

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

**VOLUME –III**

**TECHNICAL SPECIFICATION  
FOR  
PLATE HEAT EXCHANGERS**

**Specification No. : PE-TS-388/389-179-N001  
(Rev 0)**



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



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

**SPEC. NO.:** PE-TS-388/389-179-N001

**VOLUME** III

**SECTION**

**REV. NO.** 0

**DATE** 09.09.13

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

**1.1 Volume -I CONDITIONS OF CONTRACT**

This consists of four parts as below:

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

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

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

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

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

Volume - II A: General Technical Conditions

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

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

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

Section – B: This section provides “Project Information”

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

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

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

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

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

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

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



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**TECHNICAL SPECIFICATION FOR  
PLATE HEAT EXCHANGERS**

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

**VOLUME III**

**REV. NO. 0 DATE 09.09.13**

**SHEET 1 OF 1**

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SHEET 1 OF 1

## DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER



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

**PROJECT NAME :**

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

**VOLUME III**

**SECTION**

**REV. NO. 0 DATE 21.08.12**

**SHEET 1 OF 1**

**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 3<sup>rd</sup> 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 no 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.

	<b>TITLE</b> <b>* SCHEDULE OF DEVIATIONS</b> ( ) From Conditions of Contract (Volume – 1) ( ) From General Technical Conditions (Volume – II A ) ( ) From Technical Specifications (Volume –II B)	SPECIFICATION NO
		VOL III
		SHEET..... OF.....
We the undersigned hereby certify that the above mentioned are the only deviations.		

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				COMPANY SEAL
NAME	DESIGNATION	SIGNATURE	DATE	

## \* SCHEDULE OF DECLARATIONS

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SHEET..... OF.....

## DECLARATION


I hereby certify that I am duly authorized representative of the Bidder's company whose name appears above my signature.

Authorized representative's  
Signature .....

Bidder's Intent	The bidder hereby agrees to fully comply with the requirements and intent of this specification for the price indicated
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	SCHEDULE OF PERFORMANCE GUARANTEES		SPECIFICATION NO.	PE-TS-388/389-179-N001
	PLATE HEAT EXCHANGER		Vol.	III
	SL. NO.	DESCRIPTION	UNIT	GUARANTEE VALUE
			Project Name	
			PHE for TG Aux.	
1.0	PRIMARY SIDE (HOT WATER SIDE)			
	CLEAN CONDITION			
a)	Flow rate	M <sup>3</sup> /Hr.		
b)	DMCW inlet temperature	°C		
c)	DMCW outlet temperature	°C		
d)	Pressure drop	MWC		
2.0	SECONDARY SIDE (COLD WATER SIDE)			
	CLEAN CONDITION			
a)	Flow rate	M <sup>3</sup> /Hr.		
b)	ACW inlet temperature	°C		
c)	ACW outlet temperature	°C		
d)	Pressure drop	MWC		
3.0	PRIMARY SIDE (HOT WATER SIDE)			
	FOULED CONDITION			
a)	Flow rate	M <sup>3</sup> /Hr.		
b)	DMCW inlet temperature	°C		
c)	DMCW outlet temperature	°C		
d)	Pressure drop	MWC		
4.0	SECONDARY SIDE (COLD WATER SIDE)			
	FOULED CONDITION			
a)	Flow rate	M <sup>3</sup> /Hr.		
b)	ACW inlet temperature	°C		
c)	ACW outlet temperature	°C		
d)	Pressure drop	MWC		
PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE				
NAME				
SIGNATURE				
DATE				



