ALL DIMENSIONS ARE IN MM

FIRST ANGLE PROJECTION

2 X 660 MW SURATGARH SUPER CRTICAL TPS

TECHNICAL SPECIFICATION

FOR FLOW ELEMENT ASSEMBLY – NOZZLE

JOB NO. 365	TITLE	TECHNICAL SPECIFICATION FOR FLOW ELEMENT ASSEMBLIES (Orifice & Nozzle)	DOC. NO. PE-TS-392-145-I005
BHEL	BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA		

DEPT CODE		NAME	SIGN	DATE
I	DESN	RK		17.04.2014
	CHD	MK		17.04.2014
	APPD	BS		17.04.2014

spectit.dwg

SURATGARH, STAGE-V, UNIT # 7 & 8
(2 x 660 MW) THERMAL POWER

TECHNICAL SPECIFICATION
FOR

FLOW ELEMENT ASSEMBLY - NOZZLE

VOLUME II-B

SPECIFICATION Nos
PE-TS-392-145-I 005

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

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

1.1 **Volume-I (CONDITIONS OF CONTRACT)**

This consists of four parts as below :-

Volume-IA : This part contains instructions to bidders for making bids to BHEL.
Volume-IB : This part contains general commercial conditions of the tender & includes provision that vendor is responsible for the quality of item supplied by their sub-vendors.
Volume-IC : This part contains special conditions of contract.
Volume-ID : This part contains commercial conditions for erection & commissioning site work, as applicable.

1.2 **Volume-II TECHNICAL SPECIFICATIONS**

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

Volume-IIA : General Technical Conditions
Volume-IIB : Technical Specification including Drawings, if any.

1.2.1 **Volume-IIB**

This volume is sub-divided into following sections :-

Section-A : This section outlines the scope of enquiry.
Section-B : This section provides "Project Information".
Section-C : This section indicates technical requirements specific to the contract, not covered in Section-D.
Section-D : This section comprises of technical specifications of equipments complete with data sheet A, B and C.

Data Sheet - A specifies data and other requirements pertaining to the Equipment.

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

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

1.2.2 **Volume-III TECHNICAL SCHEDULES**

This volume contains technical schedules and Data Sheets-B, which are to be duly filled by the bidder and the same shall be furnished with the technical bid as per instructions given in Document No. PE-SS-999-100-Q-002 in Volume-III.

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

	Technical specification for **FLOW ELEMENT ASSEMBLIES** **(Nozzle)** **SURATGARH, STAGE-V, UNIT # 7 & 8 (2 x 660 MW) THERMAL POWER**	SPECIFICATION NO. **PE-TS-392-145-I005**	
		VOLUME **II-B**	
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VOL-II B

	Technical specification for **FLOW ELEMENT ASSEMBLY (NOZZLE)** **SURATGARH, STAGE-V, UNIT # 7 & 8 (2 x 660 MW) THERMAL POWER PROJECT**	SPECIFICATION NO. **PE-TS-392-145-I 005**	
		VOLUME **II-B**	
		SECTION **A**	
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SECTION – A

SCOPE OF ENQUIRY

	Technical specification for **FLOW ELEMENT ASSEMBLY (NOZZLE)** **SURATGARH, STAGE-V, UNIT # 7 & 8 (2 x 660 MW) THERMAL POWER PROJECT**	SPECIFICATION NO. **PE-TS-392-145-I005**
		VOLUME **II-B**
		SECTION **A**
		REV. NO. 00 DATE: 09.04.2014
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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 **2 X660 MW SURATGARH THERMAL POWER** 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 '"**COMPLAINCE 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) Schedule of submission of drawings / documents, equipment manufacture inspection and dispatch
d) Schedule of price, unit prices, inspection schedule

.3 No separate technical offer, data sheets to be submitted with the bid. Any such document shall not be taken cognizance of, and document (Compliance certificate) at 3a above shall be final and binding. Data sheets shall be furnished by the successful bidder (vendor), only after the award of contract.

.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)** **SURATGARH, STAGE-V, UNIT # 7 & 8 (2 x 660 MW) THERMAL POWER**	SPECIFICATION NO. **PE-TS-392-145-I 005**	
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SECTION – B

PROJECT INFORMATION

1.0	Owner	Rajasthan Rajya Vidyut Utpadan Nigam Ltd., Jaipur
2.0	Consulting Engineer	TATA Consulting Engineers Ltd. 73/1, St. Marks Road, Bangalore – 560 001 Tel : 080 – 6622 6000 Fax : 080 – 22274874
3.0	Location of the plant	Prabat Nagar, Suratgarh Sriganganagar district, Rajasthan.
4.0	Latitude and longitude	Latitude : 29 deg. 10 min. N Longitude : 74 deg.01 min. E
5.0	Elevation above mean sea level	186 m (approximate)
6.0	**Climatic conditions**	
6.1	Temperatures : Monthly basis	
	Mean of daily max.	32.8 deg.C (in the month of May)
	Mean of daily min.	17.6 deg.C (in the month of Jan)
6.2	Temperatures : Annual basis	
	Mean of daily max.	32.3 deg.C
	Mean of daily min.	19.6 deg.C
	Highest temperature recorded	50 deg.C
	Lowest temperature recorded	(-) 2.8 deg.C
	Design Ambient Temperature for Electrical Equipment design	50 deg C
6.3	Relative humidity	Varies between 21% and 81%
6.4	Annual average rain fall	312 mm
6.5	Annual mean wind speed :	4 km / hr.
7.0	Wind load	

	Calculations for wind effect shall be in accordance with IS:875-1987(Part-3) taking into account the following:	
	a) Basic wind speed = 47 m/sec	
	b) Factor K1 = 1.07	
	c) Category of terrain = Category 2	
	d) K3 – as per IS 875	
8.0	Seismic data (As per IS: 1893 latest issue)	
	a) Zone	Zone II
	Designs & design coefficients shall be based on IS 1893:2002	
	Design condenser cooling water inlet temperature	33 Deg C
9.0	Auxiliary power supply:	
	Auxiliary electrical equipment to be supplied against this specification shall be suitable for operation on the following system:	
a)	For motors rated 160 kW and below.	415V AC, 3-phase, 3-wire effectively earthed.
b)	For motors rated above 160 kW and up to 1500 kW	6600V AC, 3-phase, 3-wire, 50 Hz, non-effectively earthed
c)	For motors rated above 1500kW	11000V AC, 3-phase, 3-wire, 50 Hz, non-effectively earthed
d)	For motor control centres	415V AC, 3-phase, 3/4-wire effectively earthed.
e)	DC motor starters, DC solenoids, DC alarm control and protection	220 V DC, 2-wire unearthed
f)	AC control & protective devices	110 V 1 phase, 50Hz, 2 wire AC supply. The single phase 110V AC supply shall be derived by VENDOR by providing 415V / 110 V Control transformers of adequate rating with MCCB / MCB on both the primary and secondary sides.
g)	Uninterrupted power supply	230 V, 1-phase, 50 Hz, 2-wire, AC

		supply (For all instrumentation and control system equipment and solenoid valves)

g) Lighting fixtures and space heaters — 240 V, 1 phase, 2 wire, 50Hz,solidly earthed system

h) Construction supply — 415 V, 3 phase, 4 wire, 50Hz AC supply with neutral lead solidly earthed.

i) The above voltages may vary as follows :

All devices shall be suitable for continuous operation over the entire range of voltage and frequency indicated below without any change in their performance.

AC supply	Voltage variation ± 10% Frequency variation ± 5% Combined voltage & frequency variation 10%
DC supply	Voltage variation +10% ,-15%
j) For instrument and control system of steam generator and steam turbine generator.	230 V ± 5% AC UPS, 1-phase, 50 Hz, 2-wire. The 24 V DC required for control system shall be generated from this UPS.

10.0 All the electrical equipment shall be designed for 50^{o} C reference ambient temperature.

	Technical specification for **FLOW ELEMENT ASSEMBLY** **(NOZZLE)** **SURATGARH, STAGE-V, UNIT # 7 & 8** **(2 x 660 MW) THERMAL POWER**	SPECIFICATION NO**. PE-TS-392-145-I 005** VOLUME **II-B** SECTION **C** REV. NO. 00 | DATE: 09.04.2014 SHEET

SECTION – C

SPECIFIC TECHNICAL REQUIREMENTS

	Technical specification for **FLOW ELEMENT ASSEMBLY (NOZZLE)** SURATGARH, STAGE-V, UNIT # 7 & 8 (2 x 660 MW) THERMAL POWER	SPECIFICATION NO. **PE-TS-392-145-I 005**
		VOLUME **II-B**
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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. Thickness of Orifice Plate shall be 3.00 mm for main pipe dia up to 300 mm, and above pipe dia of 300 mm the same shall be 6.00 mm.

