PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800MW)

TECHNICAL SPECIFICATION FOR PLATE HEAT EXCHANGERS

Specification No. : PE-TS-434-179-N004 (REV 0)

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

	TITLE : TECHNICAL SPECIFICATION FOR PLATE HEAT EXCHANGERS 3X800MW PATRATU STPS EXP. PH-1	SPECIFICATION NO. PE-TS-434-179-N004
		SECTION
		REV. NO. 0 / DATE 21/09/2022

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This Technical Specification consists of three Sections:

Notes:

1) For detailed list of documents to be submitted by bidder in their technical offer, please refer cl. no. 10.00.00 of Section-IIA.

2) For detailed list of documents to be submitted by vendor after award of contract, please refer Datasheet-C of Section-IIA.

3) In case there is conflict in different clauses of specification, most stringent clause (as decided by BHEL / end customer) shall be followed, if no specific deviation is taken by bidder and accepted by BHEL during tender stage in that regard.

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		SECTION I	
		REV. NO. 0	DATE 21/09/22

SECTION I

IA SPECIFIC TECHNICAL REQUIREMENTS

IB DATASHEET – A

	TITLE : TECHNICAL SPECIFICATION FOR PLATE HEAT EXCHANGERS 3X800MW PATRATU STPS EXP. PH-1	SPECIFICATION NO. PE-TS-434-179-N004	
		SECTION IA	
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1.0 GENERAL :

1.1 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 mandatory spares (as applicable), 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 applicable) as mentioned in this specification for 3X800MW Patratu STPS Expansion Phase-1 project.

Note:

PHEs have been detailed in Data Sheet-A, Section-1B. The bidder shall include complete supplies in his scope for each type of PHE. Part supplies offered shall disqualify the bidder's offer. Evaluation shall be as indicated in NIT.

The Plate heat Exchangers complete with all accessories including special tools and tackles (if any) shall conform to the Data Sheet-A (Section IB) and other requirements of section IIA. In addition, the requirements of this Section IA including Customer Specification attached at Appendix 1 (as applicable) shall also be complied with.

1.2 The bids shall be evaluated as per NIT. Ordering shall be done as per NIT.

1.3 Bidder to quote for items as per price schedule attached in NIT.

1.4 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, work or material, which in his opinion is not in conformity with the duty requirements.

2.0 SPECIFIC REQUIREMENTS:

2.1 Pressure drop across the heat exchanger on the primary & secondary water circuit to be demonstrated at site. PG test at site shall have to be conducted as per clause 8.02.00 of Section-IIA. Bidder to quote Unit Rate for PG test accordingly.

2.2 The Heat transfer plate area measurement procedure and packing procedure indicated at Section-IIA are only for reference. Project specific procedures shall be submitted by the bidder during detailed engineering for approval.

2.3 Velocity in the PHE plates shall be so chosen such that sufficient turbulence should be maintained so as to prevent any deposition on the plate surface.

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3.0 The drawing / document submission schedule shall be as per NIT. MDL shall be as follows:

PACKAGE	BHEL DRG NO	DRG TITLE
PLATE HEAT EXCHANGERS (PHE)	PE-V5-434-179-N001	Technical Data sheet of PHE
	PE-V5-434-179-N002	GA drawing of PHE
	PE-V5-434-179-N003	Thermal sizing calculation of PHE
	PE-V5-434-179-N005	QAP of PHE
	PE-V5-434-179-N004	Performance curves of PHE
	PE-V5-434-179-N006	O&M MANUAL for PHE
	PE-V5-434-179-N007	PG TEST PROCEDURE -PHE

Drawings submitted shall be complete in all respects with revised drawing submitted incorporating all comments. Any incomplete drawing submitted shall be treated as non-submission with delays to bidder's account. For any clarification/ discussion required to complete the drawings, the bidder shall himself depute his personal to BHEL for across the table discussions/ finalizations/ submissions of drawings.

4.0 Following to be complied by the bidder:

a. Supplier to submit detailed 'Bill of Material' (BoM) at the time of drawing/document submission after placement of PO. Each item of the BoM to be uniquely identified with item code no. or item serial no.
b. Supplier to ensure that all items which will find separate mention in the packing list are covered in this detailed BoM.
c. Supplier to give following undertaking in the BoM"
"The BoM provided herewith completes the scope (in content and intent) of material supply under PO no.----------, dated ----------.
Any additional material which may become necessary for the intended application of the supplied items(s)/package will be supplied free of cost in most reasonable time."

	TITLE : TECHNICAL SPECIFICATION FOR PLATE HEAT EXCHANGERS	SPECIFICATION NO. PE-TS-434-179-N004	
		SECTION IA- Appendix 1	
		REV. NO. 0	DATE 21/09/22

Appendix 1

(Customer Specification)

CLAUSE NO.	QUALITY ASSURANCE	NTPC

EQUIPMENT COOLING WATER SYSTEM

	TEST / CHECKS / ITEM / COMPONENTS	Material Test	WPS/PQR/Welder Qualification	DPT/MPI	Assembly Fit Up	Visual & Dimensional Check	UT	RT	Hydraulic / Water Fill	Balancing	Type Test	Performance Test	Other Test
A	**PLATE TYPE HEAT EXCHANGER**		Y	Y[3]	Y	Y			Y				
A.1	Heat Transfer Plates	Y[1]		Y[2]		Y							Y[7]
A.2	Gaskets	Y				Y							
A.3	Cover Plates (Front & Rear)	Y[1]				Y	Y[5]						
A.4	Tie Rods	Y[1]		Y[4]			Y[6]						
B	**HORIZONTAL CENTRIFUGAL PUMP**				Y	Y						Y[10]	
B.1	Casing	Y[1]		Y[4]		Y			Y8				
B.2	Impeller	Y[1]		Y[4]		Y				Y[9]			
B.3	Shaft	Y[1]		Y		Y	Y[6]			Y[9]			

NOTES

1 One per heat / HT batch

2 DP Test shall be conducted for 10% of the lot of HT plates. However, in case of any defect, entire lot shall be tested and only defect free plates shall be accepted.

3 100% DP Test shall be conducted on butt welds and 10% DPT on fillet weld after final run.

4 100% DPT shall be carried out on machined surfaces.

5 UT shall be done on plates with thickness 25 mm or above.

6 UT shall be done on shaft / tie rod with diameter 50 mm or above.

7 After pressing each HT plate shall be subjected to either of the following tests, as per Manufacturer Practice
a) Light Box Test b) Vacuum Test c) Air Chamber Test

8 All pressure retaining parts shall be hydrostatically tested at 200% of pump rated head or 150% of shut – off head, whichever is higher, for at least 30 minutes. No leakage is allowed.

~~9 Static and Dynamic Balancing shall be carried out on complete rotor assembly~~.

~~10 All pumps shall be tested at rated speed, for head, flow capacity, efficiency and power consumption for the entire operating range i.e. from shut off head to maximum flow. A minimum of 7 readings shall be taken to plot the curve, with one reading at design flow. Testing standard shall be HIS (Hydraulic Institute Standard) of USA.~~
~~Performance test shall be carried out with contract motor, wherever Liquidated Damages are to be ascertained based on performance test at shop.~~

~~11 For Pipes, Valves and RE Joints refer LP Piping System requirements~~.

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	TECHNICAL SPECIFICATION FOR			Technical specification no	PE-TS-434-179-N004 (Rev 0)
	PLATE HEAT EXCHANGER			Section	IB
	DATASHEET - A			Rev	0
	FOR 3X800MW PATRATU STPS EXPANSION PH-1			Date	21/9/2022
	PHE DESCRIPTION			PHE FOR ECW-COMMON STATION AUX.	
1.0	General				
1.1	Number of Plate Heat Exchanger		Nos	Three (3) nos	
1.2	Arrangement			3X50% configuration for Station	
1.3	Location			Outdoor	
1.4	Primary side (Hot) Fluid			Passivated DM water (Refer enclosed water analysis)	
1.5	Secondary side (Cold) fluid			Clarified water (Refer enclosed water analysis)	
1.6	Connecting Pipe size	(Primary Side)	NB	500	
		(Secondary Side)	NB	600	
1.7	Maximum permitted Length of the PHE		mm	6000 mm (excluding reducer)	
2.0	Design				
2.1	Design Code			Latest IS/BS/DIN/ASTM/ASME Standards	
2.2	Design Pressure		Kg/cm^2 (g)	10	
2.3	Operating Pressure	(Primary Side)	Kg/cm^2 (g)	6.0 to 7.0 Kg/sq. cm(g)	
		(Secondary Side)	Kg/cm^2 (g)	2.0 to 3.0 Kg/sq. cm(g)	
2.4	Mechanical Design Temp.		°C	60	
2.5	Heat Transfer per Sq.Mtr. Of Heat Transfer Plate		$Kcal/Hr./m^2$	6500 (Max.)	
2.6	Specific Heat of Fluid	(Primary Side)	Cal/gmDeg.C	1	
		(Secondary Side)	Cal/gmDeg.C	1	
2.7	Density of Fluid	(Primary Side)	gm/cc	1	
		(Secondary Side)	gm/cc	1	
3.0	Guaranteed Performance Requirements for each Heat Exchangers in fouled condition:				
3.1	Flow rate	(DMCW Side)	M^3/hr	1460	
		(ACW Side)	M^3/hr	1460	
3.2	Inlet temperature	(DMCW Side)	°C	44.1	
		(ACW Side)	°C	36	
3.3	Outlet temp	(DMCW Side)	°C	38	
		(ACW Side)	°C	42.1	
3.4	* Allowable pressure drop across heat exchanger from inlet to outlet in fouled conditions at 1.1 times of 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. 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.				
4.0	Additional HT plates on Design Plates		%	NIL	
5.0	Heat Transfer Coefficient/Margin				
5.1	Overall fouling resistance (minimun)		Hr m2deg C/Kcal	0.00008	
5.2	Minimum corrosion allowance on heat exchanger parts of carbon steel (e.g. pressure parts,nozzles,sliding channel and frame) (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-316	
6.2	Plate Gasket			Nitrile rubber, 65 ± 5 Deg. shore hardness	
6.3	Compression/Fixed/Frame/Movable Pressure plates			Carbon Steel, IS-2062, Gr.B, Epoxy painted	
6.4	Guide Rails/ bar			Carbon Steel, IS-2062, Gr.B, with SS Cladding	
6.5	Support Beam/ column			Carbon Steel, IS-2062, Gr.B, Epoxy painted	
6.6	Nozzle (Reducer/Expander)			Carbon steel IS 2062, Gr. B, Epoxy Coated	
6.7	Nozzle flanges			Carbon Steel IS 2062 (Confirming to ANSI B 16.5 class, Min.-150 lb) Epoxy Coated	
6.8	Flange/ Counter flanges			Carbon Steel as per IS 2062 Gr. B (Confirming to ANSI B 16.5 class, Min.-150 lb) Epoxy Coated	
6.9	Tightening Bolts/Rods & Nuts			IS-1367 Gr.8.8 or equivalent	
6.10	Nozzle flange bolts / nuts			SA 193 B7/ SA 194 2H	

	TECHNICAL SPECIFICATION FOR		Technical specification no	PE-TS-434-179-N004 (Rev 0)
	PLATE HEAT EXCHANGER		Section	IB
	DATASHEET - A		Rev	0
	FOR 3X800MW PATRATU STPS EXPANSION PH-1		Date	21/9/2022
	PHE DESCRIPTION		**PHE FOR ECW-COMMON STATION AUX.**	
6.11	**Nozzle flange gasket**		3mm wire inserted Red Rubber	
6.12	**Name Plate**		AISI 316 18'-8' SS (3 mm thick)	
6.13	**Wetted fasteners**		SS-316	
6.14	**Painting**			
	External Surface			
	a.) Surface Preparation		All surface other than stainless steels shall be painted. (a) Surface preparation shall be blast cleared using non-siliceous abrasive after usual wire brushing, which shall conform to Sa 2-1/2 Swiss Standard. (b) Primer coat shall consist of one coat of epoxy resin based zinc phosphate primer having minimum DFT of 100 microns. (c) Intermediate coat (or under coat) shall consist of epoxy resin based paint pigmented with Titanium dioxide with minimum DFT of 100 microns. (d) Top coat shall consist of one coat of epoxy paint suitable pigmented of approved shade and colour with glossy finish and DFT of 75 microns. Additionally finishing coat of polyurethane of minimum DFT of 25 microns shall be provided. The paint may be applied in one coat, in case high built paint is used, otherwise two coats shall be applied. Total DFT shall not be less than 300 microns.	
	b.) Primer			
	c.) Final Paint			
7.0	**Extra Carrying capacity to be provided on frame assembly.**	%	25	
8.0	**Spares**	**Unit of Measurement**		
8.1	**Plates**		1 Lot comprising 20% of each type (Requirement for one PHE)	
8.2	**Gaskets (All types)**		1 Lot comprising 30% of total requirement of each type & size (Requirement for one PHE)	
8.3	**Fasteners**		1 Lot comprising 10% each type (Requirement for one PHE)	
9.0	**Hydrotesting at Shop**			
9.1	**Hydrotesting Pressure**	Kg/cm2 (g)	1.5 times the design pressure	
9.2	**Duration of Hydrotesting**	Minutes	30	
10.0	**Performance curves and figures to be furnished during contact stage**			
10.1	Primary side water outlet temperature vs. Secondary side water inlet temperature.			
10.2	Primary side water flow (80% to 115%) vs. Pressure drop and outlet temperature (Secondary side flow – 100%)			
10.3	Secondary side water flow (80% to 115%) vs. Secondary side pressure drop and primary side outlet temp (Primary side flow – 100%)			
10.4	Primary side water outlet temperature vs. Primary side inlet temp.			
10.5	Film heat transfer coefficient curve			
10.6	Correction Curves.			
11.0	**Minimum Standard requirement of the PHE to be offered by the bidder.**			
11.1	Minimum Corrosion allowance on thickness (as per ASME Sec. VIII Div. I)			
11.2	Metallurgy specified above is bare minimum . Equivalent or Superior materials suitable for fluid handled is also acceptable subject to Customer/BHEL approval.			
11.3	Plate thickness should be adequate to withstand all operating conditions but with Minimum plate thickness of 0.6 mm (No negative tolerance allowed in thickness specified). The plates shall be pressed from one single piece with the corrugation being smooth, uniform and identical for every plate.			
11.4	The plate Heat exchangers shall be single pass type. 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.			
11.5	Double sealing arrangement shall be provided at outer edge and around ports with the inter space between the seals vented to atmosphere in order to avoid inter-mixing of liquids in case of gaskets failure.			
11.6	Each Plate shall be numbered in sequence with the number marked by indelible ink on each plate to permit easy reassembly.			
11.7	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.			
11.8	Painting as specified at Sl. No. 6.14 above shall be subject to customer/BHEL approval during detailed engineering.			

