

# **UPPUR SUPER CRITICAL THERMAL POWER PLANT (2 X 800 MW)**

## **TECHNICAL SPECIFICATION FOR FLOW ELEMENT ASSEMBLY - NOZZLE**

### **VOLUME II-B**

**SPECIFICATION Nos  
PE-TS-425-145-I 005**



**BHARAT HEAVY ELECTRICALS LIMITED  
POWER SECTOR  
PROJECT ENGINEERING MANAGEMENT DIVISION  
NOIDA, INDIA**

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|  | <b>Technical specification for<br/>FLOW ELEMENT ASSEMBLY<br/>(NOZZLE)</b><br><br><b>UPPUR STPP (2 X 800 MW)</b> | SPECIFICATION NO. <b>PE-TS-425-145-I 005</b> |                  |
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## SECTION – A

### SCOPE OF ENQUIRY

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## SCOPE OF ENQUIRY

### 1.0 SCOPE

This specification covers the Design, Manufacture, Inspection and Testing at manufacturer's works, proper packing for transportation and delivery to site of the Flow Element Assemblies along with Accessories, Start-up/Commissioning spares as mentioned in different sections of this specification for **UPPUR STPP (2x800 MW)** project.

- .1 The quality plan enclosed forms the minimum requirement but not limited to be adhered to by the bidder.
- .2 The enquiry shall be operated in " **COMPLAINE MODE**" means bidder to comply with the requirement of specification, quality plan, delivery schedule, quantities, start-up/commissioning spares, mandatory spares, recommended spares etc, and as a token of acceptance of the same, following formats to be signed, stamped with company seal and submitted separately for each project.
  - a) Compliance certificate
  - b) Quality plan
  - c) Data sheet A&B dully filled

### .3 BLANK

- .4 **Bidder to note that CALIBRATION TEST is required to be conducted on one type per size, Bidder to group such assemblies and indicates the same along with the price bid. Unpriced portion to be submitted.**

### 2.0 GENERAL TECHNICAL INSTRUCTIONS

- 1 It is not the intent here to specify all the details of design and manufacture. However, the equipment shall conform in all respects to high standard of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to the customer / consultant, who will interpret the meaning of drawing and specification and shall be entitled to reject any component or material which in his judgment is not in full accordance herewith.
- 2 The omission of specific reference to any component / accessory necessary for the proper performance of the equipments shall not relieve the supplier of the responsibility of providing such facilities to complete the supply within the quoted prices.
- 3 BHEL's / Customer's representatives shall be given access to the shop in which the equipments are being manufactured or tested and all test records shall be made available to them.
- 4 The Equipment covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and Material Dispatch Clearance Certificate (MDCC) is issued by BHEL/ Customer.



Technical specification for  
**FLOW ELEMENT ASSEMBLY**  
(NOZZLE)

UPPUR STPP (2X800MW)

SPECIFICATION NO. **PE-TS-425-145-I 005**

VOLUME **II-B**

SECTION **C**

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## SECTION – C

### SPECIFIC TECHNICAL REQUIREMENTS

**COMPLIANCE CERTIFICATE  
FOR  
FLOW ELEMENTS ASSEMBLY- NOZZLE**

(To be Signed & Stamped by the Bidder)

**Project: UPPUR STPP (2 X 800 MW)**

**Specification no.: PE-TS-425-145-I 005**

**We shall comply with the following: -**

1. All the requirements as stated in Technical Specification / Specific Technical requirement / Data sheets / BHEL quality plan etc as enclosed in the tender, shall be fully complied **without any deviation**.
2. BHEL Quality Plan (enclosed with the specification) duly signed and stamped is submitted herewith **without any deviation**.
3. Sizing Calculations, Data sheet-C in line with Data sheet-A of specification, dimensional drawings / edge preparation details, etc shall be submitted for BHEL/Customer review and approval, to reach BHEL within 15 days after receipt of LOI.
4. Any change in Sizing calculations, QP etc., if desired by BHEL / Customer during approval of the documents after award of contract, without major changes in process parameters as per tender Specification, shall be carried out without any commercial implication and time delay.
5. The offered Flanges, Root valves, Nipples, Reducers are suitable for the applicable process parameters.

|                     |  |
|---------------------|--|
| Signature with date |  |
| Name                |  |
| Company seal        |  |

|                                                                                   |                                                                           |  |                                              |  |
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|                                                                                   | UPPUR STPP (2 X 800MW)                                                    |  |                                              |  |

### **SPECIFIC TECHNICAL REQUIREMENTS for the project.**

The requirements in this section are specific for this project and shall over-ride the specification under section-D in case of any contradiction.

1. BLANK
2. Calibration of the Flow nozzles shall be as per ASME PTC 19.5, however for Orifice plates shall be as per BS 1042.
3. Hydraulic test pressure for Assemblies shall be 1.5 times of the design pressure at normal temperature.
4. Inspection shall be carried out in line with the approved drawings / data sheets / QP and specific technical requirements.
5. Acceptance norm for surface finish after machining for both pipe, nozzle is the requirements as specified in PTC 19.5.
6. Bidder to note that data sheet-B and Quality Plan enclosed in Volume-IIB should be furnished duly signed and stamped.
7. All the formats in Volume-III should filled-up and furnished with the bid, complete in all respect. In the absence of those, the bid would be considered incomplete and liable for rejection.
8. Wherever IBR certification is required as per data sheet for an element, all accessories pertaining to that element shall require IBR Certification.
9. **SPARES** : The following spares are required to be offered
  - (A) **Mandatory Spares: (Not Applicable)**

The items listed in list of mandatory spares attached at section-D, of this specification, are the essential spares required to be offered by the bidder, and the price for which (Lump sum as well as individual) for each item to be quoted separately under the separate heading. The format for price schedule to be filled-up by the bidder is enclosed in Volume-III

|                                                                                   |                                                                                                                |                                              |                  |
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Each Case / Container containing Mandatory spares shall be clearly marked or labelled on the outside with the description of the spares contained in it. When more than one item of spare parts are packed in a single Case / Carton, a general description of the contents shall be shown outside of such case, and detailed list enclosed. All Cases, Containers and Packages must be suitably marked and numbered for the purpose of identification.

**(B) Recommended Spares:**

In addition to the Mandatory spares mentioned, the bidder shall also furnish a List of Recommended spares if for 3 years of normal operation of the Flow Element Assemblies. The BHEL reserves the right to buy any or all of the recommended spares.

**(C) Start-up & Commissioning Spares:**

Start-up and Commissioning spares are those spares, which may be required during the start-up and commissioning of the Flow Element Assemblies. All start-up spares, which are supplied under this contract, shall be strictly interchangeable with the parts for which they are intended for replacements. The format for price schedule to be filled-up by the bidder is enclosed in Volume-III

The Start-up and commissioning spares indicated by the bidder shall be a part of the main Flow Element Assembly supplies. However bidder to indicate prices separately. The list of these spares required is enclosed in the section-D of this specification.

**10. Documentation :**

**(A) Along with the bids: following documents for respective projects separately**

- a) Signed and stamped compliance certificates in attached format (VOL.-III).
- b) Schedule of prices in attached format (VOL.-III).
- c) Schedule of submission of Drg. / Doc, Equip. Manufacture, Inspection and Dispatch.
- d) Inspection schedule

**(B) After the award of contract :**

The documentation as listed below to be submitted, separately for respective projects.

6 sets of the following documents + 3 sets of Floppies / CDs to be submitted for Approval:

|                                                                                   |                                                                                                                |                                              |                  |
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- Assembly drawing of all type of Flow Element assemblies complete with all accessories indicating detailed dimensions, BOM and weights.
- Flow Element Edge preparation details.
- Installation drawings for the flow elements.
- Technical Data sheet-C completely filled-up..
- Quality Plan duly signed and stamped.
- Bore size calculations for Flow orifices and Flow Nozzles for all the conditions indicated in the data sheets.
- Differential Pressure Vs Flow, curve for each Orifice and Nozzle.
- All relevant catalogues for the models of the Flow Element Assemblies as well as accessories finalized.
- Bar chart to indicate the time schedule for procurement, manufacture, testing and dispatch.

**(C) Final documentation :**

- Category -I & IV Approved final drawings/data sheets, - 20 sets with 4 CD-ROMS  
Bore sizing calculations, DP Vs Flow Curve for each  
Orifice and Nozzle.
- Test certificates - 20 sets.
- Operation & Maintenance Manuals - 20 sets with 4 CD-ROMS  
for Flow Element Assemblies and all the  
Accessories.

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## CUSTOMER SPECIFICATION

#### **3.04.00 FLOW ELEMENTS:-**

This specification covers the design, material, construction features, manufacture, inspection and testing at the VENDOR'S/SUB-VENDOR'S WORKS and delivery to site of Flow Elements such as Flow Nozzles, Orifice plates, Aerofoils, AnnuBar etc.

The equipment furnished to this specification shall conform exactly to the requirements herein, unless modified by the respective approved Data Sheet of the equipment.

**3.04.01** The design, material, construction features, manufacture, inspection and testing of flow elements shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment will be installed. The equipment shall also conform to the latest applicable standards. Nothing in this specification shall be construed to relieve the Bidder of this responsibility.

#### **3.04.02 Standards**

The flow elements (Orifice plates) shall be designed in accordance with ASME PTC – 19.5 (Pt – II), ISA RP3.2, 1960 or BS 1042/ISO 5167.

The flow elements (Flow Nozzles) shall be designed in accordance with ASME PTC – 19.5 (Pt – II), or BS 1042/ISO 5167.

- Measurement of Fluid Flow in Pipes Using Orifice, Nozzle, and Venturi – ASME MFC – 3M.

#### **3.04.03 Technical Requirement**

Long radius, weld in flow nozzles with D and D/2 pressure tapings & SS316 or better material; and flow orifice plate assembly with flange tap connections & SS316 or better

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material with beta ratio of 0.4 to 0.7 shall be provided. In general, Flow Element material shall be of SS 316 or better.

The material of Flow nozzle shall be A182F91, where pipe material is A335P91.

End connections for flow elements will be butt welded except orifice plate on condensate return line to CST, which will be flanged. The accuracy of the each flow element shall be  $\pm 0.5\%$  or better.

Construction and installation of flow nozzles and orifices shall conform to the requirements of ASME Performance Test Code PTC-19.5 as mentioned above and discharge coefficients shall be predicted in accordance with data published in ASME Research Report on Fluid Meters.

Flow nozzles shall be provided for critical measurements, where weld-in construction is required. Flow nozzles shall be made with quater, triple or dual sets of pressure taps installed in the pipe wall wherever required considering spare one set of pressure tap. Installation of flow nozzles and pressure taps shall be made in the pipe fabricator's shop.

Anubars (Averaging Pitot tube) shall be used where pressure loss is critical and/or conditions permit their reliable installation.

Concentric orifice plates shall only be provided for other flow measurements where flanged construction and higher pressure losses are acceptable. Orifice plates shall be made of stainless steel. Orifice flanges shall be of the raised face weld neck type with dual sets of taps. Thickness of Orifice plate shall be 3.18 mm for main pipe diameter up to 300 mm, 6.35 mm for pipe diameter above 300 mm & less than 500 mm and 10 mm for main pipe diameter of & above 500 mm.

Coriolis principle based mass flow meters shall be used for flow (mass & volume) measurement of liquid fuel.

Aerofoil/ Venturi tubes shall be provided for Air flow measurement.

Maximum pressure drop/loss shall be limited to 30% of Differential Pressure for flow Nozzle & 60% of DP for Orifice plate subject to beta ratio within the range as specified.

|                                                                                                      |
|------------------------------------------------------------------------------------------------------|
| The branch pipe for mounting the flow Nozzle will be supplied as a free issue item by the purchaser. |
|------------------------------------------------------------------------------------------------------|

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## **SECTION – D**

- **EQUIPMENT SPECIFICATION**
- **DATA SHEETS – A & B**
- **DATA SHEETS - C**
- **QUALITY PLAN**
- **BILL OF QUANTITY**

|                                                                                   |                                                                                                                 |                                              |                  |
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## **SECTION – D**

# **EQUIPMENT SPECIFICATION**

(PES – 145 – 05)



## SPECIFICATION FOR FLOW MEASURING DEVICES ( NOZZLES )

SPECIFICATION NO.: PES – 145 - 05

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### 1.0 SCOPE

This specification covers the design, manufacture, inspection and testing at the manufacturer's works, proper packing for transportation and delivery to site of flow measuring devices (orifices & nozzles) for use in Utility/Captive Power Station/Combined Cycle Station.

### 2.0 CODES AND STANDARDS

- 2.1 All the equipment specified herein shall comply with the requirements of the latest issue of the relevant National and International standards.
- 2.2 The Design and Materials used for the components shall also comply with the relevant National and International standards.
- 2.3 As a minimum requirement, ASME PTC 19.5 standard shall be complied with for Flow Nozzles and BS 1042 / ISO 5167 for Flow Orifices.

### 3.0 TECHNICAL REQUIREMENTS

The orifice plates and flow nozzles shall be used as the primary flow sensing elements. These sensing elements shall provide a safe and reliable means of creating differential pressures for use in flow measurements.

#### 3.1 Orifice Plates

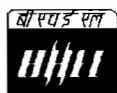
The orifice plate assemblies shall conform to the following requirements unless specified otherwise in the corresponding data sheets.

- 3.1.1 Type : The Orifice plates shall be of concentric type, designed and manufactured as per ASME PTC 19.5. The data sheet enclosed, specifies the requirements of each orifice plate assembly. The bidder shall calculate the Beta ratio and validate suitability of the selected design for the specified application, Vent holes, if required for the specified duty shall be located at the top and drain holes at the bottom of the orifice.
- 3.1.2 Material : The material of the Orifice plates shall be stainless steel type SS 316 .
- 3.1.3 Assembly : Orifice plates shall be supplied as complete assemblies, along with companion flanges on both sides having proper end connection for welding on to the associated pipe at site, gaskets, nuts & bolts. The carrier ring assembly shall be supplied if specified in the data sheet.

In case when branch pipe (as in 3.2.4 below) is specified in the data sheet, the orifice will be welded within the branch pipe. For application of SH/RH attemperation, welded type orifice shall be used.

Each flow orifice assembly shall be provided with three pairs of pressure tapping complete with associated root valves, suitable for the service conditions. The pressure tapping shall be provided either on the carrier ring or on the companion flanges as the case may be. 2 Nos Root Valves shall be provided for normal pressure above 40 ata.

Each orifice plate or the carrier ring assembly (as the case may be) will also be provided with a extended handle. The Tag No. and duty will be permanently marked on both the sides of this handle.



## SPECIFICATION FOR FLOW MEASURING DEVICES ( NOZZLES )

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3.1.4 Flanges : The Companion flanges shall conform to ANSI B16.5. The companion flange and the carrier ring material shall be same as that of the main pipe. These shall be manufactured from forged material. Companion flanges shall be suitably rated for the specified service conditions.

3.1.5 While machining the ID to maintain an uniform internal diameter, care shall be taken to ensure the minimum thickness of the branch pipe as per IBR regulations.

### 3.2 Flow Nozzles

The Flow nozzle assemblies shall conform to the following requirements unless specified otherwise in the corresponding data sheets.

3.2.1 Type : The Flow nozzles shall be of long radius, weld in type (suitable for welding with the associated branch pipe). The design and manufacture of the flow nozzles shall be as per ASME PTC 19.5. The data sheet enclosed, specifies the requirements of each flow nozzle assembly. The bidder shall calculate the Beta ratio and validate suitability of the selected design for the specified application. Vent holes, if required for the specified duty shall be located at the top and drain holes at the bottom of the nozzle.

3.2.2 Material : As specified in Customer's specification

3.2.3 Assembly : The Flow nozzles shall be supplied as complete assemblies, along with duly machined branch pipes, having proper end connection for welding on to the associated pipe at site. Welding shall be done as per the relevant ANSI practice in line with the main piping.

Each flow nozzle assembly shall be provided with three pairs of pressure tapping complete with associated root valves, suitable for the service conditions. D & D/2 pressure tapping shall be provided on the branch pipe. The size of root valve should not be less than 15 NB. Two numbers of root valves to be provided for pressure  $\geq 40\text{Kg/Cm}^2$  for each tapping.

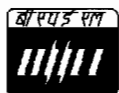
Each flow nozzle assembly will also be provided with a suitable nameplate, with tag number and duty.

3.2.4 Branch pipe: The branch pipe for mounting the flow Nozzle/Orifice will be supplied as a free issue item by the purchaser. However the successful bidder shall collect the branch pipe from any of BHEL Units or Site, to be intimated by the purchaser during contract stage. The vendor shall be responsible for proper transportation from the above collection point, machining of the branch pipe and welding the flow nozzle/orifice inside the branch pipe. Acquiring of IBR certification if required shall also be the responsibility of the successful bidder. Bidder to note that the branch pipe supplied by BHEL, may have tolerance as per ASTM standard (i.e. OD 1% (Max. 4 mm), wall thickness 12.5%). The cost of all such activities shall be included by the bidder in the offer.

3.2.5 While machining the ID to maintain uniform internal diameter, care shall be taken to ensure the minimum thickness of the branch pipe as per IBR regulations.

### 3.3 Guarantee & Performance

The guarantee for the flow orifice and the flow nozzle assemblies shall be for 12 months continuous operation from the date of commissioning.



## SPECIFICATION FOR FLOW MEASURING DEVICES ( NOZZLES )

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### 4.0 TESTS & INSPECTION

- 4.1 The equipment covered under this specification shall be subject to vendor's quality plan to be approved by the purchaser before start of manufacture. To ensure that quality is in-built in each equipment the quality assurance system manual indicating the system followed by the vendor shall be submitted to purchaser for his review.
- 4.2 The quality plan forming part of this specification shall be the minimum requirements for the vendor's quality plan to be submitted with the offer. The vendor shall give at least 15 days written notice to purchaser for witnessing the tests/inspection at various stages. The expenses for all such tests/inspection shall be to manufacturer's account except for the expenses of purchaser's representatives witnessing the tests. The purchaser shall attend such tests/inspection within 15 days failing which the manufacturer may proceed with the tests which shall be deemed to have been made in purchaser's presence and shall furnish relevant test certificates to the purchaser.
- 4.3 One orifice plate and one flow nozzle of each type and size shall be tested and calibrated by the bidder at customer's approved laboratory, within his quoted price. Details of the calibration test i.e, type of test, equipments employed etc. shall be submitted in the bid.
- 4.4 Each branch pipe shall be inspected by the purchaser after the completion of machining and prior to welding of the nozzle. This test will include dimensional checks, surface smoothness checks etc.
- 4.5 IBR certification, if required for the specified service shall be obtained by the successful bidder from the concerned authority for submission to the purchaser.
- 4.6 The Standard QP is included in this specification to enable bidder to understand the extent of inspection and testing requirements to execute this job. The successful bidder has to follow the agreed QP, taking care of customer requirements mentioned in Sec-C and submit QP for final approval by BHEL / Customer.