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, Format "Schedule of submission of Drawings / Documents, Equipment Manufacture, Inspection and Despatch" enclosed in Section-D, to be signed and stamped and submitted with the bid. 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:

   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

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:

a. Assembly drawing of all type of Flow Element assemblies complete with all accessories indicating detailed dimensions, BOM and weights.

b. Flow Element Edge preparation details.

c. Installation drawings for the flow elements.

d. Technical Data sheet-C completely filled-up..

e. Quality Plan duly signed and stamped.

f. Bore size calculations for Flow orifices and Flow Nozzles for all the conditions indicated in the data sheets.

g. Differential Pressure Vs Flow, curve for each Orifice and Nozzle.

h. All relevant catalogues for the models of the Flow Element Assemblies as well as accessories finalized.

i. Bar chart to indicate the time schedule for procurement, manufacture, testing and dispatch.

(C) Final documentation :

1. 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.

2 Test certificates – 20 sets.

3. Operation & Maintenance Manuals for Flow Element Assemblies and all the Accessories. – 20 sets with 4 CD-ROMS

	Technical specification for **NOZZLE** **SURATGARH, STAGE-V, UNIT # 7 & 8 (2 x 660 MW) THERMAL POWER**	SPECIFICATION NO**.** PE-TS-392-145-I005 VOLUME **II-B** SECTION **C** REV. NO. 00 | DATE: 09.04.2014 SHEET

CUSTOMER SPECIFICATION

1.11 Flow Glasses

Online flow glasses for pipe size up to 6" with a rotary wheel (not a flapper type) suitable for installation on vertical or horizontal pipelines, material Pyrex tempered glass. Body material shall be carbon steel, rotor & wetted parts shall be bronze. The material of accessories shall be SS. IP 65 or equivalent degree of protection for enclosure. Upto 50 Nb size, connection shall be screwed & above 50 mm Nb size it shall be flanged - ANSI, 150 RF. Accessories like name plate, mating flanges with gaskets (neoprene), bolts & nuts, etc. shall be supplied.

1.12 Flow Switches

Indicating, Differential pressure, flapper type on line flow switches for line sizes up to 80 mm with an accuracy of +/-0.5% of span and dial size of min. 50 mm having 316 SS flapper/SS 316 bellows housed in die cast aluminium. Micro switch with adjustable range with 2 SPDT contacts rated for 0.2 A, 220 V DC. IP 65 or equivalent degree of protection for enclosure. The material of accessories shall be SS. Repeatability shall be
+/-0.5% of span. Over range protection shall be 50% above maximum flow. Setting shall be tamper proof external adjustment & scale shall be provided for setting. Range spring & orifice plate shall be SS 316 for DP type. NPT for sizes below 2" & for sizes above 2" ANSI 150 RF shall be provided. Accessories like nameplate, mating flanges with gaskets, bolts & nuts, pipe assembly with orifice plate, etc. 5 way manifold, pipe, fittings (DP type), etc. shall be supplied.

1.13 Flow Elements

316 SS long radius, welded type flow nozzles as per ASME PTC 19.5 or BS-1042 for all steam and feed water services with D and D/2 pressure tappings; 316SS concentric orifice plate assembly as per ASME PTC 19.5 or BS-1042 for all water services with flange tap connections. Beta ratio of 0.34 to 0.7 for orifice and around 0.7 for flow nozzles.. The material of accessories shall be SS. Refer to Table-5 for provision of flow elements. All the flow elements shall have 3 pairs of differential pressure tappings complete with root valves. Orifice plate shall be3 mm thick for nominal pipe diameter upto 300 mm & 6 mm thick for pipe diameter > 300 mm. The thickness of the flow nozzle shall be as per the application. The flow elements shall be supplied as assemblies with High/low pressure tappings, root valves as required. Performance Guarantee flow elements shall be provided separately. Butt welded edges shall be prepared as per ANSI 16.25 & flanged connections shall be as per ANSI 16.5 standards. Orifice assembly complete with nipples & valves to be supplied by Bidder shall be one meter long with ANSI class 150 RF SS flanges at the ends including gaskets, bolts & nuts. Isolating valves shall have SW end connection. Accessories like nameplate, gaskets, bolts & nuts, reservoirs (condensing chambers), 6 nos. shut off valves per assembly, nipple, welding adapters, etc. shall supplied. Bidder shall submit assembly drawing and flow vs DP curve for each flow element.

	Technical specification for **FLOW ELEMENT ASSEMBLY** **(NOZZLE)** **SURATGARH, STAGE-V, UNIT # 7 & 8** **(2 x 660 MW) THERMAL POWER**	SPECIFICATION NO**. PE-TS-392-145-I 005**
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SECTION – D

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

  (INCLUDING SPARES)
- **SCHEDULE OF SUBMISSION OF DRAWINGS /DOCUMENTS, EQUIPMENT MANUFACTURE, INSPECTION AND DISPATCH**

BHEL	Technical specification for **FLOW ELEMENT ASSEMBLY** **(NOZZLE)** **SURATGARH, STAGE-V, UNIT # 7 & 8** **(2 x 660 MW) THERMAL POWER**	SPECIFICATION NO**. PE-TS-392-145-I 005** VOLUME **II-B** SECTION **D** REV. NO. 00 | DATE: 09.04.2014 SHEET

SECTION – D

EQUIPMENT SPECIFICATION

(PES – 145 – 05)

	SPECIFICATION FOR FLOW MEASURING DEVICES (NOZZLES)	SPECIFICATION NO.: PES – 145 - 05	
		VOLUME II B	
		SECTION D	
		REV. NO. 00	DATE 09.04.2014
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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.

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 : The Flow nozzles shall be constructed of stainless steel type SS 316 .

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 $\geq$ 40Kg/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.

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.

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.

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

	Technical specification for **FLOW ELEMENT ASSEMBLY** **(NOZZLE)** **SURATGARH, STAGE-V, UNIT # 7 & 8** **(2 x 660 MW) THERMAL POWER**	SPECIFICATION NO**. PE-TS-392-145-I 005** VOLUME **II-B** SECTION **D** REV. NO. 00 | DATE: 09.04.2014 SHEET

SECTION – D

DATA SHEETS – A & B

BHEL PEM	DATA SHEET FOR FLOW ELEMENTS	SPECIFICATION NO.: PE-TS-392-145-I105	
		VOLUME III	
		SECTION	
		REV. NO. 06	DATE : 27.02.14
		SHEET 12	OF 43

Tag No. : **LAB10 BP001, LAB20 BP001, LAB30 BP001** Date Sheet No. PES-145-05-DS1-0

DATA SHEET – A & B

DATA SHEET – A (TO BE FILLED UP BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	**RRVUNL-2x660 MW SURATGARH STPP, STAGE-V**	.....
	OFFER REFERENCE	Bidder to specify	.....
	QUANTITY	03PER UNIT (ONE AGAINST EACH TAG NO.)	.....
	SERVICE	**BFP SUCTION**	.....
	MAKE : MODEL	Bidder to specify	.....
			.....
ELEMENT	TYPE		.....
	STANDARD	[] ORIFICE [■] NOZZLE	.....
	DESIGN	[■] ASME PTC 19.5 [] BS 1042 [] OTHER	.....
		[] SQ EDGE [] BEVEL EDGE [] CARRIER RING	.....
		[] SHORT RADIUS [■] LONG RADIUS	.....
		[] LOW BETA [■] HIGH BETA	.....
	MATERIAL	[■] SS316 [] OTHER	.....
	BETA RATIO	0.5 TO 0.7	.....
	BORE DIAMETER	Bidder to specify	.....
	VENT HOLE	[] YES [■] NO	.....
	DRAIN HOLE	[] YES [■] NO	.....
END CONNECTION	TYPE	[] FLANGED [■] BUTT WELD END	.....
	FLANGE TYPE	[] WELD NECK [] SLIP ON [] THREADED	.....
	FLANGE RATING : MATERIAL	Not Applicable	.....
	BRANCH PIPE	[■] YES [] NO	.....
	BRANCH PIPE MATERIAL	Same as Pipe material	.....
	TAPPING LOCATION	[■] D&D/2 [] CORNER [] VENTA CONTRACTA [] ON FLANGE [■] ON PIPE [] ON CARRIER RING	.....
	NUMBER OF TAPPINGS	[■] 3 PAIR [] 2 PAIR [] OTHER	
	ROOT VALVE NUMBER : SIZE	[■] 12 [] 8 [] 6 [] 4 : [■] 15 NB [] 25 NB	
	ROOT VALVE MATERIAL : RATING	[] CS [] AS [■] SS : [] ANSI # 800	
	NIPPLE : SIZE/MATL/RATING/QTY	15NB/SS/SCH.40/12 NOS. ; 250mm LONG	
	EXPANDER : SIZE/MATL/QTY	Not Applicable	
PROCESS DATA	FLUID	[] CONDENSATE [■] FEED WATER [] STEAM [] CW [] OTHER	.....
		MAX. (Pump Design) / NORMAL (VWO) / MINIMUM (Min. Recirculation)	.....
	FLOW (T/HR)	1200 / 1064 / 123.5	.....
	PRESSURE (KG/CM2 (A))	26 / 30 / 21	.....
	TEMPERATURE (DEG. C.)	188.9 / 188.9 / 110	.....
	DESIGN PRESS : TEMP	40 $Kg/cm^2(g)$: 200 ^{o}C	.....
	MAX. ALLOWABLE PRESS LOSS	0.3 Kg/cm^2 at max. flow	.....
	DIFF. PRESS AT MAX FLOW	Bidder to specify	.....
			.....