DM WATER ANALYSIS

Applicable for ALL Projects (PHE - Primary Side)

ANNEXURE - A-9

CLAUSE NO.	PROJECT INFORMATION NTPC

ANALYSIS OF DM WATER TO BE USED

AS

PRIMARY FLUID FOR PHEs OF ALL THE PROJECTS

S.No.	Characteristics		Value
i)	Silica (Max.)	-	0.02 ppm as SiO2
ii)	Iron as Fe	-	Nil
iii)	Total hardness	-	Nil
iv)	pH value	-	CORRECTED TO 8.5-9.5
v)	Conductivity excludingthe effects of free CO_2	-	Not more than. 0.1

CLAUSE NO.	PROJECT INFORMATION	एनटीपीसी NTPC

ANNEXURE-III

RAW WATER ANALYSIS

S.No	Constituent	As	mg/l
1	Calcium	$CaCO_3$	105
2	Magnesium	$CaCO_3$	81
3	Sodium	$CaCO_3$	70
4	Potassium	$CaCO_3$	7
	Total cations	$CaCO_3$	263
5	M- Alkalinity	$CaCO_3$	180
6	P- Alkalinity	$CaCO_3$	0
7	Chloride	$CaCO_3$	60
8	Sulphate	$CaCO_3$	23
	Total Anions	$CaCO_3$	263
9	Total Silica, Reactive Silica, Reactive Silica, Colloidal	SiO_2	17 15 2
10	Iron (Total)	Fe	0.5
11	pH	-	7.0-7.8
12	Turbidity	NTU	100
13	Total dissolved solids		350-400
14	Temperature	Deg C	20-35
15.	TOC		1.93
16.	BOD		8
17.	COD		14

CLARIFIED WATER ANALYSIS (For DM Plant Design)

Organic Matter - Less than 0.05 mg/litre (see note #1 below)
Iron Content - Less than 0.3 mg/litre
Turbidity - Less than 10 NTU
Note # 1- Organic matter shall be tested as per KMnO4 method.
Note # 2- Clarified water is being used as cooling water. The cycle of Concentration of Cooling water is 5. Other parameters of Cooling Water shall be derived based on Raw water analysis after modifying the continuous dosing of Alum as $Al_2(SO4)_3$ -70ppm on 100% Basis, Lime as Ca(OH)2 -30ppm on 100% Basis , Coagulant aid - 2ppm on 100% Basis, PAC- 25-40 ppm on 100% Basis & Chlorine Di Oxide - 2 ppm.
Note- The above dosing rate may subject to minor variation during detail engineering stage. However the design of UF shall be based on colloidal silica value given in raw water analysis.

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SECTION II

IIA STANDARD TECHNICAL SPECIFICATION
STANDARD QUALITY PLAN

BHEL	TITLE : STANDARD TECHNICAL SPECIFICATION FOR PLATE HEAT EXCHANGER	**SPECIFICATION NO.** PE-TS-999-179-N001 **VOLUME :** **SECTION : IIA** **REV. NO.** 01 **DATE :** 2/5/2018 **SHEET** 1 **OF** 1

SECTION - IIA
PLATE HEAT EXCHANGER
STANDARD TECHNICAL SPECIFICATION
DATA SHEET C

	TITLE : STANDARD TECHNICAL SPECIFICATION FOR PLATE HEAT EXCHANGER	SPECIFICATION NO. PE-TS-999-179-N001	
		VOLUME :	
		SECTION : IIA	
		REV. NO. 01	DATE : 2/5/18
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1.00.00 **GENERAL**

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

1.01.00 **SYSTEM DESCRIPTION**:

1.01.01 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 / Sea Water).

1.01.02 Passivated DM Water is circulated through various auxiliary coolers of TG/SG/Station Aux., 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.

1.01.03 The analysis of DM Water, Clarified /Sea Water (Auxiliary cooling water) to be handled by the Plate Heat Exchangers are attached as Annexure to Data Sheet-A.

1.01.04 A strainer of 2 mm size at ACW inlet lines of PHE is provided and backwashing of PHE's is not envisaged.

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 **SCOPE OF SUPPLY**:

3.01.00 The details of the Plate Heat Exchangers with the quantity, design parameters etc. to be supplied shall be as per Data Sheet-A enclosed at Section IB.

3.02.00 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 (Raw Water/ Sea Water as applicable) 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 & reducers/ expanders.

(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 for each type of 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 at DMCW side/ ACW side as indicated in Data Sheet. In case of sea Water, Matching piece on ACW Side (Secondary) shall be flanged with coatings (as required for sea water application).

(x) Spares as applicable as per data sheet A at Section IB.

3.03.00 Finish paints for touch up painting of equipment after erection at Site in sealed containers.

3.04.00 Items though not specifically mentioned in the specification but needed to complete the equipment to meet the intent of specification, shall also be deemed to be included unless otherwise specifically mentioned in exclusions.

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4.00.00 **EXCLUSIONS :**

The following are excluded from the bidder's scope:

4.01.00 Civil foundation works required for installation of the heat exchangers.

4.02.00 Piping, valves etc., on the external circuit of both primary and secondary water streams.

4.03.00 Erection & Commissioning of equipment at site.

5.00.00 **DESIGN AND CONSTRUCTION:**

5.01.00 **General Requirements:**

5.01.01 Unless otherwise necessary manufacturer's standard and proven models of the plate heat exchanger shall be supplied.

5.01.02 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. Vibration, noise, mechanical and thermal stresses shall be kept within allowable limits specified by relevant codes/ standards in design. Due attention shall be given to ease of maintenance, repair and cleaning.

5.01.03 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).

5.01.04 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.

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

5.01.06 No back wash for the heat exchangers is envisaged.

5.02.00 **Performance Requirements:**

5.02.01 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, for the specified flow rates.

5.02.02 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.

5.02.03 In the event of failure to meet the above stipulated performance requirements, the equipment will be outrightly rejected.

5.03.00 **Construction of Heat Exchanger:**

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

5.03.02 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 interspace 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.

5.03.03 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 Datasheet-A. Flanges shall be as per ANSI B 16.5 or equivalent. Thickness of pressure and frame plates shall be as per ASME Sec. 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.

5.03.04 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.

The upper carrying bar and lower guide bar shall be rigid in construction without any risk or sagging or buckling, and shall facilitate easy guiding of the plates.

5.03.05 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 all the nozzle connections. The nozzle sizes of primary / secondary streams of PHEs shall be of adequate size within acceptable range of velocity. The size selection shall be subject to approval in the event of order.

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

5.04.00 **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.

5.05.00 **Foundation And Lifting Arrangements:**

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

5.05.02 Plate heat exchanger shall be equipped with suitable lifting lugs/ eye-bolts to facilitate handling during erection and maintenance.

6.00.00 **PAINTING:**

6.01.00 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 blasing.

6.02.00 All exterior surfaces of PHEs shall be sand / shot blasted, painted with primer and finish coated with coal tar based epoxy coating of min. 250 microns thickness. Colour shade etc. shall be subject to BHEL / customer approval.

7.00.00 **SHOP INSPECTION AND TESTS:**

7.01.00 **General:**

7.01.01 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.

7.01.02 All materails 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.

7.01.03 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.

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

7.02.00 **Heat Transfer Plates:**

7.02.01 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.

7.02.02 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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7.02.03 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. Plates cleaning agent, liquid penetrant and developer shall not contain any halogen. Procedure for DP test shall be subjected to purchaser's approval. Quantum of check shall be subject to customer's/purchaser's approval in the event of order.

7.02.04 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 (Llyods, TUV or equivalent). The plates without defects only shall be accepted. Procedure for Light box test shall be subjected to purchaser's approval. Quantum of check shall be subject to customer's/purchaser's approval in the event of order.

7.02.05 **Inspection Requirements**

(i) 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.

(ii) Minimum requirement for quality Plan shall be as per quality plan attached in the Section IIA of the specification. 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.

(iii) Heat transfer area for the PHE shall be measured by White light scanning / similar method during contract stage to ascertain the correctness of heat transfer area.

Bidder to note that Heat Transfer Area measured by White Light Scanning should not have negative tolerance more than 3% w.r.t to the heat transfer area indicated by bidder. 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.

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7.03.00 **Gaskets :**

7.03.01 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.

7.03.02 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.

7.03.03 Visual and dimensional check on a sampling basis shall be done. Plates and gaskets assembled together, will be inspected for proper assembly.

7.04.00 **Frame Assembly:**

7.04.01 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.

7.04.02 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.

7.05.00 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.

7.06.00 **Nozzle and Flanged Connections:**

All materails for various nozzles, flanges, gaskets, nuts, bolts etc., shall be of tested quality and correlating test certificates for chemical and mechanical properties shall be furnished. These shall be checked for the edge preparation, fit up, orientation and satisfactory working with matching parts.

7.07.00 **Dimensional Checks**:

Dimensional checks of various components of plate heat exchanger, plate pack length etc., shall be carried out as per assembly drawings approved by BHEL.

7.08.00 **Hydrostatic Test :**

Plate heat exchanger shall by hydrostatically tested at a pressure of 1.5 times the design pressure. Pressure shall be applied first to both the sides of the plate at the same time, then only to one side and finally only to other side. Pressure shall be maintained for a minimum period of 30 Minutes for each of the three cases above and for such additional time as may be necessary to conduct the examination, for leakage. The examination shall be performed on all joints, connections and regions of high stress. Fluorescent dye shall be used during the test for ease of leak detection. There shall be no structural damage deformation of the plates.

8.00.00 **PERFORMANCE GUARANTEE AND TESTING AT SITE:**

8.01.00 **Performance Guarantee**

8.01.01 After completion of erection at site, performance test will be conducted to ensure that the plate heat exchanger operation meets the specified requirements. Rectification of all defects shall have to be done by the supplier at no extra cost to the purchaser. However the purchaser reserves the right to reject the equipment/ parts not meeting the requirement if the deficiency still persists.

8.01.02 The Plate Heat Exchanger shall be guaranteed to meet the performance requirements as given in Data Sheet-A of Section-IB and also for trouble free operation after commissioning.

8.02.00 **PG Testing at Site**

8.02.01 The guaranteed performance figures of the plat heat exchangers shall be proved by the supplier during the performance testing at site (as applicable). If the results of these tests show the non-performance of the heat exchanger to meet the guaranteed values, the supplier shall modify the heat exchanger as required to enable it to meet the guarantees.

Even If PG test is not envisaged for any project, in the event of performance shortfall at site or if insisted by customer, performance parameters (Flow, Temperature rise & Pressure drop) are to be demonstrated at site by bidder without any cost implication to BHEL.

8.02.02 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.

8.02.03 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.

8.02.04 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.

9.00.00 **QUALITY ASSURANCE & QUALITY PLAN:**

9.01.00 The Plate Heat Exchanger to be supplied shall have assured quality and workmanship.

9.02.00 Typical quality plan is enclosed in section-IIB for guidance. The bidder shall comply with these minimum requirements and shall furnish his own quality plan for approval. The quality plan shall be subjected to customer's / purchaser's approval in the event of order without any cost implication.

10.00.00 **DRAWINGS, DATA & INFORMATION TO BE SUBMITTED ALONG WITH THE OFFER:**

10.01.00 Compliance certificate (duly signed and stamped).

10.02.00 Guarantee Schedule (duly signed and stamped).

10.03.00 Thermal sizing calculations (only for reference and shall be reviewed during detailed engineering).

10.04.00 GA Drg. of PHE indicating all-important details for Layout purpose, withdrawal space required for plates, weight of assembly, nozzle & matching piece details etc. (only for reference and shall be reviewed during detailed engineering).

10.05.00 Deviation Schedule (as per NIT format; in case of nil Deviation, mention "No Deviation" in the schedule and submit).

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11.00.00 **DRAWINGS, DATA & INFORMATION TO BE SUBMITTED AFTER THE AWARD OF CONTRACT:**

The drawings, data and other documents as required in Data Sheet-C shall be furnished after the award of contract.

12.00.00 **In the event of Contradictions between Section I and Section-II of the Specification, the requirements of Section-I shall prevail over the Section-II.**

	TITLE : DATA SHEET - C PLATE HEAT EXCHANGER	SPECIFICATION NO. PE-TS-999-179-N001	
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1.00.00 **DRAWINGS, DATA AND INFORMATION TO BE SUBMITTED AFTER THE AWARD OF CONTRACT**

After the award of contract, the following drawings, data and information is to be submitted for review/ approval of BHEL as per the distribution schedule given in the enquiry.

1.01.00 Within 2 (two) weeks of the date of LOI, the following shall be submitted.

1.01.01 Data Sheet-B duly revised conforming to accepted bid.

1.01.02 Final versions of the following drawings to enable BHEL to design foundations and structures and to finalise the layout.

a) General Arrangement/ Installation drawings indicating principal dimensions, and heights of equipment being supplied, size and location of various nozzles, connections, supporting arrangement, withdrawal space, bill of quantities and materials of construction and scope of supply etc.

b) Foundation arrangement drawings showing load data on support, size and location of anchor bolts etc.

