

NEYVELI LIGNITE CORPORATION LIMITED (NLC LTD)

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

VOLUME –III

**TECHNICAL SPECIFICATION
FOR
PLATE HEAT EXCHANGERS (PHE)**

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



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



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

SPEC. NO.: PE-TS-400/402-179-N001

VOLUME III

SECTION

REV. NO. 0

DATE 01.10.2014

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

1.1 Volume -I CONDITIONS OF CONTRACT

This consists of four parts as below:

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

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

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

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

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

Volume - II A: General Technical Conditions

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

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

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

Section – B: This section provides “Project Information”

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

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

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

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

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

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

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



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

SPECIFICATION NO. PE-TS-400/402-179-N001

VOLUME III

REV. NO. 0 DATE 01.10.2014

SHEET 1 OF 1

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DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER



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PROJECT NAME :

REV. NO. 0 DATE 01.10.2014


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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 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.

FORM NO PEM 6036-1

| | | |
|---|---|--------------------|
|  | TITLE * SCHEDULE OF DEVIATIONS () 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 | |
| | | | | |

| | | |
|---|---|--------------------|
|  | TITLE * SCHEDULE OF DECLARATIONS | SPECIFICATION NO |
| | | VOL III |
| | | SHEET..... OF..... |

* Bidder shall include this schedule both in technical and Price offers

DECLARATION

Icertify that all the technical data and information pertaining to this specification are correct and are true representation of the equipment/system covered by our format proposal number Dated and there is no deviation to the specification.

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

Bidders Company Name

Authorized representative's Signature

Name

Bidder's Intent The bidder hereby agrees to fully comply with the requirements and intent of this specification for the price indicated

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



| | | |
|------------------------------------|-------------------|------------------------|
| SCHEDULE OF PERFORMANCE GUARANTEES | SPECIFICATION NO. | PE-TS-400/402-179-N001 |
| PLATE HEAT EXCHANGER | Vol. | III |

| SL. NO. | DESCRIPTION | UNIT | GUARANTEE VALUE |
|------------|---|---------------------|------------------------------------|
| | | | Project: 2 X 500 MW NNTPP – SG PKG |
| 1.0 | PRIMARY SIDE (HOT WATER SIDE) | | |
| | CLEAN CONDITION | | |
| a) | Flow rate | M ³ /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 ³ /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 ³ /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 ³ /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-400/402-179-N001 |
| PLATE HEAT EXCHANGER | Vol. | III |

| SL. NO. | DESCRIPTION | UNIT | GUARANTEE VALUE |
|------------|---|---------------------|------------------------------------|
| | | | Project: 2 X 500 MW NNTPP – TG PKG |
| 1.0 | PRIMARY SIDE (HOT WATER SIDE) | | |
| | CLEAN CONDITION | | |
| a) | Flow rate | M ³ /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 ³ /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 ³ /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 ³ /Hr. | |
| b) | ACW inlet temperature | °C | |
| c) | ACW outlet temperature | °C | |
| d) | Pressure drop | MWC | |

| | | | |
|--|--|--|--|
| PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE | | | |
| NAME | | | |
| SIGNATURE | | | |
| DATE | | | |



TITLE :
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SHEET 1 OF 1

DOCUMENTS TO BE SUBMITTED ON PLACEMENT OF LOI



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SHEET 1 OF 1

DATA SHEET-B

FOR PHE'S

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



Title **DATA SHEET - B**

SPECIFICATION NO.
PE-TS-400/402-179-N001

PLATE HEAT EXCHANGER

VOLUME III PART A

SHEET 1 OF 7

INSTRUCTION TO BIDDER

1. This data sheet shall be read in conjunction with Specification No. PE-TS-400/402-179-N001, Section - D, Volume - IIB.
2. Items which deviate from Specification shall be marked with an asterisk (*)

| SL.NO. | ITEM | UNIT | PARTICULARS | |
|--------|--|--------------------|-------------------------------------|--|
| 1.0 | 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 | °C | | |
| 2.3 | Heat Load(without LMTD correction) | KW | | |
| 2.4 | Heat Load(with LMTD correction) | KW | | |
| 2.5 | LMTD (Corrected) | °C | | |
| 3.0 | Guaranteed Performance for Each Heat Exchanger | | Primary Side (Hot Fluid) | Secondary Side (Cold Fluid) |
| 3.1 | Flow rate | M ³ /hr | | |
| 3.2 | Inlet temperature | °C | | |
| 3.3 | Outlet temperature | °C | | |
| | a) In fouled conditions | | | |
| | b) In clean conditions | | | |
| 3.4 | Total pressure drop across heat exchanger from inlet to outlet(including inlet & outlet nozzles) | bar | | |
| | a) For design flow | | | |
| | b) For 110% design flow rate | | | |

| | | | | | |
|--|---|---|---|---|---|
| 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-400/402-179-N001

PLATE HEAT EXCHANGER

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-400/402-179-N001, Section - D, Volume - IIB.
2. Items which deviate from Specification shall be marked with an asterisk (*)

| SL.NO. | ITEM | UNIT | PARTICULARS | |
|--------|---|--------------------------|-------------------------------------|--|
| 4.0 | Heat Transfer & Fluid flow data | | Primary Side (Hot Fluid) | Secondary Side (Cold Fluid) |
| 4.1 | Film heat transfer co-efficient | KCal/hrM ² °C | | |
| 4.2 | Fouling factor | M ² hr°C/KCal | | |
| 4.3 | Overall fouling | M ² hr°C/KCal | | |
| 4.4 | Overall heat transfer coefficient | KCal/hrM ² °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 | | |
| | 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) | | |