BHEL PEM	**DATA SHEET FOR FLOW ELEMENTS**	SPECIFICATION NO.: PE-TS-392-145-I105	
		VOLUME III	
		SECTION	
		REV. NO. 06	DATE : 27.02.14
		SHEET 13	OF 43

Tag No. : **LAB10 BP001, LAB20 BP001, LAB30 BP001** Date Sheet No. PES-145-05-DS1-0

DATA SHEET – A & B

	DATA SHEET – A (TO BE FILLED UP BY PURCHASER)		DATA SHEET – B (TO BE FILLED UP BY BIDDER)
PIPE LINE DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL BORE DIAMETER mm MIN. AVAILABLE STRAIGHT LENGTH UPSTREAM : DOWNSTREAM FLOW DIRECTION	406.4 x 9.53 SA 106 GR B Bidder to specify 15 D 10 D : 5 D [■] HORIZONTAL [] VERTICAL UP [] VERTICAL DOWN	....
OTHER INFORMATION	IBR CERTIFICATION TOTAL WEIGHT OF FLOW ELEMENT AND ACCESSORIES TOTAL LENGTH OF NOZZLE ASSEMBLY	[] REQUIRED [■] NOT REQUIRED Bidder to specify	

	PREPARED BY	**CHECKED BY**	**APPROVED BY**	**COMPANY SEAL**
NAME	SSV	IJS	IJS	
SIGNATURE				
DATE	13/06/2013	13/06/2013	13/06/2013	
				NAME
				SIGNATURE
				DATE

NOTES:

1. FLOW ELEMENT ACCURACY IS REQUIRED AT 1200 T/HR & 123 T/HR FLOW VALUES.
2. RECOMMENDED RANGE IS 0 – 1300 T/HR.

BHEL PEM	**DATA SHEET FOR FLOW ELEMENTS**	SPECIFICATION NO.: PE-TS-392-145-I105	
		VOLUME III	
		SECTION	
		REV. NO. 06	DATE : 27.02.14
		SHEET 14	OF 43

Tag No. : **LCH10 BP001** Date Sheet No. PES-145-05-DS1-0

DATA SHEET – A & B

DATA SHEET – A (TO BE FILLED UP BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	**RRVUNL-2x660 MW SURATGARH STPP, STAGE-V**	.....
	OFFER REFERENCE	Bidder to specify	.....
	QUANTITY	01PER UNIT	.....
	SERVICE	**HPH-6 DRAIN FLOW TO DEAERATOR**	.....
	MAKE : MODEL	Bidder to specify	.....
			.....
ELEMENT	MAKE : MODEL		.....
	TYPE	[] ORIFICE [■] NOZZLE	.....
	STANDARD	[■] ASME PTC 19.5 [] BS 1042 [] OTHER	.....
	DESIGN	[] SQ EDGE [] BEVEL EDGE [] CARRIER RING	.....
		[] SHORT RADIUS [■] LONG RADIUS	.....
		[] LOW BETA [■] HIGH BETA	.....
			.....
	MATERIAL	[■] SS316 [] OTHER	.....
	BETA RATIO	0.5 TO 0.7	.....
	BORE DIAMETER	Bidder to specify	.....
	VENT HOLE	[] YES [■] NO	.....
	DRAIN HOLE	[] YES [■] NO	.....
END CONNECTION	TYPE	[] FLANGED [■] BUTT WELD END	.....
	FLANGE TYPE	[] WELD NECK [] SLIP ON [] THREADED	.....
	FLANGE RATING : MATERIAL	Not Applicable	.....
	BRANCH PIPE	[■] YES [] NO	.....
	BRANCH PIPE MATERIAL	Same as Pipe material	.....
	TAPPING LOCATION	[■] D&D/2 [] CORNER [] VENTA CONTRACTA	.....
		[] ON FLANGE [■] ON PIPE [] ON CARRIER RING	
	NUMBER OF TAPPINGS	[■] 3 PAIR [] 2 PAIR [] OTHER	
	ROOT VALVE NUMBER : SIZE	[] 12 [] 8 [■] 6 [] 4 : [■] 15 NB [] 25 NB	
	ROOT VALVE MATERIAL : RATING	[] CS [] AS [■] SS : [■] ANSI # 800	
	NIPPLE : SIZE/MATL/RATING/QTY	15NB/SS/SCH.40/6 NOS. ; 250mm LONG	
	EXPANDER : SIZE/MATL/QTY	Not Applicable	
PROCESS DATA	FLUID	[■] CONDENSATE [] FEED WATER	.....
		[] STEAM [] CW [] OTHER	.....
		MAX. (VWO) / NORMAL (MCR) / MINIMUM (40% MCR)	.....
	FLOW (T/HR)	417 / 377.5 / 98.8	.....
	PRESSURE (KG/CM2 (A))	24.2 / 22.5 / 8.7	.....
	TEMPERATURE (DEG. C.)	199.4 / 196.6 / 160.5	.....
	DESIGN PRESS : TEMP	30 $Kg/cm^2(g)$: 210 ^{o}C	.....
	MAX. ALLOWABLE PRESS LOSS	0.1 Kg/cm^2 at max. flow	.....
	DIFF. PRESS AT MAX FLOW	Bidder to specify	.....
			.....

BHEL PEM	**DATA SHEET FOR FLOW ELEMENTS**	SPECIFICATION NO.: PE-TS-392-145-I105	
		VOLUME III	
		SECTION	
		REV. NO. 06	DATE : 27.02.14
		SHEET 15	OF 43

Tag No. : **LCH10 BP001** Date Sheet No. PES-145-05-DS1-0

DATA SHEET – A & B

	DATA SHEET – A (TO BE FILLED UP BY PURCHASER)		DATA SHEET – B (TO BE FILLED UP BY BIDDER)
PIPE LINE DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL BORE DIAMETER mm MIN. AVAILABLE STRAIGHT LENGTH UPSTREAM : DOWNSTREAM FLOW DIRECTION	323.9 x 9.53 SA 106 GR B Bidder to specify 15 D 10 D : 5 D [■] HORIZONTAL [] VERTICAL UP [] VERTICAL DOWN	....
OTHER INFORMATION	IBR CERTIFICATION TOTAL WEIGHT OF FLOW ELEMENT AND ACCESSORIES TOTAL LENGTH OF NOZZLE ASSEMBLY	[] REQUIRED [■] NOT REQUIRED Bidder to specify	

	PREPARED BY	**CHECKED BY**	**APPROVED BY**	**COMPANY SEAL**
NAME	SSV	IJS	IJS	
SIGNATURE				
DATE	13/06/2013	13/06/2013	13/06/2013	NAME SIGNATURE DATE

NOTES:

1. FLOW ELEMENT ACCURACY IS REQUIRED AT 417 T/HR & 98 T/HR FLOW VALUES.
2. RECOMMENDED RANGE IS 0 – 500 T/HR.

BHEL PEM	DATA SHEET FOR FLOW ELEMENTS	SPECIFICATION NO.: PE-TS-392-145-I105	
		VOLUME III	
		SECTION	
		REV. NO. 06	DATE : 27.02.14
		SHEET 16	OF 43

Tag No.: **LBS51 BP001** Date Sheet No. PES-145-05-DS1-0

DATA SHEET – A & B

DATA SHEET – A (TO BE FILLED UP BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	**RRVUNL-2x660 MW SURATGARH STPP, STAGE-V**	.....
	OFFER REFERENCE	Bidder to specify	.....
	QUANTITY	ONE (1) PER UNIT	.....
	SERVICE	**EXTRACTION STEAM FLOW TO DEAERATOR**	.....
	MAKE : MODEL	Bidder to specify	.....
			.....
ELEMENT	MAKE : MODEL		.....
	TYPE	[] ORIFICE [■] NOZZLE	.....
	STANDARD	[■] ASME PTC 19.5 [] BS 1042 [] OTHER	.....
	DESIGN	[] SQ EDGE [] BEVEL EDGE [] CARRIER RING	.....
		[] SHORT RADIUS [■] LONG RADIUS	.....
		[] LOW BETA [■] HIGH BETA	.....
			.....
	MATERIAL	[■] SS316 [] OTHER	.....
	BETA RATIO	0.5 TO 0.7	.....
	BORE DIAMETER	Bidder to specify	.....
	VENT HOLE	[] YES [■] NO	.....
	DRAIN HOLE	[] YES [■] NO	.....
END CONNECTION	TYPE	[] FLANGED [■] BUTT WELD END	.....
	FLANGE TYPE	[] WELD NECK [] SLIP ON [] THREADED	.....
	FLANGE RATING : MATERIAL	Not Applicable	.....
	BRANCH PIPE	[■] YES [] NO	.....
	BRANCH PIPE MATERIAL	Same as Pipe material	.....
	TAPPING LOCATION	[■] D&D/2 [] CORNER [] VENTA CONTRACTA	.....
		[] ON FLANGE	
		[■] ON PIPE [] ON CARRIER RING	
	NUMBER OF TAPPINGS	[■] 3 PAIR [] 2 PAIR [] OTHER	
	ROOT VALVE NUMBER : SIZE	[] 12 [] 8 [■] 6 [] 4 : [■] 15 NB [] 25 NB	
	ROOT VALVE MATERIAL : RATING	[] CS [] AS [■] SS : [■] ANSI # 800	
	NIPPLE : SIZE/MATL/RATING/QTY	15NB/SS/SCH.40/6 NOS. ; 250mm LONG	
	EXPANDER : SIZE/MATL/QTY	Not Applicable	
PROCESS DATA	FLUID	[] CONDENSATE [] FEED WATER	.....
		[■] STEAM [] CW [] OTHER	.....
		MAX. (VWO) / NORMAL (MCR) / MINIMUM (40%)	.....
	FLOW (T/HR)	89.6 / 82.5 / 27.0	.....
	PRESSURE (KG/CM2 (A))	12.64 / 11.96 / 5.68	.....
	TEMPERATURE (DEG. C.)	378.1 / 379.5 / 398.4	.....
	DESIGN PRESS : TEMP	17 $Kg/cm^2(g)$: 399 ^oC	.....
	MAX. ALLOWABLE PRESS LOSS	0.1 Kg/cm^2 at max. flow	.....
	DIFF. PRESS AT MAX FLOW	Bidder to specify	.....