1.01.03 Sizing and calculations related to PHE/plates.

1.01.04 Performance curve and figures as indicated in Data Sheet-A (for both clean and fouled conditions).

1.01.05 Quality Plan for PHE.

1.01.06 PG Test procedure (as applicable).

1.02.00 Within the stipulated time period the following drawing/ document shall be submitted:

1.02.01 Drawings of components and details as deemed necessary.

1.02.02 Material Test Certificates.

1.02.03 Shop Tests Reports and Certificates.

1.02.04 Write-up and Instruction Manuals for Erection, Operation and Maintenance.

1.02.05 Storage Instruction.

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-TS-999-179-N001, R01	DATE: 02/05/18
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	PROJECT:		PO NO.:	DATE:
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SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	D	**			
					M	C/ N					M	C	N	
1.0	RAW MATERIAL INSPESTION													
1.1	Frame Plates & Pressure Plates, Counter Flanges, Connection Lining Material, Top And Bottom Carrying Bar.	Physical Properties	MA	Physical Test	1/ Heat	1/ Heat	App. Drg / Data Sheet	Relevant material Std.	Mill TC Or Lab Test Report	√	P,V	V	V	If co-related mill TCS are not available then check testing carried out by NABL lab
		Chemical Properties	MA	Chemical Analysis	1/ Heat	1/ Heat	App. Drg / Data Sheet	Relevant material Std.	Mill TC Or Lab Test Report	√	P,V	V	V	If co-related mill TCS are not available then check testing carried out by NABL lab
		Dimensions	MA	Measurement	100%	100%	Approved Drawings	Approved Drawings	Inspection Reports	√	P,V	V	V	
		Workmanship And Finish	MA	Visual	100%	100%	Approved Drawings	Approved Drawings	Inspection Reports	√	P,V	V	V	
		Lamination (Applicable For Frame And Pressure Plate Only)	CR	Ultrasonic Test	100%	100%	SA 435	SA 435	Inspection Reports	√	P,V	V	V	Applicable for plate thickness more than 25 mm only
1.2	Heat Transfer (HT) Plates/Coils	Physical Properties	MA	Physical Test	1/ Heat	1/ Heat	App. Drg. / Data Sheet	App. Drg. / Data Sheet	Mill TC Or Lab Test Report	√	P,V	V	V	**See Remark 1**
		Chemical Properties	MA	Chemical Analysis	1/ Heat	1/ Heat	App. Drg. / Data Sheet	App. Drg. / Data Sheet	Mill TC Or Lab Test Report	√	P,V	V	V	**See Remark 1**
		Dimensions	MA	Measurement	100%	Sample	Approved Drawings	Approved Drawings	Inspection Reports	√	P,V	V	V	

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ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	19/2/20	NIKHIL DUBEY	Checked by:	19.02.20	MOHIT KUMAR		
Reviewed by:	19/2/2020	VISHAL KR. YADAV	Reviewed by:	19/2/2020	RITESH KR. JAISWAL		

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MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-TS-999-179-N001, R01	DATE: 02/05/18
	CUSTOMER :		QP NO.: PE-QP-999-179-N004	DATE: 15/02/2020
	PROJECT:		PO NO.:	DATE:
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SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	D	**			
					M	C/ N					M	C	N	
1.3	Gaskets	Dimensions	MA	Measurement	100%	Sample	Approved Drawings	Approved Drawings	Inspection Reports	√	P,V	V	V	Co-related mill TCS to be provided.
		Workmanship And Finish	MA	Visual	100%	Sample	No damage, No Surface defects.	No damage, No Surface defects.	Inspection Reports	√	P,V	V	V	
		Contour	MA	Visual	100%	Sample	Mfg. Drgs / specification	Mfg. Drgs / specification	Inspection Reports	√	P,V	V	V	
		Hardness	CR	Measurement	100%	Sample	Approved Drawings	Approved Drawings	Inspection Reports	√	P,V	V	V	
1.4	Tightening Bolts & Nuts. (Tie Rod)	Physical Properties	MA	Physical Test	1/ Heat	1/ Heat	App. Drg / data sheet	Relevant Material Std.	Mill Tc Or Lab Test Report	√	P,V	V	V	
		Chemical Properties	MA	Chemical Analysis	1/ Heat	1/ Heat	App. Drg / data sheet	Relevant Material Std.	Mill Tc Or Lab Test Report	√	P,V	V	V	
		Dimensions	MA	Measurement	100%	100%	Approved Drawings	Approved Drawings	Inspection Reports	√	P,V	V	V	
		Workmanship and Finish	MA	Visual	100%	100%	Approved Drawings	Approved Drawings	Inspection Reports	√	P,V	V	V	
		Internal Soundness (For diameter >= 40 mm)	CR	UT	100%	100%	ASTM A 388	See Remark - 4	Inspection Reports	√	P,V	V	V	UT will be carried on raw material stage.
2.0	IN PROCESS INSPECTION													
2.1	HT PLATES	Area Measurement	NA	White Light Scanning	1 per Type	1 per Type	Approved drawing/ data sheet	Approved drawing/ data sheet	Inspection Reports	√	P,V	W	V	See Remark 2

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ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
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Reviewed by:	19/2/2020	VISHAL KR. YADAV	Reviewed by:	19/2/2020	RITESH KR. JAISWAL		

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MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-TS-999-179-N001, R01	DATE: 02/05/18
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1	2	3	4	5	6 M	6 C/ N	7	8	9					
		Physical Properties	MA	Physical Test	1 Sample per Heat	1 Sample per Heat	Approved drawing/ data sheet	Relevant Material Std.	Mill TC or Lab Test Report	√	P,V	V	V	
		Chemical Properties	MA	Chemical Analysis	1 Sample per Heat	1 Sample per Heat	Approved/ drawing/ data sheet	Relevant Material Std.	Mill TC or Lab Test Report	√	P,V	V	V	
		Dimension	MA	Measurement	1 Sample per Heat	1 Sample per Heat	Approved drawing/ data sheet	Approved drawing/ data sheet	Inspection Report	√	P,V	V	V	
		Workmanship And Finish	MA	Visual	100%	100%	Approved drawing/ data sheet	No scratches, cracks etc.	Inspection Report	√	P,V	V	V	
		Surface Defects And Cracks	CR	DP test	10%	2 % or min. 100 nos. whichever is higher	Manufacturer's DP test procedure (to be reviewed and approved by BHEL/Customer during contract stage)		DPT Report	√	P,V	W	V	See Remark 3
				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	√	P,V	W	V	See Remark 3
		PMI testing	CR	PMI test	100 %	1 Sample per Heat	Approved drawing/ data sheet	Approved drawing/ data sheet	PMI Compliance report	√	P,V	V	V	See Remark 5

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
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Reviewed by:	19/2/2020	VISHAL KR. YADAV	Reviewed by:	19/2/2020	RITESH KR. JAISWAL

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MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-TS-999-179-N001, R01	DATE: 02/05/18
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SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/ N				D	M	C	N	
2.2	Welding Procedures Specification (WPS)	Correctness	MA	Verification	100%	100%	ASME SEC-IX.	ASME SEC-IX.	QW 482 ASME SEC-IX	√	P,V	V	V	Customer /BHEL/ BHEL TPI / NPCIL, EIL, LLYODS) approved WPS shall be used for welding.
2.3	Procedure Qualification Records (PQR)	Suitability	MA	Visual & Mechanical Test	100%	100%	ASME SEC-IX.	ASME SEC-IX.	QW 483 ASME SEC-IX.	√	P,V	V	V	
2.4	Welders Performance Qualification	Welder's Performance Soundness Of Welds	MA	Visual / RT & Mechanical	100%	100%	ASME SEC-IX.	ASME SEC-IX.	QW 484 ASME SEC-IX	√	P,V	V	V	Customer /BHEL/ BHEL TPI / NPCIL, EIL, LLYODS) approved WPS shall be used for welding.
2.5	Weld joint of expander/reducer.	Welding Of Outer Flange To Reducer/Expander	MA	Visual	100%	100%	Approved Drawings	Approved Drawings	Inspection Report	√	P,V	V	V	
			CR	DPT	100%	100%	Manufacturer's DP test procedure (to be reviewed and approved by BHEL/Customer during contract stage)		DPT Report	√	P,V	W	V	
2.6	PHE Structure	Workmanship and finish	MA	Measurement & Visual	100%	100%	Approved Drawings	Approved Drawings	Inspection Report	√	P,V	V	V	
2.7	Plate Gaskets	Presence Of Gasket	MA	Visual	100%	100%	Mfg. Spec.	Mfg. Spec.	Inspection Report	√	P,V	W	V	
2.8	Plate arrangement to flow diagram	Correctness	CR	Visual as per flow diagram	100%	100%	Approved Drawing	Approved Drawings	Inspection Report	√	P,V	V	-	
2.9	Assembly of tightening bolts and nuts	Squeezing of threads on T/B	MA	Visual	100%	100%	Approved Drawing / Data sheet	Approved Drawing / Data sheet	Inspection Report	√	P,V	V	-	
2.10	Plate Pack	Length	MA	Dimension Measurement	100%	100%	Approved Drawing	Approved Drawing	Inspection Report	√	P,V	V	V	

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Prepared by:	19/2/20	NIKHIL DUBEY	Checked by:	19.02.20	MOHIT KUMAR			Reviewed by:			
Reviewed by:	19/2/2020	VISHAL KR. YADAV	Reviewed by:	19/2/2020	RITESH KR. JAISWAL			Approved by:			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-TS-999-179-N001, R01	DATE: 02/05/18
	CUSTOMER :		QP NO.: PE-QP-999-179-N004	DATE: 15/02/2020
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	ITEM: PLATE HEAT EXCHANGER	SYSTEM: DMCW/ACW	SECTION:	SHEET 5 of 6

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/ N				D	M	C	N	
3.0	FINAL INSPESTION													
3.1	Complete Assembly	a. Conformance to GA drg.	MA	Dimension Measurement	100%	100%	Approved Drawing	Approved Drawing	Inspection Report	√	P,V	W	W	
		B. Dimensions, No. of Heat Transfer Plates, Workmanship & finish	MA	Dimension Measurement	100%	100%	Approved Drawing	Approved Drawing	Inspection Report	√	P,V	W	W	
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	√	P,V	W	W	Hydro test @ 1.5 times the design pressure with 30 minutes holding time.
3.3	Unbalanced hydrostatic pressure (Secondary 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	√	P,V	W	W	Hydro test @ 1.5 times the design pressure with 30 minutes holding time.
3.4	Surface Preparation for Painting	Cleanliness (dust, dirt free, oil, grease free surface), surface profile	MA	Measurement & visual	100%	100%	Tech. Specs / App. Drawings	Tech. Specs / App. Drawings	Test Report	√	P,V	V	-	Surface profile as per SA 2.5
3.5	Painting	Dry film thickness & shade	MA	Measurement & visual	100%	100%	Customer/BHEL Tech. Spec. / Approved Data sheets		Test Report	√	P,V	V	V	
3.6	Packing	Completeness	MA	Measurement & visual	100%	100%	Customer/BHEL Tech. Spec. / Approved Data sheets		Test Report	√	P,V	V	V	Packing procedure as per Annexure B. **See Remarks 7**
REMARKS:-														

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	19/2/20	NIKHIL DUBEY	Checked by:	19.02.20	MOHIT KUMAR		
Reviewed by:	19/2/2020	VISHAL KR. YADAV	Reviewed by:	19/2/2020	RITESH KR. JAISWAL		

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Approved by:			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-TS-999-179-N001, R01	DATE: 02/05/18
	CUSTOMER :		QP NO.: PE-QP-999-179-N004	DATE: 15/02/2020
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SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/ N				D	M	C	N	

1	Co-related Mill TC's to be furnished by vendor to BHEL representative during inspection stage for review. BHEL to verify physical correlation of Mill TC's with material.
2	Inspection of Heat Transfer Plate Area Measurement shall be by White Light Scanning Method from BHEL (Refer Annexure –A). In case, inspection of plate area measurement by white light scanning method of specific PHE model has been witnessed by BHEL in past project then Type test certificates are acceptable to BHEL for same. The type test certificate shall not be more than 5 years old from date of inspection.
3.	Reg. Dye Penetrant Test & Light Box Test: There shall be random witness by BHEL/ Customer 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 be accepted.
4.	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.
5.	100% PMI Inspection for material grade of PHE Heat Transfer plates shall be from BHEL/ BHEL TPI. BHEL reserves the right to conduct random & independent PMI inspection on PHE's Heat Transfer plates to ascertain the plate material.
6.	BHEL reserves the right for conducting repeat test, if required.
7.	Photographs of packed material to be verified by BHEL before issuing MDCC.
8.	Project specific QP to be developed based on customer requirement.

LEGENDS:
*RECORDS, INDENTIFIED WITH "TICK"(√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION,
** **M**: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, **C**: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, **N**: CUSTOMER, **D**: DOCUMENTATION
P: PERFORM, **W**: WITNESS, **V**: VERIFICATION, AS APPROPRIATE
MA: MAJOR, **MI**: MINOR, **CR**: CRITICAL

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	19/2/20	NIKHIL DUBEY	Checked by:	19.02.20	MOHIT KUMAR
Reviewed by:	19/2/2020	VISHAL KR. YADAV	Reviewed by:	19/2/2020	RITESH KR. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

	TITLE : TECHNICAL SPECIFICATION FOR PLATE HEAT EXCHANGERS	SPECIFICATION NO. PE-TS-434-179-N004	
		SECTION IIA	
		REV. NO. 1	DATE 28/7/21
		SHEET 1 OF 2	

Annexure-A to Standard Quality Plan

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 shown in the **Annexure 1**.

Steps to Measure the Heat transfer 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 area 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.

	TITLE : TECHNICAL SPECIFICATION FOR PLATE HEAT EXCHANGERS	SPECIFICATION NO. PE-TS-434-179-N004	
		SECTION IIA	
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		SHEET 2 OF 2	

ANNEXURE-1

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

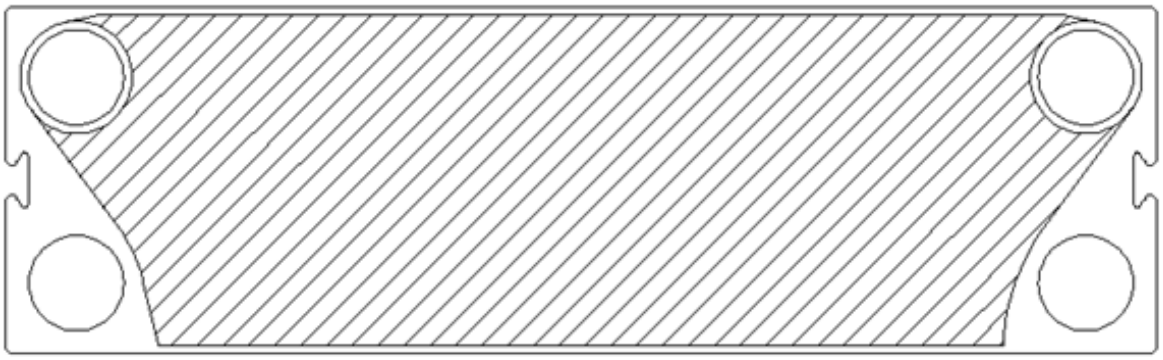

Fig. 1: Wetted Surface Area for Parallel Connection

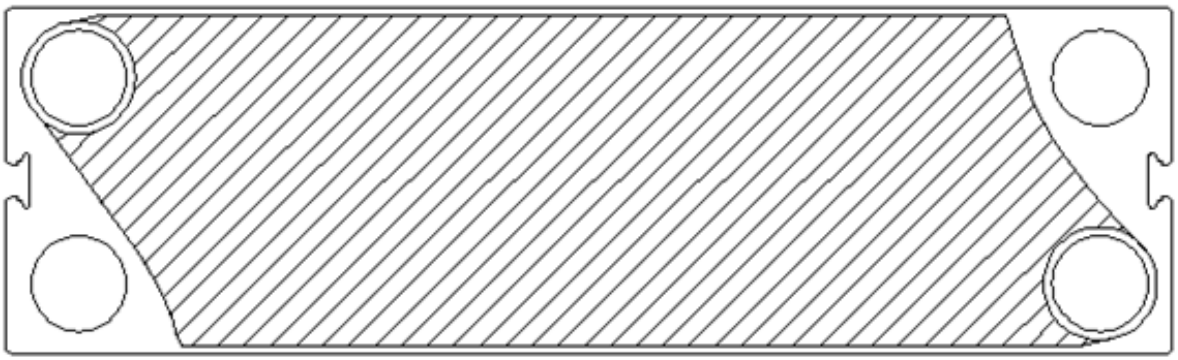

Fig. 2: Wetted Surface Area for Diagonal Connection

	TITLE : TECHNICAL SPECIFICATION FOR PLATE HEAT EXCHANGERS	SPECIFICATION NO. PE-TS-434-179-N004	
		SECTION IIA	
		REV. NO. 1	DATE 28/7/21
		SHEET 1 OF 2	

Annexure-B to Standard Quality Plan

PHE packing procedure before dispatch

1. Purpose:

The purpose of this procedure is to outline the requirements and procedures for protecting the equipment's during shipment and preserving during the storage.

