





2 X 660 MW SUPER CRITICAL TPS  
SURATGARH, STAGE-V, UNIT# 7 & 8

TECHNICAL SPECIFICATION  
FOR FLOW ELEMENT ASSEMBLY-ORIFICE

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JOB NO. 392	TITLE TECHNICAL SPECIFICATION FOR ORIFICE PLATE ASSEMBLY	DOC. NO. PE-TS-392-145-I005A				
	BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA	DEPT CODE  1		NAME	SIGN	DATE
			DESN	RK		17.04.2014
			CHD	MK		17.04.2014
			APPD	BS		17.04.2014

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

**TECHNICAL SPECIFICATION  
FOR  
FLOW ELEMENT ASSEMBLY- ORIFICE**

**VOLUME II-B**

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



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



## PREAMBLE

SPECIFICATION NO. PE-TS-392-145-I005A

VOLUME II-B

SECTION A

REV NO. 00

SHEET .... OF ....

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.

	<b>Technical specification for FLOW ELEMENT ASSEMBLIES (Orifice &amp; Nozzle)</b>  <b>SURATGARH, STAGE-V, UNIT # 7 &amp; 8 (2 x 660 MW) THERMAL POWER</b>	SPECIFICATION NO. <b>PE-TS-392-145-I005A</b>	
		VOLUME <b>II-B</b>	
		SECTION	
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### VOL-II B

SECTION	DESCRIPTION	No of sheets
<b>A</b>	<b>Scope of Enquiry</b>	1
<b>B</b>	<b>Project Information</b>	3
<b>C</b>	<b>Specific Technical Requirements</b>	
	- General Requirements	5
<b>D</b>	<b>Specification for Flow Elements</b>	
	- Equipment Specification ( PES – 145 – 05 )	5
	- Data sheets A & B for Flow Elements- ORIFICE. (Data sheet no. PES-145-05-DS1-0)	22
	- Data sheets C for Flow Elements- ORIFICE (Data sheet no. PES-145-05-DS2-0)	2
	- Quality Plan for Flow Orifice Plate	2
	- Bill of Quantity for Flow Elements with spares.	1
	- Schedule of submission of Drawings/Documents, Equipment Manufacture, Inspection and Dispatch.	1



Technical specification for  
**FLOW ELEMENT ASSEMBLIES**  
(Orifice)

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

SPECIFICATION NO. **PE-TS-392-145-I 005A**

VOLUME **II-B**

SECTION **A**


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## SECTION – A

## SCOPE OF ENQUIRY

	<b>Technical specification for FLOW ELEMENT ASSEMBLIES (Orifice)</b>  <b>SURATGARH, STAGE-V, UNIT # 7 &amp; 8 (2 x 660 MW) THERMAL POWER PROJECT</b>	SPECIFICATION NO. <b>PE-TS-392-145-I005A</b>	
		VOLUME <b>II-B</b>	
		SECTION <b>A</b>	
		REV. NO. 00	DATE: 07.04.2014
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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 "**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) 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.

**SECTION: B**

**PROJECT INFORMATION**

SPEC.NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME II SECTION – B
	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> GENERAL PROJECT INFORMATION	SHEET 1 OF 3

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	<b>Climatic conditions</b>	
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	

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SPEC.NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>		VOLUME II SECTION – B
	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> GENERAL PROJECT INFORMATION		SHEET 2 OF 3

	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

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SPEC.NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>		VOLUME II SECTION – B
	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> GENERAL PROJECT INFORMATION		SHEET 3 OF 3

		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 $\pm 10\%$ Frequency variation $\pm 5\%$
DC supply	Combined voltage & frequency variation 10% Voltage variation $+10\%$ , $-15\%$

j) For instrument and control system of steam generator and steam turbine generator.    230 V  $\pm 5\%$  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° C reference ambient temperature.

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Technical specification for  
**FLOW ELEMENT ASSEMBLIES**  
 (ORIFICE)

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

SPECIFICATION NO. **PE-TS-392-145-I 005A**

VOLUME **II-B**

SECTION **C**


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## SECTION – C

### SPECIFIC TECHNICAL REQUIREMENTS

	<b>Technical specification for FLOW ELEMENT ASSEMBLIES (ORIFICE)</b>  <b>SURATGARH, STAGE-V, UNIT # 7 &amp; 8 (2 x 660 MW) THERMAL POWER</b>	SPECIFICATION NO. <b>PE-TS-392-145-I 005A</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>Technical specification for FLOW ELEMENT ASSEMBLIES (ORIFICE)</b>		SPECIFICATION NO. <b>PE-TS-392-145-I 005A</b>	
			VOLUME <b>II-B</b>	
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**SURATGARH, STAGE-V, UNIT # 7 & 8  
(2 x 660 MW) THERMAL POWER**

**(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**


- Signed and stamped compliance certificates in attached format (VOL.-III).**
- Schedule of prices in attached format (VOL.-III).**
- Schedule of submission of Drg. / Doc, Equip. Manufacture, Inspection and Dispatch.**
- 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:

- 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..

	<b>Technical specification for FLOW ELEMENT ASSEMBLIES (ORIFICE)</b>  <b>SURATGARH, STAGE-V, UNIT # 7 &amp; 8 (2 x 660 MW) THERMAL POWER</b>	SPECIFICATION NO. <b>PE-TS-392-145-I 005A</b>	
		VOLUME <b>II-B</b>	
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- 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 - 20 sets with 4 CD-ROMS  
for Flow Element Assemblies and all the  
Accessories.