BHEL PEM	**DATA SHEET FOR FLOW ELEMENTS**	SPECIFICATION NO.: PE-TS-392-145-I105	
		VOLUME III	
		SECTION	
		REV. NO. 06	DATE : 27.02.14
		SHEET 17	OF 43

Tag No.: **LBS51 BP001** Date Sheet No. PES-145-05-DS1-0

DATA SHEET – A & B

	DATA SHEET – A (TO BE FILLED UP BY PURCHASER)		DATA SHEET – B (TO BE FILLED UP BY BIDDER)
PIPE LINE DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL BORE DIAMETER mm MIN. AVAILABLE STRAIGHT LENGTH UPSTREAM : DOWNSTREAM FLOW DIRECTION	406.4 x 9.53 SA 106 GrB Bidder to specify 15 D 10 D : 5 D [■] HORIZONTAL [] VERTICAL UP [] VERTICAL DOWN	....
OTHER INFORMATION	IBR CERTIFICATION TOTAL WEIGHT OF FLOW ELEMENT AND ACCESSORIES TOTAL LENGTH OF NOZZLE ASSEMBLY	[■] REQUIRED [] NOT REQUIRED Bidder to specify	

	PREPARED BY	**CHECKED BY**	**APPROVED BY**	**COMPANY SEAL**
NAME	SSV	IJS	IJS	
SIGNATURE				
DATE	13/06/2013	13/06/2013	13/06/2013	
				NAME
				SIGNATURE
				DATE

NOTES:

1. FLOW ELEMENT ACCURACY IS REQUIRED AT 90 T/HR & 27 T/HR FLOW VALUES.
2. RECOMMENDED RANGE IS 0 – 120 T/HR.

BHEL PEM	**DATA SHEET FOR FLOW ELEMENTS**	SPECIFICATION NO.: PE-TS-392-145-I105	
		VOLUME III	
		SECTION	
		REV. NO. 06	DATE : 27.02.14
		SHEET 18	OF 43

Tag No.: **LBS53 BP 001, LBS54 BP 001** Date Sheet No. PES-145-05-DS1-0

DATA SHEET – A & B

DATA SHEET – A (TO BE FILLED UP BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	**RRVUNL-2x660 MW SURATGARH STPP, STAGE-V**	.....
	OFFER REFERENCE	Bidder to specify	.....
	QUANTITY	02 PER UNIT (ONE AGAINST EACH TAG NO.)	.....
	SERVICE	**EXTRACTION STEAM FLOW TO BFPT-A/B**	.....
	MAKE : MODEL	Bidder to specify	.....
			.....
ELEMENT	TYPE	[] ORIFICE [■] NOZZLE	.....
	STANDARD	[■] ASME PTC 195 [] BS 1042 [] OTHER	.....
	DESIGN	[] SQ EDGE [] LEVEL EDGE [] CARRIER RING	.....
		[] SHORT RADIUS [■] LONG RADIUS	.....
		[] LOW BETA [■] HIGH BETA	.....
	MATERIAL	[■] SS316 [] OTHER	.....
	BETA RATIO	0.5 TO 0.7	.....
	BORE DIAMETER	Bidder to specify	.....
	VENT HOLE	[] YES [■] NO	.....
	DRAIN HOLE	[] YES [■] NO	.....
			.....
END CONNECTION	TYPE	[] FLANGED [■] BUTT WELD END	.....
	FLANGE TYPE	[] WELD NECK [] SLIP ON [] THREADED	.....
	FLANGE RATING : MATERIAL	Not Applicable	.....
	BRANCH PIPE	[■] YES [] NO	.....
	BRANCH PIPE MATERIAL	Same as Pipe Material	.....
	TAPPING LOCATION	[■] D&D/2 [] CORNER [] VENTA CONTRACTA	.....
		[] ON FLANGE [■] ON PIPE [] ON CARRIER RING	
	NUMBER OF TAPPINGS	[■] 3 PAIR [] 2 PAIR [] OTHER	
	ROOT VALVE NUMBER : SIZE	[] 12 [] 8 [■] 6 [] 4 : [■] 15 NB [] 25 NB	
	ROOT VALVE MATERIAL : RATING	[] CS [] AS [■] SS : [■] ANSI # 800	
	NIPPLE : SIZE/MATL/RATING/QTY	15NB/SS/SCH.40/6 NOS. ; 250mm LONG	
	EXPANDER : SIZE/MATL/QTY	Not Applicable	
PROCESS DATA	FLUID	[] CONDENSATE [] FEED WATER	.....
		[■] STEAM [] CW [] OTHER	.....
		MAX. (VWO) / NORMAL (MCR) / MINIMUM (40% MCR)	.....
	FLOW (T/HR)	55.76 / 50.4 / 7.6	.....
	PRESSURE (KG/CM2 (A))	12 / 11.44 / 5.85	.....
	TEMPERATURE (DEG. C.)	377.6 / 379 / 398.6	.....
	DESIGN PRESS : TEMP	15 $Kg/cm^2(g)$: 399 ^oC	.....
	MAX. ALLOWABLE PRESS LOSS	0.1 Kg/cm^2 at max. flow	.....
	DIFF. PRESS AT MAX FLOW	Bidder to specify	.....
			.....

BHEL PEM	**DATA SHEET FOR FLOW ELEMENTS**	SPECIFICATION NO.: PE-TS-392-145-I105	
		VOLUME III	
		SECTION	
		REV. NO. 06	DATE : 27.02.14
		SHEET 19	OF 43

Tag No.: **LBS53 BP 001, LBS54 BP 001** Date Sheet No. PES-145-05-DS1-0

DATA SHEET – A & B

	DATA SHEET – A (TO BE FILLED UP BY PURCHASER)		DATA SHEET – B (TO BE FILLED UP BY BIDDER)
PIPE LINE DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL BORE DIAMETER mm MIN. AVAILABLE STRAIGHT LENGTH UPSTREAM : DOWNSTREAM FLOW DIRECTION	406.4 x 9.53 SA 106 GrB Bidder to specify 15 D 10 D : 5 D [■] HORIZONTAL [] VERTICAL UP [] VERTICAL DOWN	....
OTHER INFORMATION	IBR CERTIFICATION TOTAL WEIGHT OF FLOW ELEMENT AND ACCESSORIES TOTAL LENGTH OF NOZZLE ASSEMBLY	[■] REQUIRED [] NOT REQUIRED Bidder to specify	

	PREPARED BY	**CHECKED BY**	**APPROVED BY**	**COMPANY SEAL**
NAME	SSV	IJS	IJS	
SIGNATURE				
DATE	13/06/2013	13/06/2013	13/06/2013	
				NAME
				SIGNATURE
				DATE

NOTES:

1. FLOW ELEMENT ACCURACY IS REQUIRED AT 56 T/HR & 8 T/HR FLOW VALUES.
2. RECOMMENDED RANGE IS 0 – 80 T/HR.

BHEL PEM	DATA SHEET FOR FLOW ELEMENTS	SPECIFICATION NO.: PE-TS-392-145-I105	
		VOLUME III	
		SECTION	
		REV. NO. 06	DATE : 27.02.14
		SHEET 20	OF 43