### 5.0 SPARES

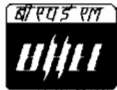
- 5.1 The offer shall include a list of all the recommended spares offered, for the flow elements and accessories required for 3 years of operation, until & unless specified.
- 5.2 The offer shall include a list of all the commissioning spares offered, which are required for commissioning of the flow elements & accessories and the cost of which shall be included in the bidder's price.
- 5.3 The offer shall include a list of mandatory spares , which is required for the guarantee period. The cost of these mandatory spares shall also be included in the price of the flow element assemblies and accessories.
- 5.4 The spares shall also include one set of maintenance kit including special tools, if required.

### 6.0 DRAWINGS & DOCUMENTS

- 6.1 To be furnished with the Bid:

The offer shall include the following technical documents in 5 copies each :

1. Technical data sheets for each flow element and accessories, in the proforma enclosed under Data sheet-B.
2. Catalogues/Technical literature for flow element and accessories.



## SPECIFICATION FOR FLOW MEASURING DEVICES ( NOZZLES )

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3. List of installations for similar equipment supplied in Thermal Power Station applications.
4. Schedules listed under Vol. III-A duly completed with bidder's signature and seal.
5. Bar chart.
6. Test & Inspection schedules.
7. Details of calibration tests i.e, type of tests, equipments employed for the testing of the flow elements, together with the name of the laboratories where these tests can be conducted.
8. The calculation of proper flow orifice and flow nozzle bore for the process conditions indicated in the data sheet.
9. Assembly drawing of each type of flow elements with detailed dimensions, B.O.M. and weights.
10. Deviations sought by bidder, if any, from the specification.

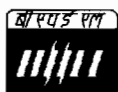
6.2 To be furnished after award of contract

6.2.1 For approval:

1. Technical data sheets for each flow element and accessories, in the proforma enclosed under Data sheet-B.
2. The calculation of proper flow orifice and flow nozzle bore for the process conditions indicated in the data sheet.
3. Assembly drawing of each type of flow elements complete with all accessories indicating detailed dimensions, B.O.M. and weights.
4. Detailed dimensional drawings of each flow orifice, companion flanges, carrier ring, root valves, flow nozzles, branch pipes, pressure connections, nipples etc.
5. Detailed dimensional drawings of each flow orifice, companion flanges, carrier ring, root valves, flow nozzles, branch pipes with edge preparation details, pressure connections, nipples etc.
6. Installation drawings for the flow elements.
7. Differential pressure vs flow curve for each Orifice and Nozzle.

6.2.2 For information:

1. Storage & commissioning instructions.
2. O&M manuals are to be supplied in 10 copies.



## SPECIFICATION FOR FLOW MEASURING DEVICES ( NOZZLES )

SPECIFICATION NO.: PES – 145 - 05

VOLUME II B

SECTION D

REV. NO. 00

DATE 10.05.2018

SHEET

OF

### 7.0 PACKING & MARKING

**7.1 Packing:** Each orifice plate & nozzle assembly and the associated accessories shall be packed properly with adequate protection against friction, stresses, vibrations and shocks during transportation. Each packing shall have markings as per Purchase Order / Special Condition of the Contract (SCC).

**7.2 Marking:** Each flow element assembly shall be identified with the following information:

- Tag Number
- Service
- Element Material
- Beta ratio
- Line size & thickness
- Direction of flow

### 8.0 APPLICABLE DATA SHEET FORMS

This document shall be read with one or more of the following data sheet forms :

- Data sheet A&B for Flow Measuring Devices  
(Orifice & Nozzle) : Data sheet no. PES-145-05-DS1-0
- Data sheet C for Flow Measuring Devices  
(Orifice & Nozzle) : Data sheet no. PES-145-05-DS2-0

|                                                                                   |                                                                                                                   |                                              |                  |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------|
|  | <p>Technical specification for<br/><b>FLOW ELEMENT ASSEMBLY</b><br/>(NOZZLE)</p> <p>UPPUR STPP ( 2 X 800 MW )</p> | SPECIFICATION NO. <b>PE-TS-425-145-I 005</b> |                  |
|                                                                                   |                                                                                                                   | VOLUME <b>II-B</b>                           |                  |
|                                                                                   |                                                                                                                   | SECTION <b>D</b>                             |                  |
|                                                                                   |                                                                                                                   | REV. NO. 00                                  | DATE: 10.05.2018 |
|                                                                                   |                                                                                                                   | SHEET                                        |                  |

## SECTION – D

## DATA SHEETS – A & B



## DATA SHEET FOR FLOW ELEMENTS

2 X 800 MW UPPUR STPS

SPECIFICATION NO.: PS-TS-425-145-I105

VOLUME II-B

SECTION D

REV. NO.

01

DATE 12.03.2018

SHEET

1

OF 34

Tag No. : LCA90BP001

Reference Date Sheet No. DS-1

## DATA SHEET – A &amp; B

DATA SHEET – A  
(TO BE FILLED UP BY PURCHASER)DATA SHEET – B  
(TO BE FILLED UP  
BY BIDDER)

|                   |                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                        |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| GENERAL*          | PROJECT<br>OFFER REFERENCE<br>QUANTITY<br>SERVICE<br>MAKE : MODEL                                                                                                                                                                                         | 2X800 MW UPPUR STPP<br>BIDDER TO SPECIFY<br>ONE (1) PER UNIT<br>CONDENSATE FLOW TO DEAERATOR<br>BIDDER TO SPECIFY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | .....<br>.....<br>.....<br>.....<br>.....                                              |
| ELEMENT           | TYPE<br>STANDARD<br>DESIGN<br><br>MATERIAL<br>BETA RADIO<br>BORE DIAMETER<br>VENT HOLE<br>DRAIN HOLE                                                                                                                                                      | <input type="checkbox"/> ORIFICE <input type="checkbox"/> NOZZLE<br><input type="checkbox"/> ASME PTC 19.5 <input type="checkbox"/> BS 1042 <input type="checkbox"/> OTHER<br><input type="checkbox"/> SQ EDGE <input type="checkbox"/> LEVEL EDGE <input type="checkbox"/> CARRIER RING<br><input type="checkbox"/> SHORT RADIUS <input type="checkbox"/> LONG RADIUS<br><input type="checkbox"/> LOW BETA <input type="checkbox"/> HIGH BETA<br><br><input type="checkbox"/> SS316 <input type="checkbox"/> OTHER<br>0.4 TO 0.7<br>BIDDER TO SPECIFY<br><input type="checkbox"/> YES <input type="checkbox"/> NO<br><input type="checkbox"/> YES <input type="checkbox"/> NO                                                                                                                                                                                                                                                                                                                                                     | .....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>..... |
| END<br>CONNECTION | TYPE<br>FLANGE TYPE<br>FLANGE RATING: MATERIAL<br>BRANCH PIPE<br>BRANCH PIPE MATERIAL<br>TAPPING LOCATION<br><br>NUMBER OF TAPPINGS<br>ROOT VALVE NUMBER: SIZE<br>ROOT VALVE MATERIAL: RATING<br>NIPPLE: SIZE/MATL/RATING/QTY<br>EXPANDER : SIZE/MATL/QTY | <input type="checkbox"/> FLANGED <input type="checkbox"/> BUTT WELD END<br><input type="checkbox"/> WELD NECK <input type="checkbox"/> SLIP ON <input type="checkbox"/> THREADED<br>NOT APPLICABLE<br><input type="checkbox"/> YES <input type="checkbox"/> NO<br>SAME AS PIPE MATERIAL<br><input type="checkbox"/> D&D/2 <input type="checkbox"/> CORNER <input type="checkbox"/> VENTA CONTRACTA<br><input type="checkbox"/> ON FLANGE <input type="checkbox"/> ON PIPE <input type="checkbox"/> ON CARRIER<br>RING<br><input type="checkbox"/> 3 PAIR <input type="checkbox"/> 2 PAIR <input type="checkbox"/> OTHER<br><input type="checkbox"/> 12 <input type="checkbox"/> 8 <input type="checkbox"/> 6 <input type="checkbox"/> 4 : <input type="checkbox"/> 15 NB <input type="checkbox"/> 25 NB<br><input type="checkbox"/> CS <input type="checkbox"/> AS <input type="checkbox"/> SS316 : <input type="checkbox"/> ANSI # 900<br>25NB/SS316/SCH.80/12 NOS.; 1000mm LONG<br>15x25NB/SS316/6 NOS/3000 CLASS ; 50.8 mm LONG | .....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>..... |
| PROCESS<br>DATA   | FLUID<br><br>FLOW (T/HR)<br>PRESSURE (KG/CM2 (A))<br>TEMPERATURE (DEG. C.)<br>DESIGN PRESS: TEMP<br>MAX. ALLOWABLE PRESS LOSS<br>DIFF. PRESS AT MAX FLOW                                                                                                  | <input type="checkbox"/> CONDENSATE <input type="checkbox"/> FEED WATER<br><input type="checkbox"/> STEAM <input type="checkbox"/> CW <input type="checkbox"/> OTHER<br><br>MAX.                      NORMAL                      MINIMUM<br>(Pump Design)                      (VWO)                      (33 % MCR)<br><br>1812                      1652                      570<br>15.0                      14.0                      6.5<br>154.0                      153.0                      120.0<br><br>51 Kg/cm <sup>2</sup> (g): 160 °C<br>0.5 Kg/cm <sup>2</sup> at max. flow<br>BIDDER TO SPECIFY                                                                                                                                                                                                                                                                                                                                                                                                                | .....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>..... |

|                                                                                                |                                                                                                                                                                                                                                                     |                                              |                                                                                                                                                                                                   |                                                      |                                                                                    |
|------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|------------------------------------------------------------------------------------|
|               | <b>DATA SHEET FOR FLOW ELEMENTS</b><br><br><b>2 X 800 MW UPPUR STPS</b>                                                                                                                                                                             |                                              |                                                                                                                                                                                                   | SPECIFICATION NO.: PS-TS-425-145-I105                |                                                                                    |
|                                                                                                |                                                                                                                                                                                                                                                     |                                              |                                                                                                                                                                                                   | VOLUME II-B                                          |                                                                                    |
|                                                                                                |                                                                                                                                                                                                                                                     |                                              |                                                                                                                                                                                                   | SECTION D                                            |                                                                                    |
|                                                                                                |                                                                                                                                                                                                                                                     |                                              |                                                                                                                                                                                                   | REV. NO. 01                                          | DATE 12.03.2018                                                                    |
|                                                                                                |                                                                                                                                                                                                                                                     |                                              |                                                                                                                                                                                                   | SHEET 1                                              | OF 34                                                                              |
| Tag No. : <b>LCA90 BP 001</b> <span style="float: right;">Reference Date Sheet No. DS-1</span> |                                                                                                                                                                                                                                                     |                                              |                                                                                                                                                                                                   |                                                      |                                                                                    |
| <b>DATA SHEET – A &amp; B</b>                                                                  |                                                                                                                                                                                                                                                     |                                              |                                                                                                                                                                                                   |                                                      |                                                                                    |
| <b>DATA SHEET – A</b><br>(TO BE FILLED UP BY PURCHASER)                                        |                                                                                                                                                                                                                                                     |                                              |                                                                                                                                                                                                   |                                                      | <b>DATA SHEET – B</b><br>(TO BE FILLED UP BY BIDDER)                               |
| PIPE LINE<br>DATA                                                                              | PIPE SIZE (OD x THK) mm<br>PIPE MATERIAL<br>BORE DIAMETER mm<br>MIN. AVAILABLE STRAIGHT<br>LENGTH<br>UPSTREAM: DOWNSTREAM<br>FLOW DIRECTION                                                                                                         |                                              | 457 X 12.7<br>SA 106 GR C<br>BIDDER TO SPECIFY<br><br>10 D : 5 D<br><input type="checkbox"/> HORIZONTAL <input checked="" type="checkbox"/> VERTICAL UP<br><input type="checkbox"/> VERTICAL DOWN |                                                      | .....<br>.....<br>.....<br>.....                                                   |
|                                                                                                | OTHER<br>INFORMATION                                                                                                                                                                                                                                |                                              | IBR CERTIFICATION<br><br>TOTAL WEIGHT OF FLOW ELEMENT<br>AND ACCESSORIES                                                                                                                          |                                                      | <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED |
| NAME<br>SIGNATURE<br>DATE                                                                      | <b>PREPARED BY</b><br><br>AKS/PKS<br><br>04.02.17                                                                                                                                                                                                   | <b>CHECKED BY</b><br><br>SSV<br><br>04.02.17 | <b>APPROVED BY</b><br><br>CM<br><br>04.02.17                                                                                                                                                      | <b>COMPANY SEAL</b><br><br>NAME<br>SIGNATURE<br>DATE |                                                                                    |
|                                                                                                | <b>NOTES:</b> <ol style="list-style-type: none"> <li>1. FLOW ELEMENT ACCURACY IS REQUIRED BETWEEN 500 T/HR AND 1900 T/HR.</li> <li>2. RECOMMENDED RANGE IS 0 – 2200 T/HR.</li> <li>3. S-BEND TO BE PROVIDED FOR VERTICAL FLOW DIRECTION.</li> </ol> |                                              |                                                                                                                                                                                                   |                                                      |                                                                                    |

## 2 X 800 MW UPPUR STPS

**SPECIFICATION NO.: PS-TS-425-145-I105**

VOLUME II-B

SECTION D.

REV. NO.

|    |                 |
|----|-----------------|
| 01 | DATE 12.03.2018 |
|----|-----------------|

SHEET

1 OF 34

**Tag No. : LAB10BP001, LAB20BP001, LAB30BP001**

Reference Date Sheet No. DS-1

## DATA SHEET – A & B

**DATA SHEET – A**  
**(TO BE FILLED UP BY PURCHASER)**

**DATA SHEET – B  
(TO BE FILLED UP  
BY BIDDER)**

### GENERAL\*

| PROJECT | OFFER REFERENCE | QUANTITY | SERVICE | MAKE : MODEL |
|---------|-----------------|----------|---------|--------------|
| 1       | 1               | 1        | 1       | 1            |
| 2       | 2               | 2        | 2       | 2            |
| 3       | 3               | 3        | 3       | 3            |
| 4       | 4               | 4        | 4       | 4            |
| 5       | 5               | 5        | 5       | 5            |
| 6       | 6               | 6        | 6       | 6            |
| 7       | 7               | 7        | 7       | 7            |
| 8       | 8               | 8        | 8       | 8            |
| 9       | 9               | 9        | 9       | 9            |
| 10      | 10              | 10       | 10      | 10           |
| 11      | 11              | 11       | 11      | 11           |
| 12      | 12              | 12       | 12      | 12           |
| 13      | 13              | 13       | 13      | 13           |
| 14      | 14              | 14       | 14      | 14           |
| 15      | 15              | 15       | 15      | 15           |
| 16      | 16              | 16       | 16      | 16           |
| 17      | 17              | 17       | 17      | 17           |
| 18      | 18              | 18       | 18      | 18           |
| 19      | 19              | 19       | 19      | 19           |
| 20      | 20              | 20       | 20      | 20           |
| 21      | 21              | 21       | 21      | 21           |
| 22      | 22              | 22       | 22      | 22           |
| 23      | 23              | 23       | 23      | 23           |
| 24      | 24              | 24       | 24      | 24           |
| 25      | 25              | 25       | 25      | 25           |
| 26      | 26              | 26       | 26      | 26           |
| 27      | 27              | 27       | 27      | 27           |
| 28      | 28              | 28       | 28      | 28           |
| 29      | 29              | 29       | 29      | 29           |
| 30      | 30              | 30       | 30      | 30           |
| 31      | 31              | 31       | 31      | 31           |
| 32      | 32              | 32       | 32      | 32           |
| 33      | 33              | 33       | 33      | 33           |
| 34      | 34              | 34       | 34      | 34           |
| 35      | 35              | 35       | 35      | 35           |
| 36      | 36              | 36       | 36      | 36           |
| 37      | 37              | 37       | 37      | 37           |
| 38      | 38              | 38       | 38      | 38           |
| 39      | 39              | 39       | 39      | 39           |
| 40      | 40              | 40       | 40      | 40           |
| 41      | 41              | 41       | 41      | 41           |
| 42      | 42              | 42       | 42      | 42           |
| 43      | 43              | 43       | 43      | 43           |
| 44      | 44              | 44       | 44      | 44           |
| 45      | 45              | 45       | 45      | 45           |
| 46      | 46              | 46       | 46      | 46           |
| 47      | 47              | 47       | 47      | 47           |
| 48      | 48              | 48       | 48      | 48           |
| 49      | 49              | 49       | 49      | 49           |
| 50      | 50              | 50       | 50      | 50           |
| 51      | 51              | 51       | 51      | 51           |
| 52      | 52              | 52       | 52      | 52           |
| 53      | 53              | 53       | 53      | 53           |
| 54      | 54              | 54       | 54      | 54           |
| 55      | 55              | 55       | 55      | 55           |
| 56      | 56              | 56       | 56      | 56           |
| 57      | 57              | 57       | 57      | 57           |
| 58      | 58              | 58       | 58      | 58           |
| 59      | 59              | 59       | 59      | 59           |
| 60      | 60              | 60       | 60      | 60           |
| 61      | 61              | 61       | 61      | 61           |
| 62      | 62              | 62       | 62      | 62           |
| 63      | 63              | 63       | 63      | 63           |
| 64      | 64              | 64       | 64      | 64           |
| 65      | 65              | 65       | 65      | 65           |
| 66      | 66              | 66       | 66      | 66           |
| 67      | 67              | 67       | 67      | 67           |
| 68      | 68              | 68       | 68      | 68           |
| 69      | 69              | 69       | 69      | 69           |
| 70      | 70              | 70       | 70      | 70           |
| 71      | 71              | 71       | 71      | 71           |
| 72      | 72              | 72       | 72      | 72           |
| 73      | 73              | 73       | 73      | 73           |
| 74      | 74              | 74       | 74      | 74           |
| 75      | 75              | 75       | 75      | 75           |
| 76      | 76              | 76       | 76      | 76           |
| 77      | 77              | 77       | 77      | 77           |
| 78      | 78              | 78       | 78      | 78           |
| 79      | 79              | 79       | 79      | 79           |
| 80      | 80              | 80       | 80      | 80           |
| 81      | 81              | 81       | 81      | 81           |
| 82      | 82              | 82       | 82      | 82           |
| 83      | 83              | 83       | 83      | 83           |
| 84      | 84              | 84       | 84      | 84           |
| 85      | 85              | 85       | 85      | 85           |
| 86      | 86              | 86       | 86      | 86           |
| 87      | 87              | 87       | 87      |              |

**2X800 MW UPPUR STPP**  
**BIDDER TO SPECIFY**  
**03 PER UNIT (ONE AGAINST EACH TAG NO.)**  
**BFP SUCTION**  
**BIDDER TO SPECIFY**

ELEMENT

TYPE  
STANDARD  
DESIGN

MATERIAL  
BETA RADIO  
BORE DIAMETER  
VENT HOLE  
DRAIN HOLE

☐ ORIFICE      ☒ NOZZLE  
☒ ASME PTC 19.5    ☐ BS 1042    ☐ OTHER  
☐ SQ EDGE    ☐ LEVEL EDGE    ☐ CARRIER RING  
☐ SHORT RADIUS    ☒ LONG RADIUS  
☐ LOW BETA    ☒ HIGH BETA