	SCHEDULE OF PERFORMANCE GUARANTEES		SPECIFICATION NO.	PE-TS-388/389-179-N001
	PLATE HEAT EXCHANGER		Vol.	III
	SL. NO.	DESCRIPTION	UNIT	GUARANTEE VALUE
			Project Name	
			PHE for SG Aux.	
1.0	PRIMARY SIDE (HOT WATER SIDE)			
	CLEAN CONDITION			
a)	Flow rate	M <sup>3</sup> /Hr.		
b)	DMCW inlet temperature	°C		
c)	DMCW outlet temperature	°C		
d)	Pressure drop	MWC		
2.0	SECONDARY SIDE (COLD WATER SIDE)			
	CLEAN CONDITION			
a)	Flow rate	M <sup>3</sup> /Hr.		
b)	ACW inlet temperature	°C		
c)	ACW outlet temperature	°C		
d)	Pressure drop	MWC		
3.0	PRIMARY SIDE (HOT WATER SIDE)			
	FOULED CONDITION			
a)	Flow rate	M <sup>3</sup> /Hr.		
b)	DMCW inlet temperature	°C		
c)	DMCW outlet temperature	°C		
d)	Pressure drop	MWC		
4.0	SECONDARY SIDE (COLD WATER SIDE)			
	FOULED CONDITION			
a)	Flow rate	M <sup>3</sup> /Hr.		
b)	ACW inlet temperature	°C		
c)	ACW outlet temperature	°C		
d)	Pressure drop	MWC		
PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE				
NAME				
SIGNATURE				
DATE				

	<b>TITLE:</b>		SPECIFICATION NO.		PE-TS-388/389-179-N001	
	SCHEDULE OF PRICES		VOLUME	III		
			SECTION	DATE 09.09.13		
			REV. NO.	00	SHEET OF	
SL. No.	DESCRIPTIONS OF WORKS OR EQUIPMENT		PRICE (In Lacs of Rs.)			
1.0	<b>1X500MW VINDHYACHAL STAGE-V –STG PKG</b>  Total price for design, manufacture, assembly, inspection and testing at manufacturer's and / or his sub contractor's works, properly packed and painted for transportation and delivery of Three (3) nos. PHE's complete with all accessories, commissioning spares (if any), counter flanges with nuts bolts, gaskets and coatings (wherever necessary), including special tools & tackles (if any) etc., including site PG test as specified in bidder's scope of supply as per Technical Specification PE-TS-388/389-179-N001 & subsequent MOM's, and including all taxes & duties.		Total Rs.			
2)	Recommended spares item-wise breakup with item-wise price to be given as per "Schedule of Recommended Spares" enclosed under Vol. III of Technical Specification.					
NOTE:	(i) Indicate all duties, taxes etc. stating whether included/ excluded in above price.  (ii) Recommended spares are only for reference purpose and not to be combined for evaluation and ordering purpose.					
<b>Bidder shall furnish this price Schedule in his price offer only</b>						
PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE						
NAME		DESIGNATION	SIGNATURE	DATE	COMPANY SEAL	

	<b>TITLE:</b>		SPECIFICATION NO.		PE-TS-388/389-179-N001
	SCHEDULE OF UNIT PRICES		VOLUME	III	
			SECTION		DATE 09.09.13
			REV. NO.	00	SHEET OF
SL. No.	DESCRIPTIONS OF WORKS OR EQUIPMENT		PRICE (In Rs.)		
<b>1.0</b>	<b>1X500MW VINDHYACHAL STAGE-V –STG PKG</b>				
<b>A)</b>	Unit Prices inclusive for Design, manufacture, assembly, inspection and testing, at manufacturer's and / or his sub contractor's works, properly packed and painted for transportation and delivery for following as specified in the Technical specification complete with accessories, commissioning spares (if any), counter flanges with nuts, bolts, gaskets and coatings (wherever necessary) on as required basis of PHE				
	a) Unit Price of PHE for TG Aux		Rs.		
<b>B)</b>	Total Lumpsum price of special tools and tackles (if required):		Rs.		
<b>C)</b>	Lumpsum Site Performance Testing of all PHE's for all Unit		Rs.		
<b>NOTES:</b> a) Total price of Unit Prices given above at sl. No. 1 should tally with Total price given in Sl. No. (1) of "Schedule of Prices" .  b) Unit price quoted by bidder, as above, shall be binding for any quantity variation, which is at the discretion of purchaser.  c) Price of commissioning & erection spares and other accessories not listed above shall be included in the price of equipment & shall be supplied with the equipment.  d) Indicate all taxes, duties etc. stating whether included/ excluded in above prices.  e) Price break up for items not asked are deemed to be included <b>A</b> .  f) Recommended spares item-wise breakup with item-wise price to be given as per "Schedule of Recommended Spares" enclosed under Vol. III of Technical Specification. Recommended spares are only for reference purpose and not to be combined for evaluation and ordering purpose.					
<b>Bidder shall furnish this price Schedule in his price offer only</b>					
PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE					
NAME		DESIGNATION	SIGNATURE	DATE	COMPANY SEAL