Tag No. : **LBF10 BP 001, LBF20 BP 001** Date Sheet No. PES-145-05-DS1-0

DATA SHEET – A & B

	DATA SHEET – A (TO BE FILLED UP BY PURCHASER)		DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	**RRVUNL-2x660 MW SURATGARH STPP, STAGE-V**	.....
	OFFER REFERENCE	Bidder to specify	.....
	QUANTITY	02 PER UNIT (ONE AGAINST EACH TAG NO.)	.....
	SERVICE	**MAIN STEAM TO HP BYPASS**	.....
	MAKE : MODEL	Bidder to specify	.....
ELEMENT	TYPE	[] ORIFICE [■] NOZZLE	.....
	STANDARD	[■] ASME PTC 19.5 [] BS 1042 [] OTHER	.....
	DESIGN	[] SQ EDGE [] BEVEL EDGE [] CARRIER RING	.....
		[] SHORT RADIUS [■] LONG RADIUS	.....
		[] LOW BETA [■] HIGH BETA	.....
	MATERIAL	[■] SS316 [] OTHER	.....
	BETA RATIO	0.5 TO 0.7	.....
	BORE DIAMETER	Bidder to specify	.....
	VENT HOLE	[] YES [■] NO	.....
	DRAIN HOLE	[] YES [■] NO	.....
END CONNECTION	TYPE	[] FLANGED [■] BUTT WELD END	.....
	FLANGE TYPE	[] WELD NECK [] SLIP ON [] THREADED	.....
	FLANGE RATING : MATERIAL	Not Applicable	.....
	BRANCH PIPE	[■] YES [] NO	.....
	BRANCH PIPE MATERIAL	Same as Pipe Material	.....
	TAPPING LOCATION	[■] D&D/2 [] CORNER [] VENTA CONTRACTA	.....
		[] ON FLANGE [■] ON PIPE [] ON CARRIER RING	
	NUMBER OF TAPPINGS	[■] 3 PAIR [] 2 PAIR [] OTHER	
	ROOT VALVE NUMBER : SIZE	[■] 12 [] 8 [] 6 [] 4 : [] 15 NB [■] 25 NB	
	ROOT VALVE MATERIAL : RATING: TYPE	[] CS [] AS [■] SS : [■] ANSI # 3000SPL : GLOBE	
	NIPPLE : SIZE/MATL/RATING/QTY	25NB/SS/SCH.XXS/12 NOS. ; 1000 MM LONG	
	EXPANDER : SIZE/MATL/QTY	15NB x 25NB /SS/6 NOS. ; 50.8mm LONG	
PROCESS DATA	FLUID	[] CONDENSATE [] FEED WATER	.....
		[■] STEAM [] CW [] OTHER	.....
		MAX. NORMAL MINIMUM (20% of Max)	.....
	FLOW (T/HR)	630 126	.....
	PRESSURE (KG/CM^2 (A))	247 247	.....
	TEMPERATURE (DEG. C.)	565 565	.....
	DESIGN PRESS : TEMP	270 Kg/cm^2(g) : 573 ºC	.....
	MAX. ALLOWABLE PRESS LOSS	3.0 Kg/cm^2 at max. flow	.....
	DIFF. PRESS AT MAX FLOW	Bidder to specify	.....

BHEL PEM	**DATA SHEET FOR FLOW ELEMENTS**	SPECIFICATION NO.: PE-TS-392-145-I105	
		VOLUME III	
		SECTION	
		REV. NO. 06	DATE : 27.02.14
		SHEET 21	OF 43

Tag No. : **LBF10 BP 001, LBF20 BP 001** Date Sheet No. PES-145-05-DS1-0

DATA SHEET – A & B

	DATA SHEET – A (TO BE FILLED UP BY PURCHASER)		DATA SHEET – B (TO BE FILLED UP BY BIDDER)
PIPE LINE DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL BORE DIAMETER mm MIN. AVAILABLE STRAIGHT LENGTH UPSTREAM : DOWNSTREAM FLOW DIRECTION	323.9 x 48 SA 335 P91 Bidder to specify 15 D 10 D : 5 D [■] HORIZONTAL [] VERTICAL UP [] VERTICAL DOWN	....
OTHER INFORMATION	IBR CERTIFICATION TOTAL WEIGHT OF FLOW ELEMENT AND ACCESSORIES TOTAL LENGTH OF NOZZLE ASSEMBLY	[■] REQUIRED [] NOT REQUIRED Bidder to specify	

	PREPARED BY	**CHECKED BY**	**APPROVED BY**	**COMPANY SEAL**
NAME	SSV	IJS	IJS	
SIGNATURE				
DATE	13/06/2013	13/06/2013	13/06/2013	NAME SIGNATURE DATE

NOTES:

1. FLOW ELEMENT ACCURACY IS REQUIRED AT 630 T/HR & 125 T/HR FLOW VALUES.
2. RECOMMENDED RANGE IS 0 – 800 T/HR.
3. PRESSURE DROP IS NOT CRITICAL.

BHEL PEM	**DATA SHEET FOR FLOW ELEMENTS**	SPECIFICATION NO.: PE-TS-392-145-I105	
		VOLUME III	
		SECTION	
		REV. NO. 06	DATE : 27.02.14
		SHEET 22	OF 43

Tag No. : **LAB 80 BP 001** Date Sheet No. PES-145-05-DS1-0

DATA SHEET – A & B

	DATA SHEET – A (TO BE FILLED UP BY PURCHASER)		DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	**RRVUNL-2x660 MW SURATGARH STPP, STAGE-V**	.....
	OFFER REFERENCE	Bidder to specify	.....
	QUANTITY	ONE (1) PER UNIT	.....
	SERVICE	**FEED WATER FLOW AT ECONOMISER INLET**	.....
	MAKE : MODEL	Bidder to specify	.....
			.....
ELEMENT			.....
	TYPE	[] ORIFICE [■] NOZZLE	.....
	STANDARD	[■] ASME PTC 19.5 [] BS 1042 [] OTHER	.....
	DESIGN	[] SQ EDGE [] BEVEL EDGE [] CARRIER RING	.....
		[] SHORT RADIUS [■] LONG RADIUS	.....
		[] LOW BETA [■] HIGH BETA	.....
			.....
	MATERIAL	[■] SS316 [] OTHER	.....
	BETA RATIO	0.5 TO 0.7	.....
	BORE DIAMETER	Bidder to specify	.....
	VENT HOLE	[] YES [■] NO	.....
	DRAIN HOLE	[] YES [■] NO	.....
END CONNECTION	TYPE	[] FLANGED [■] BUTT WELD END	.....
	FLANGE TYPE	[] WELD NECK [] SLIP ON [] THREADED	.....
	FLANGE RATING : MATERIAL	Not Applicable	.....
	BRANCH PIPE	[■] YES [] NO	.....
	BRANCH PIPE MATERIAL	Same as Pipe material	.....
	TAPPING LOCATION	[■] D&D/2 [] CORNER [] VENTA CONTRACTA	.....
		[] ON FLANGE [■] ON PIPE [] ON CARRIER RING	
	NUMBER OF TAPPINGS	[■] 3 PAIR [] 2 PAIR [] OTHER	6
	ROOT VALVE NUMBER : SIZE	[■] 12 [] 8 [] 6 [] 4 : [] 15 NB [■] 25 NB	
	ROOT VALVE MATERIAL : RATING: TYPE	[] CS [] AS [■] SS : [■] ANSI # 3000SPL : GLOBE	
	NIPPLE : SIZE/MATL/RATING/QTY	25NB/SA10GR.C/SCH.XXS/12 NOS. ; 250mm LONG	
	EXPANDER : SIZE/MATL/QTY	15NB x 25NB /SS/6 NOS. ; 50.8mm LONG	
PROCESS DATA	FLUID	[] CONDENSATE [■] FEED WATER	.....
		[] STEAM [] CW [] OTHER	.....
		MAX. (Pump Design) / NORMAL (VWO) / MINIMUM (5 % BMCR)	.....
	FLOW (T/HR)	2370 / 2062 / 105	.....
	PRESSURE (KG/CM^2 (A))	305 / 302 / 16	.....
	TEMPERATURE (DEG. C.)	295 / 295 / 111	.....
	DESIGN PRESS : TEMP	350 Kg/cm^2(g) : 300 ^oC	.....
	MAX. ALLOWABLE PRESS LOSS	0.3 Kg/cm^2 at max. flow	.....
	DIFF. PRESS AT MAX FLOW	Bidder to specify	.....

BHEL PEM	**DATA SHEET FOR FLOW ELEMENTS**	SPECIFICATION NO.: PE-TS-392-145-I105	
		VOLUME III	
		SECTION	
		REV. NO. 06	DATE : 27.02.14
		SHEET 23	OF 43

Tag No. : **LAB 60 BP 001** Date Sheet No. PES-145-05-DS1-0

DATA SHEET – A & B

DATA SHEET – A (TO BE FILLED UP BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
PIPE LINE DATA	PIPE SIZE (OD x THK) mm	559 x 75	.....
	PIPE MATERIAL	SA 106 GR C	.....
	BORE DIAMETER mm	Bidder to specify	.....
	MIN. AVAILABLE STRAIGHT LENGTH	15 D	.....
	UPSTREAM : DOWNSTREAM	10 D : 5 D	
	FLOW DIRECTION	[■] HORIZONTAL [] VERTICAL UP [] VERTICAL DOWN	
OTHER INFORMATION	IBR CERTIFICATION	[■] REQUIRED [] NOT REQUIRED	
	TOTAL WEIGHT OF FLOW ELEMENT AND ACCESSORIES		
	TOTAL LENGTH OF NOZZLE ASSEMBLY	Bidder to specify	

	PREPARED BY	**CHECKED BY**	**APPROVED BY**	**COMPANY SEAL**
NAME	SSV	IJS	IJS	
SIGNATURE				
DATE	13/06/2013	13/06/2013	13/06/2013	
				NAME
				SIGNATURE
				DATE

NOTES:

1. FLOW ELEMENT ACCURACY IS REQUIRED AT 2370 T/HR & 105 T/HR FLOW VALUES.
2. RECOMMENDED RANGE IS 0 – 2600 T/HR.

BHEL PEM	**DATA SHEET FOR FLOW ELEMENTS**	SPECIFICATION NO.: PE-TS-392-145-I105	
		VOLUME III	
		SECTION	
		REV. NO. 06	DATE : 27.02.14
		SHEET 24	OF 43

Tag No. : **LBG10 BP 001** Date Sheet No. PES-145-05-DS1-0

DATA SHEET – A & B

DATA SHEET – A (TO BE FILLED UP BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	**RRVUNL-2x660 MW SURATGARH STPP, STAGE-V**	.....
	OFFER REFERENCE	Bidder to specify	.....
	QUANTITY	ONE (1) PER UNIT	.....
	SERVICE	**MAIN STEAM FLOW TO AUX. PRDS**	.....
	MAKE : MODEL	Bidder to specify	.....
			.....
ELEMENT			.....
	TYPE	[] ORIFICE [■] NOZZLE	.....
	STANDARD	[■] ASME PTC 19.5 [] BS 1042 [] OTHER	.....
	DESIGN	[] SQ EDGE [] BEVEL EDGE [] CARRIER RING	.....
		[] SHORT RADIUS [■] LONG RADIUS	.....
		[] LOW BETA [■] HIGH BETA	.....
			.....
	MATERIAL	[■] SS316 [] OTHER	.....
	BETA RATIO	0.5 TO 0.7	.....
	BORE DIAMETER	Bidder to specify	.....
	VENT HOLE	[] YES [■] NO	.....
	DRAIN HOLE	[] YES [■] NO	.....
END CONNECTION	TYPE	[] FLANGED [■] BUTT WELD END	.....
	FLANGE TYPE	[] WELD NECK [] SLIP ON [] THREADED	.....
	FLANGE RATING : MATERIAL	Not Applicable	.....
	BRANCH PIPE	[■] YES [] NO	.....
	BRANCH PIPE MATERIAL	Same as Pipe Material	.....
	TAPPING LOCATION	[■] D&D/2 [] CORNER [] VENTA CONTRACTA	.....
		[] ON FLANGE[■] ON PIPE [] ON CARRIER RING	
	NUMBER OF TAPPINGS	[■] 3 PAIR [] 2 PAIR [] OTHER	
	ROOT VALVE NUMBER : SIZE	[■] 12 [] 8 [] 6 [] 4 : [] 15 NB [■] 25 NB	
	ROOT VALVE MATERIAL : RATING: TYPE	[] CS [] AS [■] SS : [■] ANSI # 3000SPL : GLOBE	
	NIPPLE : SIZE/MATL/RATING/QTY	25NB/SS/SCH.XXS/12 NOS. ; 1000mm LONG	
	EXPANDER : SIZE/MATL/QTY	15NB x 25NB /SS/6 NOS. ; 50.8mm LONG	
PROCESS DATA	FLUID	[] CONDENSATE [] FEED WATER	.....
		[■] STEAM [] CW [] OTHER	.....
		MAX. (Max. Reqt. at Rated Load) / NORMAL (At 15% Load) / MINIMUM (Min. Reqt. at Rated Load)	.....
	FLOW (T/HR)	200 / 120 / 20	.....
	PRESSURE (KG/CM^2 (A))	247 / 63 / 247	.....
	TEMPERATURE (DEG. C.)	565 / 375 / 565	.....
	DESIGN PRESS : TEMP	270 Kg/cm^2(g) : 573 ^oC	.....
	MAX. ALLOWABLE PRESS LOSS	3.0 Kg/cm^2 at max. flow	.....
	DIFF. PRESS AT MAX FLOW	Bidder to specify	.....

BHEL PEM	**DATA SHEET FOR FLOW ELEMENTS**	SPECIFICATION NO.: PE-TS-392-145-I105	
		VOLUME III	
		SECTION	
		REV. NO. 06	DATE : 27.02.14
		SHEET 25	OF 43

Tag No. : **LBG10 BP 001** Date Sheet No. PES-145-05-DS1-0

DATA SHEET – A & B

	DATA SHEET – A (TO BE FILLED UP BY PURCHASER)		DATA SHEET – B (TO BE FILLED UP BY BIDDER)
PIPE LINE DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL BORE DIAMETER mm MIN. AVAILABLE STRAIGHT LENGTH UPSTREAM : DOWNSTREAM FLOW DIRECTION	219.1 x 34 SA 335 P91 Bidder to specify 15 D 10 D : 5 D [■] HORIZONTAL [] VERTICAL UP [] VERTICAL DOWN	....
OTHER INFORMATION	IBR CERTIFICATION TOTAL WEIGHT OF FLOW ELEMENT AND ACCESSORIES TOTAL LENGTH OF NOZZLE ASSEMBLY	[■] REQUIRED [] NOT REQUIRED Bidder to specify	

	PREPARED BY	**CHECKED BY**	**APPROVED BY**	**COMPANY SEAL**
NAME	SSV	IJS	IJS	
SIGNATURE				
DATE	13/06/2013	13/06/2013	13/06/2013	
				NAME
				SIGNATURE
				DATE

NOTES:

1. FLOW ELEMENT ACCURACY IS REQUIRED AT 200 T/HR & 20 T/HR FLOW VALUES.
2. RECOMMENDED RANGE IS 0 – 250 T/HR.
3. PRESSURE DROP IS NOT CRITICAL.

BHEL PEM	DATA SHEET FOR FLOW ELEMENTS	SPECIFICATION NO.: PE-TS-392-145-I105	
		VOLUME III	
		SECTION	
		REV. NO. 06	DATE : 27.02.14
		SHEET 26	OF 43

Tag No. : **LBG20 BP 001** Date Sheet No. PES-145-05-DS1-0

DATA SHEET – A & B

DATA SHEET – A (TO BE FILLED UP BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	**RRVUNL-2x660 MW SURATGARH STPP, STAGE-V**	.....
	OFFER REFERENCE	Bidder to specify	.....
	QUANTITY	ONE (1) PER UNIT	.....
	SERVICE	**CRH FLOW TO AUX. PRDS**	.....
	MAKE : MODEL	Bidder to specify	.....
ELEMENT	TYPE	[] ORIFICE [■] NOZZLE	.....
	STANDARD	[■] ASME PTC 19.5 [] BS 1042 [] OTHER	.....
	DESIGN	[] SQ EDGE [] BEVEL EDGE [] CARRIER RING	.....
		[] SHORT RADIUS [■] LONG RADIUS	.....
		[] LOW BETA [■] HIGH BETA	.....
	MATERIAL	[■] SS316 [] OTHER	.....
	BETA RATIO	0.5 TO 0.7	.....
	BORE DIAMETER	Bidder to specify	.....
	VENT HOLE	[] YES [■] NO	.....
	DRAIN HOLE	[] YES [■] NO	.....
END CONNECTION	TYPE	[] FLANGED [■] BUTT WELD END	.....
	FLANGE TYPE	[] WELD NECK [] SLIP ON [] THREADED	.....
	FLANGE RATING : MATERIAL	Not Applicable	.....
	BRANCH PIPE	[■] YES [] NO	.....
	BRANCH PIPE MATERIAL	Same as Pipe Material	.....
	TAPPING LOCATION	[■] D&D/2 [] CORNER [] VENTA CONTRACTA	.....
		[] ON FLANGE	
		[■] ON PIPE [] ON CARRIER RING	
	NUMBER OF TAPPINGS	[■] 3 PAIR [] 2 PAIR [] OTHER	
	ROOT VALVE NUMBER : SIZE	[■] 12 [] 8 [] 6 [] 4 : [] 15 NB [■] 25 NB	
	ROOT VALVE MATERIAL : RATING: TYPE	[] CS [] AS [■] SS : [■] ANSI # 800 : GLOBE	
	NIPPLE : SIZE/MATL/RATING/QTY	25NB/SS/SCH.80/12 NOS. ;250mm LONG	
	EXPANDER : SIZE/MATL/QTY	15NB x 25NB /SS/6 NOS. ; 50.8mm LONG	
PROCESS DATA	FLUID	[] CONDENSATE [] FEED WATER	.....
		[■] STEAM [] CW [] OTHER	.....
		MAX. / NORMAL (NR at 40% Load) / MINIMUM (NR at 100% Load)	.....
	FLOW (T/HR)	30.0 / 11.0 / 7	.....
	PRESSURE (KG/CM^2 (A))	56.0 / 22.66 / 56	.....
	TEMPERATURE (DEG. C.)	333.4 / 343.5 / 333.4	.....
	DESIGN PRESS : TEMP	73.1 Kg/cm^2(g) : 360 ^{o}C	.....
	MAX. ALLOWABLE PRESS LOSS	0.3 Kg/cm^2 at max. flow	.....
	DIFF. PRESS AT MAX FLOW	Bidder to specify	.....