Technical specification for  
**ORIFICE**

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

SPECIFICATION NO. PE-TS-392-145-I005A

VOLUME **II-B**

SECTION **C**

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**CUSTOMER SPECIFICATION**

SPEC.NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME V SECTION : D5.4
Package: EPC	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> <b>INSTRUMENTATION AND CONTROL EQUIPMENT</b> SPECIFICATION FOR INSTRUMENTATION & CONTROL EQUIPMENT	SHEET 4 OF 42
<p>1.11      Flow Glasses</p> <p>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 &amp; 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 &amp; above 50 mm Nb size it shall be flanged - ANSI, 150 RF. Accessories like name plate, mating flanges with gaskets (neoprene), bolts &amp; nuts, etc. shall be supplied.</p> <p>1.12      Flow Switches</p> <p>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 &amp; scale shall be provided for setting. Range spring &amp; orifice plate shall be SS 316 for DP type. NPT for sizes below 2" &amp; for sizes above 2" ANSI 150 RF shall be provided. Accessories like nameplate, mating flanges with gaskets, bolts &amp; nuts, pipe assembly with orifice plate, etc. 5 way manifold, pipe, fittings (DP type), etc. shall be supplied.</p> <p>1.13      Flow Elements</p> <p>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 tapplings; 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 tapplings complete with root valves. Orifice plate shall be 3 mm thick for nominal pipe diameter upto 300 mm &amp; 6 mm thick for pipe diameter &gt; 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 tapplings, root valves as required. Performance Guarantee flow elements shall be provided separately. Butt welded edges shall be prepared as per ANSI 16.25 &amp; flanged connections shall be as per ANSI 16.5 standards. Orifice assembly complete with nipples &amp; valves to be supplied by Bidder shall be one meter long with ANSI class 150 RF SS flanges at the ends including gaskets, bolts &amp; nuts. Isolating valves shall have SW end connection. Accessories like nameplate, gaskets, bolts &amp; 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.</p>		
		ISSUE R1





Technical specification for  
**FLOW ELEMENT ASSEMBLIES**  
(ORIFICE)

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

SPECIFICATION NO. **PE-TS-392-145-I 005A**

VOLUME **II-B**

SECTION **D**


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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**

	<p>Technical specification for <b>FLOW ELEMENT ASSEMBLIES</b> (ORIFICE)</p> <p><b>SURATGARH, STAGE-V, UNIT # 7 &amp; 8</b> (2 x 660 MW) THERMAL POWER</p>		SPECIFICATION NO. <b>PE-TS-392-145-I 005A</b>	
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## SECTION – D

# EQUIPMENT SPECIFICATION

(PES – 145 – 05)



## SPECIFICATION FOR FLOW MEASURING DEVICES (ORIFICE )

SPECIFICATION NO.: PES – 145 - 05

VOLUME II B

SECTION D

REV. NO. 00

DATE 05.04.2014

SHEET 1 OF 5

### 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 (ORIFICE )

SPECIFICATION NO.: PES – 145 - 05

VOLUME II B

SECTION D

REV. NO. 00

DATE 05.04.2014

SHEET 2 OF 5

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  $\geq 40\text{Kg/Cm}^2$  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 (ORIFICE )

SPECIFICATION NO.: PES – 145 - 05

VOLUME II B

SECTION D

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DATE 05.04.2014

SHEET 3 OF 5

### 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 (ORIFICE )

SPECIFICATION NO.: PES – 145 - 05

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OF 5

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 (ORIFICE )

