

**1X500MW VINDHYACHAL STAGE-V –STG PKG
1X500MW VINDHYACHAL STAGE-V –SG PKG**

VOLUME –IIB

**TECHNICAL SPECIFICATION
FOR
PLATE HEAT EXCHANGERS**

Specification No. : PE-TS-388/389-179-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-388/389-179-N001

VOLUME II B

SECTION

REV. NO. 0

DATE 09/09/2013

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



TITLE :
**TECHNICAL SPECIFICATION FOR
PLATE HEAT EXCHANGERS**

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SECTION : -

REV. NO. 0

DATE : 09.09.13

CONTENTS

SECTION	TITLE
A	SCOPE OF ENQUIRY
B	PROJECT INFORMATION <ul style="list-style-type: none">• 1X500MW VINDHYACHAL STAGE-V –STG PKG• 1X500MW VINDHYACHAL STAGE-V –SG PKG `
C	SPECIFIC TECHNICAL REQUIREMENTS
D	STANDARD TECHNICAL SPECIFICATIONS OF PHE'S ALONGWITH <ul style="list-style-type: none">▪ DATA SHEET – A▪ DATA SHEET - C▪ QUALITY PLAN



TITLE :
TECHNICAL SPECIFICATION FOR
PLATE HEAT EXCHANGERS

SPECIFICATION NO. PE-TS-388/389-179-N001

VOLUME II B

SECTION A

REV. NO. 0 **DATE 09.09.13**

SHEET 1 OF 1

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), including site PG test as mentioned in this specification for the following projects.

1X500MW VINDHYACHAL STAGE-V –STG PKG

1X500MW VINDHYACHAL STAGE-V –SG PKG

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.



TITLE :
TECHNICAL SPECIFICATION FOR
PLATE HEAT EXCHANGERS

SPECIFICATION NO. PE-TS-388/389-179-N001

VOLUME II B

SECTION C

REV. NO. 0

DATE 09.09.13

SECTION B
PROJECT INFORMATION



TITLE :
TECHNICAL SPECIFICATION FOR
PLATE HEAT EXCHANGERS

SPECIFICATION NO. PE-TS-388/389-179-N001

VOLUME II B

SECTION C

REV. NO. 0

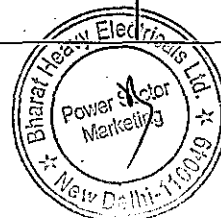
DATE 09.09.13

1X500MW VINDHYACHAL STAGE-V –STG & SG PKG


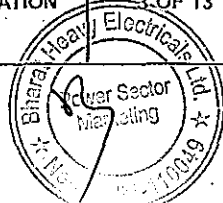
CLAUSE NO.	PROJECT INFORMATION		<div>एन टी पी सी NTPC</div>																							
1.00.00	BACKGROUND <p>Vindhyachal Super Thermal Power Project was conceived as a pit head coal based super thermal power plant of 2260 MW (6x210 MW + 2X500 MW) for which land was acquired during stage-I of the project. the capacity of the project was increased to 4260 MW by adding two units of 500 Mw each under Stage-III and two units of 500 MW each under Stage-IV of the project. Futther, the capacity of the project was increased to 4760 MW by adding one unit of 500 MW under Stage-V. Stage-I, li & III of the project comprising of six units of 210 Mw + two units of 500 MW + two units of 500 MW are under commercial operation .Two units of 500 Mw under stage-IV and one unit of 500 MW under stage. V of the project is under implmenetation. The capacity after implementation of Stage-V of the project shall be 4760 MW.</p>																									
2.00.00	CAPACITY <table><tr><th>Stage</th><th>Capacity</th><th>Status</th></tr><tr><td>I</td><td>6X210 MW</td><td>Under Commercial Operation</td></tr><tr><td>II</td><td>6X500 MW</td><td>Under Commercial Operation</td></tr><tr><td>III</td><td>2X500 MW</td><td>Under Commercial Operation</td></tr><tr><td>IV</td><td>2X500 MW</td><td>Presently under implementation</td></tr><tr><td>V</td><td>1xx500 MW</td><td>Presently under implmentation</td></tr></table>			Stage	Capacity	Status	I	6X210 MW	Under Commercial Operation	II	6X500 MW	Under Commercial Operation	III	2X500 MW	Under Commercial Operation	IV	2X500 MW	Presently under implementation	V	1xx500 MW	Presently under implmentation					
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3.00.00	LOCATION AND APPROACH: <p>The plant is located in Sidhi district of Madhya Pradesh, having a latitude and longitude of 24° 6' N and 82° 40' E respectively.</p> <p>Major rail and road distances from the project site are as under:</p> <table><tr><th rowspan="2">Between</th><th colspan="2">Distance (Kms)</th></tr><tr><th>By Road</th><th>By Rail</th></tr><tr><td>Vindhyachal – Lucknow</td><td>435</td><td>475</td></tr><tr><td>Vindhyachal – New Delhi</td><td>850</td><td>925</td></tr><tr><td>Vindhachal- Sidhi</td><td>095</td><td>-</td></tr><tr><td>Vindhyachal- Bhopal</td><td>610</td><td>590</td></tr><tr><td>Vindhyachal- Mirzapur</td><td>175</td><td>175</td></tr><tr><td>Vindhyachal – Varanasi</td><td>220</td><td>-</td></tr></table> <p>The Vicinity Plan of the project is enclosed as Annexure A-I.</p>			Between	Distance (Kms)		By Road	By Rail	Vindhyachal – Lucknow	435	475	Vindhyachal – New Delhi	850	925	Vindhachal- Sidhi	095	-	Vindhyachal- Bhopal	610	590	Vindhyachal- Mirzapur	175	175	Vindhyachal – Varanasi	220	-
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VINDHYACHAL SUPER THERMAL POWER PROJECT STAGE-V (1X500 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATIONS SECTION-VI PART-A	PROJECT INFORMATION <div>1 OF 13</div>																							


APPLICABLE FOR BOTH STG AND SG PKG.

