NEYVELI LIGNITE CORPORATION LIMITED (NLC LTD)

2 X 500 MW NEW NEYVELI TPP (NNTPP) – SG PACKAGE
2 X 500 MW NEW NEYVELI TPP (NNTPP) – TG PACKAGE

VOLUME –IIB

TECHNICAL SPECIFICATION
FOR
PLATE HEAT EXCHANGERS (PHE)

Specification No. : PE-TS-400/402-179-N001 (Rev 0)

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

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 equipment’s 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

CONTENTS

SECTION A

SCOPE OF ENQUIRY

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 per specification for the following project.

2 X 500 MW NEW NEYVELI TPP (NNTPP) – SG PACKAGE
2 X 500 MW NEW NEYVELI TPP (NNTPP) – TG PACKAGE

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.

SECTION B

PROJECT INFORMATION

SECTION - 2

2 GENERAL PROJECT INFORMATION

2.1 Introduction

The project site at Neyveli has distinct location advantages, being at pit-head distance from the source of lignite supply from Mines, making it convenient for transportation of lignite by belt conveyor. Water source is readily available from the nearby mines lake. Besides, other infrastructure such as access road, railway connection etc, already exist.

2.2 Power Plant Site

The power plant site is located at Neyveli, opposite to the now defunct Fertilizer and Briquetting & Carbonization Plant, near TPS-1 Expansion and TPS-II.

2.3 Project & Site Information

(i).	Owner/Purchaser	:	Neyveli Lignite Corporation Limited (NLC Ltd), Neyveli, Cuddalore District, Tamil Nadu State, India
(ii).	Consultant	:	Lahmeyer International (India) Pvt. Ltd (LII), Gurgaon, NCR, India.
(iii).	Project Title	:	2x500 MW Neyveli New Thermal Power Station (NNTPS)
(iv).	Location	:	200 kms south of Chennai and 50 kms south-west of Cuddalore
(v).	Latitude	:	11° 34′ 00″ N to 11° 35′ 00″ N
(vi).	Longitude	:	79° 26′ 00″ E to 79° 27′ 00″ E
(vii).	Elevation above MSL	:	+67 m
(viii).	Nearest Railway Station	:	Neyveli,
(ix).	Nearest Sea Port	:	Chennai, at a distance of 200 km
(x).	Nearest Airport	:	Chennai, at a distance of 200 km
(xi).	Road Access/Approach to Site	:	Connected by Chennai-Thanjavur NH 45C road and state highway connecting Cuddalore – Virudhachalam via Neyveli. Both NH and state high way roads are well connected to NLC township roads.The approach road is approximately 15 kms from Chennai–Thanjavur NH – 45C road
(xii).	**Site Meteorological Data**		
	• Max ambient temperature	:	42.8° C

	• Min Ambient Temperature	:	26.9° C
	• Wet bulb temp	:	29° C
	• Max. Relative Humidity	:	92 % in the month of September
	• Min. Relative Humidity	:	23 % in the month of May
	• Rainfall	:	About 1265.7 mm annually (average)
	• Wind direction	:	South West to North East direction
	• Wind Speed	:	97.2 km/hr (maximum recorded) 4.3 km/hr (average wind speed)
	• Seismicity	:	As per IS: 1893 (part 4) (Zone-II) Importance factor: 1.75.
(xiii).	Languages spoken in the region	:	English, Tamil

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SECTION C

SPECIFIC TECHNICAL REQUIREMENTS

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 Sections - C & Section - D/ Data Sheet-A, Section-C shall prevail.

Number of Plate Heat Exchangers to be supplied shall be as under:

Total Four (4) nos. PHE for 2 X 500 MW NNTPP– SG PKG (Viz. 2 Nos. [2W + 0S] per Unit
Total Six (6) nos. PHE for 2 X 500 MW NNTPP– TG PKG (Viz. 3 Nos. [2W + 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, 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.

Total Four (4) nos. PHE for 2 X 500 MW NNTPP– SG PKG (Viz. 2 Nos. [2W + 0S] per Unit
Total Six (6) nos. PHE for 2 X 500 MW NNTPP– TG PKG (Viz. 3 Nos. [2W + 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) Inspection ports at the End plates of the PHE.
(vi) Other accessories as required to make PHE's complete in all respects.
(vii) Commissioning spares, if any.

(viii) One Ratchet spanner per PHE is included in bidder's scope of supply.
(ix) Matching piece (Reducer/Expander), with coatings (as required), to match the PHE nozzle connection with connecting pipe size as indicated in Data Sheet.
(x) Mandatory spares as applicable 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-C.

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).