SPECIFICATION NO.: PES – 145 - 05

VOLUME II B

SECTION D

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OF 5

### 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 ASSEMBLIES**  
 (ORIFICE)

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

SPECIFICATION NO. **PE-TS-392-145-I 005A**

VOLUME **II-B**

SECTION **D**

REV. NO. 00

DATE: 07.04.2014

SHEET

## **SECTION – D**

## **DATA SHEETS – A & B**



<b>BHEL PEM</b>	<b>DATA SHEET FOR FLOW ELEMENTS</b>	SPECIFICATION NO.: PE-TS-392-145-I105									
		VOLUME III									
		SECTION									
		REV. NO. 06      DATE : 27.02.14									
		SHEET									
Tag No. : LCA01 BP 001, LCA02 BP 001, LCA03 BP 001		Date Sheet No. PES-145-05-DS1-0									
<b>DATA SHEET – A &amp; B</b>											
DATA SHEET – A (TO BE FILLED UP BY PURCHASER)		DATA SHEET – B (TO BE FILLED UP BY BIDDER)									
<b>I</b>	GENERAL*	PROJECT OFFER REFERENCE QUANTITY SERVICE MAKE : MODEL RRVUNL-2x660 MW SURATGARH STPP, STAGE-V Bidder to specify 03 PER UNIT (ONE AGAINST EACH TAG NO.) CEP A/B/C DISCHARGE FLOW Bidder to specify									
<b>II</b>	ELEMENT	TYPE STANDARD DESIGN MATERIAL BETA RATIO BORE DIAMETER VENT HOLE DRAIN HOLE [X] ORIFICE [ ] NOZZLE [ ] ASME PTC 19.5 [X] BS 1042 [ ] OTHER [X] SQ EDGE [ ] BEVEL EDGE [ ] CARRIER RING [ ] SHORT RADIUS [ ] LONG RADIUS [ ] LOW BETA [ ] HIGH BETA [X] SS316 [ ] OTHER 0.5 TO 0.7 Bidder to specify [X] YES [ ] NO [ ] YES [X] NO									
<b>III</b>	END CONNECTION	[X] FLANGED [X] BUTT WELD END [X] WELD NECK [ ] SLIP ON [ ] THREADED ANSI – 300# : ASTM A105 [ ] YES [X] NO Not Applicable [ ] D&D/2 [ ] CORNER [ ] VENTA CONTRACTA [X] ON FLANGE [ ] ON PIPE [ ] ON CARRIER RING [X] 3 PAIR [ ] 2 PAIR [ ] OTHER [X] 12 [ ] 8 [ ] 6 [ ] 4 : [X] 15 NB [ ] 25 NB [ ] CS [ ] AS [X] SS : [X] ANSI # 800 15NB/SS/SCH.40/12 NOS. ; 250mm LONG Not Applicable									
<b>IV</b>	PROCESS DATA	[X] CONDENSATE [ ] FEED WATER [ ] STEAM [ ] CW [ ] OTHER MAX. NORMAL MINIMUM (Pump Design) (VWO) (Min. Recirculation) <table style="width:100%;"><tr><td>880</td><td>780</td><td>290</td></tr><tr><td>35</td><td>35.8</td><td>40.9</td></tr><tr><td>46.5</td><td>46.5</td><td>39.6</td></tr></table> Flow Data: FLOW (T/HR) PRESSURE (KG/CM2 (A)) TEMPERATURE (DEG. C.) DESIGN PRESS : TEMP 45 Kg/cm²(g) : 60 °C MAX. ALLOWABLE PRESS LOSS 0.5 Kg/cm² at max. flow DIFF. PRESS AT MAX FLOW Bidder to specify	880	780	290	35	35.8	40.9	46.5	46.5	39.6
880	780	290									
35	35.8	40.9									
46.5	46.5	39.6									

<b>BHEL PEM</b>	<b>DATA SHEET FOR FLOW ELEMENTS</b>			SPECIFICATION NO.: PE-TS-392-145-1105	
				VOLUME III	
				SECTION	
				REV. NO. 06	DATE : 27.02.14
				SHEET	
Tag No. : <b>LCA01 BP 001, LCA02 BP 001, LCA03 BP 001</b> <span style="float: right;">Date Sheet No. PES-145-05-DS1-0</span>					
<b>DATA SHEET – A &amp; B</b>					
<b>DATA SHEET – A</b> (TO BE FILLED UP BY PURCHASER)					<b>DATA SHEET – B</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 <input type="checkbox"/> HORIZONTAL <input checked="" type="checkbox"/> VERTICAL UP <input type="checkbox"/> VERTICAL DOWN	..... ..... ..... .....		
OTHER INFORMATION	IBR CERTIFICATION  TOTAL WEIGHT OF FLOW ELEMENT AND ACCESSORIES	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED			
NAME SIGNATURE DATE	PREPARED BY	CHECKED BY	APPROVED BY	COMPANY SEAL	
	SSV  13/06/2013	IJS  13/06/2013	IJS  13/06/2013		
<b>NOTES:</b> <ol style="list-style-type: none"> <li>FLOW ELEMENT ACCURACY IS REQUIRED AT 880 T/HR &amp; 290 T/HR FLOW VALUES.</li> <li>RECOMMENDED RANGE IS 0 – 1000 T/HR.</li> <li>3 NOS. OF S-BAND SHALL BE REQUIRED FOR EACH TAG</li> </ol>					

[illegible]

<b>BHEL PEM</b>	<b>DATA SHEET FOR FLOW ELEMENTS</b>			SPECIFICATION NO.: PE-TS-392-145-1105	
				VOLUME III	
				SECTION	
				REV. NO. 06	DATE : 27.02.14
				SHEET	
Tag No. : <b>LCA20 BP 001</b> <span style="float: right;">Date Sheet No. PES-145-05-DS1-0</span>					
<b>DATA SHEET – A &amp; B</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	457 x 12.7 SA 106 GR C Bidder to specify 15 D 10 D : 5 D <input type="checkbox"/> HORIZONTAL <input type="checkbox"/> VERTICAL UP <input type="checkbox"/> VERTICAL DOWN			..... ..... ..... .....
OTHER INFORMATION	IBR CERTIFICATION  TOTAL WEIGHT OF FLOW ELEMENT AND ACCESSORIES	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED			
NAME SIGNATURE DATE	PREPARED BY  SSV  13/06/2013	CHECKED BY  IJS  13/06/2013	APPROVED BY  IJS  13/06/2013	COMPANY SEAL   NAME SIGNATURE DATE	
	NOTES: 1. FLOW ELEMENT ACCURACY IS REQUIRED AT 1800 T/HR& 324 T/HR FLOW VALUES. 2. RECOMMENDED RANGE IS 0 – 2200 T/HR.				