2. Preparation for Packing:

- After hydro testing, operation, all fluids e.g. water etc., shall be completely drained from all PHE's, and the equipment blown dry.
- All material shall be cleaned internally and externally to remove, scale, rust fillings and any other foreign material.
- The PHE shall be placed on a strong wooden base & bolted to the wooden base using the foundation holes for further transportation upto site.

3. Protection of parts:

- Plate Heat Exchangers shall be packed in proper sizes of wooden cases. High grade woods like Rubber woods, jungle wood, hard wood, mango wood, pine wood, etc. is used for packing.
- All finished (or) machined (External C.S. Surfaces shall be protected against corrosion with corrosion resisting coating, which is easily removable (Compound shall be such that it will remain on the surface at temperature normally encountered during shipping & storage).
- All machined surfaces shall be protected from mechanical damage. All external unfinished carbon steel surfaces shall be sand blasted & shall be coated with rust preventive primer.
- Flanged opening if any shall be covered with blank flanges sealed with blank gasket of natural rubber or equivalent. Butt welded opening shall be closed with temporary closing covers. Internal threads shall be protected with metal plug sealed with Teflon tape (if applicable). External thread shall be protected with PVC sleeve.
- Wooden cases shall be covered with HDPE cloth from inside wooden box and the top. All the opening in plate heat exchanger shall be closed properly by suitably covering to prevent foreign material entering in plate heat exchanger.
- Loose material, primary and secondary a shall be packed in corrugated box and plastic
  bags with proper tagging.
- All fabricated wooden cases & crates conform to the requirement as per table given below:

Gross Weight [Kgs.]	Board Thickness	Batton / Rafter Thickness
2000 to 9000	Min. 30 mm	Min. 35 mm

	TITLE : TECHNICAL SPECIFICATION FOR PLATE HEAT EXCHANGERS	SPECIFICATION NO. PE-TS-434-179-N004	
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		REV. NO. 1	DATE 28/7/21
		SHEET 2 OF 2	

9000 to 18000	Min. 50 mm	Min. 35 mm

- All the equipment shall be protected for entire period of dispatch, storage and erection against corrosion, incidental damage due to vermin, sunlight, rain, high temperature, humid atmosphere, rough handling in transit and storage. All MS parts which are not painted shall be provided with coating of grease.
- Clay Desiccant or such other moisture absorbing material in small cotton bags shall be placed and tied at various points on the equipment, wherever necessary.

4. Special tools and Spare parts:

Special tools and tackles and spares shall be packed separately with adequate identification. Such packages shall be identified as Tools/Commissioning/Operational spares.

5. Preservation

The equipment's shall be stored under closed/open space in packed condition until installation. The packages containing loose plates and gaskets are to be protected from extreme climatic conditions.

	TITLE : TECHNICAL SPECIFICATION FOR PLATE HEAT EXCHANGERS	SPECIFICATION NO. PE-TS-434-179-N004	
		SECTION III	
		REV. NO. 0	DATE 21/09/22

SECTION III

IIIA COMPLIANCE CERTIFICATE (TO BE SUBMITTED BY BIDDER DURING TENDER STAGE).

IIIB GUARANTEE SCHDULE (TO BE SUBMITTED BY BIDDER DURING TENDER STAGE).

IIIC DATASHEET –B FORMAT (TO BE SUBMITTED BY SUCESSFUL BIDDER AFTER AWARD OF CONTRACT).

	TITLE : TECHNICAL SPECIFICATION FOR FOR PLATE HEAT EXCHANGERS	SPECIFICATION NO. PE-TS-434-179-N004	
		SECTION IIIA	
		REV. NO. 0	DATE 21/09/22

COMPLIANCE CERTIFICATE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate and furnishing same with the offer

a.) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions/ deviations with regard to same.

b.) QP/ test procedures shall be submitted in the event of order based on the guidelines given in the specification & QP enclosed therein.
QP will be subject to BHEL/Customer approval in the event of order & customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc.
The charges for 3rd party inspection (Lloyds, TUV or equivalent) for imported components shall be included in the base price of the equipment by the bidder.

c.) All drawings/data – sheets etc. to be submitted during contract shall be subject to BHEL/Customer review/ approval.
GA drawings, as submitted with offer at tender stage are for reference purpose only and shall be subject to approval during contract stage.

d.) There are no other deviations with respect to specification other than those furnished in the 'Schedule of Deviations'.

e.) The offered materials shall be either equivalent or superior to those specified. Also for components where material is not specified it shall be suitable for intended duty, materials shall be subject to approval in the event of order.

f.) The commissioning spares (if any) are supplied on 'As Required Basis' & prices for same included in the base price (If bidders reply to this is "No commissioning spares are required" and if some spares are actually required during commissioning same shall be supplied by bidder without any cost to BHEL).

g.) All sub vendors shall be subject to BHEL/CUSTOMER approval.

h.) Any special tools & tackles, if required, shall be in bidder's scope.

i.) Performance Guarantees for PHE's shall stand valid as per commercial terms and conditions.

j.) Regarding bidder's association with their respective Principals (Plate & Gasket supplier) bidder confirms the following:

i. Plate supplier shall vet the thermal design of PHE at tender and contract stage and certify the adequacy of design and number of plates.
ii. Guarantee schedule duly vetted by Principal shall be submitted during contract stage.
iii. Bidders have back to back arrangement with their principal for technical guarantees.

	SCHEDULE OF PERFORMANCE GUARANTEES FOR PLATE HEAT EXCHANGER		SPECIFICATION NO.	PE-TS-434-179-N004
			Section	IIIB
			Rev No.	0

SL. NO.	DESCRIPTION	UNIT	GUARANTEE VALUE
	(To be Filled separately for each type of PHE)		
1.0	**PRIMARY SIDE (HOT WATER SIDE)**		
	CLEAN CONDITION		
a)	Flow rate	M^3/Hr.	
b)	DMCW inlet temperature	^oC	
c)	DMCW outlet temperature	^oC	
d)	Pressure drop	MWC	
2.0	**SECONDARY SIDE (COLD WATER SIDE)**		
	CLEAN CONDITION		
a)	Flow rate	M^3/Hr.	
b)	ACW inlet temperature	^oC	
c)	ACW outlet temperature	^oC	
d)	Pressure drop	MWC	
3.0	**PRIMARY SIDE (HOT WATER SIDE)**		
	FOULED CONDITION		
a)	Flow rate	M^3/Hr.	
b)	DMCW inlet temperature	^oC	
c)	DMCW outlet temperature	^oC	
d)	Pressure drop	MWC	
4.0	**SECONDARY SIDE (COLD WATER SIDE)**		
	FOULED CONDITION		
a)	Flow rate	M^3/Hr.	
b)	ACW inlet temperature	^oC	
c)	ACW outlet temperature	^oC	
d)	Pressure drop	MWC	

PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE

NAME

SIGNATURE

DATE

1075498/2022/PS-PEM-MSE

बी एच ई एल BHEL	Title **DATA SHEET - B**	**SPECIFICATION NO.** PE-TS-434-179-N004
	PLATE HEAT EXCHANGER	VOLUME **III** SECTION **B**
		SHEET 1 OF 7

INSTRUCTION TO BIDDER

1. This data sheet shall be read in conjunction with Specification No. PE-TS-434-179-N004, Section – IA & IB.
2. Items which deviate from Specification shall be marked with an asterisk (*)

SL.NO.	ITEM	UNIT	PARTICULARS	
1.0	**General**			
1.1	Number of plate heat exchangers being supplied.	Nos.		
1.2	Manufacturer			
1.3	Model Number/ Type			
1.4	Whether single or double pass			
1.5	Flow Pattern			
2.0	**Design**			
2.1	Design Pressure	bar (g)		
2.2	Design Temperature	^{o}C		
2.3	Heat Load(without LMTD correction)	KW		
2.4	Heat Load(with LMTD correction)	KW		
2.5	LMTD (Corrected)	^{o}C		
3.0	**Guaranteed Performance for Each Heat Exchanger (in fouled condition)**		**Primary Side (Hot Fluid)**	**Secondary Side (Cold Fluid)**
3.1	Flow rate	M^3/hr		
3.2	Inlet temperature	^{o}C		
3.3	Outlet temperature	^{o}C		
3.4	Total pressure drop across heat exchanger from inlet to outlet(including inlet & outlet nozzles) a) For design flow b) For 110% design flow rate	bar		
4.0	**Heat Transfer & Fluid flow data**		**Primary Side (Hot Fluid)**	**Secondary Side (Cold Fluid)**
4.1	Film heat transfer co-efficient	$KCal/hrM^2\ ^{o}C$		
4.2	Fouling factor	$M^2hr\ ^{o}C/KCal$		

Name of Bidder/ Vendor					
Revision Number	**0**	**1**	**2**	**3**	**4**
Signature of Bidder/ Vendor Authorised Representative					
Date :					

बी एच ई एल BHEL	Title **DATA SHEET - B**	**SPECIFICATION NO.** PE-TS-434-179-N004
	PLATE HEAT EXCHANGER	VOLUME **III** SECTION **B**
		SHEET 2 OF 7

INSTRUCTION TO BIDDER

1. This data sheet shall be read in conjunction with Specification No. PE-TS-434-179-N004, Section – IA & IB.
2. Items which deviate from Specification shall be marked with an asterisk (*)

SL.NO.	ITEM	UNIT	PARTICULARS
4.3	Overall fouling	M^2 hr^{o}C/KCal	
4.4	Overall heat transfer coefficient	KCal/hrM^2 ^{o}C	
	a) In clean conditions		
	b) In fouled conditions		
4.5	Total effective heat transfer area per heat exchanger	M^2	
4.6	Average velocity	m/s	
	a) Through ports		
	b) Through Plate Channels		
4.7	Pressure drop in ports	bar	
4.8	Pressure drop in channels	bar	
4.9	Maximum differential pressure between hot and cold fluids in plate channels (operating)	bar (g)	
5.0	**Heat Transfer Plates**		
5.1	Area of each plate	M^2	
5.2	Dimension (width x height)	mm x mm	
5.3	Thickness	mm	
5.4	Material & chemical composition		
5.5	Number of plates per heat exchanger	Nos.	
5.6	Maximum number of plates that can be accommodated in the heat exchanger frame	Nos.	
5.7	Type of corrugation		
5.8	Minimum plate pack length	mm	

Name of Bidder/ Vendor					
Revision Number	**0**	**1**	**2**	**3**	**4**
Signature of Bidder/ Vendor Authorised Representative					
Date :					

बी एच ई एल BHEL	Title **DATA SHEET - B**	**SPECIFICATION NO.** PE-TS-434-179-N004
	PLATE HEAT EXCHANGER	VOLUME **III** SECTION **B**
		SHEET 3 OF 7

INSTRUCTION TO BIDDER

1. This data sheet shall be read in conjunction with Specification No. PE-TS-434-179-N004, Section – IA & IB.
2. Items which deviate from Specification shall be marked with an asterisk (*)

SL.NO.	ITEM	UNIT	PARTICULARS
	a) As per 5.5 above b) As per 5.6 above		
		mm	
	Maximum plate pack length a) As per 5.5 above b) As per 5.6 above		
5.9	Average spacing between two plates	mm	
5.10	Hold up volume of each passage	M^3	
5.11	Port size (diameter)	mm	
6.0	**Plate Gaskets**		
6.1	Type		
6.2	Material and composition		
6.3	Thickness of gasket	mm	
6.4	Hardness of gasket		
6.5	Expected life of gasket		
7.0	**Carrying Bar**		
7.1	Type of construction		
7.2	Number per heat exchanger		
7.3	Size		
7.4	Material		
8.0	**Guide Bar**		
8.1	Type of construction		
8.2	Number per heat exchanger		
8.3	Size		
8.4	Material		
9.0	**Frame Plate**		

Name of Bidder/ Vendor					
Revision Number	**0**	**1**	**2**	**3**	**4**
Signature of Bidder/ Vendor Authorised Representative					
Date :					

बी एच ई एल BHEL	Title **DATA SHEET - B**	**SPECIFICATION NO.** PE-TS-434-179-N004
	PLATE HEAT EXCHANGER	VOLUME **III** SECTION **B**
		SHEET 4 OF 7

INSTRUCTION TO BIDDER

1. This data sheet shall be read in conjunction with Specification No. PE-TS-434-179-N004, Section – IA & IB.
2. Items which deviate from Specification shall be marked with an asterisk (*)

SL.NO.	ITEM	UNIT	PARTICULARS	
9.1	Type of Construction			
9.2	Material			
10.0	**Pressure Plate**			
10.1	Type of construction			
10.2	Material			
11.0	**Supporting Columns**			
11.1	Type of Construction			
11.2	Material			
12.0	**Clamping/Gasket Compression Arrangement**			
12.1	Type of arrangement			
12.2	Tie Rod size & material (Length to take care 25% extra plates)			
12.3	Tie Rod Nuts size & material			
12.4	Nozzle flange stud size & material			
12.5	Nozzle flange Nut size & material			
13.0	**Inlet & outlet Connection Nozzles**		**Primary Side (Hot Fluid)**	**Secondary Side (Cold Fluid)**
13.1	Size	mm		
13.2	Rating			
13.3	Facing & drilling standard			
13.4	Flange material			
13.5	Are all nozzles counter-flanges, bolts, nuts, gaskets etc., are included in the		YES/NO	

Name of Bidder/ Vendor					
Revision Number	**0**	**1**	**2**	**3**	**4**
Signature of Bidder/ Vendor Authorised Representative					
Date :					

	Title **DATA SHEET - B**	**SPECIFICATION NO.** PE-TS-434-179-N004
	PLATE HEAT EXCHANGER	VOLUME **III** SECTION **B**
		SHEET 5 OF 7

INSTRUCTION TO BIDDER

1. This data sheet shall be read in conjunction with Specification No. PE-TS-434-179-N004, Section – IA & IB.
2. Items which deviate from Specification shall be marked with an asterisk (*)