3.6 Based on the layout requirement, maximum length of PHE shall be restricted to 4.5 m.

4.0 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 DP Test shall be conducted for 100% 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.

4.3 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.

4.4 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.

5.0 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 of 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.

6.0 SPARES :

6.1 **Mandatory Spares**: Shall be as per data sheet A, as applicable.

7.0 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 as per NIT format.
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.
h) Thermal sizing calculation.

7.1 Other Drawings/ documents etc. shall be submitted by successful bidder after the award of contract as per NIT.

8.0 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.

SECTION - D

PLATE HEAT EXCHANGER

STANDARD TECHNICAL SPECIFICATION

DATA SHEET C

STANDARD QUALITY PLAN

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

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.

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

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

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.

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.

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.

	TECHNICAL SPECIFICATION FOR			Technical specification no	PE-TS-400-179-N001 (Rev 0)
	PLATE HEAT EXCHANGER			Vol/Section	IIB/D
	DATASHEET - A			Rev	0
				Date	01.10.2014
	PROJECT			2 X 500 MW NEW NEYVELI TPP (NNTPP)– SG PKG	
1.0	General			(SG AUX.)	
1.1	Number of Plate Heat Exchanger		Nos	Total Four (4) nos [2W+0S Per Unit]	
1.2	Arrangement			2 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			Cooling Water (Refer enclosed water analysis)	
1.6	Connecting Pipe size	(Primary Side)	NB	250	
		(Secondary Side)	NB	250	
2.0	Design				
2.1	Design Pressure		Kg/cm^2 (g)	12	
2.2	Operating Pressure	(Primary Side)	Kg/cm^2 (g)	About 9.8 Kg/sq. cm(g)	
		(Secondary Side)	Kg/cm^2 (g)	About 3.2 Kg/sq. cm(g)	
2.3	Mechanical Design Temp.		^oC	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	525	
		(ACW Side)	M^3/hr	570	
3.2	Inlet temperature	(DMCW Side)	^oC	44.8	
		(ACW Side)	^oC	36	
3.3	Outlet temp	(DMCW Side)	^oC	38	
		(ACW Side)	^oC	42.3	
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 (minimun)	Hr m^2deg 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-400-179-N001 (Rev 0)
	PLATE HEAT EXCHANGER		Vol/Section	IIB/D
	DATASHEET - A		Rev	0
			Date	01.10.2014
	PROJECT		2 X 500 MW NEW NEYVELI TPP (NNTPP)– SG PKG	
6.3	Compression/Fixed/Frame/Movable Pressure plates		Carbon steel to IS-2062 Gr. B, Epoxy painted/C.S. ASTM-283 Gr.C, epoxy painted	
6.4	Guide Rails/ bar		Carbon steel to IS-2062 Gr. B, Epoxy painted with stainless steel 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 as per IS 2062 Gr. B (Confirming to ANSI B 16.5 class, Min.-150 lb)	
6.9	Tightening Bolts/Rods & Nuts		IS-1367 Gr 8.8 or equivalent	
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		SS- AISI-316	
6.13	Painting			
	External Surface			
	a.) Surface Preparation		All surface other than stainless steels shall be painted. The steel surface to be applied with painting shall be thoroughly cleaned before applying painting by shotblasting (SA 2.5) etc shall be subjected to BHEL/NLC approval. For all the steel surfaces inside the (indoor installation) building, two coats of epoxy polymide resin based red oxide-zinc phosphate (primer) of minimum thickness of 30 microns/coat followed up with one coat of epoxy resin based paint with MIO/coal tar based epoxy paint of minimum thickness of 80 microns shall be applied. The top coat shall consist of two coats ofepoxy polyamide enamel suitably pigmented of minimum thickness of 30 microns/coat. Thus total thickness shall be minimum 200 microns.	
	b.) Primer			
	c.) Final Paint			
7.0	Extra Carrying capacity to be provided on frame assembly.	%	25	
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-402-179-N001 (Rev 0)
	PLATE HEAT EXCHANGER			Vol/Section	IIB/D
	DATASHEET - A			Rev	0
				Date	01.10.2014
	PROJECT			2 X 500 MW NEW NEYVELI TPP (NNTPP)– TG PKG	
1.0	General			(TG AUX.)	
1.1	Number of Plate Heat Exchanger		Nos	Total Six (6) nos [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			Cooling 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)	10	
2.2	Operating Pressure	(Primary Side)	Kg/cm^2 (g)	About 7 Kg/sq. cm(g)	
		(Secondary Side)	Kg/cm^2 (g)	About 3.5 Kg/sq. cm(g)	
2.3	Mechanical Design Temp.		^oC	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	1060	
		(ACW Side)	M^3/hr	1150	
3.2	Inlet temperature	(DMCW Side)	^oC	43.5	
		(ACW Side)	^oC	36	
3.3	Outlet temp	(DMCW Side)	^oC	38	
		(ACW Side)	^oC	41.1	
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 (minimun)	Hr m^2deg 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-402-179-N001 (Rev 0)
	PLATE HEAT EXCHANGER		Vol/Section	IIB/D
	DATASHEET - A		Rev	0
			Date	01.10.2014
	PROJECT		2 X 500 MW NEW NEYVELI TPP (NNTPP)– TG PKG	
6.3	Compression/Fixed/Frame/Movable Pressure plates		Carbon steel to IS-2062 Gr. B, Epoxy painted/C.S. ASTM-283 Gr.C, epoxy painted	
6.4	Guide Rails/ bar		Carbon steel to IS-2062 Gr. B, Epoxy painted with stainless steel 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 as per IS 2062 Gr. B (Confirming to ANSI B 16.5 class, Min.-150 lb)	
6.9	Tightening Bolts/Rods & Nuts		IS-1367 Gr 8.8 or equivalent	
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		SS- AISI-316	
6.13	Painting			
	External Surface			
	a.) Surface Preparation		All surface other than stainless steels shall be painted. The steel surface to be applied with painting shall be thoroughly cleaned before applying painting by shotblasting (SA 2.5) etc shall be subjected to BHEL/NLC approval. For all the steel surfaces inside the (indoor installation) building, two coats of epoxy polymide resin based red oxide-zinc phosphate (primer) of minimum thickness of 30 microns/coat followed up with one coat of epoxy resin based paint with MIO/coal tar based epoxy paint of minimum thickness of 80 microns shall be applied. The top coat shall consist of two coats ofepoxy polyamide enamel suitably pigmented of minimum thickness of 30 microns/coat. Thus total thickness shall be minimum 200 microns.	
	b.) Primer			
	c.) Final Paint			
7.0	Extra Carrying capacity to be provided on frame assembly.	%	25	
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 and Cycle of Concentration.