☒ SS316 ☐ OTHER  
0.4 TO 0.7  
BIDDER TO SPECIFY  
☐ YES ☒ NO  
☐ YES ☒ NO

END  
CONNECTION

TYPE  
FLANGE TYPE  
FLANGE RATING: MATERIAL  
BRANCH PIPE  
BRANCH PIPE MATERIAL  
TAPPING LOCATION

NUMBER OF TAPPINGS  
ROOT VALVE NUMBER : SIZE  
ROOT VALVE MATERIAL : RATING  
NIPPLE : SIZE/MATL/RATING/QTY  
EXPANDER : SIZE/MATL/QTY

☐ FLANGED ☒ BUTT WELD END  
☐ WELD NECK ☐ SLIP ON ☐ THREADED  
**NOT APPLICABLE**  
☐ YES ☒ NO  
 SAME AS PIPE MATERIAL  
☒ D&D/2 ☐ CORNER ☐ VENTA CONTRACTA  
☐ ON FLANGE ☒ ON PIPE ☐ ON CARRIER  
 RING  
☒ 3 PAIR ☐ 2 PAIR ☐ OTHER  
☒ 12 ☐ 8 ☐ 6 ☐ 4 : ☐ 15 NB ☒ 25 NB  
☐ CS ☐ AS ☒ SS316 : ☒ ANSI # 900  
 25NB/SS316/SCH.80/12 NOS.; 1000 mm LONG  
 15x25NB/SS316/6 NOS/3000 CLASS ; 50.8 mm LONG

## PROCESS DATA

FLUID

FLOW (T/HR)  
PRESSURE (KG/CM2 (A))  
TEMPERATURE (DEG. C.)  
DESIGN PRESS : TEMP  
MAX. ALLOWABLE PRESS LOSS  
DIFF. PRESS AT MAX FLOW

☐ CONDENSATE    ☒ FEED WATER  
☐ STEAM    ☐ CW    ☐ OTHER

| MAX.<br>(Pump Runout) | NORMAL<br>(VWO) | MINIMUM<br>(Min. Recirculation) |
|-----------------------|-----------------|---------------------------------|
|-----------------------|-----------------|---------------------------------|

|       |      |     |
|-------|------|-----|
| 1400  | 1140 | 450 |
| 35    | 32   | 37  |
| 189.9 | 188  | 110 |

40 Kg/cm<sup>2</sup>(g) : 200 °C  
0.3 Kg/cm<sup>2</sup> at max. flow

|                                                                                                                      |                                                                                                                                              |                                         |                                                                                                                                                                                         |                                                      |                                                                                    |
|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|------------------------------------------------------------------------------------|
|                                     | <b>DATA SHEET FOR FLOW ELEMENTS</b><br><br><b>2 X 800 MW UPPUR STPS</b>                                                                      |                                         |                                                                                                                                                                                         | SPECIFICATION NO.: PS-TS-425-145-I105                |                                                                                    |
|                                                                                                                      |                                                                                                                                              |                                         |                                                                                                                                                                                         | VOLUME II-B                                          |                                                                                    |
|                                                                                                                      |                                                                                                                                              |                                         |                                                                                                                                                                                         | SECTION D                                            |                                                                                    |
|                                                                                                                      |                                                                                                                                              |                                         |                                                                                                                                                                                         | REV. NO. 01                                          | DATE 12.03.2018                                                                    |
|                                                                                                                      |                                                                                                                                              |                                         |                                                                                                                                                                                         | SHEET 1                                              | OF 34                                                                              |
| Tag No. : LAB10BP001, LAB20BP001, LAB30BP001      Reference Date Sheet No. DS-1<br><br><b>DATA SHEET – A &amp; B</b> |                                                                                                                                              |                                         |                                                                                                                                                                                         |                                                      |                                                                                    |
| <b>DATA SHEET – A</b><br>(TO BE FILLED UP BY PURCHASER)                                                              |                                                                                                                                              |                                         |                                                                                                                                                                                         | <b>DATA SHEET – B</b><br>(TO BE FILLED UP BY BIDDER) |                                                                                    |
| PIPE LINE<br>DATA                                                                                                    | PIPE SIZE (OD x THK) mm<br>PIPE MATERIAL<br>BORE DIAMETER mm<br>MIN. AVAILABLE STRAIGHT<br>LENGTH<br>UPSTREAM : DOWNSTREAM<br>FLOW DIRECTION |                                         | 406.4 x 9.53<br>SA 106 GR C<br>BIDDER TO SPECIFY<br><br>6 D : 4 D<br><input type="checkbox"/> HORIZONTAL <input type="checkbox"/> VERTICAL UP<br><input type="checkbox"/> VERTICAL DOWN |                                                      | .....<br>.....<br>.....<br>.....                                                   |
|                                                                                                                      | OTHER<br>INFORMATION                                                                                                                         |                                         | IBR CERTIFICATION<br><br>TOTAL WEIGHT OF FLOW ELEMENT<br>AND ACCESSORIES                                                                                                                |                                                      | <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED |
| NAME<br>SIGNATURE<br>DATE                                                                                            | PREPARED BY<br><br>AKS/PKS<br><br>04.02.2017                                                                                                 | CHECKED BY<br><br>SSV<br><br>04.02.2017 | APPROVED BY<br><br>CM<br><br>04.02.2017                                                                                                                                                 | COMPANY SEAL<br><br><br>NAME<br>SIGNATURE<br>DATE    |                                                                                    |
|                                                                                                                      | <b>NOTES:</b><br>1. FLOW ELEMENT ACCURACY IS REQUIRED BETWEEN 450 T/HR AND 1400 T/HR.<br>2. RECOMMENDED RANGE IS 0 – 1500 T/HR.              |                                         |                                                                                                                                                                                         |                                                      |                                                                                    |

|                                                                                   |                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                 |                 |                      |     |     |    |      |      |      |     |       |       |                                                                                                 |  |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-----------------|----------------------|-----|-----|----|------|------|------|-----|-------|-------|-------------------------------------------------------------------------------------------------|--|
|  | <b>DATA SHEET FOR FLOW ELEMENTS</b><br><br><b>2 X 800 MW UPPUR STPS</b>                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | SPECIFICATION NO.: PS-TS-425-145-1105                                                           |                 |                      |     |     |    |      |      |      |     |       |       |                                                                                                 |  |
|                                                                                   |                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | VOLUME II-B                                                                                     |                 |                      |     |     |    |      |      |      |     |       |       |                                                                                                 |  |
|                                                                                   |                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | SECTION D                                                                                       |                 |                      |     |     |    |      |      |      |     |       |       |                                                                                                 |  |
|                                                                                   |                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | REV. NO. 01                                                                                     | DATE 12.03.2018 |                      |     |     |    |      |      |      |     |       |       |                                                                                                 |  |
|                                                                                   |                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | SHEET 1                                                                                         | OF 34           |                      |     |     |    |      |      |      |     |       |       |                                                                                                 |  |
| Tag No. : LCH10BP001, LCH20BP001                                                  |                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Reference Date Sheet No. DS-1                                                                   |                 |                      |     |     |    |      |      |      |     |       |       |                                                                                                 |  |
| <b>DATA SHEET – A &amp; B</b>                                                     |                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                 |                 |                      |     |     |    |      |      |      |     |       |       |                                                                                                 |  |
| DATA SHEET – A<br>(TO BE FILLED UP BY PURCHASER)                                  |                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | DATA SHEET – B<br>(TO BE FILLED UP BY BIDDER)                                                   |                 |                      |     |     |    |      |      |      |     |       |       |                                                                                                 |  |
| GENERAL*                                                                          | PROJECT<br>OFFER REFERENCE<br>QUANTITY<br>SERVICE<br>MAKE : MODEL                                                                                                                                                                                             | <b>2X800 MW UPPUR STPP</b><br>BIDDER TO SPECIFY<br>02 PER UNIT (ONE AGAINST EACH TAG NO.)<br><b>HPH-6A/6B DRAIN FLOW TO DEAERATOR</b><br>BIDDER TO SPECIFY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .....<br>.....<br>.....<br>.....<br>.....                                                       |                 |                      |     |     |    |      |      |      |     |       |       |                                                                                                 |  |
| ELEMENT                                                                           | TYPE<br>STANDARD<br>DESIGN<br><br>MATERIAL<br>BETA RADIO<br>BORE DIAMETER<br>VENT HOLE<br>DRAIN HOLE                                                                                                                                                          | <input type="checkbox"/> ORIFICE <input checked="" type="checkbox"/> NOZZLE<br><input checked="" type="checkbox"/> ASME PTC 19.5 <input type="checkbox"/> BS 1042 <input type="checkbox"/> OTHER<br><input type="checkbox"/> SQ EDGE <input type="checkbox"/> BEVEL EDGE <input type="checkbox"/> CARRIER RING<br><input type="checkbox"/> SHORT RADIUS <input checked="" type="checkbox"/> LONG RADIUS<br><input type="checkbox"/> LOW BETA <input checked="" type="checkbox"/> HIGH BETA<br><br><input checked="" type="checkbox"/> SS316 <input type="checkbox"/> OTHER<br>0.4 TO 0.7<br>BIDDER TO SPECIFY<br><input type="checkbox"/> YES <input checked="" type="checkbox"/> NO<br><input type="checkbox"/> YES <input checked="" type="checkbox"/> NO                                                                                                                                                                                                                                                                                                                                                                           | .....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>..... |                 |                      |     |     |    |      |      |      |     |       |       |                                                                                                 |  |
| END CONNECTION                                                                    | TYPE<br>FLANGE TYPE<br>FLANGE RATING : MATERIAL<br>BRANCH PIPE<br>BRANCH PIPE MATERIAL<br>TAPPING LOCATION<br><br>NUMBER OF TAPPINGS<br>ROOT VALVE NUMBER : SIZE<br>ROOT VALVE MATERIAL : RATING<br>NIPPLE : SIZE/MATL/RATING/QTY<br>EXPANDER : SIZE/MATL/QTY | <input type="checkbox"/> FLANGED <input checked="" type="checkbox"/> BUTT WELD END<br><input type="checkbox"/> WELD NECK <input type="checkbox"/> SLIP ON <input type="checkbox"/> THREADED<br>NOT APPLICABLE<br><input type="checkbox"/> YES <input checked="" type="checkbox"/> NO<br>SAME AS PIPE MATERIAL<br><input checked="" type="checkbox"/> D&D/2 <input type="checkbox"/> CORNER <input type="checkbox"/> VENTA CONTRACTA<br><input type="checkbox"/> ON FLANGE <input checked="" type="checkbox"/> ON PIPE <input type="checkbox"/> ON CARRIER RING<br><input checked="" type="checkbox"/> 3 PAIR <input type="checkbox"/> 2 PAIR <input type="checkbox"/> OTHER<br><input type="checkbox"/> 12 <input type="checkbox"/> 8 <input checked="" type="checkbox"/> 6 <input type="checkbox"/> 4    : <input type="checkbox"/> 15 NB <input checked="" type="checkbox"/> 25 NB<br><input type="checkbox"/> CS <input type="checkbox"/> AS <input checked="" type="checkbox"/> SS316 : <input checked="" type="checkbox"/> ANSI # 900<br>25NB/SS316/SCH.80/6 NOS. ; 1000mm LONG<br>15x25NB/SS316/6 NOS/3000 CLASS ; 50.8 mm LONG | .....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>..... |                 |                      |     |     |    |      |      |      |     |       |       |                                                                                                 |  |
| PROCESS DATA                                                                      | FLUID<br><br>FLOW (T/HR)<br>PRESSURE (KG/CM2 (A))<br>TEMPERATURE (DEG. C.)<br>DESIGN PRESS : TEMP<br>MAX. ALLOWABLE PRESS LOSS<br>DIFF. PRESS AT MAX FLOW                                                                                                     | <input checked="" type="checkbox"/> CONDENSATE <input type="checkbox"/> FEED WATER<br><input type="checkbox"/> STEAM <input type="checkbox"/> CW <input type="checkbox"/> OTHER<br><br><table border="0"> <tr> <td>MAX.<br/>(BMCR)</td> <td>NORMAL<br/>(VWO)</td> <td>MINIMUM<br/>(50% MCR)</td> </tr> <tr> <td>290</td> <td>258</td> <td>55</td> </tr> <tr> <td>26.0</td> <td>25.0</td> <td>8.25</td> </tr> <tr> <td>201</td> <td>198.4</td> <td>152.0</td> </tr> </table> <p style="text-align: center;">30 Kg/cm<sup>2</sup>(g) : 200 °C<br/>0.1 Kg/cm<sup>2</sup> at max. flow</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | MAX.<br>(BMCR)                                                                                  | NORMAL<br>(VWO) | MINIMUM<br>(50% MCR) | 290 | 258 | 55 | 26.0 | 25.0 | 8.25 | 201 | 198.4 | 152.0 | .....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>..... |  |
| MAX.<br>(BMCR)                                                                    | NORMAL<br>(VWO)                                                                                                                                                                                                                                               | MINIMUM<br>(50% MCR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                 |                 |                      |     |     |    |      |      |      |     |       |       |                                                                                                 |  |
| 290                                                                               | 258                                                                                                                                                                                                                                                           | 55                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                 |                 |                      |     |     |    |      |      |      |     |       |       |                                                                                                 |  |
| 26.0                                                                              | 25.0                                                                                                                                                                                                                                                          | 8.25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                 |                 |                      |     |     |    |      |      |      |     |       |       |                                                                                                 |  |
| 201                                                                               | 198.4                                                                                                                                                                                                                                                         | 152.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                 |                 |                      |     |     |    |      |      |      |     |       |       |                                                                                                 |  |

|                                                                                                                              |                                                                         |            |                                                                                                                               |                                                   |                                  |
|------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|----------------------------------|
|                                             | <b>DATA SHEET FOR FLOW ELEMENTS</b><br><br><b>2 X 800 MW UPPUR STPS</b> |            |                                                                                                                               | SPECIFICATION NO.: PS-TS-425-145-I105             |                                  |
|                                                                                                                              |                                                                         |            |                                                                                                                               | VOLUME II-B                                       |                                  |
|                                                                                                                              |                                                                         |            |                                                                                                                               | SECTION D                                         |                                  |
|                                                                                                                              |                                                                         |            |                                                                                                                               | REV. NO. 01                                       | DATE 12.03.2018                  |
|                                                                                                                              |                                                                         |            |                                                                                                                               | SHEET 1                                           | OF 34                            |
| Tag No.: LCH10BP001, LCH20BP001 <span style="float: right;">Reference Date Sheet No. DS-1</span>                             |                                                                         |            |                                                                                                                               |                                                   |                                  |
| <b>DATA SHEET – A &amp; B</b>                                                                                                |                                                                         |            |                                                                                                                               |                                                   |                                  |
| DATA SHEET – A<br>(TO BE FILLED UP BY PURCHASER)                                                                             |                                                                         |            |                                                                                                                               | DATA SHEET – B<br>(TO BE FILLED UP BY BIDDER)     |                                  |
| PIPE LINE DATA                                                                                                               | PIPE SIZE (OD x THK) mm                                                 |            | 273 X 6.35                                                                                                                    |                                                   | .....<br>.....<br>.....<br>..... |
|                                                                                                                              | PIPE MATERIAL                                                           |            | SA 106 GR B                                                                                                                   |                                                   |                                  |
|                                                                                                                              | BORE DIAMETER mm                                                        |            | BIDDER TO SPECIFY                                                                                                             |                                                   |                                  |
|                                                                                                                              | MIN. AVAILABLE STRAIGHT LENGTH                                          |            | 10 D : 5 D                                                                                                                    |                                                   |                                  |
|                                                                                                                              | UPSTREAM : DOWNSTREAM                                                   |            | <input checked="" type="checkbox"/> HORIZONTAL <input type="checkbox"/> VERTICAL UP<br><input type="checkbox"/> VERTICAL DOWN |                                                   |                                  |
| OTHER INFORMATION                                                                                                            | IBR CERTIFICATION                                                       |            | <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED                                            |                                                   |                                  |
|                                                                                                                              | TOTAL WEIGHT OF FLOW ELEMENT AND ACCESSORIES                            |            |                                                                                                                               |                                                   |                                  |
| NAME<br>SIGNATURE<br>DATE                                                                                                    | PREPARED BY                                                             | CHECKED BY | APPROVED BY                                                                                                                   | COMPANY SEAL<br><br><br>NAME<br>SIGNATURE<br>DATE |                                  |
|                                                                                                                              | RS/PKS                                                                  | SSV        | CM                                                                                                                            |                                                   |                                  |
|                                                                                                                              | 04.02.2017                                                              | 04.02.2017 | 04.02.2017                                                                                                                    |                                                   |                                  |
| <b>NOTES:</b><br>1. FLOW ELEMENT ACCURACY IS REQUIRED BETWEEN 40 T/HR AND 300 T/HR.<br>2. RECOMMENDED RANGE IS 0 – 300 T/HR. |                                                                         |            |                                                                                                                               |                                                   |                                  |