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-400/402-179-N001

PLATE HEAT EXCHANGER

VOLUME III PART A

SHEET 3 OF 7

INSTRUCTION TO BIDDER

1. This data sheet shall be read in conjunction with Specification No. PE-TS-400/402-179-N001, Section - D, Volume - IIB.
2. Items which deviate from Specification shall be marked with an asterisk (*)

| SL.NO. | ITEM | UNIT | PARTICULARS |
|--------|---|----------------|-------------|
| 5.0 | 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 | |
| | 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 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 | | |

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-400/402-179-N001

PLATE HEAT EXCHANGER

VOLUME III PART A

SHEET 4 OF 7

INSTRUCTION TO BIDDER

1. This data sheet shall be read in conjunction with Specification No. PE-TS-400/402-179-N001, Section - D, Volume - IIB.
2. Items which deviate from Specification shall be marked with an asterisk (*)

| SL.NO. | ITEM | UNIT | PARTICULARS |
|--------|---|------|-------------|
| 7.0 | 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 | | |
| 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 | | |

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-400/402-179-N001

PLATE HEAT EXCHANGER

VOLUME III PART A

SHEET 5 OF 7

INSTRUCTION TO BIDDER

1. This data sheet shall be read in conjunction with Specification No. PE-TS-400/402-179-N001, Section - D, Volume - IIB.
2. Items which deviate from Specification shall be marked with an asterisk (*)

| SL.NO. | ITEM | UNIT | PARTICULARS | |
|--------|--|--------|---------------------|-----------------------|
| 13.0 | Inlet & outlet Connection Nozzles | | Primary Side | Secondary Side |
| | | | (Hot Fluid) | (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 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 |

Name of Bidder/ Vendor

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



Title **DATA SHEET - B**

SPECIFICATION NO.
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PLATE HEAT EXCHANGER

VOLUME III PART A

SHEET 6 OF 7

INSTRUCTION TO BIDDER

1. This data sheet shall be read in conjunction with Specification No. PE-TS-400/402-179-N001, Section - D, Volume - IIB.
2. Items which deviate from Specification shall be marked with an asterisk (*)

| SL.NO. | ITEM | UNIT | PARTICULARS |
|--------|---|---------|-------------|
| 19.0 | 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? If not, what percentage is checked? | | YES/NO |
| 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 | kg. | |

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-400/402-179-N001

PLATE HEAT EXCHANGER

VOLUME III PART A

SHEET 7 OF 7

INSTRUCTION TO BIDDER

1. This data sheet shall be read in conjunction with Specification No. PE-TS-400/402-179-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 | | |
| 22.0 | Flooded Weight of heat exchanger with Max. Plates 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) | | |

Name of Bidder/ Vendor

| Revision Number | 0 | 1 | 2 | 3 | 4 |
|--|---|---|---|---|---|
| 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. | | | |

FORM NO PEM 6024-1



**SCHEDULE OF DRAWINGS/CATALOGUES
SUBMITTED WITH BID**

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 |

FORM NO PEM 6026-1



**SCHEDULE OF EQUIPMENT,
MANUFACTURE, DESPATCH AND
SHIPMENT TO SITE**

SPECIFICATION NO

VOL III

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 fro 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



**SCHEDULE OF
WEIGHTS & DIMENSIONS**

SPECIFICATION NO

VOL III

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


The bidder shall state below the weights and dimensions of various packages for shipment covering the complete scope.

| 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

|  | INSPECTION SCHEDULE | | 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 LOL/PO.</p> | | | | |

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

FORM No. PEM - 6056-D



TITLE

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

SPECIFICATION NUMBER

VOLUME III

SHEET OF

The bidder shall indicate below, designation-wise, the personnel required for supervision of erection and commissioning and their charges.

SUPERVISION OF ERECTION

| S. No. | Designation | Normal rate per day of 8 hours | Overtime rate per hour |
|--------|-------------|-----------------------------------|------------------------|
| | | | |
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SUPERVISION OF COMMISSIONING

| Sl. No. | Designation | Normal rate per day of 8 hours | Overtime rate per hour |
|---------|-------------|-----------------------------------|------------------------|
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PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE

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***SCHEDULE OF PRICES FOR COMMISSIONING AND MANDATORY SPARES**


| |
|--------------------|
| SPECIFICATION NO |
| VOL III |
| SHEET..... OF..... |

***Unpriced schedule shall also be furnished along with Part A- Schedule in technical bid**
 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.

| 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 | | | | |
| NAME | DESIGNATION | SIGNATURE | DATE | COMPANY SEAL |

FORM NO PEM 6041-1

|  | | QUALITY PLAN | | | CUSTOMER | | | PROJECT TITLE | | SPECIFICATION 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 | | | BIDDER/VENDOR COMPANY SEAL | | | |
| | | | NAME | | | | | | | | | |
| | | | SIGNATURE | | | | | | | | | |
| | | | DATE | | | | | | | | | |

INSTRUCTIONS FOR FILLING QUALITY PLAN

(Form No. PEM-6042-0)

The Quality Plan shall include all the Quality Control Measures and Checks adopted by the Vendor to ensure that the material/component/assembly/services supplied by him meet/will meet the requirements as per specifications and good practices. They shall include all stages of operation such as materials, processes, manufacture, assembly, packing and despatch. The following guide lines may be noted:

- 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 '1' 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.

Example :

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- Remarks - Any special remarks shall be given here.

NOTES :

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 otherwise 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 compiled 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).