	<b>TITLE:</b>		SPECIFICATION NO.		PE-TS-388/389-179-N001	
	SCHEDULE OF PRICES		VOLUME	III		
			SECTION	DATE 09.09.13		
			REV. NO.	00	SHEET OF	
SL. No.	DESCRIPTIONS OF WORKS OR EQUIPMENT		PRICE (In Lacs of Rs.)			
1.0	<b>1X500MW VINDHYACHAL STAGE-V –SG PKG</b>  Total price for design, manufacture, assembly, inspection and testing at manufacturer's and / or his sub contractor's works, properly packed and painted for transportation and delivery of Two (2) nos. PHE's complete with all accessories, commissioning spares (if any), mandatory spares, counter flanges with nuts bolts, gaskets and coatings (wherever necessary), including special tools & tackles (if any) etc., including site PG test as specified in bidder's scope of supply as per Technical Specification PE-TS-388/389-179-N001 & subsequent MOM's, and including all taxes & duties.		Total Rs.			
2)	Recommended spares item-wise breakup with item-wise price to be given as per "Schedule of Recommended Spares" enclosed under Vol. III of Technical Specification.					
NOTE:	(i) Indicate all duties, taxes etc. stating whether included/ excluded in above price.  (ii) Recommended spares are only for reference purpose and not to be combined for evaluation and ordering purpose.					
<b>Bidder shall furnish this price Schedule in his price offer only</b>						
PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE						
NAME		DESIGNATION	SIGNATURE	DATE	COMPANY SEAL	

	<b>TITLE:</b>		SPECIFICATION NO.		PE-TS-388/389-179-N001	
	SCHEDULE OF UNIT PRICES		VOLUME	III		
			SECTION		DATE	09.09.13
			REV. NO.	00	SHEET	OF
SL. No.	DESCRIPTIONS OF WORKS OR EQUIPMENT		PRICE (In Rs.)			
<b>1.0</b>	<b>1X500MW VINDHYACHAL STAGE-V –SG PKG</b>					
A)	Unit Prices inclusive for Design, manufacture, assembly, inspection and testing, at manufacturer's and / or his sub contractor's works, properly packed and painted for transportation and delivery for following as specified in the Technical specification complete with accessories, commissioning spares (if any), counter flanges with nuts, bolts, gaskets and coatings (wherever necessary) on as required basis of PHE					
	a) Unit Price of PHE for SG Aux		Rs.			
B)	Total Lumpsum price of special tools and tackles (if required):		Rs.			
C)	Lumpsum price for Mandatory Spares as specified in DataSheet :		Rs.			
D)	Lumpsum Site Performance Testing of all PHE's for all Unit		Rs.			
<b>NOTES:</b> a) Total price of Unit Prices given above at sl. No. 1 should tally with Total price given in Sl. No. (1) of "Schedule of Prices" .  b) Unit price quoted by bidder, as above, shall be binding for any quantity variation, which is at the discretion of purchaser.  c) Price of commissioning & erection spares and other accessories not listed above shall be included in the price of equipment & shall be supplied with the equipment.  d) Indicate all taxes, duties etc. stating whether included/ excluded in above prices.  e) Price break up for items not asked are deemed to be included <b>A.</b>  f) Recommended spares item-wise breakup with item-wise price to be given as per "Schedule of Recommended Spares" enclosed under Vol. III of Technical Specification. Recommended spares are only for reference purpose and not to be combined for evaluation and ordering purpose.						
<b>Bidder shall furnish this price Schedule in his price offer only</b>						
PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE						
NAME		DESIGNATION		SIGNATURE	DATE	COMPANY SEAL