<b>BHEL PEM</b>	<b>DATA SHEET FOR FLOW ELEMENTS</b>	SPECIFICATION NO.: PE-TS-392-145-1105														
		VOLUME III														
		SECTION														
		REV. NO. 06	DATE : 27.02.14													
		SHEET														
Tag No. : <b>LCA92 BP 001</b> <span style="float: right;">Date Sheet No. PES-145-05-DS1-0</span>																
<b>DATA SHEET – A &amp; B</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	<b>RRVUNL-2x660 MW SURATGARH STPP, STAGE-V</b> Bidder to specify ONE (1) PER UNIT <b>CONDENSATE FLOW TO DEAERATOR</b> Bidder to specify														
ELEMENT	TYPE STANDARD DESIGN  MATERIAL BETA RATIO BORE DIAMETER VENT HOLE DRAIN HOLE	<input type="checkbox"/> ORIFICE <input type="checkbox"/> NOZZLE <input type="checkbox"/> ASME PTC 19.5 <input type="checkbox"/> BS 1042 <input type="checkbox"/> OTHER <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 <input type="checkbox"/> SS316 <input type="checkbox"/> OTHER 0.5 TO 0.7 Bidder to specify <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES <input type="checkbox"/> 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	<input type="checkbox"/> FLANGED <input type="checkbox"/> BUTT WELD END <input type="checkbox"/> WELD NECK <input type="checkbox"/> SLIP ON <input type="checkbox"/> THREADED ANSI-300# : ASTM A 105 <input type="checkbox"/> YES <input type="checkbox"/> NO Not Applicable <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 <input type="checkbox"/> 3 PAIR <input type="checkbox"/> 2 PAIR <input type="checkbox"/> OTHER <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 <input type="checkbox"/> CS <input type="checkbox"/> AS <input type="checkbox"/> SS : <input type="checkbox"/> ANSI # 800 15NB/SS/SCH.40/12 NOS. ; 250mm LONG Not Applicable														
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	<input type="checkbox"/> CONDENSATE <input type="checkbox"/> FEED WATER <input type="checkbox"/> STEAM <input type="checkbox"/> CW <input type="checkbox"/> OTHER <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">MAX. (Pump Design)</th> <th style="text-align: left;">NORMAL (VVO)</th> <th style="text-align: left;">MINIMUM (40 % MCR)</th> </tr> </thead> <tbody> <tr> <td>1800</td> <td>1556</td> <td>582</td> </tr> <tr> <td>17</td> <td>13.3</td> <td>5.9</td> </tr> <tr> <td>157</td> <td>154.1</td> <td>126</td> </tr> </tbody> </table> 45 Kg/cm <sup>2</sup> (g) : 160 °C 0.5 Kg/cm <sup>2</sup> at max. flow Bidder to specify			MAX. (Pump Design)	NORMAL (VVO)	MINIMUM (40 % MCR)	1800	1556	582	17	13.3	5.9	157	154.1	126
MAX. (Pump Design)	NORMAL (VVO)	MINIMUM (40 % MCR)														
1800	1556	582														
17	13.3	5.9														
157	154.1	126														

<b>BHEL PEM</b>	<b>DATA SHEET FOR FLOW ELEMENTS</b>			SPECIFICATION NO.: PE-TS-392-145-1105	
				VOLUME III	
				SECTION	
				REV. NO. 06	DATE : 27.02.14
				SHEET	
Tag No. : <b>LCA92 BP 001</b> <span style="float: right;">Date Sheet No. PES-145-05-DS1-0</span>					
<b>DATA SHEET – A &amp; B</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	457 x 12.7 SA 106 GR C Bidder to specify 15 D 10 D : 5 D <input type="checkbox"/> HORIZONTAL <input checked="" type="checkbox"/> VERTICAL UP <input type="checkbox"/> VERTICAL DOWN			..... ..... ..... .....
OTHER INFORMATION	IBR CERTIFICATION  TOTAL WEIGHT OF FLOW ELEMENT AND ACCESSORIES	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED			
NAME SIGNATURE DATE	PREPARED BY	CHECKED BY	APPROVED BY	COMPANY SEAL	
	SSV	IJS	IJS		
	13/06/2013	13/06/2013	13/06/2013	NAME SIGNATURE DATE	
<b>NOTES:</b> <ol style="list-style-type: none"> <li>1. FLOW ELEMENT ACCURACY IS REQUIRED AT 1800 T/HR &amp; 582 T/HR FLOW VALUES.</li> <li>2. RECOMMENDED RANGE IS 0 – 2000 T/HR.</li> <li>3. 3 NOS. OF S-BAND SHALL BE REQUIRED</li> </ol>					