010



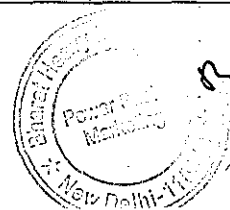
CLAUSE NO.	PROJECT INFORMATION	एनटीपीसी NTPC	
4.00.00	LAND REQUIREMENT A total area of 5378 acres of land was acquired for the project during implementation of Stage-I. The plant facilities and township for this project would be accommodated in the land acquired during Stage-I of the project. However, for ash dyke, approximately 260 acres of land is proposed to be acquired.		
5.00.00	COAL AVAILABILITY AND LINKAGE Coal requirement for Vindhyachal STPP, Stage-I, II & III is presently being met from Northern Coal Fields (NCL). The daily coal requirement for one 500 MW Unit shall be about 2.87 MTPA at 90% PLF. For FR purposes, coal from NCL has been considered.		
6.00.00	COAL TRANSPORTATION Coal requirement for Stage-V shall be met from Stage-IV itself. Accordingly Stage-IV CHP capacity has been selected as 2000 MTPH. Coal input to Stage-IV & Stage-V may be from BOBR or BOX N wagons.		
7.00.00	RAILWAY SIDING For bringing the equipment and material to the power house through rail, a permanent railway siding has already been constructed during Stage-I, II & III. This siding is proposed to be extended upto Stage-V of the project to provide rail access to unloading bays and transformer yard.		
8.00.00	COOLING WATER REQUIREMENT, SOURCE, COMMITMENT AND SYSTEM The source of raw water for the project is hot water Discharge channel of CW System of Singrauli STPP as that of in existing Stage-I, II, III & IV of Vindhyachal STPP. Raw water is proposed to be used for meeting the complete water requirement of the project. Normal Make up water requirement for this project would be about 1800 M ³ /hr with ash water re-circulation system and 2800 m ³ /hr with once thru system. The total commitment for the project is 180 Cusecs and the same has been duly concurred by CWC. The make-up water requirement of Stage-V will be about 20 Cusecs which shall be met from surplus water available within existing commitment.		
VINDHYACHAL SUPER THERMAL POWER PROJECT STAGE-V (1X500 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATIONS SECTION-VI PART-A	PROJECT INFORMATION PAGE 2 OF 13

CLAUSE NO.	PROJECT INFORMATION				
9.00.00	METREOLOGICAL DATA Important Metreological Data from nearest observatory at Sidhi is placed at Annexure B-I.				
11.00.00	PLANT WATER SCHEME The Plant water scheme is described below.				
11.01.00	Condenser Cooling (CW) Water System It is proposed to provide recirculating type CW system with induced draft type cooling towers, Raw water for Stage – V of this project shall be pumped from the hot water (CW system) discharge channel of Singrauli Project of NTPC to Water pretreatment Plant. The treated clarified water shall be pumped to the Stage – V circulating Water (CW) system as make up to the system. It is proposed to operate the CW system at a C.O.C. of about 4 and chemical treatment programme (using acid dosing and scale cum corrosion inhibitors dosing) shall be employed in addition to blow down of CW water to control the CW system water chemistry. The expected circulating water analysis is given in Annexure C-I of the Sub-section.				
11.02.00	Equipment Cooling Water (ECW) System (Unit Auxiliaries) The plant auxiliaries of Steam Generator shall be cooled by Demineralised water (DM) in a closed circuit. The primary circuit DM water shall be cooled through plate type heat exchangers by Circulating Water tapped from CW system in a closed secondary circuit. The hot secondary circuit cooling water shall be cooled in the cooling towers and shall be returned back to the system.				
11.03.00	Ash Water System (a) It is proposed to operate ash water system in a closed circuit. The ash water from the ash dyke shall be recirculated. During re-circulation mode, the make up to the ash water system (to compensate for the ash water blow down and evaporation loss in ash dyke) shall be supplied from CW blow down. (b) During initial operating stage of the project, when decanted ash water is not available from the dyke, the ash water system shall be operated in once through mode. The make-up water to ash water system shall be pumped from the raw water (from the discharge channel of Singrauli station) source and CW blow down water.				
VINDHYACHAL SUPER THERMAL POWER PROJECT STAGE-V (1X500 MW) STEAM TURBINE GENERATOR PACKAGE		<table border="1"> <tr> <td data-bbox="694 1892 1077 1993"> TECHNICAL SPECIFICATIONS SECTION-VI PART-A </td><td data-bbox="1077 1892 1284 1993"> PROJECT INFORMATION </td><td data-bbox="1284 1892 1449 1993"> PAGE 3 OF 13 </td></tr> </table> <div data-bbox="1204 1937 1428 2139" style="text-align: right;">  </div>	TECHNICAL SPECIFICATIONS SECTION-VI PART-A	PROJECT INFORMATION	PAGE 3 OF 13
TECHNICAL SPECIFICATIONS SECTION-VI PART-A	PROJECT INFORMATION	PAGE 3 OF 13			