TITLE :  
TECHNICAL SPECIFICATION FOR  
PLATE HEAT EXCHANGERS

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

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REV. NO. 0

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## DOCUMENTS TO BE SUBMITTED ON PLACEMENT OF LOI



TITLE :  
TECHNICAL SPECIFICATION FOR  
PLATE HEAT EXCHANGERS

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

VOLUME III

REV. NO. 0


DATE 09.09.13

**DATA SHEET - B**

**FOR**

**PHE's**

**( TO BE FILLED UP DURING CONTRACT STAGE SEPERATELY FOR EACH PROJECT )**

	Title <b>DATA SHEET - B</b>		SPECIFICATION NO. PE-TS-388/389-179-N001			
	<b>PLATE HEAT EXCHANGER</b>		VOLUME <b>III</b>	PART <b>A</b>		
			SHEET <b>1</b>	OF <b>7</b>		

**INSTRUCTION TO BIDDER**

1. This data sheet shall be read in conjunction with Specification No. PE-TS-388/389-179-N001, Section - D, Volume - IIB.

2. Items which deviate from Specification shall be marked with an asterisk (\*)

SL.NO.	ITEM	UNIT	PARTICULARS	
1.0	<b>General</b>			
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	<b>Design</b>			
2.1	Design Pressure	bar (g)		
2.2	Design Temperature	°C		
2.3	Heat Load(without LMTD correction)	KW		
2.4	Heat Load(with LMTD correction)	KW		
2.5	LMTD (Corrected)	°C		
3.0	<b>Guaranteed Performance for Each Heat Exchanger</b>		<b>Primary Side (Hot Fluid)</b>	<b>Secondary Side (Cold Fluid)</b>
3.1	Flow rate	M <sup>3</sup> /hr		
3.2	Inlet temperature	°C		
3.3	Outlet temperature a) In fouled conditions b) In clean conditions	°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		

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



	Title <b>DATA SHEET - B</b>		SPECIFICATION NO. PE-TS-388/389-179-N001			
	<b>PLATE HEAT EXCHANGER</b>		VOLUME    III	PART    A		
			SHEET    2	OF    7		

**INSTRUCTION TO BIDDER**

1. This data sheet shall be read in conjunction with Specification No. PE-TS-388/389-179-N001, Section - D, Volume - IIB.

2. Items which deviate from Specification shall be marked with an asterisk (\*)

SL.NO.	ITEM	UNIT	PARTICULARS	
4.0	<b>Heat Transfer &amp; Fluid flow data</b>		<b>Primary Side (Hot Fluid)</b>	<b>Secondary Side (Cold Fluid)</b>
4.1	Film heat transfer co-efficient	KCal/hrM <sup>2</sup> °C		
4.2	Fouling factor	M <sup>2</sup> hr°C/KCal		
4.3	Overall fouling	M <sup>2</sup> hr°C/KCal		
4.4	Overall heat transfer coefficient	KCal/hrM <sup>2</sup> °C		
	a) In clean conditions			
	b) In fouled conditions			
4.5	Total effective heat transfer area per heat exchanger	M <sup>2</sup>		
4.6	Average velocity	m/s		
	a) Through ports			
	b) Through Plate Channels			
4.7	Pressure drop in ports	bar		
	a) In Clean Condition			
	b) In fouled conditions			
4.8	Pressure drop in channels	bar		
	a) In Clean Condition			
	b) In fouled conditions			
4.9	Maximum differential pressure between hot and cold fluids in plate channels (operating)	bar (g)		

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

	Title <b>DATA SHEET - B</b>		SPECIFICATION NO. PE-TS-388/389-179-N001			
	<b>PLATE HEAT EXCHANGER</b>		VOLUME <b>III</b>	PART <b>A</b>		
			SHEET <b>3</b>	OF	<b>7</b>	


**INSTRUCTION TO BIDDER**

1. This data sheet shall be read in conjunction with Specification No. PE-TS-388/389-179-N001, Section - D, Volume - IIB.