<b>BHEL</b> <b>PEM</b>	<b>DATA SHEET FOR FLOW ELEMENTS</b>		SPECIFICATION NO.: PE-TS-392-145-1105																	
			VOLUME III																	
			SECTION																	
			REV. NO. 06	DATE : 27.02.14																
			SHEET																	
Tag No. : <b>LCR80 BP 001</b> <span style="float: right;">Date Sheet No. PES-145-05-DS1-0</span>																				
<b>DATA SHEET – A &amp; B</b>																				
DATA SHEET – A (TO BE FILLED UP BY PURCHASER)					DATA SHEET – B (TO BE FILLED UP BY BIDDER)															
GENERAL*	PROJECT	<b>RRVUNL-2x660 MW SURATGARH STPP, STAGE-V</b> Bidder to specify			.....															
	OFFER REFERENCE				.....															
	QUANTITY	ONE (1) PER UNIT <b>DM MAKE-UP TO HOTWELL</b> Bidder to specify			.....															
	SERVICE				.....															
	MAKE : MODEL				.....															
					.....															
ELEMENT	TYPE	<input checked="" type="checkbox"/> ORIFICE <input type="checkbox"/> NOZZLE <input type="checkbox"/> ASME PTC 19.5 <input checked="" type="checkbox"/> BS 1042 <input type="checkbox"/> OTHER <input checked="" 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 <input checked="" type="checkbox"/> SS316 <input type="checkbox"/> OTHER 0.5 TO 0.7 Bidder to specify <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO			.....															
	STANDARD				.....															
	DESIGN				.....															
					.....															
	MATERIAL				.....															
	BETA RATIO				.....															
	BORE DIAMETER				.....															
	VENT HOLE				.....															
	DRAIN HOLE				.....															
					.....															
END CONNECTION	TYPE	<input checked="" type="checkbox"/> FLANGED <input checked="" type="checkbox"/> BUTT WELD END <input checked="" type="checkbox"/> WELD NECK <input type="checkbox"/> SLIP ON <input type="checkbox"/> THREADED ANSI – 300      :    A182 F 304 <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO Not Applicable <input type="checkbox"/> D&D/2 <input type="checkbox"/> CORNER <input type="checkbox"/> VENTA CONTRACTA <input checked="" type="checkbox"/> ON FLANGE <input type="checkbox"/> ON PIPE <input type="checkbox"/> ON CARRIER RING <input checked="" type="checkbox"/> 3 PAIR <input type="checkbox"/> 2 PAIR <input type="checkbox"/> OTHER <input type="checkbox"/> 12 <input type="checkbox"/> 8 <input checked="" type="checkbox"/> 6 <input type="checkbox"/> 4      : <input checked="" type="checkbox"/> 15 NB <input type="checkbox"/> 25 NB <input type="checkbox"/> CS <input type="checkbox"/> AS <input checked="" type="checkbox"/> SS : <input checked="" type="checkbox"/> ANSI # 800 15NB/SS/SCH.40/6 NOS. ; 250mm LONG Not Applicable			.....															
	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				.....															
					.....															
PROCESS DATA	FLUID	<input type="checkbox"/> CONDENSATE <input type="checkbox"/> FEED WATER <input type="checkbox"/> STEAM <input type="checkbox"/> CW <input checked="" type="checkbox"/> OTHER (DM WATER) <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">MAX.</td> <td style="width: 33%;">NORMAL</td> <td style="width: 33%;">MINIMUM</td> </tr> <tr> <td>(3% MU)</td> <td>(1% MU)</td> <td>(0.5% MU)</td> </tr> <tr> <td>31.5</td> <td>21</td> <td>10.5</td> </tr> <tr> <td>4.0</td> <td>6.8</td> <td>7.2</td> </tr> <tr> <td>33</td> <td>33</td> <td>33</td> </tr> </table> 10 Kg/cm <sup>2</sup> (g) : 50 °C 0.3 Kg/cm <sup>2</sup> at max. flow Bidder to specify			MAX.	NORMAL	MINIMUM	(3% MU)	(1% MU)	(0.5% MU)	31.5	21	10.5	4.0	6.8	7.2	33	33	33	.....
	MAX.				NORMAL	MINIMUM														
(3% MU)	(1% MU)	(0.5% MU)																		
31.5	21	10.5																		
4.0	6.8	7.2																		
33	33	33																		
	FLOW (T/HR)				.....															
	PRESSURE (KG/CM2 (A)) #				.....															
	TEMPERATURE (DEG. C.)				.....															
	DESIGN PRESS : TEMP				.....															
	MAX. ALLOWABLE PRESS LOSS				.....															
	DIFF. PRESS AT MAX FLOW				.....															

<b>BHEL PEM</b>	<b>DATA SHEET FOR FLOW ELEMENTS</b>			SPECIFICATION NO.: PE-TS-392-145-1105	
				VOLUME III	
				SECTION	
				REV. NO. 06	DATE : 27.02.14
				SHEET	
Tag No. : <b>LCR80 BP 001</b> <span style="float: right;">Date Sheet No. PES-145-05-DS1-0</span>					
<b>DATA SHEET – A &amp; B</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		114.3 x 3.05		.....
	PIPE MATERIAL		SA 312 TP 304 (ERW)		.....
	BORE DIAMETER mm		Bidder to specify		.....
	MIN. AVAILABLE STRAIGHT		15 D		.....
	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 type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		
	TOTAL WEIGHT OF FLOW ELEMENT AND ACCESSORIES				
NAME SIGNATURE DATE	PREPARED BY	CHECKED BY	APPROVED BY	COMPANY SEAL	
	SSV	IJS	IJS		
	13/06/2013	13/06/2013	13/06/2013	NAME	
				SIGNATURE	
				DATE	
<b>NOTES:</b> 1. FLOW ELEMENT ACCURACY IS REQUIRED AT 32 T/HR & 10 T/HR FLOW VALUES. 2. RECOMMENDED RANGE IS 0 – 50 T/HR.					