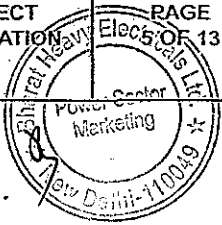
CLAUSE NO.	PROJECT INFORMATION		
11.04.00	<p>(c) Considering total ash handling plant water requirement of 1100 Cu.M/hr. for slurry formation during re-circulation mode operation, it is expected that about 970 M³/hr of decanted ash water shall return to the ash handling system after accounting for evaporation loss.</p> <p>(d) The quality of raw water is given at Annexure B-III.</p> <p>Other Miscellaneous Water Systems</p> <p>(a) CW system blow down water shall be used for the dust suppression system of coal handling plant, ash slurry pumps sealing, make-up to ash handling plant, make-up to fire water storage tanks and cooling water requirement of hydrogen generation plant. The service (wash water) water collected from various areas shall be treated using oil water separators, tube settlers, coal settling pits etc. as per requirement and treated water from liquid effluent treatment plant shall be recycled back to the service water system for re-use. The excess service water shall be led to central monitoring basin for disposal.</p> <p>(b) Separate water Pre-treatment plants are proposed for Circulating water (PT-CW) system and Demineralisation Plant (PT-CW) plant.</p> <p>(c) It is proposed to provided a DM plant for this stage of the project. From the proposed DM plant DM water shall be pumped to meet the Steam Cycle make-up water requirement, makeup the hydrogen generation plant and makeup to the primary circuit of ECW (unit auxiliaries) system, boiler fill water shall be provided from Demineralising plant. In addition, separate set of boiler fill pumps shall be provided to fill the boiler from these DM water storage tanks, DM water required for regeneration of condensate polishing plant and resin transfer operation shall also be provided by these tanks.</p> <p>(d) The quality of filtered (potable) water and DM water is given in Annexure -B-III of this sub-section.</p>		
12.00.00	<p>CRITERIA FOR WIND RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT</p> <p>All structures and equipment of the power plant, including plant auxiliary structures and equipment, shall be designed for wind forces as given in Sub-Section-D-1, Part-B, Section-VI, i.e. Technical Specification for Civil and Structural Works.</p>		
VINDHYACHAL SUPER THERMAL POWER PROJECT STAGE-V (1X500 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATIONS SECTION-VI PART-A	PROJECT INFORMATION PAGE 4 OF 13

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APPLICABLE FOR BOTH STG AND SG PKG.





CLAUSE NO.	PROJECT INFORMATION		
13.00.00	CRITERIA FOR EARTHQUAKE RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT All power plant structures and equipment, including plant auxiliary structures and equipment shall be designed for seismic forces as given in Sub-Section-D-1, Part-B, Section-VI, i.e. Technical Specification for Civil and Structural Works. <div data-bbox="429 1783 1163 1832">APPLICABLE FOR BOTH STG AND SG PKG.</div>		
	VINDHYACHAL SUPER THERMAL POWER PROJECT STAGE-V (1X500 MW) STEAM TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATIONS SECTION-VI PART-A	PROJECT INFORMATION PAGE 5 OF 13 

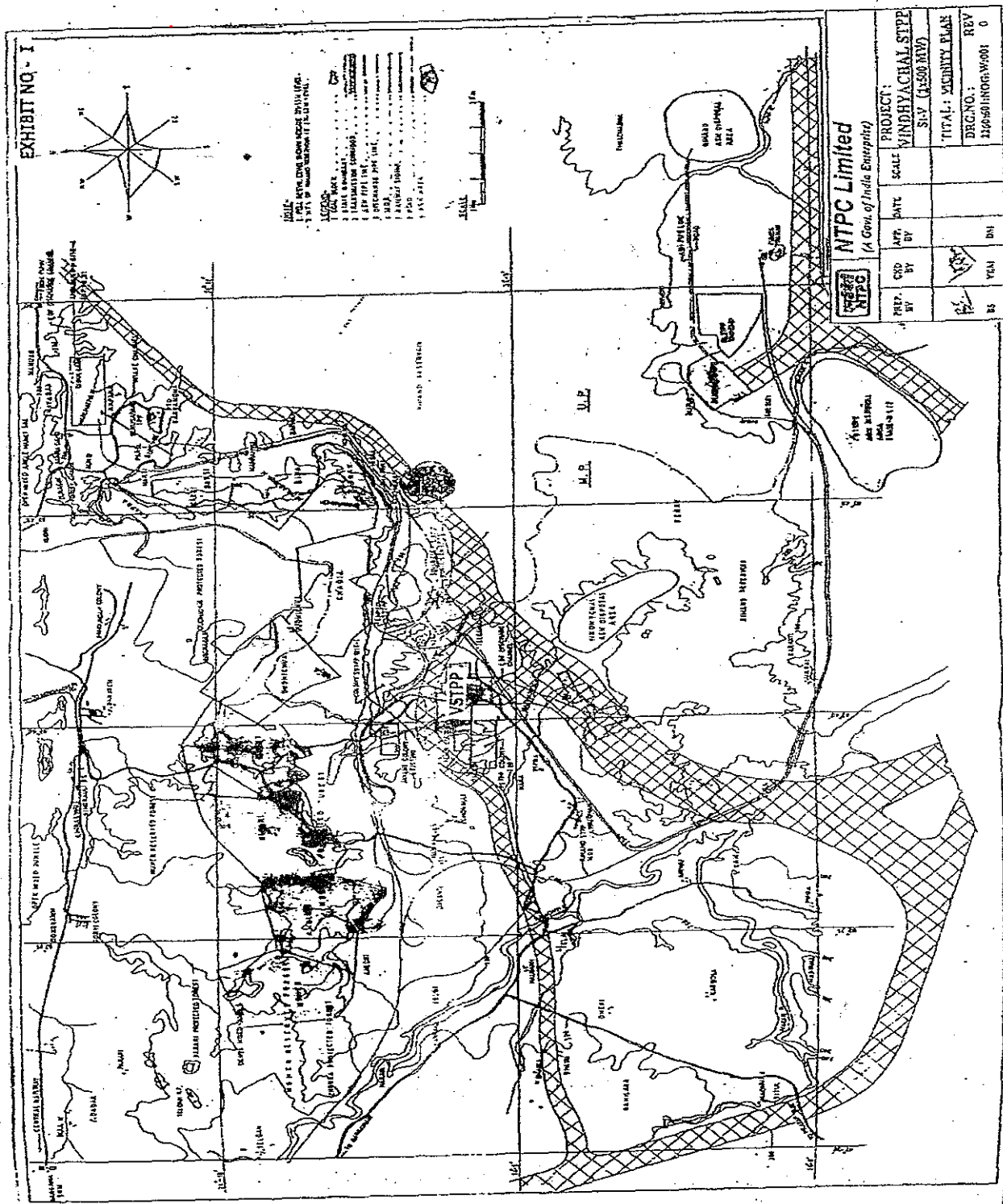
CLAUSE NO.