SL.NO.	ITEM	UNIT	PARTICULARS
	offer?		
14.0	Recommended Cleaning frequency of the heat exchanger for assumed fouling factor	Months	
15.0	Is backwash necessary		YES/NO
16.0	Are all auxiliaries and accessories included in the offer		YES/NO
17.0	Are all counter-flanges with nuts, bolts and gaskets for all terminal points included in the offer?		YES/ NO
18.0	Are all heat exchangers supplied with necessary foundation plates, anchor, bolts, sleeves, inserts, lifting lugs etc., as specified.		YES/ NO
19.0	**Shop Tests & Inspection**		
19.1	Whether all the tests and inspections as detailed in the specification/ quality plan are carried out		YES/ NO
19.2	Hydrostatic Test :		
	a) Test Pressure	bar (g)	
	b) Test duration	min.	
19.3	Are all plates checked for cracks and other defects by the penetration method?		YES/NO

Name of Bidder/ Vendor					
Revision Number	**0**	**1**	**2**	**3**	**4**
Signature of Bidder/ Vendor Authorised Representative					
Date :					

बी एच ई एल BHEL	Title **DATA SHEET - B**	**SPECIFICATION NO.** PE-TS-434-179-N004
	PLATE HEAT EXCHANGER	VOLUME **III** SECTION **B**
		SHEET 6 OF 7

INSTRUCTION TO BIDDER

1. This data sheet shall be read in conjunction with Specification No. PE-TS-434-179-N004, Section – IA & IB.
2. Items which deviate from Specification shall be marked with an asterisk (*)

SL.NO.	ITEM	UNIT	PARTICULARS
	If not, what percentage is checked?		
19.4	Is hardness test conducted for plate gaskets?		YES/NO
20.0	**Details of Painting**		
20.1	***Exterior surface*** a) Surface preparation b) Primer c) Finish Preparation		
20.2	***Interior Surface*** a) Surface preparation b) Primer c) Finish Preparation		
21.0	Weight of each heat exchanger a) Empty b) Flooded Flooded Weight of heat exchanger with Max. Plates	kg.	
22.0	Overall dimensions - (Length x Breadth x Height)	mm x mm x mm	
23.0	withdrawal space		
24.0	Recommended Maintenance tools and tackles furnished		Yes/No

Name of Bidder/ Vendor					
Revision Number	**0**	**1**	**2**	**3**	**4**
Signature of Bidder/ Vendor Authorised Representative					
Date :					

	Title **DATA SHEET - B**	**SPECIFICATION NO.** PE-TS-434-179-N004
	PLATE HEAT EXCHANGER	VOLUME **III** SECTION **B**
		SHEET 7 OF 7

INSTRUCTION TO BIDDER

1. This data sheet shall be read in conjunction with Specification No. PE-TS-434-179-N004, Section – IA & IB.
2. Items which deviate from Specification shall be marked with an asterisk (*)

SL.NO.	ITEM	UNIT	PARTICULARS
25.0	Mesh Size of recommended Strainer	mm	
26.0	Foundation nuts and bolts supplied		Yes/No
27.0	Other information (if any)		

Name of Bidder/ Vendor					
Revision Number	**0**	**1**	**2**	**3**	**4**
Signature of Bidder/ Vendor Authorised Representative					
Date :					

3X800MW PATRATU STPS EXPANSION PHASE-I

PRICE SCHEDULE FOR PLATE HEAT EXCHANGER PACKAGE

SL. No.	DESCRIPTIONS OF WORKS OR EQUIPMENT	HSN CODE	UOM	TOTAL QTY.
1	2		3	4
A	Total Price for Design, manufacture, assembly, inspection and testing, at manufacturer's and / or his sub contractor's works, painting, properly packed for transportation and delivery of Plate Heat Exchangers for Common Station Aux. along with mandatory spares complete with all accessories, special tools & tackles (if any), commissioning spares (if any), counter flanges with nuts, bolts, gaskets and coatings (wherever necessary) etc. as specified in the Technical specification No. PE-TS-434-179-N004 (Rev 0) .			
	Break up of 'A' above			
A.1	**PHE for ECW-Common Station Aux.**		NOS.	3
A.2	**Lumpsum price for following Mandatory spares (also specified in Data Sheet-A) Break-up as under:**			
A.2.1	**PHE for ECW-Common Station Aux.**			
A.2.1.1	**Plates**		LOT	1 Lot comprising 20% of each type (Requirement for one PHE)
A.2.1.2	**Gaskets (All type)**		LOT	1 Lot comprising 30% of total requirement of each type & size (Requirement for one PHE)
A.2.1.3	**Fasteners**		LOT	1 Lot comprising 10% each type (Requirement for one PHE)
	Total (A.1+A.2)			
B	**Lumpsum Site Performance Testing of all PHE's.**	**SAC CODE**	UOM	TOTAL QTY.
			SET	3
C	**Grand Total (A+B)**			

NOTES :

1) Bidder to note that total price indicated above at C shall be considered complete in all respect for the full scope defined and considering all terms and conditions agreed.

2) Quantities indicated above shall be known as Order Quantities. The variation in Quantity shall be as per NIT.

3) Unit prices quoted by bidder, as above, shall be binding for any quantity variation.

4) Price of commissioning & erection spares, special tools & tackles and other accessories not listed above shall be included in the price of PHE & shall be supplied with the PHE.

5) Price break up for items not asked are deemed to be included in Sl.no '**A'** of this price schedule.

Notes related to Mandatory Spares:

6) Wherever quantity has been specified as percentage (%), it shall mean percentage (%) of the requirement for one PHE, unless specified otherwise and the fraction will be rounded off to the next higher whole number.

7) Wherever the quantities have been indicated for each type, size etc., these shall cover all the items to be supplied and installed.

8) Any item indicated as 'not applicable' or 'na' in its offer by the bidder and later on during detailed engineering found applicable, same shall be supplied by the bidder without any cost implication to BHEL/Purchaser.

1075511/2022/PS-PEM-MSE

	PRE-QUALIFYING REQUIREMENTS (TECHNICAL) - PLATE HEAT EXCHANGERS (PHE)	DOCUMENT NO: PE-TS-434-179-N004 REVISION NO: 03 DATE: 03/08/2021 SHEET: **1** of **3**

FORM NO. PEM 6100-0

ENQUIRY NO.:

PROJECT: 3X800MW NTPC PATRATU STPS EXPANSION PHASE-1

PACKAGE: PLATE HEAT EXCHANGER (PHE) – COMMON STATION AUX.

1. The bidder should have designed, manufactured, tested, inspected & supplied the PHE with minimum heat load of **2671800 Kcal/hr**, which have been successfully in use for at least 1 year in thermal power plant or similar industry/ application and bidder is in business of PHE on continuous basis.

2. Offers of the JV companies/ Joint Bidders/ bidders having collaboration / licensing agreement/ MOU/ Indian subsidiaries meeting the PQR at sl. no. 1 above shall be evaluated as follows:

   a. If bidder happens to be an Indian subsidiaries of foreign OEM, then the credentials of the foreign OEM can also be considered for meeting PQR.

   b. If bidder happens to be the Joint Venture Company, then the credentials of any of JV partners can be also considered for meeting PQR.

   c. If bidder happens to bid jointly with their partner, then credentials of both the partners will be considered for meeting PQR as per distribution of the work. In all such cases, lead bidder as specified in bid documents shall be responsible for overall execution of the contract and all guarantee/ warranty

   d. If bidder happens to be the having valid collaboration agreement/ MOU/ licensing agreement with some other company, then the credentials of collaborator/ MOU partner/ licensing company can also be considered for meeting PQR.

Notes:

i) Bidder quoting on above route(s) should be manufacturer of PHE and qualifying on the basis of credentials of his principal/ JV partner/ Collaborator/ MOU partner/joint bidder/licensing Company etc., then the principal/ JV partner/ Collaborator/ MOU partner/ joint bidder/ licensing Company shall be responsible for overall design vetting and warranty/ guarantee of the package. The scope matrix clearly defining their respective roles including design vetting, manufacturing of critical component, E&C etc. and warranty/ guarantee shall be submitted along with the offer.

ii) Bidder to note that the arrangement of bidding (joint bid partners/ collaborator/ MOU partner/ licensing company etc.) once offered to BHEL as a part of bidding documents cannot be changed till the execution of the project.

3. The Bidders shall furnish following support documents for assessment of Bidder

	PRE-QUALIFYING REQUIREMENTS (TECHNICAL) - PLATE HEAT EXCHANGERS (PHE)	DOCUMENT NO: PE-TS-434-179-N004 REVISION NO: 03 DATE: 03/08/2021 SHEET: **2** of **3**

w.r.t. PQR as indicated at Sl. No. 1 above:

A. Bidder's Experience list of PHE for last 5 years (as on the enquiry/NIT date) for assessment of bidder for supplying the PHE on regular basis for establishing business continuity in the enclosed format- Annexure-1.

Bidder shall furnish the PO copy of at least one executed Contract as indicated in the experience list.

B. Bidder shall furnish any one from below in support of successful performance of PHE for one year:

i. Satisfactory Performance feedback certificates from End Customer (Owner) (in English) for at least one successfully executed contract which has been in use for at least one year indicating salient features like year of commissioning of PHE, rating of project, flow & heat load of PHE, project name etc., date of issue of certificate and name/ designation of the certificate issuer for power plant/similar application industry. The time duration of satisfactory performance completion should be before the date of subject enquiry/NIT.

OR

ii. The bidder has been awarded one repeat contract for PHE from End Customer (Owner) / Purchaser (in English) for power plant/similar application industry. Repeat contract shall be considered when the second contract is given by the same purchaser/ owner after lapse of minimum 1 year from execution (viz. supply) of first contract. Supporting documents for execution of the first contract like dispatch[N2] details or commissioning report or PG test report along with the PO Copy to be furnished, if bidder intends to submit the documents for Repeat Contracts. The date of repeat contract order should not be later than the date of subject enquiry/NIT.

Notes:-

N1 - Purchase order copy, supporting drgs/technical data sheets etc. are to be submitted along with the bid for which the bidder intends to furnish the performance feedbacks / repeat contracts for reference purpose only.

N2 - Dispatch details shall include any one of the following documents:
a. Tax Invoice.
b. Site receipt/Receipted LR.
c. Customer's material dispatch clearance certificate.

N3 – Purchase order for spare items shall not be considered as repeat order qualifying criteria.

Any additional document required in support of above documents to establish the co-relation between the above documents and the supplied item shall be provided by the

	PRE-QUALIFYING REQUIREMENTS (TECHNICAL) - PLATE HEAT EXCHANGERS (PHE)	DOCUMENT NO: PE-TS-434-179-N004
		REVISION NO: 03 DATE: 03/08/2021
		SHEET: **3** of **3**

	bidder.
	4. Bidder to submit all supporting documents in English. If documents submitted by bidder are in language other than English, a self-attested English translated document should also be submitted.
	5. Notwithstanding anything stated above, BHEL reserves the right to assess the capabilities and capacity of the bidder/collaborators to perform the contract, should the circumstances warrant such assessment in the overall interest of BHEL.
	6. After satisfactory fulfilment of all the above criteria/ requirement, offer shall be considered for further evaluation as per NIT and all the other terms of the tender.
	7. Consideration of offer shall be subject to customer's approval of bidders, if applicable.

EXPERIENCE LIST

ANNEXURE-1

EXPERIENCE LIST

PROJECT NAME	END CUSTOMER	PHE PARAMETERS			HEAT TRANSFER AREA (sq.m.)	PHE MODEL NUMBER	No. OF PHE's SUPPLIED	TYPE OF FLUID	PLATE MATERIAL	YEAR OF SUPPLY	PERFORMANE FEEDBACK CERTIFICATE ENCLOSED (Y/N)
		FLOW (Cu M/Hr.)	TEMP RISE (Deg. Cel.)	HEAT LOAD							

3 x 800 MW PVUNL PATRATU TPP PHASE-I							
HEAT EXCHANGERS (PLATE TYPE)- (Types: Common Station Aux.)							
Item Number	**Item Title**	**Item Description**	**Item Quantity**	**Unit of Measure**	**Consignee ID**	**Delivery Period (In number of days)**	**Quote/Unquote**
1	PHE for ECW-Common Station Aux. For details refer technical Specification.	179-11012-A	3	NOS	PATRATU_CON1	999	
2	HEAT EXCHANGERS PLATE TYPE- MANDATORY SPARES. For details refer technical Specification.	179-11000-B	1	LOT	PATRATU_CON1	999	
3	PG TEST. For details refer technical Specification.	179-11002-A	3	SETS	PATRATU_CON1	999	

PEM / PG-III, BHEL, Noida

SPECIAL CONDITIONS OF CONTRACT (SCC) Rev-0

3 x 800 MW PVUNL PATRATU TPP PHASE-I (Job No. 434)

These Conditions shall be read and construed along with General Conditions of Contract (GCC) rev.06 & GST related Corrigendum to GCC rev.06, to be enclosed along with the tender enquiry. In case of any conflict or inconsistency, the conditions given in SCC shall prevail over the GCC and its corrigendum.