<div>BHEL PEM</div>	DATA SHEET FOR FLOW ELEMENTS		SPECIFICATION NO.: PE-TS-392-145-1105																	
			VOLUME III																	
			SECTION																	
			REV. NO. 06	DATE : 27.02.14																
			SHEET 28	OF	43															
Tag No.: 00LCP01 BP 001, 00LCP02 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 OFFER REFERENCE QUANTITY SERVICE MAKE : MODEL			RRVUNL-2x660 MW SURATGARH STPP, STAGE-V Bidder to specify ONE (1) PER UNIT DM WATER TO CST-1 & 2 INLET Bidder to specify																
ELEMENT	MAKE : MODEL TYPE STANDARD DESIGN  MATERIAL BETA RATIO BORE DIAMETER VENT HOLE DRAIN HOLE			<input checked="" type="checkbox"/> ORIFICE <input type="checkbox"/> NOZZLE <input type="checkbox"/> ASME PTC 195 <input checked="" type="checkbox"/> BS 1042 <input type="checkbox"/> OTHER <input checked="" 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 <input checked="" type="checkbox"/> SS316 <input type="checkbox"/> OTHER 0.5 TO 0.7 Bidder to specify <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES <input checked="" type="checkbox"/> 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			<input checked="" type="checkbox"/> FLANGED <input checked="" type="checkbox"/> BUTT WELD END <input checked="" type="checkbox"/> WELD NECK <input type="checkbox"/> SLIP ON <input type="checkbox"/> THREADED ANSI – 300       :    A182 F 304 <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO Not Applicable <input type="checkbox"/> D&D/2 <input type="checkbox"/> CORNER <input type="checkbox"/> VENTA CONTRACTA <input checked="" type="checkbox"/> ON FLANGE <input type="checkbox"/> ON PIPE <input type="checkbox"/> ON CARRIER RING <input checked="" type="checkbox"/> 3 PAIR <input type="checkbox"/> 2 PAIR <input type="checkbox"/> OTHER <input type="checkbox"/> 12 <input type="checkbox"/> 8 <input checked="" type="checkbox"/> 6 <input type="checkbox"/> 4       : <input checked="" type="checkbox"/> 15 NB <input type="checkbox"/> 25 NB <input type="checkbox"/> CS <input type="checkbox"/> AS <input checked="" type="checkbox"/> SS : <input checked="" type="checkbox"/> ANSI # 800 15NB/SS/SCH.40/6 NOS. ; 250mm LONG Not Applicable																
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			<div><input type="checkbox"/> CONDENSATE    <input type="checkbox"/> FEED WATER <input type="checkbox"/> STEAM    <input type="checkbox"/> CW    <input checked="" type="checkbox"/> OTHER (DM WATER)</div> <table><tr><td>MAX.</td><td>NORMAL</td><td>MINIMUM</td></tr><tr><td>68</td><td>31.5</td><td>21</td></tr><tr><td>2.0</td><td>4.0</td><td>6.0</td></tr><tr><td>33</td><td>33</td><td>33</td></tr></table> <div>10 Kg/cm<sup>2</sup>(g) : 50 °C 0.3 Kg/cm<sup>2</sup> at max. flow Bidder to specify</div>			MAX.	NORMAL	MINIMUM	68	31.5	21	2.0	4.0	6.0	33	33	33		
MAX.	NORMAL	MINIMUM																		
68	31.5	21																		
2.0	4.0	6.0																		
33	33	33																		

<b>BHEL PEM</b>	<b>DATA SHEET FOR FLOW ELEMENTS</b>			SPECIFICATION NO.: PE-TS-392-145-1105	
				VOLUME III	
				SECTION	
				REV. NO. 06	DATE : 27.02.14
				SHEET 29	OF 43
Tag No.: <b>00LCP01 BP 001, 00LCP02 BP 001</b> Date Sheet No. PES-145-05-DS1-0					
<b>DATA SHEET – A &amp; B</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 3.05 SA 312 TP 304 (ERW) Bidder to specify 15 D  10 D: 5 D <input type="checkbox"/> HORIZONTAL <input type="checkbox"/> VERTICAL UP <input type="checkbox"/> VERTICAL DOWN	..... ..... ..... .....		
OTHER INFORMATION	IBR CERTIFICATION  TOTAL WEIGHT OF FLOW ELEMENT AND ACCESSORIES	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED			
NAME SIGNATURE DATE	PREPARED BY	CHECKED BY	APPROVED BY	COMPANY SEAL	
	SSV 13/06/2013	IJS 13/06/2013	IJS 13/06/2013		
<b>NOTES:</b> 1. FLOW ELEMENT ACCURACY IS REQUIRED AT 68 T/HR & 21 T/HR FLOW VALUES. 2. RECOMMENDED RANGE IS 0 – 80 T/HR.					

SPECIFICATION NO.: PE-TS-392-145-I005A

SECTION

REV. NO.