PROJECT INFORMATION

एनटीपीसी
NTPC

VICINITY PLAN

ANNEXURE A-I



VINDHYACHAL SUPER THERMAL POWER PROJECT
STAGE-V (1X500 MW)
STEAM TURBINE GENERATOR PACKAGE

TECHNICAL SPECIFICATIONS

SECTION-VI

PART-A

PROJECT INFORMATION

PAGE
6 OF 13

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APPLICABLE FOR BOTH STG AND SG PKG.

EXHIBIT NO - I

LEGEND

- 1. STATE BOUNDARY
- 2. STATE CAPITAL
- 3. STATE HIGHWAY
- 4. STATE RAILWAY
- 5. STATE CANAL
- 6. STATE DAM
- 7. STATE RESERVOIR
- 8. STATE FOREST
- 9. STATE WATERSHED
- 10. STATE TOWN
- 11. STATE VILLAGE
- 12. STATE TEMPLE
- 13. STATE MOUNTAIN
- 14. STATE RIVER
- 15. STATE LAKE
- 16. STATE CANYON
- 17. STATE CLIFF
- 18. STATE CAVE
- 19. STATE MONUMENT
- 20. STATE MONUMENT

SCALE

1:100,000

COMPASS

N

PROJECT :
VINDHYACHAL STPP
S.S.V. (1500 MW)

TITLE : VICINITY PLAN

DRG. NO. : 1

REV. : 0

22/04/80 INO.G.W/001

NTPC Limited
(A Govt. of India Enterprise)

REC. BY : [Signature]

CHK. BY : [Signature]

APP. BY : [Signature]

DATE : [Date]

SCALE : [Scale]

PROJECT : [Project Name]

TITLE : [Title]

DRG. NO. : [Drawing Number]

REV. : [Revision]

22/04/80 INO.G.W/001

Stamp: Bharat Heavy Electricals Ltd. Power Sector Marketing, New Delhi-110049

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ANNEXURE A-II
Page 1 of 2

जलवायवी सारणी
CLIMATOLOGICAL TABLE

स्टेशन : सिधि
STATION : Sidhi

अक्षांश देशांतर
LAT 24°25' N LONG 81°52' E

समुद्री तल सतह से ऊँचाई मीटर
HEIGHT ABOVE M. S. L. 272 METRES

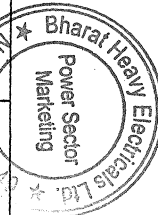
1958 से 1980 तक के प्रेक्षणों पर आधारित
BASED ON OBSERVATIONS FROM 1958 TO 1980