2. Items which deviate from Specification shall be marked with an asterisk (\*)

SL.NO.	ITEM	UNIT	PARTICULARS
5.0	<b>Heat Transfer Plates</b>		
5.1	Area of each plate	M <sup>2</sup>	
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	
	a) As per 5.5 above		
	b) As per 5.6 above		
	Maximum plate pack length	mm	
	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 <sup>3</sup>	
5.11	Port size (diameter)	mm	
6.0	<b>Plate Gaskets</b>		
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		

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

	Title <b>DATA SHEET - B</b>		SPECIFICATION NO. PE-TS-388/389-179-N001			
	<b>PLATE HEAT EXCHANGER</b>		VOLUME <b>III</b>	PART <b>A</b>		
			SHEET <b>4</b>	OF	<b>7</b>	


**INSTRUCTION TO BIDDER**

1. This data sheet shall be read in conjunction with Specification No. PE-TS-388/389-179-N001, Section - D, Volume - IIB.

2. Items which deviate from Specification shall be marked with an asterisk (\*)

SL.NO.	ITEM	UNIT	PARTICULARS
7.0	<b>Carrying Bar</b>		
7.1	Type of construction		
7.2	Number per heat exchanger		
7.3	Size		
7.4	Material		
8.0	<b>Guide Bar</b>		
8.1	Type of construction		
8.2	Number per heat exchanger		
8.3	Size		
8.4	Material		
9.0	<b>Frame Plate</b>		
9.1	Type of Construction		
9.2	Material		
10.0	<b>Pressure Plate</b>		
10.1	Type of construction		
10.2	Material		
11.0	<b>Supporting Columns</b>		
11.1	Type of Construction		
11.2	Material		
12.0	<b>Clamping/Gasket Compression Arrangement</b>		
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		

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

	Title <b>DATA SHEET - B</b>		SPECIFICATION NO. PE-TS-388/389-179-N001			
	<b>PLATE HEAT EXCHANGER</b>		VOLUME <b>III</b>	PART <b>A</b>		
			SHEET <b>5</b>	OF	<b>7</b>	

**INSTRUCTION TO BIDDER**

1. This data sheet shall be read in conjunction with Specification No. PE-TS-388/389-179-N001, Section - D, Volume - IIB.

2. Items which deviate from Specification shall be marked with an asterisk (\*)

SL.NO.	ITEM	UNIT	PARTICULARS	
13.0	<b>Inlet &amp; outlet Connection Nozzles</b>		<b>Primary Side</b>	<b>Secondary Side</b>
			<b>(Hot Fluid)</b>	<b>(Cold Fluid)</b>
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 offer?		YES/NO	
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	

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

	Title <b>DATA SHEET - B</b>		SPECIFICATION NO. PE-TS-388/389-179-N001			
	<b>PLATE HEAT EXCHANGER</b>		VOLUME <b>III</b>	PART <b>A</b>		
			SHEET <b>6</b>	OF <b>7</b>		

**INSTRUCTION TO BIDDER**

1. This data sheet shall be read in conjunction with Specification No. PE-TS-388/389-179-N001, Section - D, Volume - IIB.

2. Items which deviate from Specification shall be marked with an asterisk (\*)

SL.NO.	ITEM	UNIT	PARTICULARS
19.0	<b>Shop Tests &amp; Inspection</b>		
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 b) Test duration	bar (g) min.	
19.3	Are all plates checked for cracks and other defects by the penetration method?  If not, what percentage is checked?		YES/NO
19.4	Is hardness test conducted for plate gaskets?		YES/NO
20.0	<b>Details of Painting</b>		
20.1	<b>Exterior surface</b> a) Surface preparation b) Primer c) Finish Preparation		
20.2	<b>Interior Surface</b> a) Surface preparation b) Primer c) Finish Preparation		
21.0	Weight of each heat exchanger	kg.	