Sl No.	Title	Description
1.	Project Name	3 x 800 MW PVUNL PATRATU TPP PHASE-I (EPC)
2.	Nature of project & Type of Bidding	Non-Mega & ICB (International Competitive Bidding)
3.	Customer Order Ref No	01/PVUNL-CS-9585-001-2/NOA-FC dated 08.03.2018 01/PVUNL-CS-9585-001-2/NOA-SC dated 08.03.2018 01/PVUNL-CS-9585-001-2/NOA-TC dated 08.03.2018
4.	BHEL's Customer	PATRATU VIDYUT UTPADAN NIGAM LIMITED (subsidiary of NTPC Limited in joint venture with JBVNL)
5.	**PVUNL GST No.**	**20AAICP3718K1ZH**
6.	Customer Consultants	No consultant
7.	Consignee Address (Bill To)	For supply package: BHEL, Power Sector-Project Engineering Management, Power Project Engineering Institute, Plot No. 25, Sector-16A, Noida, Uttar Pradesh-201301. **GSTIN: 09AAACB4146P2ZC** **For turnkey packages** (where BHEL-PEM will issue only the LOA and Purchase Order shall be issued by BHEL-PSWR): Construction Manager, BHEL site office, Patratu Vidyut Utpadan Njigam Ltd , PO: PTPS , Patratu , Ramgarh, Jharkhand - 829119 **BHEL PSWR GSTIN No.- 27AAACB4146P1ZF**
8.	Delivery Address (Ship To)	Construction Manager, Bharat Heavy Electricals Limited, Patratu Vidyut Utpadan Njigam Ltd, PO: PTPS , Patratu , Ramgarh ,Jharkhand - 829119
9.	BHEL Site Office Address	Construction Manager, Bharat Heavy Electricals Limited, Patratu Vidyut Utpadan Njigam Ltd , PO: PTPS , Patratu , Ramgarh, Jharkhand - 829119
10.	Location of Plant	Site is Located just outside the coal belt of South Karanpura in Ramgarh District of Jharkhand State. The nearest Railway Station is Patratu which is at a distance of about 4 km on Barkakhana-Barwadih Railway line. **District: Ramgarh (state- Jharkhand)** **Next big cities to site: Ranchi** **Nearest Railway Station: - Patratu** **Nearest Airport: Ranchi (45 km by road from site)**
11.	Mode of Dispatch	Air, Road, Rail & Sea Transportation For indigenous supplies: By Rail/Road on door delivery and freight pre-paid basis. For imported supplies: On C&F basis. Transit Insurance will be in BHEL scope
12.	Road Permit /E-waybill	Road Permit / E-way bill, to be arranged by Supplier/ transporter/ BHEL (as per GOI mandate).
13.	BHEL GSTIN Details	For supply packages: BHEL-PEM is registered in the State of Uttar Pradesh with GSTIN 09AAACB4146P2ZC

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		For Turnkey packages: BHEL PSWR GSTIN No.- 27AAACB4146P1ZF
14.	Transit Insurance	In BHEL Scope. For each dispatch, vendor shall inform the following to the Underwriter under intimation to BHEL-PEM and BHEL Site office: (i) Policy No. (ii) Consignee Name. (iii) Consignment Details (items with their weights and value (in INR). (iv) Project Name and P.O. No. (v) LR No. and date, Dispatch origin and destination details, Invoice No. Vendors to intimate the underwriters quoting the insurance Policy No. as mentioned in Purchase Order.
15.	Dispatch intimation	Yes in writing, Not less than 30 (Thirty) days prior to date of shipment and dispatch details to be sent to: BHEL Site office (As mentioned in Sl. No. 9) BHEL PEM Noida (As mentioned in NIT) At the point of dispatch, vendor must furnish docs required as given below through Email / Fax i. Vendor's invoice ii. LR / RR / GR / Courier Receipt iii. Packing List/ Challan indicating the items dispatched (with their weights) iv. Insurance intimation letter informing the underwriters about the dispatches v. MDCC (of BHEL / NTPC) as applicable vi. Photograph of packing / boxes showing dispatch marking as per Sl. No. 26
16.	Document required for Vendor's payment.	**For materials originating from Indian territory** For claiming the payment against dispatch, MRC & Freight, documents as mentioned in GCC rev 06 & its corrigendum shall be submitted by vendor to BHEL. Original money receipt must be submitted for Freight payment. **Packing List** must comply to Clause No. ~~19.3 of General Commercial~~ Terms & ~~Conditions of~~ GCC rev.06. Description of items in packing list shall be as per PO such that proper correlation between PO & packing list must be furnished. Soft copy of documents for claiming payment shall be submitted by vendor as advance copy. **For materials originating from non-Indian Territory** Three (3) original and Three (3) copies of clean bill of lading or One (1) clean original Airway Bill & Three (3) copies, in case of air freight. One (1) original and Three (3) copies of signed Invoices One (1) original and Three (3) copies of Packing List (clearly showing number of packages, gross weight and net weight). Three (3) copies of certificate of country of origin. Copy of MDCC from BHEL / NTPC (as applicable) Three (3) copies of inspection certificate, if any, issued by the customer/his authorized representative. Three (3) of certificate from the vendor to the effect that drawings and catalogues for customs clearance purpose have been kept with the packages for shipment. Three (3) copies of certificate from the vendor to the effect that the contents in each case are not less than that entered in the invoices and guaranteed as new and as per the relevant technical specifications. Shipping Specification – One (1) copy. Quality Certificate – One (1) copy. Approved Test Certificates, if any. - Three (3) copies. Guarantee Certificate – One (1) Original + One (1) copy.

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		Inspection Reports – One (1) Original + One (1) copy. PVC Calculation and copy of all applicable indices, if PVC applicable. – Two (2) copies.
17.	Material Receipt Certificate (MRC)	A) For supply packages- BHEL-PEM will arrange MRC from BHEL site B) For Turnkey (Supply + Erection & Commissioning) – Original MRC duly signed by customer (PVUNL) & BHEL site is to be arranged by Vendor.
18.	Buyer and Paying Authority	For packages where PEM will issue the Purchase Order: **BHEL PEM** will be the paying authority. For packages where BHEL-PEM will issue only the LOA and Purchase Order shall be issued by BHEL-PSWR: **BHEL Patratu Site will be the paying Authority.**
19.	Demurrage charges	Demurrage charges shall be paid by supplier/ vendor only to the transporter. No claim shall be acceptable to BHEL in this regard.
20.	Unloading, Storage & Movement of material at site	a) By BHEL site office for supply packages. b) By vendors for Turnkey i.e. Supply and E&C packages
21.	Concessional custom duty against Essentiality certificate (EC)	The project has been qualified through Project Import route. Accordingly, the benefits applicable to PI project would be granted for this project In this regard applicable documents such as Essentiality certificate will be issued by NTPC (ultimate customer). Under this, Concessional rate of Customs Duty shall be applicable on the Import Contents of the supplier respectively. Based on the above EC, Customs Duty Benefits will be passed on to the vendor. The Bidder to indicate the Import contents i.e. list of the item, Currency of Import and Country of Import including CIF value in their offers. BHEL shall inform, the availability of CIF value for a particular package, if any, at the time of NIT. The benefits availed in Concessional Customs Duty must be passed on to BHEL in their offer. Vendor shall inform BHEL and provide the necessary documents to obtain required certificates from BHEL to avail exemption. Obtaining custom duty benefit in line with the Essentiality Certificate issued shall be in vendor's scope.
22.	Taxes & Duties (For Domestic Vendor)	As per General Conditions of Contract (GCC rev 06) & GST related Corrigendum to GCC rev.06
23. a	Taxes & Duties (For Order Directly to Foreign Bidders)- supply packages	In case of foreign vendors, quoted prices & Dispatches shall be on C & F (Port-Chennai) basis and the Taxes & duties in the country of dispatch shall be borne by Foreign vendor.
23. b	Taxes & Duties (For Order Directly to Foreign Bidders)- Turnkey packages	Complete responsibility of import including (but not limited to) import clearance, all taxes and duties in the country of export (origin), all taxes and duties in India shall be to vendor's account.
24.	Inspection Agency	BHEL/ BHEL approved 3rd party inspection agencies and/or NTPC/ Customer Agency as applicable.
25.	Inspection procedure for Domestic supplies	<u>For Domestic supplies</u> Vendor shall raise inspection call at least 15 business days in advance on BHEL CQS website to applicable inspection agency (as mentioned in PO/LOI or to be informed later) and submit copy of inspection call to BHEL-PEM for arranging NTPC inspection/Joint inspection on the proposed date, as applicable. MDCC shall be issued on the basis of clear inspection report (CQIR). <u>For Foreign supplies</u> In case of Foreign supplies, if NTPC approved 3rd party inspection agency does not participate in the inspection, test certificates & inspection reports duly accepted by the agreed Inspection agency shall be submitted in soft copy to BHEL-PEM. The same shall be reviewed by PEM and then, sent to NTPC for clearance. The dispatch clearance (MDCC) by NTPC/ BHEL as applicable shall be given to the foreign supplier or representative in India after acceptance of above test certificates.

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26.	Packing, Identification & marking [if not specified in NIT]	Each box shall be marked with Capital Letters in "Red" indicating the **PEM SUPPLY (Main Supply/ Commissioning Spares/ Mandatory Spares) for** 3 x 800 MW PVUNL PATRATU TPP. **NOTE:** Main supply item and items for commissioning spares must be packed separately. Each package delivered under the Contract shall be marked by supplier and such marking must be distinct and in English language (all previous irrelevant markings being carefully obliterated). Such marking shall show the description and quantity of contents, the name and address of consignee, the Gross weight and Net weight of the package, the name of the Supplier, PEM P.O. reference number, with a distinctive number of mark sufficient for purposes of identification. Besides above necessary, packing shall bear a special marking `TOP', `BOTTOM', 'DO NOT TURN OVER", "KEEP DRY", "HANDLE WITH CARE", etc **IMPORTANT: -** • Two copies of respective standard manufacturer's erection instruction/operation instruction manual shall be kept in each package / container for immediate reference by BHEL site and same shall be reflected in packing slip also • The Packing list details for the consignment must be put inside the Box/Boxes. Items like pumps, Valves, Hoists, Cranes etc shall essentially have O&M Manuals and E&C guidelines duly enclosed in the packing box. Certificate to such effect shall also be reflected in packing slip. Mandatory spares shall be properly packed separately in separate box painted in Red, indicating **Mandatory Spares in bold letters** and each spare shall be properly tagged giving details i.e. item number of the equipment in line with the CUSTOMER approved BBU for Mandatory spares & Number per item (to match the description given ~~in the packing slip) to facilitate their proper~~ identification by PVUNL/ NTPC. One Copy of Packing list must be put inside the Box along with Manufacturing drawing no. reference, Catalogue reference etc.
27.	Submission of Final Drgs/Docs alongwith O&M Manual, Type Test Certificates (if any)	As per GCC rev.06/ Technical Specification/Kick-off meeting.

	Prepared by	Checked by	Reviewed by	Vetted by	Approved by
Name	Gaurav Garg				16/05/18
Designation	Sr. Engr/ PG III	DGM/ PG III	DGM/ PG III	Finance	AGM & DH/ PG III
Signature	Gaurav 08/5/18				DEEPAK GUPTA

Project: 3 x 800 MW PVUNL PATRATU TPP PHASE-I						
Package : HEAT EXCHANGER (PLATE TYPE)						
Annexure-A to MOP: Delivery schedule						
Sl. No.	**Package Code**	**Package name**	**BHEL Drawing No**	**Drawing Title**	**Primary/Secondary**	**Drg Sch for Vendors**
1	**179-11000-A**	**HEAT EXCHANGERS (PLATE TYPE)- PHE**	PE-V5-434-179-N001	TDS -PHE	Primary	R-0 within 21 days from PO & subsequent revisions incorporating all the BHEL comments within 10 days of comments received from BHEL. BHEL shall furnish comments / approval on each submission within 18 days from receipt.
2			PE-V5-434-179-N002	GENERAL ARRANGEMENT OF PHE	Primary	
3			PE-V5-434-179-N003	SIZING CALCULATION OF PHE's	Primary	
4			PE-V5-434-179-N005	QP-PHE	Primary	
5			PE-V5-434-179-N004	PERFORMANCE CURVES OF PHE's	Secondary	R-0 within 20 days of approval on TDS & subsequent revisions incorporating all the BHEL comments within 10 days of comments received from BHEL.BHEL shall furnish comments / approval on each submission within 18 days from receipt.
6			PE-V5-434-179-N006	O&M MANUAL-PHE	Secondary	within 30 days of issuance of MDCC.
7			PE-V5-434-179-N007	PG TEST PROCEDURE-PHE	Secondary	R-0 within 30 days after R-0 submission of last primary document and revised submission within 10 days of receiveing comments from BHEL.

Annexure-B to MOP: HEAT EXCHANGERS (PLATE TYPE) for 3 x 800 MW PVUNL PATRATU TPP PHASE-I

DEFAULT/ BREACH OF CONTRACT, INSOLVENCY AND RISK PURCHASE

In case of delays (beyond the maximum late delivery period as per LD clause) in supplies, or if there be defective supplies or non-fulfilment of any other terms and conditions of the Contract as enumerated subsequently in this clause, then, without prejudice to its right to recover any expenses, losses or damages to which the Buyer may be put to incur or sustain by reason of the Seller/Contractor's default or breach of Order/Contract or to suspend business dealings with the Seller/Contractor in terms of the Buyers' Guidelines for Suspension of Business Dealings as applicable from time to time, the Buyer shall also be entitled to cancel the Order/ Contract either in whole or portion thereof without compensation to Seller. On the occurrence of any of the acts/omissions mentioned below, the Buyer may if it so desires, procure upon such terms and in such manner as deemed appropriate, plant/ equipment/ stores not so delivered or others of similar description where plant/ equipment/ stores exactly complying with particulars are not, in the opinion of the Buyer (which shall be final), readily procurable, at the risk and cost of the Seller.

The Seller shall be liable to the Buyer for any excess costs incurred thereof and the Seller shall continue the performance of the Order/Contract to the extent not cancelled under the provisions of this clause. The Seller shall on no account be entitled to any gain on such repurchases. If the Bidder does not agree to this Risk Purchase clause, BHEL reserves the right to reject the bid/offer of the Bidder.

The order/contract may be cancelled in whole or part thereof and Risk & Cost Clause in line with terms and conditions of PO/Contract may be invoked by the Buyer in any of the following cases:

i. If the Seller/Contractor fails to deliver the goods or materials or any installment thereof within the period(s) fixed for such delivery or the Seller's poor progress of the supply/services vis-à-vis delivery/execution timeline as stipulated in the contract, backlog attributable to the Seller including unexecuted portion of supply does not appear to be executable within balance period available;
ii. delivers goods or materials not of the contracted quality and failing to adhere to the contract specifications/execution methodology;
iii. withdrawal from or repudiation/abandonment of the supply/services by the Seller before completion as per contract or if the Seller refuses or is unable to supply goods or materials covered by the order/Contract either in whole or in part or otherwise fails to perform the Order/Contract.
iv. Non supply by the Seller within scheduled completion/delivery period as per contract or as extended from time to time for reasons attributable to the Seller;
v. Termination of Contract on account of any other reason(s) attributable to the Seller.
vi. Assignment, transfer, sub-letting of Contract without BHEL's written permission resulting in termination of Contract or part thereof by BHEL.
vii. If the Seller be an individual or a Sole Proprietorship, in the event of death or insanity of the Seller.
viii. If the Seller/Contractor being an individual or if a partnership firm thereof, shall at any time be adjudged insolvent or shall have a receiving order for administration of his estate made against him or shall take any proceeding for composition under any Insolvency Act for the time being in force or make any assignment of the order/Contract or enter into any arrangement or composition with his creditors or suspend payment or if the firm dissolved under the Partnership Act;
ix. If the Seller/Contractor being a Company is wound up voluntarily or by order of a Court or a Receiver, Liquidator or Manager on behalf of the debenture holders and creditors is appointed or circumstances have arisen which entitles the Court of debenture holder and creditors to appoint a receiver, liquidator or manager
x. Non- Compliance to any contractual condition or any other default attributable to the Seller.

Such defaulting vendor/Seller shall not be eligible to participate in re-tendering conducted on account of risk purchase made due to fault of such vendor/Seller.

BHEL's right to go for Risk and Cost, Calculation of Risk and Cost amount & LD, recovery options to BHEL are given in detail in Annexure-V hereto.