|                                                                                   |                                                                         |                                                                                                                                                                                                                     |                                               |                   |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-------------------|
|  | <b>DATA SHEET FOR FLOW ELEMENTS</b><br><br><b>2 X 800 MW UPPUR STPS</b> |                                                                                                                                                                                                                     | SPECIFICATION NO.: PS-TS-425-145-1105         |                   |
|                                                                                   |                                                                         |                                                                                                                                                                                                                     | VOLUME II-B                                   |                   |
|                                                                                   |                                                                         |                                                                                                                                                                                                                     | SECTION D                                     |                   |
|                                                                                   |                                                                         |                                                                                                                                                                                                                     | REV. NO. 01                                   | DATE 12.03.2018   |
|                                                                                   |                                                                         |                                                                                                                                                                                                                     | SHEET 1                                       | OF 34             |
| Tag No.: LBS51BP001                                                               |                                                                         |                                                                                                                                                                                                                     | Reference Date Sheet No.DS1                   |                   |
| <b>DATA SHEET – A &amp; B</b>                                                     |                                                                         |                                                                                                                                                                                                                     |                                               |                   |
| DATA SHEET – A<br>(TO BE FILLED UP BY PURCHASER)                                  |                                                                         |                                                                                                                                                                                                                     | DATA SHEET – B<br>(TO BE FILLED UP BY BIDDER) |                   |
| GENERAL*                                                                          | PROJECT                                                                 | 2X800 MW UPPUR STPP                                                                                                                                                                                                 | .....                                         |                   |
|                                                                                   | OFFER REFERENCE                                                         | BIDDER TO SPECIFY                                                                                                                                                                                                   | .....                                         |                   |
|                                                                                   | QUANTITY                                                                | ONE (1) PER UNIT                                                                                                                                                                                                    | .....                                         |                   |
|                                                                                   | SERVICE                                                                 | EXTRACTION STEAM FLOW TO DEAERATOR                                                                                                                                                                                  | .....                                         |                   |
|                                                                                   | MAKE : MODEL                                                            | BIDDER TO SPECIFY                                                                                                                                                                                                   | .....                                         |                   |
|                                                                                   |                                                                         |                                                                                                                                                                                                                     | .....                                         |                   |
| ELEMENT                                                                           | TYPE                                                                    | <input type="checkbox"/> ORIFICE <input type="checkbox"/> NOZZLE                                                                                                                                                    | .....                                         |                   |
|                                                                                   | STANDARD                                                                | <input type="checkbox"/> ASME PTC 19.5 <input type="checkbox"/> BS 1042 <input type="checkbox"/> OTHER                                                                                                              | .....                                         |                   |
|                                                                                   | DESIGN                                                                  | <input type="checkbox"/> SQ EDGE <input type="checkbox"/> BEVEL EDGE <input type="checkbox"/> CARRIER RING                                                                                                          | .....                                         |                   |
|                                                                                   |                                                                         | <input type="checkbox"/> SHORT RADIUS <input type="checkbox"/> LONG RADIUS                                                                                                                                          | .....                                         |                   |
|                                                                                   |                                                                         | <input type="checkbox"/> LOW BETA <input type="checkbox"/> HIGH BETA                                                                                                                                                | .....                                         |                   |
|                                                                                   |                                                                         |                                                                                                                                                                                                                     | .....                                         |                   |
|                                                                                   | MATERIAL                                                                | <input type="checkbox"/> SS316 <input type="checkbox"/> OTHER                                                                                                                                                       | .....                                         |                   |
|                                                                                   | BETA RADIO                                                              | 0.4 TO 0.7                                                                                                                                                                                                          | .....                                         |                   |
|                                                                                   | BORE DIAMETER                                                           | BIDDER TO SPECIFY                                                                                                                                                                                                   | .....                                         |                   |
|                                                                                   | VENT HOLE                                                               | <input type="checkbox"/> YES <input type="checkbox"/> NO                                                                                                                                                            | .....                                         |                   |
|                                                                                   | DRAIN HOLE                                                              | <input type="checkbox"/> YES <input type="checkbox"/> NO                                                                                                                                                            | .....                                         |                   |
|                                                                                   |                                                                         |                                                                                                                                                                                                                     | .....                                         |                   |
| END CONNECTION                                                                    | TYPE                                                                    | <input type="checkbox"/> FLANGED <input type="checkbox"/> BUTT WELD END                                                                                                                                             | .....                                         |                   |
|                                                                                   | FLANGE TYPE                                                             | <input type="checkbox"/> WELD NECK <input type="checkbox"/> SLIP ON <input type="checkbox"/> THREADED                                                                                                               | .....                                         |                   |
|                                                                                   | FLANGE RATING : MATERIAL                                                | NOT APPLICABLE                                                                                                                                                                                                      | .....                                         |                   |
|                                                                                   | BRANCH PIPE                                                             | <input type="checkbox"/> YES <input type="checkbox"/> NO                                                                                                                                                            | .....                                         |                   |
|                                                                                   | BRANCH PIPE MATERIAL                                                    | SAME AS PIPE MATERIAL                                                                                                                                                                                               | .....                                         |                   |
|                                                                                   | TAPPING LOCATION                                                        | <input type="checkbox"/> D&D/2 <input type="checkbox"/> CORNER <input type="checkbox"/> VENTA ONTRACTA <input type="checkbox"/> ON FLANGE <input type="checkbox"/> ON PIPE <input type="checkbox"/> ON CARRIER RING | .....                                         |                   |
|                                                                                   | NUMBER OF TAPPINGS                                                      | <input type="checkbox"/> 3 PAIR <input type="checkbox"/> 2 PAIR <input type="checkbox"/> OTHER                                                                                                                      | .....                                         |                   |
|                                                                                   | ROOT VALVE NUMBER : SIZE                                                | <input type="checkbox"/> 12 <input type="checkbox"/> 8 <input type="checkbox"/> 6 <input type="checkbox"/> 4 : <input type="checkbox"/> 15 NB <input type="checkbox"/> 25 NB                                        | .....                                         |                   |
|                                                                                   | ROOT VALVE MATERIAL : RATING                                            | <input type="checkbox"/> CS <input type="checkbox"/> AS <input type="checkbox"/> SS316 : <input type="checkbox"/> ANSI # 900                                                                                        | .....                                         |                   |
|                                                                                   | NIPPLE : SIZE/MATL/RATING/QTY                                           | 25NB/SS316/SCH.80/6 NOS.; 1000mm LONG                                                                                                                                                                               | .....                                         |                   |
|                                                                                   | EXPANDER : SIZE/MATL/QTY                                                | 15x25NB/SS316/6 NOS/3000 CLASS ; 50.8 mm LONG                                                                                                                                                                       | .....                                         |                   |
|                                                                                   |                                                                         |                                                                                                                                                                                                                     | .....                                         |                   |
| PROCESS DATA                                                                      | FLUID                                                                   | <input type="checkbox"/> CONDENSATE <input type="checkbox"/> FEED WATER                                                                                                                                             | .....                                         |                   |
|                                                                                   |                                                                         | <input type="checkbox"/> STEAM <input type="checkbox"/> CW <input type="checkbox"/> OTHER                                                                                                                           | .....                                         |                   |
|                                                                                   |                                                                         | MAX. (Max Output, Both Strings HPH Out)                                                                                                                                                                             | NORMAL (VWO)                                  | MINIMUM (40% MCR) |
|                                                                                   | FLOW (T/HR)                                                             | 116                                                                                                                                                                                                                 | 93.5                                          | 27.0              |
|                                                                                   | PRESSURE (KG/CM2 (A))                                                   | 13.36                                                                                                                                                                                                               | 12.26                                         | 4.75              |
|                                                                                   | TEMPERATURE (DEG. C.)                                                   | 371                                                                                                                                                                                                                 | 369                                           | 332               |
|                                                                                   | DESIGN PRESS : TEMP                                                     | 15 Kg/cm <sup>2</sup> (g) : 370 °C                                                                                                                                                                                  |                                               |                   |
|                                                                                   | MAX. ALLOWABLE PRESS LOSS                                               | 0.1 Kg/cm <sup>2</sup> at max. flow                                                                                                                                                                                 |                                               |                   |
|                                                                                   | DIFF. PRESS AT MAX FLOW                                                 | BIDDER TO SPECIFY                                                                                                                                                                                                   |                                               |                   |

|                                                                                                                              |                                                                                                                                              |                                                |                                                                                                                                                                                                   |                                                          |                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|------------------------------------------------------------------------------------|
|                                             | <b>DATA SHEET FOR FLOW ELEMENTS</b><br><br><b>2 X 800 MW UPPUR STPS</b>                                                                      |                                                |                                                                                                                                                                                                   | SPECIFICATION NO.: PS-TS-425-145-I105                    |                                                                                    |
|                                                                                                                              |                                                                                                                                              |                                                |                                                                                                                                                                                                   | VOLUME II-B                                              |                                                                                    |
|                                                                                                                              |                                                                                                                                              |                                                |                                                                                                                                                                                                   | SECTION D                                                |                                                                                    |
|                                                                                                                              |                                                                                                                                              |                                                |                                                                                                                                                                                                   | REV. NO. 01                                              | DATE 12.03.2018                                                                    |
|                                                                                                                              |                                                                                                                                              |                                                |                                                                                                                                                                                                   | SHEET 1                                                  | OF 34                                                                              |
| Tag No. <b>LBS51BP001</b> <span style="float: right;">Reference Date Sheet No.DS1</span>                                     |                                                                                                                                              |                                                |                                                                                                                                                                                                   |                                                          |                                                                                    |
| <b>DATA SHEET – A &amp; B</b>                                                                                                |                                                                                                                                              |                                                |                                                                                                                                                                                                   |                                                          |                                                                                    |
| <b>DATA SHEET – A</b><br>(TO BE FILLED UP BY PURCHASER)                                                                      |                                                                                                                                              |                                                |                                                                                                                                                                                                   | <b>DATA SHEET – B</b><br>(TO BE FILLED UP BY BIDDER)     |                                                                                    |
| PIPE LINE<br>DATA                                                                                                            | PIPE SIZE (OD x THK) mm<br>PIPE MATERIAL<br>BORE DIAMETER mm<br>MIN. AVAILABLE STRAIGHT<br>LENGTH<br>UPSTREAM : DOWNSTREAM<br>FLOW DIRECTION |                                                | 457 x 9.53<br>SA 106 GR B<br>BIDDER TO SPECIFY<br><br>10 D : 5 D<br><input checked="" type="checkbox"/> HORIZONTAL <input type="checkbox"/> VERTICAL UP<br><input type="checkbox"/> VERTICAL DOWN |                                                          | .....<br>.....<br>.....<br>.....                                                   |
|                                                                                                                              | OTHER<br>INFORMATION                                                                                                                         |                                                | IBR CERTIFICATION<br><br>TOTAL WEIGHT OF FLOW ELEMENT<br>AND ACCESSORIES                                                                                                                          |                                                          | <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED |
| NAME<br>SIGNATURE<br>DATE                                                                                                    | <b>PREPARED BY</b><br><br>AKS/PKS<br><br>07.02.2017                                                                                          | <b>CHECKED BY</b><br><br>SSV<br><br>07.02.2017 | <b>APPROVED BY</b><br><br>CM<br><br>07.02.2017                                                                                                                                                    | <b>COMPANY SEAL</b><br><br><br>NAME<br>SIGNATURE<br>DATE |                                                                                    |
|                                                                                                                              |                                                                                                                                              |                                                |                                                                                                                                                                                                   |                                                          |                                                                                    |
| <b>NOTES:</b><br>1. FLOW ELEMENT ACCURACY IS REQUIRED BETWEEN 25 T/HR AND 130 T/HR.<br>2. RECOMMENDED RANGE IS 0 – 150 T/HR. |                                                                                                                                              |                                                |                                                                                                                                                                                                   |                                                          |                                                                                    |

|  | <b>DATA SHEET FOR FLOW ELEMENTS</b><br><br><b>2 X 800 MW UPPUR STPS</b>                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | SPECIFICATION NO.: PS-TS-425-145-1105         |                 |                      |      |       |       |       |       |       |       |     |       |  |  |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-----------------|----------------------|------|-------|-------|-------|-------|-------|-------|-----|-------|--|--|
|                                                                                   |                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | VOLUME II-B                                   |                 |                      |      |       |       |       |       |       |       |     |       |  |  |
|                                                                                   |                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | SECTION D                                     |                 |                      |      |       |       |       |       |       |       |     |       |  |  |
|                                                                                   |                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | REV. NO. 01                                   | DATE 12.03.2018 |                      |      |       |       |       |       |       |       |     |       |  |  |
|                                                                                   |                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | SHEET 1                                       | OF 34           |                      |      |       |       |       |       |       |       |     |       |  |  |
| Tag No.: LBS53BP001, LBS54BP001                                                   |                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Reference Date Sheet No. DS1                  |                 |                      |      |       |       |       |       |       |       |     |       |  |  |
| <b>DATA SHEET – A &amp; B</b>                                                     |                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                               |                 |                      |      |       |       |       |       |       |       |     |       |  |  |
| DATA SHEET – A<br>(TO BE FILLED UP BY PURCHASER)                                  |                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | DATA SHEET – B<br>(TO BE FILLED UP BY BIDDER) |                 |                      |      |       |       |       |       |       |       |     |       |  |  |
| GENERAL*                                                                          | PROJECT<br>OFFER REFERENCE<br>QUANTITY<br>SERVICE<br>MAKE : MODEL                                                                                                                                                                                             | 2X800 MW UPPUR STPP<br>BIDDER TO SPECIFY<br>02 PER UNIT (ONE AGAINST EACH TAG NO.)<br>EXTRACTION STEAM FLOW TO BFPT-A/B<br>BIDDER TO SPECIFY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                               |                 |                      |      |       |       |       |       |       |       |     |       |  |  |
| ELEMENT                                                                           | TYPE<br>STANDARD<br>DESIGN<br><br>MATERIAL<br>BETA RADIO<br>BORE DIAMETER<br>VENT HOLE<br>DRAIN HOLE                                                                                                                                                          | <input type="checkbox"/> ORIFICE <input type="checkbox"/> NOZZLE<br><input checked="" type="checkbox"/> ASME PTC 1.95 <input type="checkbox"/> BS 1042 <input type="checkbox"/> OTHER<br><input type="checkbox"/> SQ EDGE <input type="checkbox"/> LEVEL EDGE <input type="checkbox"/> CARRIER RING<br><input type="checkbox"/> SHORT RADIUS <input checked="" type="checkbox"/> LONG RADIUS<br><input type="checkbox"/> LOW BETA <input checked="" type="checkbox"/> HIGH BETA<br><br><input checked="" type="checkbox"/> SS316 <input type="checkbox"/> OTHER<br>0.4 TO 0.7<br>BIDDER TO SPECIFY<br><input type="checkbox"/> YES <input checked="" type="checkbox"/> NO<br><input type="checkbox"/> YES <input checked="" type="checkbox"/> NO                                                                                                                                                                                                                                                                                                                                                                                          |                                               |                 |                      |      |       |       |       |       |       |       |     |       |  |  |
| END CONNECTION                                                                    | TYPE<br>FLANGE TYPE<br>FLANGE RATING : MATERIAL<br>BRANCH PIPE<br>BRANCH PIPE MATERIAL<br>TAPPING LOCATION<br><br>NUMBER OF TAPPINGS<br>ROOT VALVE NUMBER : SIZE<br>ROOT VALVE MATERIAL : RATING<br>NIPPLE : SIZE/MATL/RATING/QTY<br>EXPANDER : SIZE/MATL/QTY | <input type="checkbox"/> FLANGED <input checked="" type="checkbox"/> BUTT WELD END<br><input type="checkbox"/> WELD NECK <input type="checkbox"/> SLIP ON <input type="checkbox"/> THREADED<br>NOT APPLICABLE<br><input type="checkbox"/> YES <input checked="" type="checkbox"/> NO<br>SAME AS PIPE MATERIAL<br><input checked="" type="checkbox"/> D&D/2 <input type="checkbox"/> CORNER <input type="checkbox"/> VENTA<br>CONTRACTA <input type="checkbox"/> ON FLANGE<br><input checked="" type="checkbox"/> ON PIPE <input type="checkbox"/> ON CARRIER RING<br><input checked="" type="checkbox"/> 3 PAIR <input type="checkbox"/> 2 PAIR <input type="checkbox"/> OTHER<br><input type="checkbox"/> 12 <input type="checkbox"/> 8 <input checked="" type="checkbox"/> 6 <input type="checkbox"/> 4    : <input type="checkbox"/> 15 NB <input checked="" type="checkbox"/> 25 NB<br><input type="checkbox"/> CS <input type="checkbox"/> AS <input checked="" type="checkbox"/> SS 316 : <input checked="" type="checkbox"/> ANSI # 900<br>25NB/SS316/SCH.80/6 NOS. ; 1000mm LONG<br>15x25NB/SS316/6 NOS/3000 CLASS ; 50.8 mm LONG |                                               |                 |                      |      |       |       |       |       |       |       |     |       |  |  |
| PROCESS DATA                                                                      | FLUID<br><br>FLOW (T/HR)<br>PRESSURE (KG/CM2 (A))<br>TEMPERATURE (DEG. C.)<br>DESIGN PRESS : TEMP<br>MAX. ALLOWABLE PRESS LOSS<br>DIFF. PRESS AT MAX FLOW                                                                                                     | <input type="checkbox"/> CONDENSATE <input type="checkbox"/> FEED WATER<br><input checked="" type="checkbox"/> STEAM <input type="checkbox"/> CW <input type="checkbox"/> OTHER<br><br><table border="1"> <thead> <tr> <th>MAX.<br/>(BMCR,)</th> <th>NORMAL<br/>(VWO)</th> <th>MINIMUM<br/>(40% MCR)</th> </tr> </thead> <tbody> <tr> <td>86.0</td> <td>57.35</td> <td>13.95</td> </tr> <tr> <td>12.26</td> <td>12.26</td> <td>12.26</td> </tr> <tr> <td>285.0</td> <td>369</td> <td>296.8</td> </tr> </tbody> </table> 15 Kg/cm <sup>2</sup> (g) : 370 °C<br>0.1 Kg/cm <sup>2</sup> at max. flow<br>Bidder to Specify                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | MAX.<br>(BMCR,)                               | NORMAL<br>(VWO) | MINIMUM<br>(40% MCR) | 86.0 | 57.35 | 13.95 | 12.26 | 12.26 | 12.26 | 285.0 | 369 | 296.8 |  |  |
| MAX.<br>(BMCR,)                                                                   | NORMAL<br>(VWO)                                                                                                                                                                                                                                               | MINIMUM<br>(40% MCR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                               |                 |                      |      |       |       |       |       |       |       |     |       |  |  |
| 86.0                                                                              | 57.35                                                                                                                                                                                                                                                         | 13.95                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                               |                 |                      |      |       |       |       |       |       |       |     |       |  |  |
| 12.26                                                                             | 12.26                                                                                                                                                                                                                                                         | 12.26                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                               |                 |                      |      |       |       |       |       |       |       |     |       |  |  |
| 285.0                                                                             | 369                                                                                                                                                                                                                                                           | 296.8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                               |                 |                      |      |       |       |       |       |       |       |     |       |  |  |