A.Clarified Water Quality:

S. No	DESCRIPTION	Unit	Tentative Values
1.0	Total dissolved solids	mg/l	425
2.0	Suspended solids /Turbidity	mg/l	20
3.0	Calcium hardness as $CaCO_3$	mg/l	120
4.0	Magnesium hardness as $CaCO_3$	mg/l	78
5.0	Sodium + Potassium as $CaCO_3$	mg/l	95.35
6.0	Chloride as $CaCO_3$	mg/l	84.6
7.0	Sulphate as $CaCO_3$	mg/l	84.7
8.0	M alkalinity as $CaCO_3$	mg/l	160
9.0	P alkalinity as $CaCO_3$	mg/l	Nil
10.0	Iron as $CaCO_3$	mg/l	1.25
11.0	Silica as SiO_2	mg/l	36.4
12.0	Aluminium as $CaCO_3$	mg/l	2.0
13.0	Conductivity at 30 °C	m-mho/cm	705
14.0	pH at 30 °C		7.0
15.0	Free CO_2		19.36
16.0	Total hardness (as $CaCO_3$)	mg/l	198

B. Cycle of concentration: 5

DM Water analysis:

• Conductivity	Less than 0.1 microS/cm
• Total silica	Less than 0.02 ppm
• pH	pH 8.5 to 9.5

[redacted]

STANDARD QUALITY PLAN

SHEET OF

CUSTOMER: PROJECT TITLE:

BIDDER/VENDOR: QUALITY PLAN NO.:PE-QP-999-179-N005

SYSTEM: ITEM: PLATE HEAT EXCHANGER

SPECIFICATION NO. :

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
					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	-	-	
		Workmanship And Finish	MA	Visual	100%	100%	-do-	-do-	-do-		2,3	-	-	
		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 (including thickness)	MA	Measurement	100%	Sample	Approved Drawings/ Datasheets		Inspection Reports	√	2,3	-	1	
1.3	Gaskets	Dimensions	MA	Measurement	100%	Sample	Approved Drawings/ Datasheets		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	
		Hardness	CR	Measurement	-do-	-do-	Approved Drawings		-do-	√	2,3	-	1	

MANUFACTURER/ SUB-SUPPLIER	MAIN-SUPPLIER
SIGNATURE	

LEGEND: * RECORDS, INDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.
** **1:** BHEL **2:** VENDOR, **3:** SUB VENDOR
P: PERFORM **W:** WITNESS AND **V:** VERIFICATION.
CHP: CUSTOMER HOLD POINT