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

	Title <b>DATA SHEET - B</b>		SPECIFICATION NO. PE-TS-388/389-179-N001	
	<b>PLATE HEAT EXCHANGER</b>		VOLUME <b>III</b>	PART <b>A</b>
			SHEET <b>7</b>	OF <b>7</b>

**INSTRUCTION TO BIDDER**

1. This data sheet shall be read in conjunction with Specification No. PE-TS-388/389-179-N001, Section - D, Volume - IIB.


2. Items which deviate from Specification shall be marked with an asterisk (\*)

SL.NO.	ITEM	UNIT	PARTICULARS
	a) Empty b) Flooded		
	Flooded Weight of heat exchanger with Max. Plates		
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
25.0	Mesh Size of recommended Strainer	mm	
26.0	Foundation nuts and bolts supplied		Yes/No
27.0	Other information (if any)		

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

## CHECKLIST — LIST OF SCHEDULES

Sl. No.	Form No.	Description	Tick Applicable Forms
1.	PEM-6024	Schedule of Drawings / Catalogues submitted with Bid	✓
2.	PEM-6025@	Schedule of Occurance of Key Events of Delivery, Erection & Commissioning	
3.	PEM-6026	Schedule of Equipment Manufacture, Despatch and Shipment to Site.	✓
4.	PEM-6027	Schedule of Weights & Dimensions	
5.	PEM-6028@	Schedule of Performance Guarantee	
6.	PEM-6030	Inspection Schedule	✓
7.	PEM-6031	Schedule of Cement and Steel and Quarterly Cement Requirement	
8.	PEM-6032	Schedule of Quarterly Requirement of Reinforcing Bars and Structural Steel	
9.	PEM-6033@	Bill of Quantities (Civil Works)	
10.	PEM-6035	Schedule of Bidder's Proposed Construction / Site Fabrication Facilities.	
11.	PEM-6036	Schedule of Deviations	✓
12.	PEM-6040	Schedule of Declaration	✓
13.	PEM-6041	Quality Plan	✓
14.	PEM-6042	Vendor's Drawings / Documents Schedule	✓
15.	PEM-6043@	Schedule of Occurance of Key Events for Civil / Structural Works	
16.	PEM-6046	Inspection Request	✓
17.	PEM-6051	Schedule of Prices	✓
18.	PEM-6052@	Schedule of Unit Prices	✓
19.	PEM-6053	Schedule of Prices for Commissioning & Mandatory Spares	✓
20.	PEM-6054	Schedule of Prices for Recommended Spares	✓
21.	PEM-6055	Schedule Prices for Erection and Maintenance Tools & Tackles	✓
22.	PEM-6056	Schedule of Bidder's Man-power for Supervision of E & C and their Charges.	✓
23.	PEM-6057	Schedule of Daily & Overtime Rates	
24.	PEM-6058	Schedule of Hire-charges for Construction / Site Fabrication Facilities	
For Forms marked with @ certain information to be filled by DEs - before issuing to bidder.			

	<b>SCHEDULE OF DRAWINGS/CATALOGUES SUBMITTED WITH BID</b>		SPECIFICATION NO	
			VOL III	
			SHEET..... OF.....	
Section C/D enclosed with the specification indicate the drawings / catalogues to be furnished with the bid. The bidder in addition to furnishing the same, can also include any other drawings / catalogues which he may desire to submit with the bid. This schedule duly lists out such drawings as enclosed by the bidder with the bid.				
DRAWING/ CATALOGUE NUMBER	DESCRIPTION			NUMBER OF SHEETS

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	
				COMPANY SEAL



SPECIFICATION NO

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VOL III

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SHEET..... OF.....

Equipment/Major Bought-out items	Time for Manufacture/ Procurement from Date of issues of Letter of intent (Weeks)	Time for Test Dismantling Packing & Ready for Dispatch (Weeks)	Time required fro Shipment to Site (Weeks)	Total Time from Date of Issue of Letter of intent to Shipment to Site (Weeks)

We, the undersigned hereby undertake to meet the schedule in weeks from manufacture, dispatch and shipment of each equipment and procurement of major boughtout items as listed above.


PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL

FORM NO PEM 6027-1

	<b>SCHEDULE OF WEIGHTS &amp; DIMENSIONS</b>	SPECIFICATION NO
		VOL III
		SHEET..... OF.....
<p>The bidder shall state below the weights and dimensions of various packages for shipment covering the complete scope.</p>		
Description of Package(S)	Dimension (in meters)	Weight (in tones)

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	
				COMPANY SEAL

FORM NO PEM 6030-1

		<b>INSPECTION SCHEDULE</b>		SPECIFICATION NO	
				VOL III	
				SHEET..... OF.....	
S No.	ITEM/COMPONENT	PLACE & ADDRESS OF TEST / INSPECTION	SCHEDULE D DATE OF INSPECTION	DURATION OF TEST / INSPECTION (IN DAYS)	
<p>This schedule shall be in the line with specification and quality plan requirements. The information in this form shall be furnished after receipt of LOI/PO.</p>					

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	
				COMPANY SEAL

**SCHEDULE OF BIDDER'S MAN POWER  
FOR SUPERVISION OF E & C  
AND THEIR CHARGES**


SHEET \_\_\_\_\_ OF \_\_\_\_\_

## SUPERVISION OF ERECTION


S. No.	Designation	Normal rate per day of 8 hours	Overtime rate per hour

Sl. No.	Designation	Normal rate per day of 8 hours	Overtime rate per hour


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	<b>TITLE</b> <b>* SCHEDULE OF PRICE FOR ERECTION AND MAINTENANCE TOOLS &amp; TACKLES</b>		SPECIFICATION NO	
			VOL III	
			SHEET..... OF.....	
The bidder shall be given below the list of erection and maintenance tools and tackles as offered by him. This shall also include the customer's list of maintenance tools, if specified in Section – C / Section - D				
S. No	DESCRIPTION OF TOOLS & TACKLES	QUANTITY OFFERED	UNIT PRICE (Rs.)	TOTAL PRICE (Rs.)
NOTE : The hire charges for vendors equipment called for in this schedule shall include the cost of consumables, operation services, descriptions, wear and tear as well as vendor's over head and profit (These rates will be payable by customer to the vendor, only if the customer's requires the use of this equipment for carrying out his own work out side the scope of this contract).				

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				COMPANY SEAL
NAME	DESIGNATION	SIGNATURE	DATE	


	<b>*SCHEDULE OF PRICES FOR RECOMMENDED SPARES</b>						SPECIFICATION NO		
							VOL III		
							SHEET..... OF.....		
<b>*Unpriced schedule shall also be furnished along with Part A- Schedule in technical bid</b> The bidder shall give below a list of spares recommended for three years (or as otherwise specified in section – C) for trouble free performance of the equipment / system offered.									
S. No.	Manufacturer's Drawing No / Part of spare	Description	Material	Quantity per Unit / Equipment	Quantity Recommended	If Set, Nos. Per Set	Delivery Period (Weeks)	Unit Price (Rs.)	Total Price (Rs.)

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE					
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL	

		<b>*SCHEDULE OF PRICES FOR COMMISSIONING AND MANDATORY SPARES</b>					SPECIFICATION NO		
							VOL III		
							SHEET..... OF.....		
<p><b>*Unpriced schedule shall also be furnished along with Part A- Schedule in technical bid</b></p> <p>The bidder shall indicate here the quantity required for erection / commissioning and mandatory spares for equipment as listed in Section C / Section – D. If the listed spares are not adequate then the bidder shall indicate those and additional spares considered necessary by him.</p>									
Type	Manufacturer's Drawing No / Part of spare	Description	Material	Quantity per Unit / Equipment	Quantity Recommended	If Set, Nos. Per Set	Delivery Period (Weeks)	Unit Price (Rs.)	Total Price (Rs.)
Erection & Commissioning									
Mandatory Spares									
Additional Spares Mandatory Erection / Commissioning									