वायु तापमान																	वर्षा					
मह	स्टेशन का स्तर दाय	मध्य				चरम				आर्द्रता				मेघ की मात्रा		मासिक योग	वर्षा के दिनों की संख्या	वर्षा के दिनों का सबसे कम योग	वर्षा के दिनों का अधिकतम योग	24 घंटे की सबसे पारी वर्षा	दिनांक और वर्ष	मध्य वर्ष महि
		रूक बरत	सम बरत	दैनिक अधिकतम	दैनिक न्यूनतम	मह में अधिकतम	मह में न्यूनतम	दिनांक और वर्ष	दिनांक और वर्ष	सापेक्ष आर्द्रता	खम दाय	समस्त मेघ	निम्न मेघ									
		AIR TEMPERATURE								HUMIDITY				CLOUD AMOUNT								
MONTH	STATION LEVEL PRESSURE	DRY BULB	WET BULB	DAILY MAX	DAILY MIN	HIGHEST IN THE MONTH	LOWEST IN THE MONTH	HIGHEST DATE AND YEAR	LOWEST DATE AND YEAR	RELATIVE HUMIDITY	VAPOUR PRESSURE	ALL CLOUDS	LOW CLOUDS	MONTHLY TOTAL	NO. OF RAINY DAYS	TOTAL IN WETTEST MONTH WITH YEAR	TOTAL IN DRIEST MONTH WITH YEAR	HEAVIEST FALL IN 24 HOURS	DATE AND YEAR	MEAN WIND SPEED		
	एच. पी. ए.	डि.से.	डि.से.	डि.से.	डि.से.	डि.से.	डि.से.	डि.से.	डि.से.	प्रतिशत %	एच.पी.ए.	अकारा के अनुसार OKtas of sky	मि.मि.	मि.मि.	मि.मि.	मि.मि.	मि.मि.	मि.मि.	मि.मि.	कि.मी. X घंटे (Kmph)		
जनवरी JAN	985.4 982.1	12.2 10.1	10.1 15.0	24.3	8.1	29.1	3.3	32.8 1959	21 1962	1.0	17	78 50	10.8 12.2	1.2 0.8	0.8	27.0	2.0	118.1 1971	0.0	49.4 1971	2.7	
फरवरी FEB	983.4 980.0	15.6 24.9	12.4 16.5	27.6	10.8	32.8	5.3	36.0 1966	28 1974	2.0	10	68 40	12.1 12.1	1.1 0.9	0.7 0.5	18.4	1.7	80.6 1978	0.0	34.4 1971	2.7	
मार्च MAR	981.0 977.0	22.0 30.9	15.8 19.0	33.4	15.5	38.4	10.0	41.2 1972	30 1972	4.6	10	51 29	13.1 12.4	0.8 1.0	0.5 0.6	13.2	1.0	58.7 1967	0.0	30.2 1963	3.3	
अप्रैल APR	977.0 972.8	29.1 36.6	19.5 21.8	39.1	21.5	43.4	16.5	48.8 1959	10 1968	11.8	01	38 24	15.0 14.1	0.5 1.0	0.3 0.6	3.4	0.5	17.7 1971	0.0	12.2 1965	4.5	
मई MAY	972.8 968.4	33.1 39.4	22.0 23.0	42.0	25.8	45.1	21.2	46.6 1959	26 1960	17.0	09	35 23	17.5 15.0	0.8 1.4	0.5 0.9	8.8	0.8	57.0 1971	0.0	23.2 1971	5.1	
जून JUN	969.0 965.4	31.8 35.5	25.0 25.4	39.2	27.5	44.2	23.4	47.4 1966	09 1968	20.0	27	58 46	26.4 24.0	2.7 4.0	1.7 2.7	133.5	6.3	675.3 1971	8.4	180.2 1965	6.5	
जुलाई JUL	968.5 965.7	27.9 30.0	25.5 26.1	32.9	25.1	37.8	22.7	42.2 1969	01 1968	17.0	22	83 74	30.8 30.8	5.2 5.5	3.2 3.7	338.2	15.0	594.8 1969	114.6	189.8 1980	5.3	
अगस्त AUG	969.9 967.2	27.2 28.9	25.3 25.9	31.7	24.6	34.9	22.6	38.8 1972	03 1968	17.4	04	85 79	30.7 31.0	5.3 5.5	3.4 3.7	325.2	14.9	620.1 1967	154.4	176.5 1972	4.5	
सितम्बर SEP	974.2 971.0	27.0 29.1	24.6 25.1	32.3	23.8	35.5	21.1	39.0 1969	11 1972	18.2	27	82 72	29.1 28.6	3.9 4.6	2.6 3.1	211.8	9.2	488.1 1970	44.4	186.4 1970	3.9	
अक्टूबर OCT	980.0 976.8	24.4 29.0	21.0 21.9	32.8	19.4	35.0	14.8	38.4 1966	05 1964	12.2	31	73 53	22.4 20.9	1.6 1.9	1.0 1.2	33.4	2.2	139.8 1958	0.0	69.6 1958	2.4	
नवम्बर NOV	984.1 980.8	18.5 25.3	15.3 18.1	29.5	13.0	32.6	8.7	35.9 1965	04 1970	4.0	30	69 47	14.9 15.0	0.8 1.0	0.5 0.6	12.1	0.7	118.0 1969	0.0	99.4 1969	1.8	
दिसम्बर DEC	985.9 982.6	13.4 21.3	11.1 15.4	25.3	8.3	28.7	4.0	31.2 1960	31 1961	1.0	27	74 51	11.5 12.9	0.8 0.9	0.4 0.4	7.7	0.7	38.8 1978	0.0	33.2 1966	1.8	
वर्षा के दिनों का योग	977.6	23.5	19.0	32.5	18.6	45.5	2.9	48.8	1.0			66	19.5	2.1	1.3	1132.7	55.0	2082.3	505.5	189.8	3.6	
वर्षा के दिनों का औसत	974.2	29.3	21.1									49	19.1	2.4	1.6			1971	1965			
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VINDHYACHAL STPP-V(1X500MW)
STEAM GENERATOR WITH ELECTROSTATIC
PRECIPITATOR PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI
BID DOC. NO.: CS-2260-101-2

PART-A
SUB-SECTION-II
PROJECT
INFORMATION
PAGE 6 OF 12



ANNEXURE A-II
Page 2 of 2

जलवायवी सारणी
CLIMATOLOGICAL TABLE

स्टेशन : सिद्धि
STATION : Sidhi

मौसम परिवर्तन										वन										मेघ										दूरत्व																													
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TITLE :
TECHNICAL SPECIFICATION FOR
PLATE HEAT EXCHANGERS

SPECIFICATION NO. PE-TS-388/389-179-N001

VOLUME II B

SECTION C

REV. NO. 0

DATE 09.09.13

SECTION C

SPECIFIC TECHNICAL REQUIREMENTS



TITLE :
TECHNICAL SPECIFICATION FOR
PLATE HEAT EXCHANGERS

SPECIFICATION NO. PE-TS-388/389-179-N001

VOLUME II B

SECTION C

REV. NO. 0

DATE 09.09.13

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 to be supplied shall be as under:

- Total Three (3) nos. PHE for 1X500MW VINDHYACHAL STAGE-V –STG PKG
Viz. 3 nos [2W + 1S] per Unit
- Total Two (2) nos. PHE for 1X500MW VINDHYACHAL STAGE-V –SG PKG
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) in case of following Projects:

1. 1X500MW VINDHYACHAL STAGE-V –STG PKG
2. 1X500MW VINDHYACHAL STAGE-V –SG PKG

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.