BHEL PEM	DATA SHEET FOR FLOW ELEMENTS	SPECIFICATION NO.: PE-TS-392-145-I105	
		VOLUME III	
		SECTION	
		REV. NO. 06	DATE : 27.02.14
		SHEET 27	OF 43

Tag No. : **LBG20 BP 001** Date Sheet No. PES-145-05-DS1-0

DATA SHEET – A & B

	DATA SHEET – A (TO BE FILLED UP BY PURCHASER)		DATA SHEET – B (TO BE FILLED UP BY BIDDER)
PIPE LINE DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL BORE DIAMETER mm MIN. AVAILABLE STRAIGHT LENGTH UPSTREAM : DOWNSTREAM FLOW DIRECTION	114.3 x 6.02 SA 106 GR B Bidder to specify 15 D 2 10 D : 5 D [■] HORIZONTAL [] VERTICAL UP [] VERTICAL DOWN	....
OTHER INFORMATION	IBR CERTIFICATION TOTAL WEIGHT OF FLOW ELEMENT AND ACCESSORIES TOTAL LENGTH OF NOZZLE ASSEMBLY	[■] REQUIRED [] NOT REQUIRED Bidder to specify	

	PREPARED BY	CHECKED BY	APPROVED BY	COMPANY SEAL
NAME	SSV	IJS	IJS	
SIGNATURE				NAME
DATE	13/06/2013	13/06/2013	13/06/2013	SIGNATURE DATE

NOTES:

1. FLOW ELEMENT ACCURACY IS REQUIRED AT 30 T/HR & 7 T/HR FLOW VALUES.
2. RECOMMENDED RANGE IS 0 –50 T/HR.

	Technical specification for **FLOW ELEMENT ASSEMBLY (NOZZLE)** **SURATGARH, STAGE-V, UNIT # 7 & 8 (2 x 660 MW) THERMAL POWER**	SPECIFICATION NO. **PE-TS-392-145-I 005**
		VOLUME **II-B**
		SECTION **D**
		REV. NO. 00 | DATE: 09.04.2014
		SHEET

SECTION – D

DATA SHEETS - C

FORM NO. PEM-6666-0

	DATA SHEET FOR FLOW MEASURING DEVICES (NOZZLES) **SURATGARH, STAGE-V, UNIT # 7 & 8 (2 x 660 MW) THERMAL POWER.**	SPECIFICATION NO.: **PE-TS-392-145-I 005** VOLUME III SECTION REV. NO. / DATE: 09.04.2014 SHEET 1 OF 2

TAG No. ……. Qty..... Data Sheet No.: **PES-145-05-DS2-0**

Data Sheet C

DATA SHEET-C FOR FLOW MEASURING DEVICES (ORIFICE & NOZZLES)
(TO BE FILLED BY CONTRACTOR AFTER AWARD OF CONTRACT)

GENERAL	PROJECT			
	OFFER REFERENCE			
	TAG NO.: QUANTITY			
	SERVICE			
	MAKE	MODEL		
ELEMENT	TYPE			
	STANDARD			
	DESIGN			
	MATERIAL			
	BETA RATIO			
	BORE DIAMETER			
	VENT HOLE			
	DRAIN HOLE			
END CONNECTION	TYPE			
	FLANGE TYPE			
	FLANGE RATING			
	MATERIAL			
	BRANCH PIPE			
	BRANCH PIPE MATERIAL			
	TAPPING LOCATION			
	NO. OF TAPPINGS			
	ROOT VALVE			
	NUMBER	SIZE		
	ROOT VALVE MATERIAL			
	RATING			
PROCESS DATA	FLUID			
	FLOW T/HR			
	PRESS ATA			
	TEMP (DEG. C)			
	DESIGN PRESS	TEMP		
	PRESS LOSS at MAX/ NORMAL FLOW			
	DIFF PRESS AT MAX/NORMAL FLOW			
PIPE LINE DATA	PIPE SIZE (OD X THK) mm			
	PIPE MATERIAL			

FORM NO. PEM-6666-0

	DATA SHEET FOR FLOW MEASURING DEVICES (NOZZLES) **SURATGARH, STAGE-V, UNIT # 7 & 8 (2 x 660 MW) THERMAL POWER.**	SPECIFICATION NO.: **PE-TS-392-145-I 005** VOLUME III SECTION REV. NO. / DATE: 09.04.2014 SHEET 2 OF 2

TAG No. ……. Qty..... Data Sheet No.: **PES-145-05-DS2-0**

Data Sheet C

DATA SHEET-C FOR FLOW MEASURING DEVICES (ORIFICE & NOZZLES)
(TO BE FILLED BY CONTRACTOR AFTER AWARD OF CONTRACT)

	BORE DIAMETER mm			
	AVAILABLE STRAIGHT LENGTH			
	UPSTREAM	DOWNSTREAM		
	FLOW DIRECTION			
OTHER INFORMATION	IBR CERTIFICATION			
	TOTAL WEIGHT OF FLOW ELEMENT AND ACCESSORIES			
NAME				NAME
SIGNATURE				SIGNATURE
DATE				DATE

	Technical specification for **FLOW ELEMENT ASSEMBLY (NOZZLE)** **SURATGARH, STAGE-V, UNIT # 7 & 8 (2 x 660 MW) THERMAL POWER**	SPECIFICATION NO. **PE-TS-392-145-I 005**
		VOLUME **II-B**
		SECTION **D**
		REV. NO. 00 | DATE: 09.04.2014
		SHEET

SECTION – D

QUALITY PLAN

PEM :: C&I

QUALITY PLAN FOR FLOW NOZZLE ASSEMBLY

QUALITY PLAN NO.:	**PE-QP-392-145-I005**
VOLUME	IIB
SECTION	D
REV. NO.	02 DATE: 01.08.2013
SHEET	3 OF 7

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**											
	Flow Nozzle, pipe, adapter	Physical, Chemical properties	MA	Physical, Chemical tests	One / Heat	AP / DP /SP	AP / DP /SP	TC	3/2	---	2,1,4	Refer Note-1
		Ultrasonic testing (nozzle only)	MA	Ultrasonic test	100%	ASTMA388 & ANSI B 16.34	ASTMA388 & ANSI B 16.34	TC	3	2	1,4	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	---	2,1,4	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	1,4	Welding to be done by qualified welders. Refer Note-3
2.3	Weld FIT-UPS	Dimension, Alignment, Orientation.	MA	Measurement & Visual	100%	WPS/Approved drg.	WPS/Approved drg.	IR / Log Book	3/2	---	2	
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	1,4	100% by Vendor,10 % by BHEL
		2. Sub Surface defects(After PWHT)	MA	Radiographic Test	100%	ASME SEC. V	ASME SEC. VIII	IR	3/2	2	1,4	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	1,4	100% by Vendor,10% by BHEL

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; 4 --Customer / Consultant

1

PEM :: C&I

QUALITY PLAN FOR FLOW NOZZLE ASSEMBLY

QUALITY PLAN NO.:	**PE-QP-392-145-I005**
VOLUME	IIB
SECTION	D
REV. NO.	02 DATE: 01.08.2013
SHEET	4 OF 7

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency $ P	Agency $ W	Agency $ V	Remarks
2.5	Machining											
	1. Flow Nozzle (machined)	1. Dimensions	MA	Measurement	100%	AP / DS	AP / DS	IR	3/2	2	1,4	1
		2. Profile	MA	Measurement	100%	AP / DS	AP / DS	IR	3/2	2	1,4	
		3. Surface finish	MA	Visual	100%	----------	Mirror finish.	IR / Mfd Records	3/2	2	1,4	
	2. Pipe, Adapter	1. Machining of pipe ID	MA	Measurement	100%	AP / DS	AP / DS	IR	3/2	2	1,4	
		2. Dimensions	MA	Measurement	100%	AP / DS	AP / DS	IR	3/2	2	1,4	
		3. Surface flaw on weld edge preparation (for shop welding)	MA	Penetrant Test	100%	ASTM 165/ IS-3658	ASTM 165/ IS-3658	IR /TC	3/2	2	1,4	
		4. IBR Clearance	MA	Review	100%	IBR Compliance	IBR Compliance	Form III C	3/2		1,4	
3.0	**ROUTINE TEST**	1. Leak tightness	CR	Hydraulic test(1.5 times Design pressure)	100%	AP / DS	No Leakage	Test Certificate	3/2	2,1	4 2	IBR approval (wherever applicable) Minimum time duration of test shall be ½ hours.

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; 4 --Customer / Consultant

PEM :: C&I

QUALITY PLAN FOR FLOW NOZZLE ASSEMBLY

QUALITY PLAN NO.:	**PE-QP-392-145-I005**
VOLUME	IIB
SECTION	D
REV. NO.	02 DATE: 01.08.2013
SHEET	5 OF 7

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency $ P	Agency $ W	Agency $ V	Remarks
		2. Calibration	CR	Measurement	1 per type per size	----	Tech Spec.	TC	2	---	1,4	Refer note-4
4.0	**FINAL ASSEMBLY**	1. Marking – Tag No., direction of flow	MI	Visual	100%	AP / DS	AP / DS	IR	2	---	1,4	1
		2. Workmanship, surface flaw on weld edge preparation on end of pipe (for site welding)	MA	Visual, Penetrant test	100%	ASTM165 / IS: 3658	No Surface Flaw	TC /IR	3/2	2	1,4	
		3. Overall Dimensions and end connection	MA	Measurement	100%	AP / DS	AP / DS	IR	3/2	2/1	---	Refer Note-2 before dispatch
5.0	**PACKING & DISPATCH**	Soundness of Packing against transit damage	MA	Visual	100%	SP / MS	SP /MS		2	---	---	Refer Note-5

NOTE:

1. Test Certificates to be verified by BHEL at final inspection stage.
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.
8. Inspection call shall be raised to Customer / Customer representative for the scheduled inspection/ testing. In absence of Customer/ Customer representative BHEL representative will do inspection and necessary approval.