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				COMPANY SEAL
NAME	DESIGNATION	SIGNATURE	DATE	

**FORM NO PEM 6041-1**

		<b>QUALITY PLAN</b>		CUSTOMER		PROJECT TITLE		SPECIFICAION NUMBER				
				BIDDER/ VENDOR		QUALITY PLAN NUMBER		PACKAGE : PLATE HEAT EXCHANGER				
		SHEET OF		SYSTEM		ITEM		SECTION VOLUME III				
S. No.	COMPONENT / OPERATION	CHARACTERISTIC CHECK	CAT	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
BHEL			PARTICULARS		BIDDER / VENDOR							
			NAME									
			SIGNATURE									
			DATE									
									BIDDER/VENDOR COMPANY SEAL			



(Form No. PEM-6042-0)

Column 1-	Serial Number
Column 2-	Component/Operation- The component and/or operation being checked shall be given here.
Column 3-	Characteristics check- The characteristics being checked shall be given here. e.g., chemical composition, mechanical properties, leak tightness, surface defects etc..
Column 4-	Category - 'CR' stands for critical characteristic - affecting safety of equipment and personnel 'MA' stands for major Characteristic - affecting safety of equipment and personnel 'MI' stands for minor characteristic - affecting appearance etc.
Column 5-	Type/Method of check e.g. chemical analysis tensile testing, hydraulic test, visual examination radiography etc.
Column 6-	Extent of check, such as, 100, 10, 1 per heat etc.
Column 7-	Reference Documents - Documents, such as technical specification, drawings, standard specifications (IS, BS ETC.) procedure, etc. according to which check is done.
Column 8-	Acceptance Norms - Standards etc. according to which acceptability or otherwise of the characteristics being checked is decided.
Column 9-	Format of Record - Formats, log sheets, reports, etc. in which the observations are recorded. Standard log sheets, reports, formats etc. of the Vendors shall be numbered and such reference numbers shall be included here.
Column 10-	Agency - The agency which performs the test/instruction shall be written in sub-column 'W' The agency which verifies test certificates/inspection records and carries out audit check of the components/operation shall be written in sub-column 'V'
	The agencies are codified     'I' stands for (BHEL) as 1,2 & 3                      '1' means the operation shall be cleared by BHEL before the start of the next operation. '2' Stands for Vendor '3' stands for sub-Vendor of the Vendor and so on.

Entry	'3' in column 'P'	means test/inspection to be performed by sub-Vendor's QC
Entry	'2' in column 'W'	means test/inspection to be witnessed by Vendor's QC
Entry	'1' in column 'V'	means verification shall be done by BHEL and next stage to be started only after the hold point is cleared by BHEL
Column II-	<b>Remarks</b> - Any special remarks shall be given here.	

1. In absence of correlation with the test certificate(s) (e.g. material identification) samples shall be drawn by BHEL and all tests as per relevant specifications shall be carried out in their presence or in recognized Government Laboratory.
2. When materials and components are initially identified and stamped by BHEL QS engineer, the identification marks shall be preserved till despatch. Wherever this is not possible, the identification mark shall be transferred to the components in the presence of BHEL QS Engineer unless other wise agreed.
3. For castings and forgings integral test specimens shall be provided. When this is not possible for casting, they shall be poured in the presence of BHEL QS Engineer unless otherwise, if witnessing of test by BHEL is called for.
4. When welders qualified by reputed inspection agencies or statutory bodies are not available, qualification tests shall be conducted in the presence of BHEL QS Engineer.
5. This Quality Plan is liable to be modified as per the requirements of approved drawings and changes in technical specifications/drawings. If there are contradictions in respect of column 7 & 8 between this Quality Plan and the approved drawings specifications, the latter shall prevail.
6. Wherever inspection by BHEL's Purchaser/Third Party/Statutory authorities are mandatory, this shall be complied with.
7. Inspection reports, log sheets, test reports/certificate, etc. shall be furnished to BHEL at the appropriate stage or at the time of final inspection, as required.
8. This Quality Plan is also applicable to spares, if any, under scope of supply of Vendor.
9. The quality plan shall be submitted in septuplicate (7 Copies).