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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 1X500MW VINDHYACHAL STAGE-V –STG PKG
Total Three (3) nos. PHE Viz. 3 nos [2W + 1S] per Unit

3.1.2 1X500MW VINDHYACHAL STAGE-V –SG PKG
Total Two (2) nos. PHE viz. 2 nos [1W + 1S] per Unit

3.2 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 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.

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

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

3.5 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.



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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.

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 After commissioning of PHE's at site, performance test of all PHE's for each unit individually will be conducted by bidder at project site to ensure that the PHE's meet the specified requirements. 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



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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:** Shall be as per data sheet A,

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.

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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	(FOR MEMORANDUM OF UNDERSTANDING PURPOSE)	REV. NO. 0	DATE : 15.06.12
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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:

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

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

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	TECHNICAL SPECIFICATION	VOLUME : II B
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	(FOR MEMORANDUM OF	REV. NO. 0 DATE : 15.06.12
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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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	TECHNICAL SPECIFICATION	VOLUME :	II B
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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.


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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-PER)
6042023-2013/09/03

	TECHNICAL SPECIFICATION FOR		Technical Specification No.		PE-TS-388/389-179-N001 (Rev 0)
			Vol/Section		IIB / D
	PLATE HEAT EXCHANGER		Rev		0
	DATASHEET - A		Rev.-00	Date	09.09.13
SL. NO.	DESCRIPTION		UNIT		
				1X500 MW VINDHYACHAL STAGE-V (NTPC)	
1.0	General			(TG AUX.)	(SG AUX.)
1.1	Number of Plate Heat Exchanger		Nos	Total Three (3) nos. [2W+1S Per Unit]	Total Two (2) nos. [1W+1S Per Unit]
1.2	Arrangement			3 x 50% per unit	2 x 100% per unit
1.3	Location			Indoor	Indoor
1.4	Primary side (Hot) Fluid			Passivated DM water (Ref enclosed water analysis)	Passivated DM water (Ref enclosed water analysis)
1.5	Secondary side (Cold) fluid			Cooling Water (Refer enclosed water analysis)	Cooling Water (Refer enclosed water analysis)
1.6	Connecting Pipe size	(Primary Side)	NB (OD x Thk.)	400 (406.4 X 6.0)	300 (323.9 x 6.0)
		(Secondary Side)	NB (OD x Thk.)	400 (406.4 X 6.0)	350 (355.6 x 6.0)
2.0	Design				
2.1	Design Pressure		Kg/cm ² (g)	10	12
2.2	Operating Pressure	(Primary Side) (approx.)	Kg/cm ² (g)	6	8.5
		(Secondary Side) (approx.)	Kg/cm ² (g)	2.5	2.8
2.3	Mechanical Design Temp.		°C	60	60
2.3	Heat Transfer per Sq.Mtr. Of Heat Transfer Plate		Kcal/Hr./m ²	6500	6500
2.4	Minimum Heat Transfer Area		Sq. M.	-	-
2.5	Specific Heat of Fluid	(Primary Side)	Cal/gmDeg.C	1.0	1.0
		(Secondary Side)	Cal/gmDeg.C	1.0	1.0
2.6	Density of Fluid	(Primary Side)	gm/cc	1.0	1.0
		(Secondary Side)	gm/cc	1.0	1.0
3.0	Guaranteed Performance Requirements for each Heat Exchangers :				
3.1	Flow rate	(DMCW Side)	M ³ /hr	1040	515
		(ACW Side)	M ³ /hr	1040	750
3.2	Inlet temperature	(DMCW Side)	°C	43.4	43.8
		(ACW Side)	°C	36	36
3.3	Outlet temp	(DMCW Side)	°C	38	38
		(ACW Side)	°C	41.4	40
3.4	* Allowable pressure drop across heat exchanger from inlet to outlet in fouled conditions	(DMCW Side)	MWC	7	7
		(ACW Side)	MWC	7	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.Pr. Drop mentioned shall be calculated against flow mentioned at S. No. 3.4				
4.0	Additional HT plates on Design Plates		%	-	-