06

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SHEET

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Data Sheet No. PES-145-05-DS1-0

## DATA SHEET – A & B

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

GENERAL \*

PROJECT
OFFER REFERENCE
QUANTITY
SERVICE
MAKE : MODEL :

RRUVNL - 2X660MW SURATGARH STPP.STAGE-V

Bidder to specify  
01 PER UNIT (2 FOR STATION)  
**SCS DISCHARGE HEADER**  
Bidder to specify

ELEMENT

TYPE  
STANDARD  
DESIGN

MATERIAL  
BETA RATIO  
BORE DIAMETER  
VENT HOLE  
DRAIN HOLE

☐ ORIFICE                      ☐ NOZZLE  
☐ ASME PTC 19.5   ☒ BS 1042   ☐ OTHER  
☒ SQ EDGE ,CONCENTRIC TYPE  
☐ SHORT RADIUS   ☐ LONG RADIUS  
☐ LOW BETA   ☐ HIGH BETA

☒ SS316 ☐ OTHER  
0.5 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: TYPE  
NIPPLE : SIZE/MATL/RATING/QTY  
EXPANDER : SIZE/MATL/QTY

☐ FLANGED                      ☐ BUTT WELD END  
☐ WELD NECK   ☐ SLIP ON   ☐ THREADED  
 ANSI-300#        :    ASTM A106  
☐ YES            ☐ NO  
 NOT APPLICABLE  
☐ 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   ☐ SS   :   ☐ ANSI # 800 : GLOBE  
 15NB/ SS316/SCH.80/6 NOS. ; 250mm LONG  
 NOT APPLICABLE

## PROCESS DATA

FLUID

FLOW (T/HR)

PRESSURE (KG/CM<sup>2</sup> (A))

TEMPERATURE (DEG. C.)

DESIGN PRESS : TEMP

MAX. ALLOWABLE PRESS LOSS

DIFF. PRESS AT MAX FLOW

<input type="checkbox"/> CONDENSATE <input type="checkbox"/> FEED WATER <input type="checkbox"/> STEAM <input checked="" type="checkbox"/> ACW <input type="checkbox"/> OTHER		
MAX.	NORMAL	MINIMUM
3603	2771	835
7.5	4.2	3.2
60	36	36
7.5 Kg/cm <sup>2</sup> (g) : 60 °C		
0.15 Kg/cm <sup>2</sup>		

Bidder to specify



# DATA SHEET FOR FLOW ELEMENTS (ORIFICE) FOR 2 X 660 MW SURATGARH STPS

SPECIFICATION NO.: PE-TS-392-145-I005A

VOLUME

SECTION

REV. NO.

06

DATE 27.02.14

SHEET

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Tag No. : **PCB10 BP001**

Data 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

711 x 10  
Carbon Steel IS 2062  
Bidder to specify

10 D : 5 D

☒ HORIZONTAL ☐ VERTICAL UP  
☐ VERTICAL DOWN

.....  
.....  
.....  
.....

OTHER  
INFORMATION

IBR CERTIFICATION  
  
TOTAL WEIGHT OF FLOW ELEMENT  
AND ACCESSORIES

☐ REQUIRED ☒ NOT REQUIRED

### NOTES:

1. FLOW ELEMENT ACCURACY IS REQUIRED BETWEEN 835 T/HR TO 3602 T/HR.
2. RECOMMENDED RANGE IS 0 – 3602 T/HR.





# **DATA SHEET FOR FLOW ELEMENTS (ORIFICE) FOR 2 X 660 MW SURATGARH STPS**

SPECIFICATION NO.: PE-TS-392-145-I005A

VOLUME

SECTION

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06

DATE 27.02.14

SHEET

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Tag No. : **PGC10BP001**

Data 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

610 x 8.0  
Carbon Steel IS 2062  
Bidder to specify

10 D : 5 D  
☐ HORIZONTAL ☐ VERTICAL UP  
☐ VERTICAL DOWN

.....  
.....  
.....  
.....

OTHER  
INFORMATION

IBR CERTIFICATION  
  
TOTAL WEIGHT OF FLOW ELEMENT  
AND ACCESSORIES

☐ REQUIRED ☒ NOT REQUIRED

### **NOTES:**

1. FLOW ELEMENT ACCURACY IS REQUIRED BETWEEN 565 T/HR TO 2440 T/HR.
2. RECOMMENDED RANGE IS 0 – 2440 T/HR.

SPECIFICATION NO.: PE-TS-392-145-I005A

VOLUME

SECTION

REV. NO.

06

DATE 27.02.14

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Tag No. : **PGC40BP001**

Data 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	OFFER REFERENCE	QUANTITY	SERVICE	MAKE : MODEL
---------	-----------------	----------	---------	--------------

**RUVNL - 2X660 MW SURATGARH**  
Bidder to specify  
**ONE (1) PER UNIT (2 FOR STATION)**  
**DMCW (SG) PUMP DISCHARGE HEADER**  
Bidder to specify

ELEMENT

MAKE : MODEL  
TYPE  
STANDARD  
DESIGN

MATERIAL  
BETA RATIO  
BORE DIAMETER  
VENT HOLE  
DRAIN HOLE

Bidder to specify

☐ ORIFICE ☐ NOZZLE

☐ ASME PTC 19.5 ☐ BS 1042 ☐ OTHER

☐ SQ EDGE, CONCENTRIC TYPE

☐ SHORT RADIUS ☐ LONG RADIUS

☐ LOW BETA ☐ HIGH BETA

☐ SS316 ☐ OTHER

0.5 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: TYPE  
NIPPLE : SIZE/MATL/RATING/QTY  
EXPANDER : SIZE/MATL/QTY

☐ FLANGED                    ☐ BUTT WELD END  
☐ WELD NECK   ☐ SLIP ON   ☐ THREADED  
 ANSI-300# : ASTM A106  
☐ YES       ☐ NO  
 NOT APPLICABLE  
☐ 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   ☐ SS : ☐ ANSI # 800 : GLOBE  
 15NB/ SS316/SCH.80/6 NOS. ; 250mm LONG  
 NOT APPLICABLE