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; 4 --Customer / Consultant

	Technical specification for **FLOW ELEMENT ASSEMBLY** **(NOZZLE)** **SURATGARH, STAGE-V, UNIT # 7 & 8** **(2 x 660 MW) THERMAL POWER**	SPECIFICATION NO**. PE-TS-392-145-I 005** VOLUME **II-B** SECTION **D** REV. NO. 00 | DATE: 09.04.2014 SHEET

SECTION – D

BILL OF QUANTITY
(INCLUDING SPARES)

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
i)	LAB10BP001, LAB20BP001, LAB30BP001	BFP SUCTION FLOW	NOZZLE	03
ii)	LCH10BP001	HPH-6 DRAIN FLOW TO DEAERATOR	NOZZLE	01
iii)	LBS51BP001	EXTRACTION STEAM FLOW TO DEAERATOR	NOZZLE	01
iv)	LBS53BP001, LBS54 BP001	EXTRACTION STEAM FLOW TO BFPT-A/B	NOZZLE	02
v)	LBF10BP001, LBF20 BP001	MAIN STEAM TO HP BYPASS	NOZZLE	02
vi)	LAB80BP001	FEED WATER FLOW AT ECONOMISER I/L	NOZZLE	01
vii)	LBG10BP001	MAIN STEAM FLOW TO AUX. PRDS	NOZZLE	01
viii)	LBG20BP001	CRH FLOW TO AUX. PRDS	NOZZLE	01

[B] MANDATORY SPARES FOR FLOW ELEMENTS – FLOW NOZZLE (ONLY) : 10 % for each type, size and range or minimum 2 No. whichever is higher.

S. No.	SERVICE	TYPE OF ASSY	QTY (NOS.)
1	BFP SUCTION FLOW	NOZZLE	2
2	HPH-6 DRAIN FLOW TO DEAERATOR	NOZZLE	2
3	EXTRACTION STEAM FLOW TO DEAERATOR	NOZZLE	2
4	EXTRACTION STEAM FLOW TO BFPT-A	NOZZLE	2
5	MAIN STEAM TO HP BYPASS	NOZZLE	2
6	FEED WATER FLOW AT ECONOMISER I/L	NOZZLE	2
7	MAIN STEAM FLOW TO AUX. PRDS	NOZZLE	2
8	MAIN STEAM FLOW TO AUX. PRDS	NOZZLE	2

	Technical specification for **FLOW ELEMENT ASSEMBLY**	SPECIFICATION NO. **PE-TS-392-145-I 005**
		VOLUME **III**
		SECTION
	SURATGARH, STAGE-V, UNIT # 7 & 8 (2 x 660 MW) THERMAL POWER	REV. NO. 00 / DATE: 09.04.2014
		SHEET 1 OF 1

SCHEDULE OF SUBMISSION OF DRAWINGS / DOCUMENTS, EQUIPMENT MANUFACTURE INSPECTION AND DESPATCH

1.	**ZERO DATE**	**DATE of LOI / FOI / TOI**
2.	Submission of Data Sheets / documents / catalogues / Valve sizing calculations / Noise calculations for approval.	2 Weeks from the Zero date.
3.	Technical finalisation, freezing of inputs of manufacture by way of vetting of documents and technical discussions and resubmissions of documents (if required)	6 Weeks from the Zero date.
4.	Inspection of Equipment as per Approved (Category-I) drawings / documents.	14 Weeks from the Zero date.
5.	Release of MDCC by BHEL	15 Weeks from the Zero date.
6.	Dispatch (Packaging & Dispatch)	16 Weeks from the Zero date.
7.	Final documents submission as per Contract	16 Weeks from the Zero date.

NOTE: Delays due to non-fulfillment of the requirements of approved Quality Plan and approved Data sheets, Drawings, Catalogues and Sizing Calculations observed during inspection shall be to the Vendor's account.

Delays due to INCOMPLETE (Partly) submission of Data sheets, Drawings, Catalogues and Sizing Calculations also be considered as **"DOCUMENTS NOT SUBMITTED"**

(Signature and Stamp of the Bidder)

SURATGARH, STAGE-V, UNIT # 7 & 8
(2 x 660 MW) THERMAL POWER

TECHNICAL SPECIFICATION
FOR

FLOW ELEMENT ASSEMBLY - NOZZLE

VOLUME III

SPECIFICATION Nos
PE-TS-392-145-I 005

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

CONTENTS

VOL-III

COMPLIANCE CERTIFICATE
FOR
FLOW ELEMENTS ASSEMBLY- NOZZLE

(To be Signed & Stamped by the Bidder)

Project : SURATGARH, STAGE-V, UNIT # 7 & 8 (2 x 660 MW) THERMAL POWER

Specification no. : PE-TS-392-145-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	

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-6 DRAIN FLOW TO DEA	NOZZLE		
v)	LBS51BP001	EXTRACTION STEAM FLOW TO DEA	NOZZLE		
vi)	LBS53BP001	EXTRACTION STEAM FLOW TO BFPT-A	NOZZLE		
vii)	LBS54 BP001	EXTRACTION STEAM FLOW TO BFPT-B	NOZZLE		
viii)	LBF10BP001	MAIN STEAM TO HP BYPASS	NOZZLE		
ix)	LBF20BP001	MAIN STEAM TO HP BYPASS	NOZZLE		
x)	LAB80BP001	FEED WATER FLOW AT ECONOMISER I/L	NOZZLE		
xi)	LBG10BP001	MAIN STEAM FLOW TO AUX. PRDS	NOZZLE		
xii)	LBG20BP001	CRH FLOW TO AUX. PRDS	NOZZLE		

[B] CALIBRATION CHARGES (SEPARATE LIST TO BE ATTACHED)

[C] MANDATORY SPARES (SEPARATE LIST TO BE ATTACHED)

[D] DOCUMENTATION CHARGES

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

SCHEDULE OF UNIT PRICES

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

S.No	DESCRIPTION	Tag Nos	Unit Rate (Rs) (Ex. Works)
1	ROOT VALVES	SS304, 15 NB, SW, # 800	
		SS316,25 NB, SW, # 3000	
		SS316,25 NB, SW, # 3000 SPL	
		SS316,25 NB, SW, # 3500 SPL	
2	NIPPLE	15NB/SS/SCH.40/12 NOS.; 250mm LONG	
		15NB/SS/SCH.40/6 NOS.; 250mm LONG	
		25NB/SS/SCH.XXS/12 NOS.; 1000mm LONG	
		25NB/SA106 GR.C/SCH.XXS/12 NOS. ; 250 mm LONG	
		25NB/SS/SCH.80/12 NOS.; 250mm LONG	
3	EXPANDER	15NB x 25NB /SS/6 NOS. ; 50.8mm LONG	
		15NB x 25NB / SA106GR.C/6 NOS. ; 50.8mm LONG	

[B] MANDATORY SPARES FOR FLOW ELEMENT : - FLOW NOZZLE ONLY

SNO	SERVICE (A)	TYPE (B)	Unit price (Ex Works)	Qty (Nos.)	Total Price (Ex-works)
1	TD-BFP SUCTION FLOW	NOZZLE		2	
2	HPH-6 DRAIN FLOW TO DEA	NOZZLE		2	
3	EXTRACTION STEAM FLOW TO DEA	NOZZLE		2	
4	EXTRACTION STEAM FLOW TO BFPT-A	NOZZLE		2	
5	MAIN STEAM TO HP BYPASS	NOZZLE		2	
6	FEED WATER FLOW AT ECONOMISER I/L	NOZZLE		2	
7	MAIN STEAM FLOW TO AUX. PRDS	NOZZLE		2	
8	CRH FLOW TO AUX. PRDS	NOZZLE		2	

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

INSPECTION SCHEDULE

(PLACE & ADDRESS OF TESTING/ INSPECTION AND ITS SCHEDULE DATE & DURATION IN NUMBER OF DAYS ITEM/COMPONENTWISE TO BE LISTED)

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

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, LAB20BP001, LAB30BP001	BFP SUCTION FLOW	NOZZLE		
ii)	LCH10BP001	HPH-6 DRAIN FLOW TO DEAERATOR	NOZZLE		
iii)	LBS51BP001	EXTRACTION STEAM FLOW TO DEAERATOR	NOZZLE		
iv)	LBS53BP001, LBS54 BP001	EXTRACTION STEAM FLOW TO BFPT-A/B	NOZZLE		
v)	LBF10BP001, LBF20 BP001	MAIN STEAM TO HP BYPASS	NOZZLE		
vi)	LAB80BP001	FEED WATER FLOW AT ECONOMISER I/L	NOZZLE		
vii)	LBG10BP001	MAIN STEAM FLOW TO AUX. PRDS	NOZZLE		
viii)	LBG20BP001	CRH FLOW TO AUX. PRDS	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.