	TECHNICAL SPECIFICATION FOR		Technical Specification No.		PE-TS-388/389-179-N001 (Rev 0)
	PLATE HEAT EXCHANGER		Vol/Section		IIB / D
	DATASHEET - A		Rev		0
SL. NO.	DESCRIPTION	UNIT	Rev.-00	Date	09.09.13
					1X500 MW VINDHYACHAL STAGE-V (NTPC)
5.0	Heat Transfer Coefficient/Margin				
5.1	Overall fouling resistance	Hr m2deg C/Kcal		0.00008	0.00008
5.2	Minimum corrosion allowance (refer note 1)	mm		1.6	1.6
6.0	Material of Construction :				
6.1	Heat Transfer Plates (Minimum acceptable plate thickness 0.6 mm) (refer note 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 with SS cladding
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
6.8	Flange/ Counter flanges				Carbon steel to IS-2062 Gr. B (conforming to ANSI B 16.5 class Min. 150 lb)
6.9	Tie Bolts & Nuts				IS 1367 Gr. 8.8 or equivalent
6.10	Nozzle flange bolt and nut				SA 193 B7/ SA 194 Gr. 2H
6.11	Nozzle flange gasket				3mm wire inserted Red Rubber
6.12	Name Plate				AISI- 316
6.13	Expander / Reducer / Spool Piece				Carbon steel to IS-2062 Gr. B, epoxy painted
6.14	Painting				
	External Surface				<p>All surface other than stainless steels shall be painted.</p> <p>The steel surface to be applied with painting shall be thoroughly cleaned before applying painting by shotblasting etc as agreed. For all the steel surfaces inside the (indoor installation) building, a coat of red oxide primer of minimum thickness of 50 microns followed up with undercoat of synthetic enamel paint of minimum thickness of 50 microns shall be applied. The top coat shall consist of two coats each: of minimum thickness of 50 microns of synthetic enamel paint and thus total thickness shall be minimum 200 microns.</p>
	a.) Surface Preparation				
	b.) Primer				
	c.) Intermediate				
	d.) Final Paint				
7.0	Extra Carrying capacity to be provided on frame assembly.	%		25	25
8.0	Mandatory Spares				
8.1	Plates	%		NIL	2% each type & size
8.2	Gaskets	%		NIL	10% of total requirement each type & size

	TECHNICAL SPECIFICATION FOR		Technical Specification No.		PE-TS-388/389-179-N001 (Rev 0)
			Vol/Section		IIB / D
	PLATE HEAT EXCHANGER		Rev		0
	DATASHEET - A	Rev.-00	Date	09.09.13	
SL. NO.	DESCRIPTION	UNIT			
			1X500 MW VINDHYACHAL STAGE-V (NTPC)		
8.3	Fasteners	%	NIL	10% each type & size	
8.4	Valve		NIL	NIL	
8.6	Definitions Regarding % & set		Quantity shall be calculated for % of total population of item in the project (if in fraction, round-off to next higher whole no.)		
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		All supplied PHEs to be tested by the vendor at site to demonstrate guaranteed performance.		
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.				

CLAUSE NO.

PROJECT INFORMATION



ANNEXURE C-I
PAGE 1 OF 5

COOLING WATER ANALYSIS

	Constituent	as	mg per litre
1.	Calcium	CaCO ₃	148.0
2.	Magnesium	CaCO ₃	37.5
3.	Sodium & Potassium	CaCO ₃	47.5
4.	Bicarbonate	CaCO ₃	104.5
5.	Chloride	CaCO ₃	47.5
6.	Sulphate	CaCO ₃	81.0
7.	Carbonate	CaCO ₃	0
8.	Silica	SiO ₂	25.0
9.	Iron	Fe	.75
10.	pH Value	-	7.6-7.9
11.	Turbidity	NTU	50

Note: The C.W system is expected to operate at about 4.0 Cycles of concentration.

APPLICABLE FOR BOTH STG AND SG PKG.

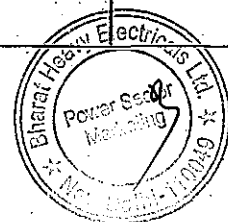
VINDHYACHAL SUPER THERMAL POWER PROJECT
STAGE-V (1X500 MW)
STEAM TURBINE GENERATOR PACKAGE


TECHNICAL SPECIFICATIONS
SECTION-VI
PART-A

PROJECT
INFORMATION

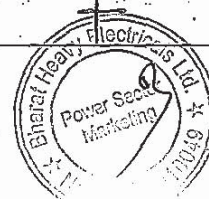
PAGE
9 OF 13

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CLAUSE NO.	PROJECT INFORMATION																				
	<p style="text-align: right;">ANNEXURE C-I PAGE 5 OF 5</p> <p style="text-align: center;">ANALYSIS OF DM WATER TO BE USED FOR MAKE-UP WATER TO CONDENSER</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Sl. No.</th> <th style="text-align: left;">Characteristics</th> <th style="text-align: left;">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 excluding the effects of free CO₂</td> </tr> </tbody> </table> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>NOTE : FOR PASSIVATED DM WATER pH IS 8.5 - 9.5</p> </div> <div style="border: 1px solid black; padding: 10px; margin-top: 20px; text-align: center;"> <p>APPLICABLE FOR BOTH STG AND SG PKG.</p> </div>		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 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 excluding the effects of free CO ₂																			
VINDHYACHAL SUPER THERMAL POWER PROJECT STAGE-V (1X500 MW) STEAM TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATIONS SECTION-VI PART-A	PROJECT INFORMATION	PAGE 13 OF 13																		

022





TITLE :
TECHNICAL SPECIFICATION FOR
PLATE HEAT EXCHANGERS

SPECIFICATION NO. PE-TS-380/381/382-179-N001

VOLUME II B

SECTION D

REV. NO. 0 **DATE 23/04/12**

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.
4	As built drawings	18 Nos.	2 Nos.