ANNEXURE-V

(RISK AND COST CLAUSE)

1. BHEL reserves the right to terminate the contract or withdraw portion of work and get it done through other agency, at the risk and cost of the contractor *after due notice of a period of 14 days' by BHEL* in any of the following cases:

   i) If the Seller/Contractor fails to deliver the goods or materials or any instalment thereof within the period(s) fixed for such delivery or the Seller's poor progress of the supply/ services vis-a-vis delivery/execution timeline as stipulated in the Contract, backlog attributable to seller including unexecuted portion of supply does not appear to be executable within balance available period;
   ii) Delivers goods or materials not of the contracted quality and failing to adhere to the contract specifications;
   iii) Withdrawal from or repudiation/ abandonment of the supply/ services by Seller before completion as per contract or if the Seller refuses or is unable to supply goods or materials covered by the Order/Contract either in whole or in part or otherwise fails to perform the Order/Contract;
   iv) Non-supply by the Seller within scheduled completion/delivery period as per Contract or as extended from time to time, for the reasons attributable to the Seller;
   v) Termination of Contract on account of any other reason (s) attributable to Seller.
   vi) Assignment, transfer, subletting of Contract without BHEL's written permission resulting in termination of Contract or part thereof by BHEL.
   vii) If the Seller be an individual or a sole proprietorship Firm, in the event of the death or insanity of the Seller;
   viii) If the Seller/Contractor being an individual or if a firm on a partnership thereof, shall at any time, be adjudged insolvent or shall have a receiving order for administration of his estate made against him or shall take any proceeding for composition under any Insolvency Act for the time being in force or make any assignment of the Order/Contract or enter into any arrangement or composition with his creditors or suspend payment or if the firm dissolved under the Partnership Act;
   ix) If the Seller/Contractor being a company is wound up voluntarily or by order of a Court or a Receiver, Liquidator or Manager on behalf of the debenture holders and creditors is appointed or circumstances shall have arisen which entitles the Court of debenture holder and creditors to appoint a receiver, liquidator or manager;
   x) Non-compliance to any contractual condition or any other default attributable to Seller.

1.1 **Risk & Cost Amount against Balance Work:**

Risk & Cost amount against balance work shall be calculated as follows:

Risk & Cost Amount= [(A-B) + (A x H/100)]

Where,
A= Value of Balance scope of Work (*) as per rates of new contract
B= Value of Balance scope of Work (*) as per rates of old contract being paid to the contractor at the time of termination of contract i.e. inclusive of PVC & ORC, if any.
H = Overhead Factor to be taken as 5

In case (A-B) is less than 0 (zero), value of (A-B) shall be taken as 0 (zero).

1.2 *** Balance scope of work (in case of termination of contract):**

Difference of Contract Quantities and Executed Quantities as on the date of issue of Letter for 'Termination of Contract', shall be taken as balance scope of Work for calculating risk & cost amount.

Contract quantities are the quantities as per original contract. If, Contract has been amended, quantities as per amended Contract shall be considered as Contract Quantities.

Items for which total quantities to be executed have exceeded the Contract Quantities based on drawings issued to contractor from time to time till issue of Termination letter, then for these items total Quantities as per issued drawings would be deemed to be contract quantities.

Substitute/ extra items whose rates have already been approved would form part of contract quantities for this purpose.

Substitute/ extra items which have been executed but rates have not been approved, would also form part of contract quantities for this purpose and rates of such items shall be determined in line with contractual provisions.

However, increase in quantities on account of additional scope in new tender shall not be considered for this purpose.

NOTE: In case portion of work is being withdrawn at risk & cost of contractor instead of termination of contract, contract quantities pertaining to portion of work withdrawn shall be considered as 'Balance scope of work' for calculating Risk & Cost amount.

1.3 **LD against delay in executed work in case of Termination of Contract:**

LD against delay in executed work shall be calculated in line with LD clause no. 16 of GCC, for the delay attributable to contractor. For limiting the maximum value of LD, contract value shall be taken as Executed Value of work till termination of contract.

Method for calculation of LD against delay in executed work in case of termination of contract" is given below.

i. Let the time period from scheduled date of start of work till termination of contract excluding the period of Hold (if any) not attributable to contractor = T1
ii. Let the value of executed work till the time of termination of contract = X
iii. Let the Total Executable Value of work for which inputs/fronts were made available to contractor and were planned for execution till termination of contract = Y
iv. Delay in executed work attributable to contractor i.e. T2 = [1-(X/Y)] x T1
v. LD shall be calculated in line with LD clause (clause 16) of the Contract for the delay attributable to contractor taking "X" as Contract Value and "T2" as period of delay attributable to contractor.

2. <u>Recoveries arising out of Risk & Cost and LD or any other recoveries due from Contractor</u>

Without prejudice to the other means of recovery of such dues from the Seller recoveries from the Seller on whom risk & cost has been invoked shall be made from the following:

a) Dues available in the form of Bills payable to seller, SD, BGs against the same contract.
b) Dues payable to seller against other contracts in the same Region/Unit/ Division of BHEL.
c) Dues payable to seller against other contracts in the different Region/Unit/ division of BHEL.

In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against contractor.

Annexure-1

INTEGRITY PACT

Between

Bharat Heavy Electricals Ltd. (BHEL), a company registered under the Companies Act 1956 and having its registered office at "BHEL House", Siri Fort, New Delhi - 110049 (India) hereinafter referred to as "The Principal", which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the ONE PART

and

_____, (description of the party along with address), hereinafter referred to as "The Bidder/ Contractor" which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the OTHER PART

Preamble

The Principal intends to award, under laid-down organizational procedures, contract/s for _____

_____
_____ (hereinafter referred to as "Contract"). The Principal values full compliance with all relevant laws of the land, rules and regulations, and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder(s)/ Contractor(s).

In order to achieve these goals, the Principal will appoint panel of Independent External Monitor(s) (IEMs), who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1- Commitments of the Principal

1.1 The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles: -

1.1.1 No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

1.1.2 The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential/ additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.

1.1.3 The Principal will exclude from the process all known prejudiced persons.

1.2 If the Principal obtains information on the conduct of any of its employees which is a penal offence under the Indian Penal Code 1860 and Prevention of Corruption Act 1988 or any other statutory penal enactment, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions.

Section 2 - Commitments of the Bidder(s)/ Contractor(s)

2.1 The Bidder(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. The Bidder(s)/ Contractor(s) commits himself to observe the following principles during participation in the tender process and during the contract execution.

2.1.1 The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material, immaterial or any other benefit which he/ she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.

2.1.2 The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any illegal or undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.

2.1.3 The Bidder(s)/ Contractor(s) will not commit any penal offence under the relevant Indian Penal Code (IPC) and Prevention of Corruption Act; further the Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

2.1.4 Foreign Bidder(s)/ Contractor(s) shall disclose the name and address of agents and representatives in India and Indian Bidder(s)/ Contractor(s) to disclose their foreign principals or associates. The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

2.2 The Bidder(s)/ Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

2.3 The Bidder(s)/ Contractor(s) shall not approach the Courts while representing the matters to IEMs and shall await their decision in the matter.

Section 3 - Disqualification from tender process and exclusion from future contracts

If the Bidder(s)/ Contractor(s), before award or during execution has committed a transgression through a violation of Section 2 above, or acts in any other manner such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidder(s)/ Contractor(s) from the tender process , terminate the contract, if already awarded, exclude from future business dealings and/ or take action as per the separate "Guidelines on Banning of Business dealings with Suppliers/ Contractors", framed by the Principal.

Section 4 - **Compensation for Damages**

4.1 If the Principal has disqualified the Bidder (s) from the tender process before award / order acceptance according to Section 3, the Principal is entitled to demand and recover the damages equivalent to Earnest Money Deposit/ Bid Security.

4.2 If the Principal is entitled to terminate the Contract according to Section 3, or terminates the Contract in application of Section 3 above , the Bidder(s)/ Cotractor (s) transgression through a violation of Section 2 above shall be construed breach of contract and the Principal shall be-entitled to demand and recover from the Contractor an amount equal to 5% of the contract value or the amount equivalent to Security Deposit/ Performance Bank Guarantee , whichever is higher, as damages, in addition to and without prejudice to its right to demand and recover compensation for any other loss or damages specified elsewhere in the contract.

Section 5 - Previous Transgression

5.1 The Bidder declares that no previous transgressions occurred in the last 3 (three) years with any other company in any country conforming to the anti-corruption approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.

5.2 If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason or action can be taken as per the separate "Guidelines on Banning of Business dealings with Suppliers/ Contractors", framed by the Principal.

Section 6 - Equal treatment of all Bidder (s)/ Contractor (s) / Sub-contractor (s)

6.1 The Principal will enter into Integrity Pacts with identical conditions as this Integrity Pact with all Bidders and Contractors.

6.2 In case of Sub-contracting, the Principal Contractor shall take the responsibility of the adoption of Integrity Pact by the Sub-contractor(s) and ensure that all Sub-contractors also sign the Integrity Pact.

6.3 The Principal will disqualify from the tender process all Bidders who do not sign this Integrity Pact or violate its provisions.

Section 7 - Criminal Charges against violating Bidders/ Contractors /Subcontractors

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Vigilance Office.

Section 8 -Independent External Monitor(s)

8.1 The Principal appoints competent and credible panel of Independent External Monitor (s) (IEMs) for this Integrity Pact. The task of the IEMs is to review independently and objectively, whether and to what extent the parties comply with the obligations under this Integrity Pact.

8.2 The IEMs are not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CMD, BHEL.

8.3 The IEMs shall be provided access to all documents/ records pertaining to the Contract, for which a complaint or issue is raised before them as and when warranted. However, the documents/records/information having National Security implications and those documents which have been classified as Secret/Top Secret are not to be disclosed.

8.4 The Principal will provide to the IEMs sufficient information about all meetings among the parties related to the Contract provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the IEMs the option to participate in such meetings.

8.5 The advisory role of IEMs is envisaged as that of a friend, philosopher and guide. The advice of IEMs would not be legally binding and it is restricted to resolving issues raised by a Bidder regarding any aspect of the tender which allegedly restricts competition or bias towards some Bidders. At the same time, it must be understood that IEMs are not consultants to the Management. Their role is independent in nature and the advice once tendered would not be subject to review at the request of the organization.

8.6 For ensuring the desired transparency and objectivity in dealing with the complaints arising out of any tendering process or during execution of Contract, the matter should be examined by the full panel of IEMs jointly, who would look into the records, conduct an investigation, and submit their joint recommendations to the Management.

8.7 The IEMs would examine all complaints received by them and give their recommendations/ views to the CMD, BHEL at the earliest. They may also send their report directly to the CVO, in case of suspicion of serious irregularities requiring legal/ administrative action. Only in case of very serious issue having a specific, verifiable Vigilance angle, the matter should be reported directly to the Commission. IEMs will tender their advice on the complaints within 30 days.

8.8 The CMD, BHEL shall decide the compensation to be paid to the IEMs and its terms and conditions.

8.9 IEMs should examine the process integrity, they are not expected to concern themselves with fixing of responsibility of officers. Complaints alleging mala fide on the part of any officer of the Prinicpal should be looked into by the CVO of the Principal.

8.10 If the IEMs have reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant Indian Penal Code / Prevention of Corruption Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the IEMs may also transmit this information directly to the Central Vigilance Commissioner, Government of India.

8.11 After award of work, the IEMs shall look into any issue relating to execution of Contract, if specifically raised before them. As an illustrative example, if a Contractor who has been awarded the Contract, during the execution of Contract, raises issue of delayed payment etc. before the IEMs, the same shall be examined by the panel of IEMs. Issues like warranty/ guarantee etc. shall be outside the purview of IEMs.

8.12 However, the IEMs may suggest systemic improvements to the management of the Principal, if considered necessary, to bring about transparency, equity and fairness in the system of procurement.

8.13 The word `Monitor' would include both singular and plural.

Section 9 - Pact Duration

9.1 This Integrity Pact shall be operative from the date this Integrity Pact is signed by both the parties till the final completion of contract for successful Bidder, and for all other Bidders 6 months after the Contract has been awarded. Any violation of the same would entail disqualification of the bidders and exclusion from future business dealings.

9.2 If any claim is made/ lodged during currency of this Integrity Pact, the same shall be binding and continue to be valid despite the lapse of this Pact as specified above, unless it is discharged/ determined by the CMD, BHEL.

Section 10 - Other Provisions

10.1 This Integrity Pact is subject to Indian Laws and exclusive jurisdiction shall be of the competent Courts as indicated in the Tender or Contract, as the case may be.

10.2 Changes and supplements as well as termination notices need to be made in writing.

10.3 If the Bidder(s)/ Contractor(s) is a partnership or a consortium or a joint venture, this Integrity Pact shall be signed by all partners of the partnership or joint venture or all consortium members.

10.4 Should one or several provisions of this Integrity Pact turn out to be invalid, the remainder of this Integrity Pact remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

10.5 Only those bidders / contractors who have entered into this Integrity Pact with the Principal would be competent to participate in the bidding. In other words, entering into this Integrity Pact would be a preliminary qualification.

10.6 In the event of any dispute between the Principal and Bidder(s)/ Contractor(s) relating to the Contract, in case, both the parties are agreeable, they may try to settle dispute through Mediation before the panel of IEMs in a time bound manner. In case, the dispute remains unresolved even after mediation by the panel of IEMs, either party may take further action as the terms & conditions of the Contract. The fees/expenses on dispute resolution through mediation shall be shared by both the parties. Further, the mediation proceedings shall be confidential in nature and the parties shall keep confidential all matters relating to the mediation proceedings including any settlement agreement arrived at between the parties as outcome of mediation. Any views expressed, suggestions, admissions or proposals etc. made by either party in the course of mediation shall not be relied upon or introduced as evidence in any further arbitral or judicial proceedings, whether or not such proceedings relate to the dispute that is the subject of mediation proceedings. Neither of the parties shall present IEMs as witness in any Alternative Dispute Resolution or judicial proceedings in respect of the dispute that was subject of mediation.

For & On behalf of the Principal
(Office Seal)

For & On behalf of the Bidder/ Contractor
(Office Seal)

Place _____
Date _____

Witness:_____
(Name & Address) _____
_____

Witness:_____
(Name & Address) _____
_____

Clause on IP in the tender

Integrity Pact (IP)

(a) IP is a tool to ensure that activities and transactions between the Company and its Bidders/ Contractors are handled in a fair, transparent and corruption free manner. Following Independent External Monitors (IEMs) on the present panel have been appointed by BHEL with the approval of CVC to oversee implementation of IP in BHEL.