|                                                                                                                                                                            |                                                                         |            |                                                                                                                               |                                                      |                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|-----------------|
|                                                                                           | <b>DATA SHEET FOR FLOW ELEMENTS</b><br><br><b>2 X 800 MW UPPUR STPS</b> |            |                                                                                                                               | SPECIFICATION NO.: PS-TS-425-145-I105                |                 |
|                                                                                                                                                                            |                                                                         |            |                                                                                                                               | VOLUME II-B                                          |                 |
|                                                                                                                                                                            |                                                                         |            |                                                                                                                               | SECTION D                                            |                 |
|                                                                                                                                                                            |                                                                         |            |                                                                                                                               | REV. NO. 01                                          | DATE 12.03.2018 |
|                                                                                                                                                                            |                                                                         |            |                                                                                                                               | SHEET 1                                              | OF 34           |
| Tag No. : LBS53BP001, LBS54BP001 <span style="float: right;">Reference Date Sheet No. DS1</span>                                                                           |                                                                         |            |                                                                                                                               |                                                      |                 |
| <b>DATA SHEET – A &amp; B</b>                                                                                                                                              |                                                                         |            |                                                                                                                               |                                                      |                 |
| <b>DATA SHEET – A</b><br>(TO BE FILLED UP BY PURCHASER)                                                                                                                    |                                                                         |            |                                                                                                                               | <b>DATA SHEET – B</b><br>(TO BE FILLED UP BY BIDDER) |                 |
| PIPE LINE DATA                                                                                                                                                             | PIPE SIZE (OD x THK) mm                                                 |            | 406.4 x 9.53                                                                                                                  |                                                      | .....           |
|                                                                                                                                                                            | PIPE MATERIAL                                                           |            | SA 106 GR C                                                                                                                   |                                                      | .....           |
|                                                                                                                                                                            | BORE DIAMETER mm                                                        |            | SPECIFY BY BIDDER                                                                                                             |                                                      | .....           |
|                                                                                                                                                                            | MIN. AVAILABLE STRAIGHT LENGTH                                          |            |                                                                                                                               |                                                      | .....           |
|                                                                                                                                                                            | UPSTREAM : DOWNSTREAM                                                   |            | 10 D : 5 D                                                                                                                    |                                                      | .....           |
|                                                                                                                                                                            | FLOW DIRECTION                                                          |            | <input checked="" type="checkbox"/> HORIZONTAL <input type="checkbox"/> VERTICAL UP<br><input type="checkbox"/> VERTICAL DOWN |                                                      | .....           |
| OTHER INFORMATION                                                                                                                                                          | IBR CERTIFICATION                                                       |            | <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED                                            |                                                      |                 |
|                                                                                                                                                                            | TOTAL WEIGHT OF FLOW ELEMENT AND ACCESSORIES                            |            |                                                                                                                               |                                                      |                 |
| NAME<br>SIGNATURE<br>DATE                                                                                                                                                  | PREPARED BY                                                             | CHECKED BY | APPROVED BY                                                                                                                   | COMPANY SEAL                                         |                 |
|                                                                                                                                                                            | AKS/PKS                                                                 | SSV        | CM                                                                                                                            |                                                      |                 |
|                                                                                                                                                                            | 04.02.2017                                                              | 04.02.2017 | 04.02.2017                                                                                                                    | NAME                                                 |                 |
|                                                                                                                                                                            |                                                                         |            |                                                                                                                               | SIGNATURE                                            |                 |
|                                                                                                                                                                            |                                                                         |            |                                                                                                                               | DATE                                                 |                 |
| <b>NOTES:</b> <ol style="list-style-type: none"> <li>FLOW ELEMENT ACCURACY IS REQUIRED BETWEEN 20 T/HR AND 75 T/HR.</li> <li>RECOMMENDED RANGE IS 0 – 100 T/HR.</li> </ol> |                                                                         |            |                                                                                                                               |                                                      |                 |

|                                                                                   |                                                                         |                                                                                                                                                                                                    |                                               |                    |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|--------------------|
|  | <b>DATA SHEET FOR FLOW ELEMENTS</b><br><br><b>2 X 800 MW UPPUR STPS</b> |                                                                                                                                                                                                    | SPECIFICATION NO.: PS-TS-425-145-1105         |                    |
|                                                                                   |                                                                         |                                                                                                                                                                                                    | VOLUME II-B                                   |                    |
|                                                                                   |                                                                         |                                                                                                                                                                                                    | SECTION D                                     |                    |
|                                                                                   |                                                                         |                                                                                                                                                                                                    | REV. NO. 01                                   | DATE 12.03.2018    |
|                                                                                   |                                                                         |                                                                                                                                                                                                    | SHEET 1                                       | OF 34              |
| Tag No. : LAB80BP001                                                              |                                                                         |                                                                                                                                                                                                    | Reference Date Sheet No. DS3                  |                    |
| <b>DATA SHEET – A &amp; B</b>                                                     |                                                                         |                                                                                                                                                                                                    |                                               |                    |
| DATA SHEET – A<br>(TO BE FILLED UP BY PURCHASER)                                  |                                                                         |                                                                                                                                                                                                    | DATA SHEET – B<br>(TO BE FILLED UP BY BIDDER) |                    |
| GENERAL*                                                                          | PROJECT                                                                 | 2X800 MW UPPUR STPP                                                                                                                                                                                | .....                                         |                    |
|                                                                                   | OFFER REFERENCE                                                         | SPECIFY BY BIDDER                                                                                                                                                                                  | .....                                         |                    |
|                                                                                   | QUANTITY                                                                | ONE (1) PER UNIT                                                                                                                                                                                   | .....                                         |                    |
|                                                                                   | SERVICE                                                                 | FEED WATER FLOW AT ECONOMISER INLET                                                                                                                                                                | .....                                         |                    |
|                                                                                   | MAKE : MODEL                                                            | SPECIFY BY BIDDER                                                                                                                                                                                  | .....                                         |                    |
|                                                                                   |                                                                         |                                                                                                                                                                                                    | .....                                         |                    |
| ELEMENT                                                                           | TYPE                                                                    | <input type="checkbox"/> ORIFICE <input checked="" type="checkbox"/> NOZZLE                                                                                                                        | .....                                         |                    |
|                                                                                   | STANDARD DESIGN                                                         | <input checked="" type="checkbox"/> ASME PTC 19.5 <input type="checkbox"/> BS 1042 <input type="checkbox"/> OTHER                                                                                  | .....                                         |                    |
|                                                                                   |                                                                         | <input type="checkbox"/> SQ EDGE <input type="checkbox"/> LEVEL EDGE <input type="checkbox"/> CARRIER RING                                                                                         | .....                                         |                    |
|                                                                                   |                                                                         | <input type="checkbox"/> SHORT RADIUS <input checked="" type="checkbox"/> LONG RADIUS                                                                                                              | .....                                         |                    |
|                                                                                   |                                                                         | <input type="checkbox"/> LOW BETA <input checked="" type="checkbox"/> HIGH BETA                                                                                                                    | .....                                         |                    |
|                                                                                   |                                                                         |                                                                                                                                                                                                    | .....                                         |                    |
|                                                                                   | MATERIAL                                                                | <input checked="" type="checkbox"/> SS316 <input type="checkbox"/> OTHER                                                                                                                           | .....                                         |                    |
|                                                                                   | BETA RADIO                                                              | 0.4 TO 0.7                                                                                                                                                                                         | .....                                         |                    |
|                                                                                   | BORE DIAMETER                                                           | BIDDER TO SPECIFY                                                                                                                                                                                  | .....                                         |                    |
|                                                                                   | VENT HOLE                                                               | <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO                                                                                                                                | .....                                         |                    |
|                                                                                   | DRAIN HOLE                                                              | <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO                                                                                                                                | .....                                         |                    |
|                                                                                   |                                                                         |                                                                                                                                                                                                    | .....                                         |                    |
| END CONNECTION                                                                    | TYPE                                                                    | <input type="checkbox"/> FLANGED <input checked="" type="checkbox"/> BUTT WELD END                                                                                                                 | .....                                         |                    |
|                                                                                   | FLANGE TYPE                                                             | <input type="checkbox"/> WELD NECK <input type="checkbox"/> SLIP ON <input type="checkbox"/> THREADED                                                                                              | .....                                         |                    |
|                                                                                   | FLANGE RATING : MATERIAL                                                | NOT APPLICABLE                                                                                                                                                                                     | .....                                         |                    |
|                                                                                   | BRANCH PIPE                                                             | <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO                                                                                                                                | .....                                         |                    |
|                                                                                   | BRANCH PIPE MATERIAL                                                    | SAME AS PIPE MATERIAL                                                                                                                                                                              | .....                                         |                    |
|                                                                                   | TAPPING LOCATION                                                        | <input checked="" type="checkbox"/> D&D/2 <input type="checkbox"/> CORNER <input type="checkbox"/> VENTA                                                                                           | .....                                         |                    |
|                                                                                   |                                                                         | CONTRACTA <input type="checkbox"/> ON FLANGE <input checked="" type="checkbox"/> ON PIPE <input type="checkbox"/> ON CARRIER RING                                                                  | .....                                         |                    |
|                                                                                   |                                                                         |                                                                                                                                                                                                    | .....                                         |                    |
|                                                                                   | NUMBER OF TAPPINGS                                                      | <input checked="" type="checkbox"/> 3 PAIR <input type="checkbox"/> 2 PAIR <input type="checkbox"/> OTHER                                                                                          | .....                                         |                    |
|                                                                                   | ROOT VALVE NUMBER : SIZE                                                | <input checked="" type="checkbox"/> 12 <input type="checkbox"/> 8 <input type="checkbox"/> 6 <input type="checkbox"/> 4 : <input type="checkbox"/> 15 NB <input checked="" type="checkbox"/> 25 NB | .....                                         |                    |
|                                                                                   | ROOT VALVE MATERIAL : RATING                                            | <input type="checkbox"/> CS <input type="checkbox"/> AS <input checked="" type="checkbox"/> SS316 : <input checked="" type="checkbox"/> ANSI # 3500 SPL                                            | .....                                         |                    |
|                                                                                   | NIPPLE : SIZE/MATL/RATING/QTY                                           | 25NB/SS316/SCH.XXS/12 NOS. ; 1000 mm LONG                                                                                                                                                          | .....                                         |                    |
|                                                                                   | EXPANDER : SIZE/MATL/QTY                                                | 15x25NB/SS316/6 NOS/9000 CLASS ; 50.8 mm LONG                                                                                                                                                      | .....                                         |                    |
|                                                                                   |                                                                         |                                                                                                                                                                                                    | .....                                         |                    |
| PROCESS DATA                                                                      | FLUID                                                                   | <input type="checkbox"/> CONDENSATE <input checked="" type="checkbox"/> FEED WATER                                                                                                                 | .....                                         |                    |
|                                                                                   |                                                                         | <input type="checkbox"/> STEAM <input type="checkbox"/> CW <input type="checkbox"/> OTHER                                                                                                          | .....                                         |                    |
|                                                                                   |                                                                         | MAX. (Pump Emer. Opern.)                                                                                                                                                                           | NORMAL (VWO)                                  | MINIMUM (5 % BMCR) |
|                                                                                   |                                                                         | 2485                                                                                                                                                                                               | 2270                                          | 125                |
|                                                                                   | FLOW (T/HR)                                                             | 327                                                                                                                                                                                                | 318                                           | 16                 |
|                                                                                   | PRESSURE (KG/CM2 (A))                                                   | 311                                                                                                                                                                                                | 307                                           | 111                |
|                                                                                   | TEMPERATURE (DEG. C.)                                                   | 385 Kg/cm <sup>2</sup> (g): 315 °C                                                                                                                                                                 |                                               |                    |
|                                                                                   | DESIGN PRESS : TEMP                                                     | 0.3 Kg/cm <sup>2</sup> at max. flow                                                                                                                                                                |                                               |                    |
|                                                                                   | MAX. ALLOWABLE PRESS LOSS                                               | BIDDER TO SPECIFY                                                                                                                                                                                  |                                               |                    |
|                                                                                   | DIFF. PRESS AT MAX FLOW                                                 |                                                                                                                                                                                                    |                                               |                    |

|                                                                                                                                                                                |                                                                                                                                              |                                                |                                                                                                                                                                                                    |                                                      |                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|----------------------------------|
|                                                                                               | <b>DATA SHEET FOR FLOW ELEMENTS</b><br><b>2 X 800 MW UPPUR STPS</b>                                                                          |                                                |                                                                                                                                                                                                    | SPECIFICATION NO.: PS-TS-425-145-I105                |                                  |
|                                                                                                                                                                                |                                                                                                                                              |                                                |                                                                                                                                                                                                    | VOLUME II-B                                          |                                  |
|                                                                                                                                                                                |                                                                                                                                              |                                                |                                                                                                                                                                                                    | SECTION D                                            |                                  |
|                                                                                                                                                                                |                                                                                                                                              |                                                |                                                                                                                                                                                                    | REV. NO. 01                                          | DATE 12.03.2018                  |
|                                                                                                                                                                                |                                                                                                                                              |                                                |                                                                                                                                                                                                    | SHEET 1                                              | OF 34                            |
| Tag No. : <b>LAB80BP001</b> <span style="float: right;">Reference Date Sheet No. DS-3</span>                                                                                   |                                                                                                                                              |                                                |                                                                                                                                                                                                    |                                                      |                                  |
| <b>DATA SHEET – A &amp; B</b>                                                                                                                                                  |                                                                                                                                              |                                                |                                                                                                                                                                                                    |                                                      |                                  |
| <b>DATA SHEET – A</b><br>(TO BE FILLED UP BY PURCHASER)                                                                                                                        |                                                                                                                                              |                                                |                                                                                                                                                                                                    | <b>DATA SHEET – B</b><br>(TO BE FILLED UP BY BIDDER) |                                  |
| PIPE LINE<br>DATA                                                                                                                                                              | PIPE SIZE (OD x THK) mm<br>PIPE MATERIAL<br>BORE DIAMETER mm<br>MIN. AVAILABLE STRAIGHT<br>LENGTH<br>UPSTREAM : DOWNSTREAM<br>FLOW DIRECTION |                                                | ID 440 x 75<br>SA 106 GR C<br>BIDDER TO SPECIFY<br><br>10 D : 5 D<br><input checked="" type="checkbox"/> HORIZONTAL <input type="checkbox"/> VERTICAL UP<br><input type="checkbox"/> VERTICAL DOWN |                                                      | .....<br>.....<br>.....<br>..... |
|                                                                                                                                                                                | IBR CERTIFICATION<br><br>TOTAL WEIGHT OF FLOW ELEMENT<br>AND ACCESSORIES                                                                     |                                                | <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED                                                                                                                 |                                                      |                                  |
| NAME<br>SIGNATURE<br>DATE                                                                                                                                                      | <b>PREPARED BY</b><br><br>RS/PKS<br><br>06.02.2017                                                                                           | <b>CHECKED BY</b><br><br>SSV<br><br>06.02.2017 | <b>APPROVED BY</b><br><br>CM<br><br>06.02.2017                                                                                                                                                     | <b>COMPANY SEAL</b><br><br>NAME<br>SIGNATURE<br>DATE |                                  |
|                                                                                                                                                                                |                                                                                                                                              |                                                |                                                                                                                                                                                                    |                                                      |                                  |
| <b>NOTES:</b> <ol style="list-style-type: none"> <li>FLOW ELEMENT ACCURACY IS REQUIRED BETWEEN 500 T/HR AND 2550 T/HR.</li> <li>RECOMMENDED RANGE IS 0 – 3200 T/HR.</li> </ol> |                                                                                                                                              |                                                |                                                                                                                                                                                                    |                                                      |                                  |

|                                                                                                                                           |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                      |                 |
|-------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|-----------------|
|                                                          | <b>DATA SHEET FOR FLOW ELEMENTS</b><br><br><b>2 X 800 MW UPPUR STPS</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SPECIFICATION NO.: PS-TS-425-145-1105                |                 |
|                                                                                                                                           |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | VOLUME II-B                                          |                 |
|                                                                                                                                           |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SECTION D                                            |                 |
|                                                                                                                                           |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | REV. NO. 01                                          | DATE 12.03.2018 |
|                                                                                                                                           |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SHEET 1                                              | OF 34           |
| Tag No. : <b>LBF10BP001, LBF20BP001</b> <span style="float: right;">Reference Date Sheet No. DS-6</span><br><b>DATA SHEET – A &amp; B</b> |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                      |                 |
| <b>DATA SHEET – A</b><br>(TO BE FILLED UP BY PURCHASER)                                                                                   |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>DATA SHEET – B</b><br>(TO BE FILLED UP BY BIDDER) |                 |
| GENERAL*                                                                                                                                  | PROJECT                                                                 | 2X800 MW UPPUR STPP                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                      | .....           |
|                                                                                                                                           | OFFER REFERENCE                                                         | BIDDER TO SPECIFY                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                      | .....           |
|                                                                                                                                           | QUANTITY                                                                | 02 PER UNIT (ONE AGAINST EACH TAG NO.)                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                      | .....           |
|                                                                                                                                           | SERVICE                                                                 | HP BYPASS STEAM FLOW                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                      | .....           |
|                                                                                                                                           | MAKE : MODEL                                                            | BIDDER TO SPECIFY                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                      | .....           |
|                                                                                                                                           |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                      | .....           |
| ELEMENT                                                                                                                                   | TYPE                                                                    | <input type="checkbox"/> ORIFICE <input checked="" type="checkbox"/> NOZZLE<br><input checked="" type="checkbox"/> ASME PTC 19.5 <input type="checkbox"/> BS 1042 <input type="checkbox"/> OTHER<br><input type="checkbox"/> SQ EDGE <input type="checkbox"/> BEVEL EDGE <input type="checkbox"/> CARRIER RING<br><input type="checkbox"/> SHORT RADIUS <input checked="" type="checkbox"/> LONG RADIUS<br><input type="checkbox"/> LOW BETA <input checked="" type="checkbox"/> HIGH BETA |                                                      | .....           |
|                                                                                                                                           | STANDARD DESIGN                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                      | .....           |
|                                                                                                                                           | MATERIAL                                                                | <input type="checkbox"/> OTHERS <input checked="" type="checkbox"/> SS316                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                      | .....           |
|                                                                                                                                           | BETA RADIO                                                              | 0.4 TO 0.7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                      | .....           |
|                                                                                                                                           | BORE DIAMETER                                                           | BIDDER TO SPECIFY                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                      | .....           |
|                                                                                                                                           | VENT HOLE                                                               | <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                      | .....           |
|                                                                                                                                           | DRAIN HOLE                                                              | <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                      | .....           |
|                                                                                                                                           |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                      | .....           |
| END CONNECTION                                                                                                                            | TYPE                                                                    | <input type="checkbox"/> FLANGED <input checked="" type="checkbox"/> BUTT WELD END<br><input type="checkbox"/> WELD NECK <input type="checkbox"/> SLIP ON <input type="checkbox"/> THREADED<br>NOT APPLICABLE<br><input type="checkbox"/> YES <input checked="" type="checkbox"/> NO                                                                                                                                                                                                       |                                                      | .....           |
|                                                                                                                                           | FLANGE TYPE                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                      | .....           |
|                                                                                                                                           | FLANGE RATING : MATERIAL                                                | SAME AS PIPE MATERIAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                      | .....           |
|                                                                                                                                           | BRANCH PIPE                                                             | <input checked="" type="checkbox"/> D&D/2 <input type="checkbox"/> CORNER <input type="checkbox"/> VENTA CONTRACTA<br><input type="checkbox"/> ON FLANGE                                                                                                                                                                                                                                                                                                                                   |                                                      | .....           |
|                                                                                                                                           | BRANCH PIPE MATERIAL                                                    | <input checked="" type="checkbox"/> ON PIPE <input type="checkbox"/> ON CARRIER RING<br><input checked="" type="checkbox"/> 3 PAIR <input type="checkbox"/> 2 PAIR <input type="checkbox"/> OTHER                                                                                                                                                                                                                                                                                          |                                                      | .....           |
|                                                                                                                                           | TAPPING LOCATION                                                        | <input checked="" type="checkbox"/> 12 <input type="checkbox"/> 8 <input type="checkbox"/> 6 <input type="checkbox"/> 4 : <input type="checkbox"/> 15 NB <input checked="" type="checkbox"/> 25 NB<br><input type="checkbox"/> CS <input type="checkbox"/> AS <input checked="" type="checkbox"/> SS316 : <input checked="" type="checkbox"/> ANSI # 4500 SPL<br>25NB/SS316/SCH.XXS/12 NOS. ; 1000mm LONG<br>15x25NB/SS316/6 NOS/9000 CLASS ; 50.8 mm LONG                                 |                                                      | .....           |
| PROCESS DATA                                                                                                                              | FLUID                                                                   | <input type="checkbox"/> CONDENSATE <input type="checkbox"/> FEED WATER<br><input checked="" type="checkbox"/> STEAM <input type="checkbox"/> CW <input type="checkbox"/> OTHER                                                                                                                                                                                                                                                                                                            |                                                      | .....           |
|                                                                                                                                           |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                      | .....           |
|                                                                                                                                           |                                                                         | MAX.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | NORMAL                                               | MINIMUM         |
|                                                                                                                                           |                                                                         | (Trip from BMCR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                      | (20% of Normal) |
|                                                                                                                                           | FLOW (T/HR)                                                             | 808                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                      | 161.6           |
|                                                                                                                                           | PRESSURE (KG/CM2 (A))                                                   | 270                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                      | 270             |
|                                                                                                                                           | TEMPERATURE (DEG. C.)                                                   | 600                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                      | 600             |
|                                                                                                                                           | DESIGN PRESS : TEMP                                                     | 295.7 Kg/cm <sup>2</sup> (g) : 608 °C                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                      |                 |
|                                                                                                                                           | MAX. ALLOWABLE PRESS LOSS                                               | 3.0 Kg/cm <sup>2</sup> at max. flow                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                      |                 |
|                                                                                                                                           | DIFF. PRESS AT MAX FLOW                                                 | BIDDER TO SPECIFY                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                      |                 |