	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.	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	

		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 COLUM "N" AS ' W"	Cust. Logo	DOC. NO.:		REV.	CAT.
MANUFACTURER/ SUB-SUPPLIER	MAIN-SUPPLIER						
SIGNATURE				FOR CUST. USE	REVIEWED BY	APPROVED BY	APPROVAL SEAL


		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		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					2/3	1				D*	P	W	V	
1.	2.	3.	4.	5.	6.		7.	8.	9.	D*	** 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
	HT PLATES	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.
		Chemical Properties	MA	Chemical Analysis	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.
		Dimension	MA	Measurement	1 Sample per Heat	1 Sample per Heat	Approved drawing/ data sheet	Approved drawing/ data sheet	Inspection Report	√	2,3	-	1	

		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 COLUM "N" AS ' W"	Cust. Logo	DOC. NO.:		REV.	CAT.
MANUFACTURER/ SUB-SUPPLIER							
SIGNATURE				FOR CUST. USE	REVIEWED BY	APPROVED BY	APPROVAL SEAL

	STANDARD QUALITY PLAN	CUSTOMER:		PROJECT TITLE:		SPECIFICATION NO. :	
		BIDDER/VENDOR:		QUALITY PLAN NO.:		SPECIFICATION TITLE :	
		SYSTEM:		ITEM: PHE		SECTION :	
SHEET OF							


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	-	

		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 COLUM "N" AS ' W"	Cust. Logo	DOC. NO.:		REV.	CAT.
MANUFACTURER/ SUB-SUPPLIER	MAIN-SUPPLIER						
SIGNATURE				FOR CUST. USE	REVIEWED BY	APPROVED BY	APPROVAL SEAL

	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.	D*	** 10.			11.
2.5	PHE Structure	Workmanship and finish	MA	Measurement & Visual	100%	100%	Approved Drawings		Inspection Report	√	-	2	1	
2.6	Plate Gaskets	Presence Of Gasket	MA	Visual	100%	100%	Mfg. Spec.	Mfg. Spec.	-do-	√	2	1	-	
2.7	Plate arrangement to flow diagram	Correctness	CR	Visual as per flow diagram	100%	100%	Approved Drawing		Inspection Report		2	-	1	
2.8	Assembly of tightening bolts and nuts	Squeezing of threads on T/B	MA	Visual	100%	100%	Approved Drawing / Data sheet		-do-		2	-	1	
2.9	Plate Pack	Length	MA	Dimension Measurement	100%	100%	Approved Drawing		-do-		2	-	1	
3.0	FINAL INSPECTION													
3.1	Complete Assembly	a. Conformance to GA drg.	MA	-do-	100%	100%	-do-	-do-	-do-		2	1	-	CHP
		B. Dimensions, No. of Heat Transfer Plates, Workmanship & finish	MA	-do-	100%	100%	-do-	-do-	-do-	√	2	1	-	CHP
3.2	Unbalanced hydrostatic pressure (Primary Side)	Leakage / strength of structure	MA	Hyd. Test	100%	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%	100%	-do-		-do-	√	2	1	-	CHP.

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MANUFACTURER/ SUB-SUPPLIER	MAIN-SUPPLIER						
SIGNATURE					REVIEWED BY	APPROVED BY	APPROVAL SEAL

	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.	D*	** 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.

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MANUFACTURER/ SUB-SUPPLIER							
SIGNATURE					REVIEWED BY	APPROVED BY	APPROVAL SEAL

**PROCEDURE FOR MEASUREMENT OF HEAT TRANSFER SURFACE AREA OF THE
PHE PLATES**

Definition of Heat transfer area:

The Heat transfer area of the PHE plate is the area of the plate participating in the heat transfer process viz. the wetted surface area inside the gasketed groove of the plate as the Annexure 1.

Steps to Measure the Area:

- 1) The surface area of the plate shall be cleaned thoroughly.
- 2) Apply the developer (as used in Dye Penetrant test) over the entire surface of the plate.
- 3) Fix the reference stickers at several appropriate locations on the plate.
- 4) White light (CFL) is projected on the plate.
- 5) The entire surface area including all the geometrical features of the plate (corrugations) is captured by the 3D camera.
- 6) The 3D image of the plate is then converted into CAD format.
- 7) The surface area can be measured from the 3D- CAD drawing.

ANNEXURE -1

Heat transfer area to be measured – Shown in Hatched portion below

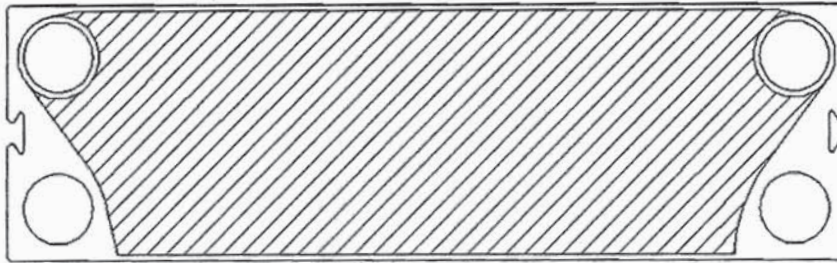


Fig. 1: Wetted Surface Area for Parallel Connection

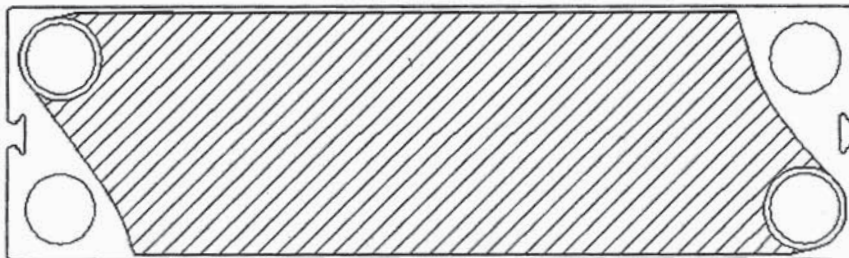


Fig. 2: Wetted Surface Area for Diagonal Connection