPECIFICATION TITLE :							
		SYSTEM:		ITEM: PHE		SECTION :							
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CAT	TYPE/METHOD OF CHECK	EXTENT OF CHECK 2/3 1	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
									P	W	V		
1.	2.	3.	4.	5.	6.	7.	8.	9.	D*	**	10.	11.	
2.5	PHE Structure	Workmanship and finish	MA	Measurement & Visual	100%	Approved Drawings		Inspection Report	✓	-	2	1	
2.6	Plate Gaskets	Presence Of Gasket	MA	Visual	100%	Mfg. Spec.	Mfg. Spec.	-do-	✓	2	1	-	
2.7	Plate arrangement to flow diagram	Correctness	CR	Visual as per flow diagram	100%	Approved Drawing		Inspection Report		2	-	1	
2.8	Assembly of tightening bolts and nuts	Squeezing of threads on T/B	MA	Visual	100%	Approved Drawing / Data sheet		-do-		2	-	1	
2.9	Plate Pack	Length	MA	Dimension Measurement	100%	Approved Drawing		-do-		2	-	1	
3.0 FINAL INSPECTION													
3.1	Complete Assembly	a. Conformance to GA drg.	MA	-do-	100%	-do-	-do-	-do-		2	1	-	CHP
		B. Dimensions, No. of Heat Transfer Plates, Workmanship & finish	MA	-do-	100%	-do-	-do-	-do-	✓	2	1	-	CHP
3.2	Unbalanced hydrostatic pressure (Primary Side)	Leakage / strength of structure	MA	Hyd. Test	100%	Manufacturer's Hydro test procedure (to be reviewed and approved by BHEL/Customer during contract stage)		Hydro Test Report	✓	2	1	-	CHP.
3.3	Unbalanced hydrostatic pressure (Secondary Side)	Leakage / strength of structure	MA	Hyd. Test	100%	-do-	-do-	-do-	✓	2	1	-	CHP.

MANUFACTURER/ SUB-SUPPLIER		SIGNATURE	MAIN-SUPPLIER	LEGEND: * RECORDS IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** 1: BHEL 1* SHALL BE CLEARED BY BHEL 2: VENDOR, 3: SUB VENDOR P: PERFORM W: WITNESS AND V: VERIFICATION, AS APPROPRIATE CHP: CUSTOMER SHALL IDENTIFY IN COLUMN "N" AS 'W'		Cust. Logo	DOC. NO.:		REV.	CAT-
				FOR CUST. USE	REVIEWED BY	APPROVED BY	APPROVAL SEAL			

FORMAT NO.: QS-01-QAI-P-09/F1-R1

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ENGG. DIV./QA&I

<div></div> <div>STANDARD QUALITY PLAN</div> <div>SHEET OF</div>		CUSTOMER:		PROJECT TITLE:			SPECIFICATION NO. : SPECIFICATION TITLE : SECTION :								
		BIDDER/VENDOR:		QUALITY PLAN NO.:											
		SYSTEM:		ITEM: PHE											
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CAT	TYPE/ METHOD OF CHECK	EXTENT OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY		REMARKS			
1.	2.	3.	4.	5.	2/3	1	7.	8.	9.	D*	P	W	V	10.	11.
3.4	Completeness of all previous tests	Completeness	MA	Verification of reports	100%	100%	Tech. Specs / App. Drawings		Completion Certificate	✓	2	-	1		
3.5	Painting and packing	Dry film thickness, shade, soundness & completeness	MA	Measurement & visual	100%	100%	Customer/BHEL Tech. Spec. / Approved Data sheets		-do-	✓	2	-	1		
REMARKS:-															
1	As per Sect. C , Clause No. 4.2, random witness by BHEL/ NTPC at Bidder's works, in case any defect is found in any of selected % of plates, the whole lot shall be tested in presence of BHEL & Customer. H.T. Plates without defect only shall only be accepted.														
2	Ultrasonic test of tie rods shall be carried out using 10 mm / 20 mm size Normal Beam Probe of frequency 2 MHz. Using this probe the back wall echo in the sound area of bar shall be adjusted to 100% of full Screen Height (FSH). The whole bar shall be scanned under this sensitivity setting. In this sensitivity setting any defect echo indication having height greater than 20% of FSH is not acceptable.														
3.	Inspection of Heat Transfer Plate Area Measurement shall be by White Light Scanning Method from Third Party like TUV/ Lloyd and certificate shall be submitted for review of BHEL.														

<div></div> <div>MANUFACTURER/ SUB-SUPPLIER</div>		<div></div> <div>MAIN-SUPPLIER</div>		<div></div> <div>SIGNATURE</div>		LEGEND: * RECORDS IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** 1: BHEL 1* SHALL BE CLEARED BY BHEL 2: VENDOR, 3: SUB VENDOR P: PERFORM W: WITNESS AND V: VERIFICATION AS APPROPRIATE CHP: CUSTOMER SHALL IDENTIFY IN COLUMN "N" AS 'W'		Cust. Logo	DOC. NO.:		REV.	CAT-
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FORMAT NO.: QS-01-QAI-P-09/F1-R1						5 / 5						