|                                                                                                              |                                                                                                                                              |                                         |                                                                                                                                                                                                   |                                                      |                                  |
|--------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|----------------------------------|
|                             | <b>DATA SHEET FOR FLOW ELEMENTS</b><br><b>2 X 800 MW UPPUR STPS</b>                                                                          |                                         |                                                                                                                                                                                                   | SPECIFICATION NO.: PS-TS-425-145-I105                |                                  |
|                                                                                                              |                                                                                                                                              |                                         |                                                                                                                                                                                                   | VOLUME II-B                                          |                                  |
|                                                                                                              |                                                                                                                                              |                                         |                                                                                                                                                                                                   | SECTION D                                            |                                  |
|                                                                                                              |                                                                                                                                              |                                         |                                                                                                                                                                                                   | REV. NO. 01                                          | DATE 12.03.2018                  |
|                                                                                                              |                                                                                                                                              |                                         |                                                                                                                                                                                                   | SHEET 1                                              | OF 34                            |
| Tag No. : <b>LBF10BP100, LBF20BP100</b>                                                                      |                                                                                                                                              |                                         |                                                                                                                                                                                                   |                                                      |                                  |
| Reference Date Sheet No. <b>DS-6</b>                                                                         |                                                                                                                                              |                                         |                                                                                                                                                                                                   |                                                      |                                  |
| <b>DATA SHEET – A &amp; B</b>                                                                                |                                                                                                                                              |                                         |                                                                                                                                                                                                   |                                                      |                                  |
| <b>DATA SHEET – A</b><br>(TO BE FILLED UP BY PURCHASER)                                                      |                                                                                                                                              |                                         |                                                                                                                                                                                                   | <b>DATA SHEET – B</b><br>(TO BE FILLED UP BY BIDDER) |                                  |
| PIPE LINE<br>DATA                                                                                            | PIPE SIZE (OD x THK) mm<br>PIPE MATERIAL<br>BORE DIAMETER mm<br>MIN. AVAILABLE STRAIGHT<br>LENGTH<br>UPSTREAM : DOWNSTREAM<br>FLOW DIRECTION |                                         | ID 200 X 57<br>SA 335 P92<br>BIDDER TO SPECIFY<br><br>10 D : 5 D<br><input checked="" type="checkbox"/> HORIZONTAL <input type="checkbox"/> VERTICAL UP<br><input type="checkbox"/> VERTICAL DOWN |                                                      | .....<br>.....<br>.....<br>..... |
|                                                                                                              | IBR CERTIFICATION<br><br>TOTAL WEIGHT OF FLOW ELEMENT<br>AND ACCESSORIES                                                                     |                                         | <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED                                                                                                                |                                                      |                                  |
| NAME<br>SIGNATURE<br>DATE                                                                                    | PREPARED BY<br><br>AKS/PKS<br><br>04.02.2017                                                                                                 | CHECKED BY<br><br>SSV<br><br>04.02.2017 | APPROVED BY<br><br>CM<br><br>04.02.2017                                                                                                                                                           | COMPANY SEAL<br><br><br>NAME<br>SIGNATURE<br>DATE    |                                  |
|                                                                                                              |                                                                                                                                              |                                         |                                                                                                                                                                                                   |                                                      |                                  |
| <b>NOTES:</b>                                                                                                |                                                                                                                                              |                                         |                                                                                                                                                                                                   |                                                      |                                  |
| 1. FLOW ELEMENT ACCURACY IS REQUIRED BETWEEN 20 T/HR AND 900 T/HR.<br>2. RECOMMENDED RANGE IS 0 – 1000 T/HR. |                                                                                                                                              |                                         |                                                                                                                                                                                                   |                                                      |                                  |



## DATA SHEET FOR FLOW ELEMENTS

2 X 800 MW UPPUR STPS

SPECIFICATION NO.: PS-TS-425-145-1105

VOLUME II-B

SECTION D

REV. NO.

01

DATE 12.03.2018

SHEET

1

OF 34

Tag No. : LBG10BP001

Reference Date Sheet No. DS-6

## DATA SHEET – A &amp; B

| DATA SHEET – A<br>(TO BE FILLED UP BY PURCHASER) |                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | DATA SHEET – B<br>(TO BE FILLED UP BY BIDDER)                                          |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| GENERAL*                                         | PROJECT<br>OFFER REFERENCE<br>QUANTITY<br>SERVICE<br>MAKE : MODEL                                                                                                                                                                                             | 2X800 MW UPPUR STPP<br>BIDDER TO SPECIFY<br>ONE (1) PER UNIT<br>MAIN STEAM FLOW TO AUX. PRDS<br>BIDDER TO SPECIFY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | .....<br>.....<br>.....<br>.....<br>.....                                              |
| ELEMENT                                          | TYPE<br>STANDARD<br>DESIGN<br><br>MATERIAL<br>BETA RADIO<br>BORE DIAMETER<br>VENT HOLE<br>DRAIN HOLE                                                                                                                                                          | <input type="checkbox"/> ORIFICE <input type="checkbox"/> NOZZLE<br><input type="checkbox"/> ASME PTC 19.5 <input type="checkbox"/> BS 1042 <input type="checkbox"/> OTHER<br><input type="checkbox"/> SQ EDGE <input type="checkbox"/> BEVEL EDGE <input type="checkbox"/> CARRIER RING<br><input type="checkbox"/> SHORT RADIUS <input type="checkbox"/> LONG RADIUS<br><input type="checkbox"/> LOW BETA <input type="checkbox"/> HIGH BETA<br><br><input type="checkbox"/> SS316 <input type="checkbox"/> OTHER<br>0.4 TO 0.7<br>BIDDER TO SPECIFY<br><input type="checkbox"/> YES <input type="checkbox"/> NO<br><input type="checkbox"/> YES <input type="checkbox"/> NO                                                                                                                                                                                                                                                                                                                                                       | .....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>..... |
| END CONNECTION                                   | TYPE<br>FLANGE TYPE<br>FLANGE RATING : MATERIAL<br>BRANCH PIPE<br>BRANCH PIPE MATERIAL<br>TAPPING LOCATION<br><br>NUMBER OF TAPPINGS<br>ROOT VALVE NUMBER : SIZE<br>ROOT VALVE MATERIAL : RATING<br>NIPPLE : SIZE/MATL/RATING/QTY<br>EXPANDER : SIZE/MATL/QTY | <input type="checkbox"/> FLANGED <input type="checkbox"/> BUTT WELD END<br><input type="checkbox"/> WELD NECK <input type="checkbox"/> SLIP ON <input type="checkbox"/> THREADED<br>NOT APPLICABLE<br><input type="checkbox"/> YES <input type="checkbox"/> NO<br>SAME AS PIPE MATERIAL<br><input type="checkbox"/> D&D/2 <input type="checkbox"/> CORNER <input type="checkbox"/> VENTA CONTRACTA<br><input type="checkbox"/> ON FLANGE<br><input type="checkbox"/> ON PIPE <input type="checkbox"/> ON CARRIER RING<br><input type="checkbox"/> 3 PAIR <input type="checkbox"/> 2 PAIR <input type="checkbox"/> OTHER<br><input type="checkbox"/> 12 <input type="checkbox"/> 8 <input type="checkbox"/> 6 <input type="checkbox"/> 4 : <input type="checkbox"/> 15 NB <input type="checkbox"/> 25 NB<br><input type="checkbox"/> CS <input type="checkbox"/> AS <input type="checkbox"/> SS316 : <input type="checkbox"/> ANSI # 4500 SPL<br>25NB/SS316/SCH.XXS/12 NOS. ; 1000mm<br>15x25NB/SS316/6 NOS/9000 CLASS ; 50.8 mm LONG | .....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>..... |
| PROCESS DATA                                     | FLUID<br><br>FLOW (T/HR)<br>PRESSURE (KG/CM2 (A))<br>TEMPERATURE (DEG. C.)<br>DESIGN PRESS : TEMP<br>MAX. ALLOWABLE PRESS LOSS<br>DIFF. PRESS AT MAX FLOW                                                                                                     | <input type="checkbox"/> CONDENSATE <input type="checkbox"/> FEED WATER<br><input type="checkbox"/> STEAM <input type="checkbox"/> CW <input type="checkbox"/> OTHER<br><br>MAX. (Max. Reqt.)      NORMAL (At 15% Load)      MINIMUM (Min. Reqt.)<br><br>150                      126                      20<br>270                      52                      270<br>600                      331                      600<br>295.7 Kg/cm <sup>2</sup> (g) : 608 °C<br>3.0 Kg/cm <sup>2</sup> at max. flow<br>BIDDER TO SPECIFY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | .....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>.....<br>..... |

|                                                                                                                                                                             |                                                                                                                                              |                                                |                                                                                                                                                                                       |                                                      |                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------|
|                                                                                            | <b>DATA SHEET FOR FLOW ELEMENTS</b><br><b>2 X 800 MW UPPUR STPS</b>                                                                          |                                                |                                                                                                                                                                                       | SPECIFICATION NO.: PS-TS-425-145-I105                |                                                                         |
|                                                                                                                                                                             |                                                                                                                                              |                                                |                                                                                                                                                                                       | VOLUME II-B                                          |                                                                         |
|                                                                                                                                                                             |                                                                                                                                              |                                                |                                                                                                                                                                                       | SECTION D                                            |                                                                         |
|                                                                                                                                                                             |                                                                                                                                              |                                                |                                                                                                                                                                                       | REV. NO. 01                                          | DATE 12.03.2018                                                         |
|                                                                                                                                                                             |                                                                                                                                              |                                                |                                                                                                                                                                                       | SHEET 1                                              | OF 34                                                                   |
| Tag No. : <b>LBG10BP001</b> <span style="float: right;">Reference Date Sheet No. DS-6</span>                                                                                |                                                                                                                                              |                                                |                                                                                                                                                                                       |                                                      |                                                                         |
| <b>DATA SHEET – A &amp; B</b>                                                                                                                                               |                                                                                                                                              |                                                |                                                                                                                                                                                       |                                                      |                                                                         |
| DATA SHEET – A<br>(TO BE FILLED UP BY PURCHASER)                                                                                                                            |                                                                                                                                              |                                                |                                                                                                                                                                                       | DATA SHEET – B<br>(TO BE FILLED UP BY BIDDER)        |                                                                         |
| PIPE LINE<br>DATA                                                                                                                                                           | PIPE SIZE (OD x THK) mm<br>PIPE MATERIAL<br>BORE DIAMETER mm<br>MIN. AVAILABLE STRAIGHT<br>LENGTH<br>UPSTREAM : DOWNSTREAM<br>FLOW DIRECTION |                                                | 219.1 x 47<br>SA 335 P92<br>BIDDER TO SPECIFY<br><br>10 D : 5 D<br><input type="checkbox"/> HORIZONTAL <input type="checkbox"/> VERTICAL UP<br><input type="checkbox"/> VERTICAL DOWN |                                                      | .....<br>.....<br>.....<br>.....                                        |
|                                                                                                                                                                             | OTHER<br>INFORMATION                                                                                                                         |                                                | IBR CERTIFICATION<br>TOTAL WEIGHT OF FLOW ELEMENT<br>AND ACCESSORIES                                                                                                                  |                                                      | <input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED |
| NAME<br>SIGNATURE<br>DATE                                                                                                                                                   | <b>PREPARED BY</b><br><br>AKS/PKS<br><br>04.02.2017                                                                                          | <b>CHECKED BY</b><br><br>SSV<br><br>04.02.2017 | <b>APPROVED BY</b><br><br>CM<br><br>04.02.2017                                                                                                                                        | <b>COMPANY SEAL</b><br><br>NAME<br>SIGNATURE<br>DATE |                                                                         |
|                                                                                                                                                                             |                                                                                                                                              |                                                |                                                                                                                                                                                       |                                                      |                                                                         |
| <b>NOTES:</b> <ol style="list-style-type: none"> <li>FLOW ELEMENT ACCURACY IS REQUIRED BETWEEN 20 T/HR AND 165 T/HR.</li> <li>RECOMMENDED RANGE IS 0 – 200 T/HR.</li> </ol> |                                                                                                                                              |                                                |                                                                                                                                                                                       |                                                      |                                                                         |

|                                                                                   |                                                                         |                                                                                                                                                                              |                                               |                 |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-----------------|
|  | <b>DATA SHEET FOR FLOW ELEMENTS</b><br><br><b>2 X 800 MW UPPUR STPS</b> |                                                                                                                                                                              | SPECIFICATION NO.: PS-TS-425-145-I105         |                 |
|                                                                                   |                                                                         |                                                                                                                                                                              | VOLUME II-B                                   |                 |
|                                                                                   |                                                                         |                                                                                                                                                                              | SECTION D                                     |                 |
|                                                                                   |                                                                         |                                                                                                                                                                              | REV. NO. 01                                   | DATE 12.03.2018 |
|                                                                                   |                                                                         |                                                                                                                                                                              | SHEET 1                                       | OF 34           |
| Tag No. : LBG20BP100                                                              |                                                                         |                                                                                                                                                                              | Reference Date Sheet No. DS-1                 |                 |
| <b>DATA SHEET – A &amp; B</b>                                                     |                                                                         |                                                                                                                                                                              |                                               |                 |
| DATA SHEET – A<br>(TO BE FILLED UP BY PURCHASER)                                  |                                                                         |                                                                                                                                                                              | DATA SHEET – B<br>(TO BE FILLED UP BY BIDDER) |                 |
| GENERAL*                                                                          | PROJECT                                                                 | 2X800 MW UPPUR STPP                                                                                                                                                          | .....                                         |                 |
|                                                                                   | OFFER REFERENCE                                                         | BIDDER TO SPECIFY                                                                                                                                                            | .....                                         |                 |
|                                                                                   | QUANTITY                                                                | ONE (1) PER UNIT                                                                                                                                                             | .....                                         |                 |
|                                                                                   | SERVICE                                                                 | CRH FLOW TO AUX. PRDS                                                                                                                                                        | .....                                         |                 |
|                                                                                   | MAKE : MODEL                                                            | BIDDER TO SPECIFY                                                                                                                                                            | .....                                         |                 |
|                                                                                   |                                                                         |                                                                                                                                                                              | .....                                         |                 |
| ELEMENT                                                                           | TYPE                                                                    | <input type="checkbox"/> ORIFICE <input type="checkbox"/> NOZZLE                                                                                                             | .....                                         |                 |
|                                                                                   | STANDARD                                                                | <input type="checkbox"/> ASME PTC 195 <input type="checkbox"/> BS 1042 <input type="checkbox"/> OTHER                                                                        | .....                                         |                 |
|                                                                                   | DESIGN                                                                  | <input type="checkbox"/> SQ EDGE <input type="checkbox"/> BEVEL EDGE <input type="checkbox"/> CARRIER RING                                                                   | .....                                         |                 |
|                                                                                   |                                                                         | <input type="checkbox"/> SHORT RADIUS <input type="checkbox"/> LONG RADIUS                                                                                                   | .....                                         |                 |
|                                                                                   |                                                                         | <input type="checkbox"/> LOW BETA <input type="checkbox"/> HIGH BETA                                                                                                         | .....                                         |                 |
|                                                                                   |                                                                         |                                                                                                                                                                              | .....                                         |                 |
|                                                                                   | MATERIAL                                                                | <input type="checkbox"/> SS316 <input type="checkbox"/> OTHER                                                                                                                | .....                                         |                 |
|                                                                                   | BETA RADIO                                                              | 0.4 TO 0.7                                                                                                                                                                   | .....                                         |                 |
|                                                                                   | BORE DIAMETER                                                           | BIDDER TO SPECIFY                                                                                                                                                            | .....                                         |                 |
|                                                                                   | VENT HOLE                                                               | <input type="checkbox"/> YES <input type="checkbox"/> NO                                                                                                                     | .....                                         |                 |
|                                                                                   | DRAIN HOLE                                                              | <input type="checkbox"/> YES <input type="checkbox"/> NO                                                                                                                     | .....                                         |                 |
|                                                                                   |                                                                         |                                                                                                                                                                              | .....                                         |                 |
| END CONNECTION                                                                    | TYPE                                                                    | <input type="checkbox"/> FLANGED <input type="checkbox"/> BUTT WELD END                                                                                                      | .....                                         |                 |
|                                                                                   | FLANGE TYPE                                                             | <input type="checkbox"/> WELD NECK <input type="checkbox"/> SLIP ON <input type="checkbox"/> THREADED                                                                        | .....                                         |                 |
|                                                                                   | FLANGE RATING : MATERIAL                                                | NOT APPLICABLE                                                                                                                                                               | .....                                         |                 |
|                                                                                   | BRANCH PIPE                                                             | <input type="checkbox"/> YES <input type="checkbox"/> NO                                                                                                                     | .....                                         |                 |
|                                                                                   | BRANCH PIPE MATERIAL                                                    | SAME AS PIPE MATERIAL                                                                                                                                                        | .....                                         |                 |
|                                                                                   | TAPPING LOCATION                                                        | <input type="checkbox"/> D&D/2 <input type="checkbox"/> CORNER <input type="checkbox"/> VENTA CONTRACTA                                                                      | .....                                         |                 |
|                                                                                   |                                                                         | <input type="checkbox"/> ON FLANGE                                                                                                                                           | .....                                         |                 |
|                                                                                   |                                                                         | <input type="checkbox"/> ON PIPE <input type="checkbox"/> ON CARRIER RING                                                                                                    | .....                                         |                 |
|                                                                                   | NUMBER OF TAPPINGS                                                      | <input type="checkbox"/> 3 PAIR <input type="checkbox"/> 2 PAIR <input type="checkbox"/> OTHER                                                                               | .....                                         |                 |
|                                                                                   | ROOT VALVE NUMBER : SIZE                                                | <input type="checkbox"/> 12 <input type="checkbox"/> 8 <input type="checkbox"/> 6 <input type="checkbox"/> 4 : <input type="checkbox"/> 15 NB <input type="checkbox"/> 25 NB | .....                                         |                 |
|                                                                                   | ROOT VALVE MATERIAL : RATING                                            | <input type="checkbox"/> CS <input type="checkbox"/> AS <input type="checkbox"/> SS : <input type="checkbox"/> ANSI # 900                                                    | .....                                         |                 |
|                                                                                   | NIPPLE : SIZE/MATL/RATING/QTY                                           | 25NB/SS316/SCH.80/12 NOS. ; 1000mm LONG                                                                                                                                      | .....                                         |                 |
|                                                                                   | EXPANDER : SIZE/MATL/QTY                                                | 15x25NB/SS316/6 NOS/3000 CLASS ; 50.8 mm LONG                                                                                                                                | .....                                         |                 |
|                                                                                   |                                                                         |                                                                                                                                                                              | .....                                         |                 |
| PROCESS DATA                                                                      | FLUID                                                                   | <input type="checkbox"/> CONDENSATE <input type="checkbox"/> FEED WATER                                                                                                      | .....                                         |                 |
|                                                                                   |                                                                         | <input type="checkbox"/> STEAM <input type="checkbox"/> CW <input type="checkbox"/> OTHER                                                                                    | .....                                         |                 |
|                                                                                   |                                                                         | MAX. NORMAL MINIMUM                                                                                                                                                          | .....                                         |                 |
|                                                                                   |                                                                         | (NR at 40% Load) (NR at 100% Load)                                                                                                                                           | .....                                         |                 |
|                                                                                   | FLOW (T/HR)                                                             | 20 11 10                                                                                                                                                                     | .....                                         |                 |
|                                                                                   | PRESSURE (KG/CM2 (A))                                                   | 25 25 61.0                                                                                                                                                                   | .....                                         |                 |
|                                                                                   | TEMPERATURE (DEG. C.)                                                   | 311 311 361.2                                                                                                                                                                | .....                                         |                 |
|                                                                                   | DESIGN PRESS : TEMP                                                     | 73.2 Kg/cm <sup>2</sup> (g) : 380 °C                                                                                                                                         | .....                                         |                 |
|                                                                                   | MAX. ALLOWABLE PRESS LOSS                                               | 0.3 Kg/cm <sup>2</sup> at max. flow                                                                                                                                          | .....                                         |                 |
|                                                                                   | DIFF. PRESS AT MAX FLOW                                                 | Bidder to specify                                                                                                                                                            | .....                                         |                 |