Sl	IEM	Email
1.	Shri Otem Dai, IAS (Retd.)	iem1@bhel.in
2.	Shri Bishwamitra Pandey, IRAS (Retd.)	iem2@bhel.in
3.	Shri Mukesh Mittal, IRS (Retd.)	iem3@bhel.in

(b) The IP as enclosed with the tender is to be submitted (duly signed by authorized signatory) along with techno-commercial bid (Part-I, in case of two/ three part bid). Only those bidders who have entered into such an IP with BHEL would be competent to participate in the bidding. In other words, entering into this Pact would be a preliminary qualification.

(c) Please refer Section-8 of IP for Role and Responsibilities of IEMs. In case of any complaint arising out of the tendering process, the matter may be referred to any of the above IEM(s). All correspondence with the IEMs shall be done through email only.

Note:

No routine correspondence shall be addressed to the IEM (phone/ post/ email) regarding the clarifications, time extensions or any other administrative queries, etc on the tender issued. All such clarification/ issues shall be addressed directly to the tender issuing (procurement) department's officials whose contact details are provided below:

Details of contact person(s):

(1)
Name:_____
Deptt: _____
Address: _____
Phone: (Landline/ Mobile)
_____
Email: _____
Fax: _____

(2)
Name:_____
Deptt: _____
Address: _____
Phone: (Landline/ Mobile)
_____
Email: _____
Fax: _____

CORPORATE QUALITY ASSURANCE/ कॉरपोरेट गुणवत्ता आश्वासन

SUB-VENDOR QUESTIONNAIRE/ सब-वेंडर प्रश्नावली

i.	***Item/Scope of Sub-contracting*** **उप-संविदा(अनुबंध) का मद/ दायरा**	
ii.	***Address of the registered office*** पंजीकृत कार्यालय का पता	***Details of Contact Person*** संपर्क व्यक्ति का विवरण ***(Name, Designation, Mobile, Email)*** (नाम, पदनाम, मोबाइल, ईमेल)
iii.	***Name and Address of the proposed Sub-vendor's works where item is being manufactured*** प्रस्तावित उप-विक्रेता के कार्यों का नाम और पता, जहां मद का निर्माण किया जा रहा है	***Details of Contact Person:*** संपर्क व्यक्ति का विवरण ***(Name, Designation, Mobile, Email)*** (नाम, पदनाम, मोबाइल, ईमेल)
iv.	***Annual Production Capacity for proposed item/scope of sub-contracting*** **उप-संविदा(अनुबंध)** के प्रस्तावित मद / दायरे के लिए वार्षिक उत्पादन क्षमता	
v.	***Annual production for last 3 years for proposed item/scope of sub-contracting*** **उप-संविदा(अनुबंध)** के प्रस्तावित मद / दायरे के लिए पिछले 3 वर्षों का वार्षिक उत्पादन	
vi.	***Details of proposed works*** **प्रस्तावित कार्यों का विवरण**	
1.	***Year of establishment of present works*** वर्तमान फैक्टरी की स्थापना का वर्ष	
2.	***Year of commencement of manufacturing at above works*** उपरोक्त फैक्टरी में निर्माण कार्य शुरू होने का वर्ष	
3.	***Details of change in Works address in past (if any*** पूर्व में फैक्टरी स्थल में परिवर्तन का विवरण (यदि कोई हो)***)***	
4.	***Total Area*** कुल क्षेत्र	
	Covered Area शामिल क्षेत्र	
5.	***Factory Registration Certificate*** फैक्टरी पंजीकरण प्रमाण पत्र	***Details attached at Annexure – F2.1*** विवरण अनुलग्नक- एफ 2.1 पर संलग्न है
6.	***Design/ Research & development set-up*** डिजाइन / अनुसंधान और विकास सेटअप ***(No. of manpower, their qualification, machines & tools employed etc.)*** (श्रमिकों की संख्या, उनकी योग्यता, मशीन और उपलब्ध उपकरण आदि)	***Applicable / Not applicable if manufacturing is as per Main Contractor/purchaser design)*** ***Details attached at Annexure – F2.2*** ***(if applicable)*** लागू / लागू नहीं, अगर विनिर्माण मुख्य संविदाकार / खरीददार के डिजाइन के अनुसार है) विवरण अनुलग्नक –एफ 2.2 पर संलग्न है । (यदि लागू हो)
7.	***Overall organization Chart with Manpower Details (Design/Manufacturing/Quality etc)*** मैनपावर विवरण के साथ समग्र संगठन का चार्ट(डिजाइन / विनिर्माण / गुणवत्ता आदि)	***Details attached at Annexure – F2.3*** विवरण अनुलग्नक – F2.3 में संलग्न है ।
8.	***After sales service set up in India, in case of foreign sub-vendor(Location, Contact Person, Contact details etc.)*** भारत	***Applicable / Not applicable*** लागू / लागू नहीं

	में बिक्री सेवा की स्थापना के बाद, विदेशी उप-विक्रेता के मामले में(स्थल , संपर्क व्यक्ति, संपर्क विवरण आदि)	***Details attached at Annexure – F2.4*** विवरण अनुलग्नक -2.4 पर संलग्न है ।
9.	***Manufacturing process execution plan with flow chart indicating various stages of manufacturing from raw material to finished product including outsourced process, if any*** फ्लोचार्ट सहित विनिर्माण प्रक्रिया निष्पादन योजना , जिसमें आउटसोर्स प्रक्रिया, यदि कोई हो, सहित कच्चे माल से तैयार उत्पाद तक विनिर्माण के विभिन्न चरणों को दर्शाया गया हो,	***Details attached at Annexure – F2.5*** विवरण अनुलग्नक - F2.5में संलग्न है ।
10.	***Sources of Raw Material/Major Bought Out Item*** कच्चे माल के स्रोत / खरीदे हुए मुख्य मद	***Details attached at Annexure – F2.6*** विवरण अनुलग्नक - F2.6में संलग्न है।
11.	***Quality Control exercised during receipt of raw material/BOI, in-process , Final Testing, packing*** कच्चे माल / खरीदे हुए मद, प्रक्रियाबद्ध, अंतिम परीक्षण, पैकिंग करते समय गुणवत्ता नियंत्रण	***Details attached at Annexure – F2.7*** विवरण अनुलग्नक - F2.7 पर संलग्न है
12.	***Manufacturing facilities (List of machines, special process facilities, material handling etc.)*** विनिर्माण सुविधा(मशीनों की सूची , विशेष प्रक्रिया सुविधाएं, सामग्री रख-रखाव आदि)	***Details attached at Annexure – F2.8*** विवरण अनुलग्नक - F2.8में संलग्न है ।
13.	***Testing facilities (List of testing equipment)*** परीक्षण सुविधाएं(परीक्षण उपकरण की सूची)	***Details attached at Annexure – F2.9*** विवरण अनुलग्नक – F2. 9 में संलग्न है ।
14.	***If manufacturing process involves fabrication then-*** यदि निर्माण प्रक्रिया में फेब्रिकेशन की गई है तो-	***Applicable / Not applicable*** लागू / लागू नहीं ***Details attached at Annexure – F2.10*** विवरण अनुलग्नक - F2.10में संलग्न है। ***(if applicable)*** लागू / लागू नहीं
	List of qualified Welders पात्र वेल्डर की सूची	
	List of qualified NDT personnel with area of specialization विशेषज्ञता के क्षेत्र सहित पात्र एनडीटी कार्मिकों की सूची	
15.	***List of out-sourced manufacturing processes with Sub-Vendors' names & addresses*** सब-वेंडर द्वारा बाह्य स्रोतों (उनके नाम और पते सहित)से करवाएं गए निर्माण प्रक्रियाओं की सूची	***Applicable / Not applicable*** लागू / लागू नहीं ***Details attached at Annexure. –F2.11*** विवरण अनुलग्नक - F2.10में संलग्न है। ***(if applicable)*** (यदि लागू हो)
16.	***Supply reference list including recent supplies*** नवीनतम आपूर्ति सहित आपूर्ति संदर्भ सूची	***Details attached at Annexure – F2.12*** विवरण अनुलग्नक - F2.12 में संलग्न है । ***(as per format given below)*** (नीचे दिए गए प्रारूप के अनुसार)

Project/ package परियोजना /पैकेज	***Customer Name*** ग्राहक का नाम	***Supplied Item (Type/Rating/Model /Capacity/Size etc)*** आपूर्ति की गई वस्तु (प्रकार / रेटिंग / मॉडल / क्षमता / आकार आदि)	***PO ref no/date*** पीओ संदर्भ सं. / तिथि	***Supplied Quantity*** आपूर्ति की मात्रा	***Date of Supply*** आपूर्ति की तारीख

17.	***Product satisfactory performance feedback letter/certificates/End User Feedback*** उत्पाद के संतोषजनक प्रदर्शन संबंधी फीडबैक पत्र / प्रमाण पत्र / अंतिम उपयोगकर्ता फ़ीडबैक	***Attached at annexure - F2.13*** अनुलग्नक F2. 3पर संलग्न है
18.	***Summary of Type Test Report (Type Test Details, Report No, Agency, Date of testing) for the proposed product***	***Applicable / Not applicable*** लागू / लागू नहीं

	(similar or higher rating) प्रस्तावित उत्पाद (एक समान या उच्च रेटिंग वाले) के लिए टाइप टेस्ट रिपोर्ट (टाइप टेस्ट विवरण, रिपोर्ट संख्या, एजेंसी, जांच की तारीख) का सारांश नोट: - रिपोर्ट प्रस्तुत करने की आवश्यकता नहीं है ***Note:- Reports need not to be submitted***	***Details attached at Annexure – F2.14*** विवरण अनुलग्नक - F2.1 4में संलग्न है ***(if applicable)*** (यदि लागू हो)
19.	***Statutory / mandatory certification for the proposed product*** प्रस्तावित उत्पाद के लिए वैधानिक / अनिवार्य प्रमाणीकरण	***Applicable / Not applicable*** लागू / लागू नहीं ***Details attached at Annexure – F2.15*** ***(if applicable)*** (यदि लागू हो)
20.	***Copy of ISO 9001 certificate*** आईएसओ 9001 प्रमाण पत्र की प्रति ***(if available***(यदि उपलब्ध हो)	***Attached at Annexure – F2.16*** अनुलग्नक में संलग्न - F2.1 6 है
21.	***Product technical catalogues for proposed item (if available)*** प्रस्तावित मद के लिए उत्पाद तकनीकी कैटलॉग (यदि उपलब्ध हो)	***Details attached at Annexure – F2.17*** विवरण अनुलग्नक - F2.1 7 में संलग्न है

Name: ***नाम:***		***Desig:*** ***पदः***		***Sign:*** ***हस्ताक्षरः***		***Date:*** ***तिथि:***	

Company's Seal/Stamp:- कंपनी की मुहर/ मोहरः -

Guidelines for Remote Inspection of PEM BOIs

1) OBJECTIVE:

To lay down the procedure for carrying out Remote Inspection of Bought-out Items (BOIs) for PEM suppliers wherever applicable.

2) SCOPE:

It will cover suppliers for packages of PEM BOIs for various project requirements.

Invitation is sent to the suppliers for remote inspection on applications like MS Teams, Webex, etc. by BHEL.

3) MINIMUM REQUIREMENTS AT SUPPLIER'S WORKS:

i. Uninterrupted internet services

ii. Good internet bandwidth (Min 100 Mbps)

iii. Good resolution camera (2 nos) – one preferably CCTV (static at one place) and one hand hold (moving)

iv. Smart phone with minimum 8MPi camera front and back both with optical zoom facility suitable for using web applications like Webex, MicroSoft (MS) Teams, etc.

v. Computer and Scanner with good resolution

vi. Digital signatures of supplier's Quality Engineer

vii. Availability of web applications like Webex, MicroSoft (MS) Teams, as required.

viii. All Test certificates, internal test reports, calibration reports, etc. for the items offered for inspection.

ix. Availability of the above to be submitted to BHEL two days in advance before inspection.

x. Dedicated team from supplier side for facilitating inspection requirements.

xi. For ensuring proper visibility, the suggested Portable lighting sources (torch/ electric LED bulb of minimum 15 W) with no glare is to be ensured at offered job, location for remote inspection/testing. This is to be verified before start of the inspection.

xii. The GPS location co-ordinates or any method to locate inspection location shall be captured indicating the location of the Vendor-Premises of remote inspection/testing.

4) MINIMUM REQUIREMENTS AT BHEL and CUSTOMER LOCATION :

i. Uninterrupted internet services

ii. Suitable internet bandwidth

iii. Digital signatures wherever required.

iv. Availability of web applications like Webex, MS Teams, etc. as required.

v. Clearance from customer for conducting remote inspection

5) PROCEDURE:

i. Supplier will raise the inspection call in BHEL - CQIR portal.

ii. Supplier shall ensure availability of minimum requirements at supplier's works as mentioned above at point 3.

iii. Before starting the inspection, the supplier shall submit the documents (TCs, internal test reports and calibration certificates as per approved QAP) two days before the date of inspection for review by BHEL and supplier shall coordinate with BHEL and if found satisfactory, inspection shall be considered for remote.

iv. Prior to commencement of remote inspection a pre inspection meeting shall be organised by BHEL inspector with supplier to ascertain the readiness for remote inspection.

6) During inspection, supplier shall share the location on Google maps for verifying the address of the manufacturer. Location may be captured by BHEL as screenshot.

i. Inspection shall be on the basis of approved Quality Plans and associated reference documents mentioned.

ii. For witnessing inspection, supplier shall bring the mobile video camera near to the surface of the equipment or as per requirement of the inspector for clarity in viewing the test/ equipment which shall be the responsibility of supplier. Supplier shall ensure that proper lighting in available during live video streaming.

iii. Before start of the inspection, inspector shall ensure that all instruments shall have valid calibration report. Supplier shall ensure use of digital instruments preferably for inspection to the extent possible.

iv. Details of suppliers's dedicated team handling the remote inspection shall also be incorporated in the CQIR.

v. All details of inspection/ testing referred documents shall be mentioned in the CQIR. Recording of remote inspection shall be maintained by the BHEL inspector and this recording (unedited) shall be maintained at BHEL system for a minimum period of 3 years or till the warranty period whichever is later.

vi. PEM (Engineering) shall accord final technical clearance, in case of any deviation in inspected item noticed during inspection.

vii. Inspection shall be conducted by PEM-Q&BE assigned inspector along with PEM-Engg (if required). CQIR shall be prepared and maintained by PEM-Q&BE.

viii. PG will issue MDCC on the basis of acceptance of inspected items along with accepted packing photographs as per contract provisions.

7) **UNDERTAKING BY VENDOR:** Material inspected through remote inspections is meeting all technical requirements of BHEL. In case of any discrepancy from the above procedure/ material inspected, if found later, vendor will replace the materials without any cost implication to BHEL.

8) Vendor shall provide the signed and stamped of the above guidelines to BHEL as a token of acceptance.