Cust. Logo

FOR CUST. USE

DOC. NO.:	REV.	CAT-.
REVIEWED BY	APPROVED BY	APPROVAL SEAL

[redacted]	**STANDARD QUALITY PLAN** SHEET OF	CUSTOMER: BIDDER/VENDOR: SYSTEM:	PROJECT TITLE: QUALITY PLAN NO.:PE-QP-999-179-N005 ITEM: PLATE HEAT EXCHANGER	SPECIFICATION NO. : SPECIFICATION TITLE : SECTION :

SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CAT	TYPE/ METHOD OF CHECK	EXTENT OF CHECK 2/3	EXTENT OF CHECK 1	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	D*	AGENCY P	AGENCY W	AGENCY V	REMARKS
1.	2.	3.	4.	5.	6.		7.	8.	9.	D*	**	10.		11.
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	-	-	
		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**													
	HEAT TRANSFER PLATES	Area Measurement	MA	White Light Scanning	1 per Type	1 per Type	Approved drawing/ data sheet	Approved drawing/ data sheet	TC	√	2,3	-	1	**See Remark 4**
		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 (including thickness)	MA	Measurement	1 Sample per Heat	1 Sample per Heat	Approved drawing/ data sheet	Approved drawing/ data sheet	Inspection Report	√	2,3	-	1	
		Workmanship And Finish	MA	Visual	100%	100%	Approved drawing/ data sheet	No scratches, cracks etc.	-do-		2,3	-	1	

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

[redacted]	STANDARD QUALITY PLAN SHEET OF	CUSTOMER: BIDDER/VENDOR: SYSTEM:	PROJECT TITLE: QUALITY PLAN NO.: PE-QP-999-179-N005 ITEM: PLATE HEAT EXCHANGER	SPECIFICATION NO. : 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
					2/3	1					P	W	V	
1.	2.	3.	4.	5.	6.		7.	8.	9.	D*	** 10.			11.
		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 2**
				Light Box Test/ Vacuum chamber test	100%	2%	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 2**
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	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	-	
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	-	

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MANUFACTURER/ SUB-SUPPLIER	MAIN-SUPPLIER		FOR CUST. USE	REVIEWED BY	APPROVED BY	APPROVAL SEAL
SIGNATURE						

[redacted]	STANDARD QUALITY PLAN SHEET OF	CUSTOMER:	PROJECT TITLE:	SPECIFICATION NO. :
		BIDDER/VENDOR: SYSTEM:	QUALITY PLAN NO.: PE-QP-999-179-N005 ITEM: PLATE HEAT EXCHANGER	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
					2/3	1					P	W	V	
1.	2.	3.	4.	5.	6.		7.	8.	9.	D*	**	10.		11.
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	Torque wrench to be used & torque value to be specified.
2.9	Plate Pack	Length	MA	Dimension Measurement	100%	100%	Approved Drawing		-do-		2	-	1	
3.0	**FINAL INSPESTION**													
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. Hydro Test Duration shall be 30 minutes (Minimum). Hydro Test pressure shall be 1.5 times of Design pressure.
3.3	Unbalanced hydrostatic pressure (Secondary Side)	Leakage / strength of structure	MA	Hyd. Test	100%	100%	-do-		-do-	√	2	1	-	
3.4	Completeness of all previous tests	Completeness	MA	Verification of reports	100%	100%	Tech. Specs / App. Drawings		Completion Certificate	√	2	-	1	

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SIGNATURE				REVIEWED BY	APPROVED BY	APPROVAL SEAL

	STANDARD QUALITY PLAN SHEET OF	CUSTOMER: PROJECT TITLE: BIDDER/VENDOR: SYSTEM:	QUALITY PLAN NO.:PE-QP-999-179-N005 ITEM: PLATE HEAT EXCHANGER	SPECIFICATION NO. : 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
					2/3	1					P	W	V	
1.	2.	3.	4.	5.	6.		7.	8.	9.	D*	** 10.			11.
3.5	Painting and packing	Dry film thickness, shade, soundness & completeness	MA	Measurement & visual	100%	Random	Approved Drawings/ Data sheets	-do-	√		2	1	-	Packing photograph shall be submitted by vendor along with TCs

REMARKS:-

1. Mill TC's for HT Plates & Gaskets shall be submitted for review of BHEL.
2. 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 shell be tested in presence of BHEL & Customer. H.T. Plates without defect only shall only be accepted.
3. 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. More than 20% loss in back wall echo at any stage is also not acceptable.
4. 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.

MANUFACTURER/ SUB-SUPPLIER	MAIN-SUPPLIER
SIGNATURE	

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Cust. Logo	DOC. NO.:		REV. CAT-.
FOR CUST. USE	REVIEWED BY	APPROVED BY	APPROVAL SEAL