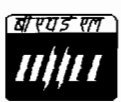
|                                                                                                                                                                                |                                                                     |            |                                                                                     |                                                      |                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|------------|-------------------------------------------------------------------------------------|------------------------------------------------------|-----------------|
|                                                                                               | <b>DATA SHEET FOR FLOW ELEMENTS</b><br><b>2 X 800 MW UPPUR STPS</b> |            |                                                                                     | SPECIFICATION NO.: PS-TS-425-145-I105                |                 |
|                                                                                                                                                                                |                                                                     |            |                                                                                     | VOLUME II-B                                          |                 |
|                                                                                                                                                                                |                                                                     |            |                                                                                     | SECTION D                                            |                 |
|                                                                                                                                                                                |                                                                     |            |                                                                                     | REV. NO. 01                                          | DATE 12.03.2018 |
|                                                                                                                                                                                |                                                                     |            |                                                                                     | SHEET 1                                              | OF 34           |
| Tag No. : <b>LBG20BP001</b> <span style="float: right;">Reference Date Sheet No. DS-1</span>                                                                                   |                                                                     |            |                                                                                     |                                                      |                 |
| <b>DATA SHEET – A &amp; B</b>                                                                                                                                                  |                                                                     |            |                                                                                     |                                                      |                 |
| <b>DATA SHEET – A</b><br>(TO BE FILLED UP BY PURCHASER)                                                                                                                        |                                                                     |            |                                                                                     | <b>DATA SHEET – B</b><br>(TO BE FILLED UP BY BIDDER) |                 |
| PIPE LINE DATA                                                                                                                                                                 | PIPE SIZE (OD x THK) mm                                             |            | 114.3 x 6.02                                                                        |                                                      | .....           |
|                                                                                                                                                                                | PIPE MATERIAL                                                       |            | SA 106 GR B                                                                         |                                                      | .....           |
|                                                                                                                                                                                | BORE DIAMETER mm                                                    |            | NOT APPLICABLE                                                                      |                                                      | .....           |
|                                                                                                                                                                                | MIN. AVAILABLE STRAIGHT LENGTH                                      |            | 10 D : 5 D                                                                          |                                                      | .....           |
|                                                                                                                                                                                | UPSTREAM : DOWNSTREAM                                               |            | <input checked="" type="checkbox"/> HORIZONTAL <input type="checkbox"/> VERTICAL UP |                                                      |                 |
|                                                                                                                                                                                | FLOW DIRECTION                                                      |            | <input type="checkbox"/> VERTICAL DOWN                                              |                                                      |                 |
| OTHER INFORMATION                                                                                                                                                              | IBR CERTIFICATION                                                   |            | <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED  |                                                      |                 |
|                                                                                                                                                                                | TOTAL WEIGHT OF FLOW ELEMENT AND ACCESSORIES                        |            |                                                                                     |                                                      |                 |
| NAME<br>SIGNATURE<br>DATE                                                                                                                                                      | PREPARED BY                                                         | CHECKED BY | APPROVED BY                                                                         | COMPANY SEAL                                         |                 |
|                                                                                                                                                                                | RKV                                                                 | SSV        | SSV                                                                                 |                                                      |                 |
|                                                                                                                                                                                | 04.02.2017                                                          | 04.02.2017 | 04.02.2017                                                                          | NAME                                                 |                 |
|                                                                                                                                                                                |                                                                     |            |                                                                                     | SIGNATURE                                            |                 |
|                                                                                                                                                                                |                                                                     |            |                                                                                     | DATE                                                 |                 |
| <b>NOTES:</b> <ol style="list-style-type: none"> <li>1. FLOW ELEMENT ACCURACY IS REQUIRED BETWEEN 8 T/HR AND 20 T/HR.</li> <li>2. RECOMMENDED RANGE IS 0 – 30 T/HR.</li> </ol> |                                                                     |            |                                                                                     |                                                      |                 |
|                                                                                                                                                                                |                                                                     |            |                                                                                     |                                                      |                 |

|                                                                                   |                                                                                                          |                                              |                  |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------|
|  | <b>Technical specification for<br/>FLOW ELEMENT ASSEMBLY<br/>(NOZZLE)</b><br><br>UPPUR STPP (2 X 800 MW) | SPECIFICATION NO. <b>PE-TS-425-145-I 005</b> |                  |
|                                                                                   |                                                                                                          | VOLUME <b>II-B</b>                           |                  |
|                                                                                   |                                                                                                          | SECTION <b>D</b>                             |                  |
|                                                                                   |                                                                                                          | REV. NO. 00                                  | DATE: 10.05.2018 |
|                                                                                   |                                                                                                          | SHEET                                        |                  |

## **SECTION – D**

## **DATA SHEETS - C**

|                                                                                                                     |                                                                                                       |       |                                               |                  |
|---------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-------|-----------------------------------------------|------------------|
|                                    | <b>DATA SHEET FOR<br/>FLOW MEASURING DEVICES<br/>(NOZZLES)</b><br><br><b>UPPUR STPP ( 2 X 800 MW)</b> |       | SPECIFICATION NO.: <b>PE-TS-425-145-I 005</b> |                  |
|                                                                                                                     |                                                                                                       |       | VOLUME III                                    |                  |
|                                                                                                                     |                                                                                                       |       | SECTION                                       |                  |
|                                                                                                                     |                                                                                                       |       | REV. NO.                                      | DATE: 10.05.2018 |
|                                                                                                                     |                                                                                                       |       | SHEET 1                                       | OF 2             |
| TAG No. .... Qty.....                                                                                               |                                                                                                       |       | Data Sheet No.: <b>PES-145-05-DS2-0</b>       |                  |
| <b>Data Sheet C</b>                                                                                                 |                                                                                                       |       |                                               |                  |
| DATA SHEET-C FOR FLOW MEASURING DEVICES (ORIFICE & NOZZLES)<br>(TO BE FILLED BY CONTRACTOR AFTER AWARD OF CONTRACT) |                                                                                                       |       |                                               |                  |
| <b>GENERAL</b>                                                                                                      | PROJECT                                                                                               |       |                                               |                  |
|                                                                                                                     | OFFER REFERENCE                                                                                       |       |                                               |                  |
|                                                                                                                     | TAG NO.: QUANTITY                                                                                     |       |                                               |                  |
|                                                                                                                     | SERVICE                                                                                               |       |                                               |                  |
|                                                                                                                     | MAKE                                                                                                  | MODEL |                                               |                  |
| <b>ELEMENT</b>                                                                                                      | TYPE                                                                                                  |       |                                               |                  |
|                                                                                                                     | STANDARD                                                                                              |       |                                               |                  |
|                                                                                                                     | DESIGN                                                                                                |       |                                               |                  |
|                                                                                                                     | MATERIAL                                                                                              |       |                                               |                  |
|                                                                                                                     | BETA RATIO                                                                                            |       |                                               |                  |
|                                                                                                                     | BORE DIAMETER                                                                                         |       |                                               |                  |
|                                                                                                                     | VENT HOLE                                                                                             |       |                                               |                  |
|                                                                                                                     | DRAIN HOLE                                                                                            |       |                                               |                  |
| <b>END<br/>CONNECTION</b>                                                                                           | TYPE                                                                                                  |       |                                               |                  |
|                                                                                                                     | FLANGE TYPE                                                                                           |       |                                               |                  |
|                                                                                                                     | FLANGE RATING                                                                                         |       |                                               |                  |
|                                                                                                                     | MATERIAL                                                                                              |       |                                               |                  |
|                                                                                                                     | BRANCH PIPE                                                                                           |       |                                               |                  |
|                                                                                                                     | BRANCH PIPE MATERIAL                                                                                  |       |                                               |                  |
|                                                                                                                     | TAPPING LOCATION                                                                                      |       |                                               |                  |
|                                                                                                                     | NO. OF TAPPINGS                                                                                       |       |                                               |                  |
|                                                                                                                     | ROOT VALVE                                                                                            |       |                                               |                  |
|                                                                                                                     | NUMBER                                                                                                | SIZE  |                                               |                  |
|                                                                                                                     | ROOT VALVE MATERIAL                                                                                   |       |                                               |                  |
|                                                                                                                     | RATING                                                                                                |       |                                               |                  |
|                                                                                                                     | <b>PROCESS DATA</b>                                                                                   | FLUID |                                               |                  |
| FLOW T/HR                                                                                                           |                                                                                                       |       |                                               |                  |
| PRESS ATA                                                                                                           |                                                                                                       |       |                                               |                  |
| TEMP (DEG. C)                                                                                                       |                                                                                                       |       |                                               |                  |
| DESIGN PRESS                                                                                                        |                                                                                                       | TEMP  |                                               |                  |
| PRESS LOSS at MAX/ NORMAL FLOW                                                                                      |                                                                                                       |       |                                               |                  |
| DIFF PRESS AT MAX/NORMAL FLOW                                                                                       |                                                                                                       |       |                                               |                  |
| <b>PIPE LINE DATA</b>                                                                                               | PIPE SIZE (OD X THK) mm                                                                               |       |                                               |                  |
|                                                                                                                     | PIPE MATERIAL                                                                                         |       |                                               |                  |

|                                                                                                                     |                                                                                                       |            |                                               |                  |
|---------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|------------|-----------------------------------------------|------------------|
|                                    | <b>DATA SHEET FOR<br/>FLOW MEASURING DEVICES<br/>(NOZZLES)</b><br><br><b>UPPUR STPP ( 2 X 800 MW)</b> |            | SPECIFICATION NO.: <b>PE-TS-425-145-I 005</b> |                  |
|                                                                                                                     |                                                                                                       |            | VOLUME III                                    |                  |
|                                                                                                                     |                                                                                                       |            | SECTION                                       |                  |
|                                                                                                                     |                                                                                                       |            | REV. NO.                                      | DATE: 10.05.2018 |
|                                                                                                                     |                                                                                                       |            | SHEET 2                                       | OF 2             |
| TAG No. .... Qty.....                                                                                               |                                                                                                       |            | Data Sheet No.: <b>PES-145-05-DS2-0</b>       |                  |
| <b>Data Sheet C</b>                                                                                                 |                                                                                                       |            |                                               |                  |
| DATA SHEET-C FOR FLOW MEASURING DEVICES (ORIFICE & NOZZLES)<br>(TO BE FILLED BY CONTRACTOR AFTER AWARD OF CONTRACT) |                                                                                                       |            |                                               |                  |
|                                                                                                                     | BORE DIAMETER mm                                                                                      |            |                                               |                  |
|                                                                                                                     | AVAILABLE STRAIGHT LENGTH                                                                             |            |                                               |                  |
|                                                                                                                     | UPSTREAM                                                                                              | DOWNSTREAM |                                               |                  |
|                                                                                                                     | FLOW DIRECTION                                                                                        |            |                                               |                  |
| <b>OTHER INFORMATION</b>                                                                                            | IBR CERTIFICATION                                                                                     |            |                                               |                  |
|                                                                                                                     | TOTAL WEIGHT OF FLOW ELEMENT AND ACCESSORIES                                                          |            |                                               |                  |
| NAME                                                                                                                |                                                                                                       |            |                                               | NAME             |
| SIGNATURE                                                                                                           |                                                                                                       |            |                                               | SIGNATURE        |
| DATE                                                                                                                |                                                                                                       |            |                                               | DATE             |

|                                                                                   |                                                                                                                 |                                              |                   |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|----------------------------------------------|-------------------|
|  | <p>Technical specification for<br/><b>FLOW ELEMENT ASSEMBLY</b><br/>(NOZZLE)</p> <p>UPPUR STPP (2 X 800 MW)</p> | SPECIFICATION NO. <b>PE-TS-425-145-I 005</b> |                   |
|                                                                                   |                                                                                                                 | VOLUME <b>II-B</b>                           |                   |
|                                                                                   |                                                                                                                 | SECTION <b>D</b>                             |                   |
|                                                                                   |                                                                                                                 | REV. NO. 00                                  | DATE : 10.05.2018 |
|                                                                                   |                                                                                                                 | SHEET                                        |                   |

## SECTION – D

## QUALITY PLAN

| <div></div> <div>PEM :: C&amp;I</div> |                                                             | STANDARD QUALITY PLAN<br>FOR<br>FLOW NOZZLE ASSEMBLY                  |              |                                                 |                           |                                            |                                            |                     |              |            |              | QUALITY PLAN NO.: PE-QP-425-145-1005                    |  |     |  |                |  |
|--------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------------------------------|--------------|-------------------------------------------------|---------------------------|--------------------------------------------|--------------------------------------------|---------------------|--------------|------------|--------------|---------------------------------------------------------|--|-----|--|----------------|--|
|                                                                                                                          |                                                             |                                                                       |              |                                                 |                           |                                            |                                            |                     |              |            |              | VOLUME                                                  |  | IIB |  |                |  |
|                                                                                                                          |                                                             |                                                                       |              |                                                 |                           |                                            |                                            |                     |              |            |              | SECTION                                                 |  | D   |  |                |  |
|                                                                                                                          |                                                             |                                                                       |              |                                                 |                           |                                            |                                            |                     |              |            |              | REV. NO.                                                |  | 00  |  | DATE: 25.10.16 |  |
|                                                                                                                          |                                                             |                                                                       |              |                                                 |                           |                                            |                                            |                     |              |            |              | SHEET                                                   |  | 1   |  | OF             |  |
| Sl. No.                                                                                                                  | Component / operation                                       | Characteristics Checked                                               | * Category   | Type/Method of Check                            | Extent of Check           | Reference documents                        | Acceptance Norms                           | Format of Records   | Agency \$    |            | Remarks      |                                                         |  |     |  |                |  |
|                                                                                                                          |                                                             |                                                                       |              |                                                 |                           |                                            |                                            |                     | P            | W          | V            |                                                         |  |     |  |                |  |
| 1.0                                                                                                                      | RAW MATERIAL<br>Flow Nozzle, pipe, adapter                  | Physical, Chemical properties<br><br>Ultrasonic testing (nozzle only) | MA<br><br>MA | Physical, Chemical tests<br><br>Ultrasonic test | One / Heat<br><br>100%    | AP / DP /SP<br><br>ASTMA388 & ANSI B 16.34 | AP / DP /SP<br><br>ASTMA388 & ANSI B 16.34 | TC<br><br>TC        | 3/2<br><br>3 | —<br><br>2 | 2,1<br><br>1 | Refer Note-1                                            |  |     |  |                |  |
| 2.0                                                                                                                      | IN PROCESS                                                  |                                                                       |              |                                                 |                           |                                            |                                            |                     |              |            |              |                                                         |  |     |  |                |  |
| 2.1                                                                                                                      | Welding procedure specification (WPS)                       | Correctness                                                           | MA           | Scrutiny                                        | 100%                      | IS:7307 / ASME IX                          | IS:7307 / ASME IX                          | Format of IS / ASME | 3/2          | —          | 2,1          | IBR certification to be verified by BHEL, if applicable |  |     |  |                |  |
| 2.2                                                                                                                      | Procedure Qualification Record(PQR) & Welders qualification | Weld soundness                                                        | MA           | Physical test / Radiographic Test               | IS:7307/ IS:7310/ ASME IX | IS:7307/ IS:7310/ ASME IX                  | IS:7307/ IS:7310/ ASME IX                  | Format of IS / ASME | 3/2          | 2          | 1            | Welding to be done by qualified welders.                |  |     |  |                |  |
| 2.3                                                                                                                      | Weld FIT-UPS                                                | Dimension, Alignment, Orientation.                                    | MA           | Measurement & Visual                            | 100%                      | WPS/Approved drg.                          | WPS/Approved drg.                          | IR / Log Book       | 3/2          | —          | 2            | Refer Note-3                                            |  |     |  |                |  |
| 2.4                                                                                                                      | Weldments final run                                         | 1. Surface defects                                                    | MA           | Penetrant Test                                  | 100%                      | IS:3658 / ASTM 165/ ASME VIII Div. I       | ASTM. / 165ASME VIII Div I                 | IR / Log Book       | 3/2          | 2          | 1            | 100% by Vendor, 10 % by BHEL                            |  |     |  |                |  |

|         |                            |                            |                  |                            |                                    |   |              |  |  |  |  |  |  |  |  |
|---------|----------------------------|----------------------------|------------------|----------------------------|------------------------------------|---|--------------|--|--|--|--|--|--|--|--|
| LEGEND: |                            |                            |                  |                            |                                    |   |              |  |  |  |  |  |  |  |  |
| * CR    | - Critical characteristics | IR - Inspection Reports    | DS – Data Sheet  | MR- Manufacturer records   | \$ P - Agency Performing the Test. | 1 | - BHEL       |  |  |  |  |  |  |  |  |
| MA      | - Major characteristics    | TC - Test Certificates     | SP – Tech. Spec. | MS- Manufacturer standards | W - Agency Witnessing the Test.    | 2 | - Vendor     |  |  |  |  |  |  |  |  |
| MI      | - Minor characteristics    | AP – Approved Drawings/doc |                  |                            | V - Agency Verifying the Test.     | 3 | - Sub-vendor |  |  |  |  |  |  |  |  |

| STANDARD QUALITY PLAN<br>FOR<br>FLOW NOZZLE ASSEMBLY                                                              |                                            |                                    |                   |                            |                       |                        |                     |                         |           | QUALITY PLAN NO.: PE-QP-425-145-1005 |   |                                                                          |  |                |  |
|-------------------------------------------------------------------------------------------------------------------|--------------------------------------------|------------------------------------|-------------------|----------------------------|-----------------------|------------------------|---------------------|-------------------------|-----------|--------------------------------------|---|--------------------------------------------------------------------------|--|----------------|--|
| <div><br/>PEM :: C&amp;I</div> |                                            |                                    |                   |                            |                       |                        |                     |                         |           | VOLUME                               |   | IIB                                                                      |  |                |  |
|                                                                                                                   |                                            |                                    |                   |                            |                       |                        |                     |                         |           | SECTION                              |   | D                                                                        |  |                |  |
|                                                                                                                   |                                            |                                    |                   |                            |                       |                        |                     |                         |           | REV. NO.                             |   | 00                                                                       |  | DATE: 25.10.16 |  |
|                                                                                                                   |                                            |                                    |                   |                            |                       |                        |                     |                         |           | SHEET                                |   | 2                                                                        |  | OF 4           |  |
|                                                                                                                   |                                            |                                    |                   |                            |                       |                        |                     |                         |           |                                      |   |                                                                          |  |                |  |
| Sl. No.                                                                                                           | Component / operation                      | Characteristics Checked            | *<br>Cate<br>gory | Type/Method<br>of<br>Check | Extent<br>of<br>Check | Reference<br>documents | Acceptance<br>Norms | Format<br>of<br>Records | Agency \$ |                                      |   | Remarks                                                                  |  |                |  |
|                                                                                                                   |                                            |                                    |                   |                            |                       |                        |                     |                         | P         | W                                    | V |                                                                          |  |                |  |
|                                                                                                                   |                                            | 2. Sub Surface defects(After PWHT) | MA                | Radiographic Test          | 100%                  | ASME SEC. V            | ASME SEC. VIII      | IR                      | 3/2       | 2                                    | 1 | As applicable depending on pipe thickness. Films to be reviewed by BHEL. |  |                |  |
|                                                                                                                   |                                            | 3 Heat Treatment                   | MA                | Review of HT Chart         | 100%                  | ASME SEC. VIII         | ASME SEC. VIII      | HT Chart                | 3/2       | 2                                    | 1 | 100% by Vendor, 10% by BHEL                                              |  |                |  |
| 2.5                                                                                                               | Machining<br><br>1. Flow Nozzle (machined) | 1. Dimensions                      | MA                | Measurement                | 100%                  | AP / DS                | AP / DS             | IR                      | 3/2       | 2                                    | 1 |                                                                          |  |                |  |
|                                                                                                                   |                                            | 2. Profile                         | MA                | Measurement                | 100%                  | AP / DS                | AP / DS             | IR                      | 3/2       | 2                                    | 1 |                                                                          |  |                |  |
|                                                                                                                   |                                            | 3. Surface finish                  | MA                | Visual                     | 100%                  | -----                  | Mirror finish.      | IR / Mfd Records        | 3/2       | 2                                    | 1 |                                                                          |  |                |  |
|                                                                                                                   | 2. Pipe, Adapter                           | 1. Machining of pipe ID            | MA                | Measurement                | 100%                  | AP / DS                | AP / DS             | IR                      | 3/2       | 2                                    | 1 |                                                                          |  |                |  |
|                                                                                                                   |                                            | 2. Dimensions                      | MA                | Measurement                | 100%                  | AP / DS                | AP / DS             | IR                      | 3/2       | 2                                    | 1 |                                                                          |  |                |  |

LEGEND: \* CR - Critical characteristics  
 MA - Major characteristics  
 MI - Minor characteristics  
 IR - Inspection Reports  
 TC - Test Certificates  
 AP - Approved Drawings/doc  
 DS - Data Sheet  
 SP - Tech. Spec.  
 MR- Manufacturer records  
 MS- Manufacturer standards  
 \$ P - Agency Performing the Test.  
 W - Agency Witnessing the Test.  
 V - Agency Verifying the Test.  
 1 - BHEL  
 2 - Vendor  
 3 - Sub-vendor



|                                                                                                                                                                  |                       |                                             |            |                      |                 |                     |                  |                   |           |   |   |         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------------------------------------|------------|----------------------|-----------------|---------------------|------------------|-------------------|-----------|---|---|---------|
| <br><b>STANDARD QUALITY PLAN</b><br><b>FOR</b><br><b>FLOW NOZZLE ASSEMBLY</b> |                       | QUALITY PLAN NO.: <b>PE-QP-425-145-1005</b> |            |                      |                 |                     |                  |                   |           |   |   |         |
|                                                                                                                                                                  |                       | VOLUME                                      |            |                      |                 |                     | IIB              |                   |           |   |   |         |
|                                                                                                                                                                  |                       | SECTION                                     |            |                      |                 |                     | D                |                   |           |   |   |         |
|                                                                                                                                                                  |                       | REV. NO.                                    |            |                      |                 |                     | 00               |                   |           |   |   |         |
|                                                                                                                                                                  |                       | SHEET                                       |            |                      |                 |                     | 4 OF 4           |                   |           |   |   |         |
| DATE: 25.10.16                                                                                                                                                   |                       |                                             |            |                      |                 |                     |                  |                   |           |   |   |         |
| Sl. No.                                                                                                                                                          | Component / operation | Characteristics Checked                     | * Category | Type/Method of Check | Extent of Check | Reference documents | Acceptance Norms | Format of Records | Agency \$ |   |   | Remarks |
|                                                                                                                                                                  |                       |                                             |            |                      |                 |                     |                  |                   | P         | W | V |         |

**NOTE:**

1. Test Certificates to be verified by BHEL at final inspection stage. Positive material identification testing shall be performed by vendor and same shall be witnessed by BHEL.
2. Minimum 2 coats of primer paint to be applied before dispatch.
3. In case of NTPC / LLOYDS / BHEL qualified welders available, then prequalification and WPS, PQR not required, only TC to be verified.
4. CALIBRATION Test to be carried out at IIT-DELHI / FCRI or BHEL approved laboratory.
5. Sea Worthy packing ,If applicable
6. Qualification records of the Vendors can be verified.
7. For P91 & P22 material welding should be continuously done. No interruptions shall be allowed.

|         |  |      |                            |                            |                  |                            |                                    |   |              |
|---------|--|------|----------------------------|----------------------------|------------------|----------------------------|------------------------------------|---|--------------|
| LEGEND: |  | * CR | - Critical characteristics | IR - Inspection Reports    | DS – Data Sheet  | MR- Manufacturer records   | \$ P - Agency Performing the Test. | 1 | - BHEL       |
|         |  | MA   | - Major characteristics    | TC - Test Certificates     | SP – Tech. Spec. | MS- Manufacturer standards | W - Agency Witnessing the Test.    | 2 | - Vendor     |
|         |  | MI   | - Minor characteristics    | AP – Approved Drawings/doc |                  |                            | V - Agency Verifying the Test.     | 3 | - Sub-vendor |

|                                                                                   |                                                                                                                 |                                              |                  |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------|
|  | <b>Technical specification for<br/>FLOW ELEMENT ASSEMBLY<br/>(NOZZLE)</b><br><br><b>UPPUR STPP (2 X 800 MW)</b> | SPECIFICATION NO. <b>PE-TS-425-145-I 005</b> |                  |
|                                                                                   |                                                                                                                 | VOLUME <b>II-B</b>                           |                  |
|                                                                                   |                                                                                                                 | SECTION <b>D</b>                             |                  |
|                                                                                   |                                                                                                                 | REV. NO. 00                                  | DATE: 10.05.2018 |
|                                                                                   |                                                                                                                 | SHEET                                        |                  |

## **SECTION – D**

# **BILL OF QUANTITY**

|                                                                                   |                                                                           |  |                                       |                  |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------|--|---------------------------------------|------------------|
|  | <b>Technical specification for<br/>FLOW ELEMENT ASSEMBLY<br/>(Nozzle)</b> |  | SPECIFICATION NO. PE-TS-425-145-I 005 |                  |
|                                                                                   |                                                                           |  | VOLUME <b>II-B</b>                    |                  |
|                                                                                   | <b>UPPUR STPP (2 X 800 MW)</b>                                            |  | SECTION <b>D</b>                      |                  |
|                                                                                   |                                                                           |  | REV. NO. 00                           | DATE: 10.05.2018 |
|                                                                                   |                                                                           |  | SHEET                                 | 1 of 1           |

## BILL OF QUANTITY

| [A] FLOW ELEMENT ASSEMBLIES COMPLETE WITH Three (3) pairs of tappings, AND ACCESSORIES, like Pressure take-off points, Root valves, Nipples etc. |                                          |                                     |              |              |           |
|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-------------------------------------|--------------|--------------|-----------|
| S. No                                                                                                                                            | TAG NO.                                  | SERVICE                             | TYPE OF ASSY | QTY PER UNIT | QTY TOTAL |
| i)                                                                                                                                               | LAB10BP001,<br>LAB20BP001,<br>LAB30BP001 | BFP SUCTION FLOW                    | NOZZLE       | 03           | 06        |
| ii)                                                                                                                                              | LCH10BP001,<br>LCH20BP001                | HPH-6A/6B DRAIN FLOW TO DEAERATOR   | NOZZLE       | 02           | 04        |
| iii)                                                                                                                                             | LBS51BP001                               | EXTRACTION STEAM FLOW TO DEAERATOR  | NOZZLE       | 01           | 02        |
| iv)                                                                                                                                              | LBS53BP001,<br>LBS54BP001                | EXTRACTION STEAM FLOW TO BFPT-A/B   | NOZZLE       | 02           | 04        |
| v)                                                                                                                                               | LCA90BP001                               | CONDENSATE FLOW TO DEAERATOR        | NOZZLE       | 01           | 02        |
| vi)                                                                                                                                              | LAB80BP001                               | FEED WATER FLOW AT ECONOMISER INLET | NOZZLE       | 01           | 02        |
| vii)                                                                                                                                             | LBG10BP001                               | MAIN STEAM FLOW TO AUX. PRDS        | NOZZLE       | 01           | 02        |
| viii)                                                                                                                                            | LBG20BP001                               | CRH FLOW TO AUX. PRDS               | NOZZLE       | 01           | 02        |
| ix)                                                                                                                                              | LBF10BP001,<br>LBF20BP001                | HP BYPASS STEAM FLOW                | NOZZLE       | 02           | 04        |

### [B] MANDATORY SPARES FOR FLOW NOZZLE ASSEMBLIES:

**NOT APPLICABLE**

|                                                                                   |                                                                                               |                                       |                  |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|---------------------------------------|------------------|
|  | <b>Technical specification for<br/>FLOW ELEMENT ASSEMBLIES</b><br><br><b>UPPUR (2X800 MW)</b> | SPECIFICATION NO. PE-TS-425-145-1 005 |                  |
|                                                                                   |                                                                                               | VOLUME <b>II</b>                      |                  |
|                                                                                   |                                                                                               | SECTION                               |                  |
|                                                                                   |                                                                                               | REV. NO. 00                           | DATE: 10.05.2018 |
|                                                                                   |                                                                                               | SHEET                                 |                  |

### SCHEDULE OF PRICES

| [A] FLOW ELEMENT ASSEMBLIES COMPLETE WITH Three (3) pairs of tappings, AND ACCESSORIES, like Pressure take-off points, Root valves, Nipples etc. |            |                                 |              |                                                                    |                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------|------------|---------------------------------|--------------|--------------------------------------------------------------------|------------------------------------------------------------|
| S. No                                                                                                                                            | TAG NO.    | SERVICE                         | TYPE OF ASSY | UNIT PRICE (Complete Assembly excluding Calibration charges) In Rs | Total price of flow assemblies (Rs.) (PER UNIT) (Ex-works) |
| i)                                                                                                                                               | LAB10BP001 | BFP-A SUCTION FLOW              | NOZZLE       |                                                                    |                                                            |
| ii)                                                                                                                                              | LAB20BP001 | BFP-B SUCTION FLOW              | NOZZLE       |                                                                    |                                                            |
| iii)                                                                                                                                             | LAB30BP001 | BFP-C SUCTION FLOW              | NOZZLE       |                                                                    |                                                            |
| iv)                                                                                                                                              | LCH10BP001 | HPH-6A DRAIN FLOW TO DEAERATOR  | NOZZLE       |                                                                    |                                                            |
| v)                                                                                                                                               | LCH20BP001 | HPH-6B DRAIN FLOW TO DEAERATOR  | NOZZLE       |                                                                    |                                                            |
| vi)                                                                                                                                              | LBS51BP001 | EXTRACTION STEAM FLOW TO DEA    | NOZZLE       |                                                                    |                                                            |
| vii)                                                                                                                                             | LBS53BP001 | EXTRACTION STEAM FLOW TO BFPT-A | NOZZLE       |                                                                    |                                                            |
| viii)                                                                                                                                            | LBS54BP001 | EXTRACTION STEAM FLOW TO BFPT-B | NOZZLE       |                                                                    |                                                            |
| ix)                                                                                                                                              | LCA90BP001 | CONDENSATE FLOW TO DEAERATOR    | NOZZLE       |                                                                    |                                                            |
| x)                                                                                                                                               | LAB80BP001 | FEED WATER FLOW AT ECO. INLET   | NOZZLE       |                                                                    |                                                            |
| xi)                                                                                                                                              | LBG10BP001 | MAIN STEAM FLOW TO AUX. PRDS    | NOZZLE       |                                                                    |                                                            |
| xii)                                                                                                                                             | LBG20BP001 | CRH FLOW TO AUX. PRDS           | NOZZLE       |                                                                    |                                                            |
| xiii)                                                                                                                                            | LBF10BP001 | HP BYPASS-A STEAM FLOW          | NOZZLE       |                                                                    |                                                            |
| xiv)                                                                                                                                             | LBF20BP001 | HP BYPASS-B STEAM FLOW          | NOZZLE       |                                                                    |                                                            |

#### [B] CALIBRATION CHARGES (SEPARATE LIST ATTACHED)

#### [C] DOCUMENTATION CHARGES

#### PARTICULARS OF THE BIDDER / AUTHORISED REPRESENTATIVE

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

|                                                                                   |                                                                                                                |                                              |                  |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------|
|  | <b>Technical specification for<br/>FLOW ELEMENT ASSEMBLY<br/>(NOZZLE)</b><br><br><b>UPPU STPP (2 X 800 MW)</b> | SPECIFICATION NO. <b>PE-TS-425-145-I 005</b> |                  |
|                                                                                   |                                                                                                                | VOLUME <b>III</b>                            |                  |
|                                                                                   |                                                                                                                | SECTION                                      |                  |
|                                                                                   |                                                                                                                | REV. NO. 00                                  | DATE: 10.05.2018 |
|                                                                                   |                                                                                                                | SHEET                                        | 1 of 1           |

### CALIBRATION CHARGES FOR FLOW ELEMENTS

**[A] FLOW ELEMENT ASSEMBLIES COMPLETE WITH Three (3) pairs of tappings, AND ACCESSORIES, like Pressure take-off points, Root valves, Nipples etc.**

| S. No. | TAG NO.                                  | SERVICE                                | TYPE OF ASSY | CALIBRATION CHARGES PER ASSY(EX WORKS) | REMARKS |
|--------|------------------------------------------|----------------------------------------|--------------|----------------------------------------|---------|
| i)     | LAB10BP001,<br>LAB20BP001,<br>LAB30BP001 | BFP SUCTION FLOW                       | NOZZLE       |                                        |         |
| ii)    | LCH10BP001,<br>LCH20BP001                | HPH-6A/6B DRAIN FLOW TO<br>DEAERATOR   | NOZZLE       |                                        |         |
| iii)   | LBS51BP001                               | EXTRACTION STEAM FLOW TO<br>DEAERATOR  | NOZZLE       |                                        |         |
| iv)    | LBS53CF001,<br>LBS54CF001                | EXTRACTION STEAM FLOW TO BFPT-<br>A/B  | NOZZLE       |                                        |         |
| v)     | LCA90BP001                               | CONDENSATE FLOW TO DEAERATOR           | NOZZLE       |                                        |         |
| vi)    | LAB80BP001                               | FEED WATER FLOW AT<br>ECONOMISER INLET | NOZZLE       |                                        |         |
| vii)   | LBG10BP001                               | MAIN STEAM FLOW TO AUX. PRDS           | NOZZLE       |                                        |         |
| viii)  | LBG20BP001                               | CRH FLOW TO AUX. PRDS                  | NOZZLE       |                                        |         |
| ix)    | LBF10BP001,<br>LBF20BP001                | HP BYPASS STEAM FLOW                   | NOZZLE       |                                        |         |

**NOTE:** 1. Bidder to note that CALIBRATION TEST is required to be conducted on one type per size, Bidder to group such assemblies and indicate the same along with the price bid.

|  |                                                                                               |                                       |                  |
|--|-----------------------------------------------------------------------------------------------|---------------------------------------|------------------|
|  | <b>Technical specification for<br/>FLOW ELEMENT ASSEMBLIES</b><br><br><b>UPPUR (2X800 MW)</b> | SPECIFICATION NO. PE-TS-425-145-I 005 |                  |
|  |                                                                                               | VOLUME II                             |                  |
|  |                                                                                               | SECTION                               |                  |
|  |                                                                                               | REV. NO. 00                           | DATE: 10.05.2018 |
|  |                                                                                               | SHEET                                 |                  |

### SCHEDULE OF UNIT PRICES

#### [A] UNIT PRICE FOR ROOT VALVES, NIPPLES AND EXPANDER

| S.No | DESCRIPTION | Tag Nos                                            | Unit Rate (Rs)<br>(Ex. Works) |
|------|-------------|----------------------------------------------------|-------------------------------|
| 1    | ROOT VALVES | SS316, 15 NB, SW, # 900                            |                               |
|      |             | SS316, 25 NB, SW, # 3500 SPL                       |                               |
|      |             | SS316, 25 NB, SW, # 4500 SPL                       |                               |
|      |             |                                                    |                               |
| 2    | NIPPLE      | 15NB/SS316/SCH.80/12 NOS.; 1000mm LONG             |                               |
|      |             | 25NB/SS316/SCH.XXS/12 NOS.; 1000mm LONG            |                               |
|      |             |                                                    |                               |
|      |             |                                                    |                               |
|      |             |                                                    |                               |
| 3    | EXPANDER    | 15NB x 25NB /SS316/6 NOS/3000 CLASS. ; 50.8mm LONG |                               |
|      |             | 15NB x 25NB /SS316/6 NOS/9000 CLASS. ; 50.8mm LONG |                               |
|      |             |                                                    |                               |

#### PARTICULARS OF THE BIDDER / AUTHORISED REPRESENTATIVE

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