## PROCESS DATA

FLUID

☐ CONDENSATE    ☐ FEED WATER  
☐ STEAM    ☒ DMCW    ☐ OTHER

MAX.                      NORMAL                      MINIMUM

910                      696                      210

12	8.5	7.5
----	-----	-----

60	46.1	46.1
----	------	------

12 Kg/cm<sup>2</sup>(g) : 60 °C

0.15 Kg/cm<sup>2</sup>

Bidder to specify



# **DATA SHEET FOR FLOW ELEMENTS (ORIFICE) FOR 2 X 660 MW SURATGARH STPS**

SPECIFICATION NO.: PE-TS-392-145-I005A

VOLUME

SECTION

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06

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SHEET

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Tag No. : **PGC40BP001**

Data 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

355.6 x 7.1  
Carbon Steel IS 2062  
Bidder to specify

10 D : 5 D  
☒ HORIZONTAL ☐ VERTICAL UP  
☐ VERTICAL DOWN

.....  
.....  
.....  
.....

OTHER  
INFORMATION

IBR CERTIFICATION  
  
TOTAL WEIGHT OF FLOW ELEMENT  
AND ACCESSORIES

☐ REQUIRED ☒ NOT REQUIRED

TO BE REFLECTED IN VENDOR DOCUMENT

### **NOTES:**

1. FLOW ELEMENT ACCURACY IS REQUIRED BETWEEN 210 T/HR TO 910 T/HR.
2. RECOMMENDED RANGE IS 0 – 910 T/HR.



	<b>DATA SHEET FOR FLOW ELEMENTS (ORIFICE) FOR 2 X 660 MW SURATGARH STPS</b>		SPECIFICATION NO.: PE-TS-392-145-I005A	
			VOLUME	
			SECTION	
			REV. NO. 06	DATE 27.02.14
			SHEET 36 of 43	
Tag No. : <b>GHD10BP001</b> <span style="float: right;">Data Sheet No. PES-145-05-DS1-0</span> <b>DATA SHEET – A &amp; B</b>				
<b>DATA SHEET – A (TO BE FILLED UP BY PURCHASER)</b>			<b>DATA SHEET – B (TO BE FILLED UP BY BIDDER)</b>	
GENERAL*	PROJECT	<b>RRUVNL - 2X660 MW SURATGARH</b>	.....	
	OFFER REFERENCE	Bidder to specify	.....	
	QUANTITY	ONE (1) FOR STATION	.....	
	SERVICE	<b>RAW WATER PUMP DISCHARGE HEADER</b>	.....	
	MAKE : MODEL	Bidder to specify	.....	
ELEMENT	MAKE : MODEL	Bidder to specify	.....	
	TYPE	<input type="checkbox"/> ORIFICE <input type="checkbox"/> NOZZLE	.....	
	STANDARD	<input type="checkbox"/> ASME PTC 19.5 <input checked="" type="checkbox"/> BS 1042 <input type="checkbox"/> OTHER	.....	
	DESIGN	<input checked="" type="checkbox"/> SQ EDGE ,CONCENTRIC TYPE	.....	
		<input type="checkbox"/> SHORT RADIUS <input type="checkbox"/> LONG RADIUS	.....	
		<input type="checkbox"/> LOW BETA <input type="checkbox"/> HIGH BETA	.....	
	MATERIAL	<input checked="" type="checkbox"/> SS316 <input type="checkbox"/> OTHER	.....	
	BETA RATIO	0.5 TO 0.7	.....	
	BORE DIAMETER	Bidder to specify	.....	
	VENT HOLE	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	.....	
	DRAIN HOLE	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	.....	
END CONNECTION	TYPE	<input checked="" type="checkbox"/> FLANGED <input checked="" type="checkbox"/> BUTT WELD END	.....	
	FLANGE TYPE	<input checked="" type="checkbox"/> WELD NECK <input type="checkbox"/> SLIP ON <input type="checkbox"/> THREADED	.....	
	FLANGE RATING : MATERIAL	ANSI -300 # : ASTM A106	.....	
	BRANCH PIPE	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	.....	
	BRANCH PIPE MATERIAL	NOT APPLICABLE	.....	
	TAPPING LOCATION	<input type="checkbox"/> D&D/2 <input type="checkbox"/> CORNER <input type="checkbox"/> VENTA CONTRACTA	.....	
		<input checked="" type="checkbox"/> ON FLANGE	.....	
		<input 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 type="checkbox"/> 12 <input type="checkbox"/> 8 <input checked="" type="checkbox"/> 6 <input type="checkbox"/> 4 : <input checked="" type="checkbox"/> 15 NB <input type="checkbox"/> 25 NB	.....	
	ROOT VALVE MATERIAL : RATING: TYPE	<input type="checkbox"/> CS <input type="checkbox"/> AS <input checked="" type="checkbox"/> SS : <input type="checkbox"/> ANSI # 800 : GLOBE	.....	
	NIPPLE : SIZE/MATL/RATING/QTY	15NB/SS316/SCH.80/6 NOS. ; 250mm LONG	.....	
	EXPANDER : SIZE/MATL/QTY	NOT APPLICABLE	.....	
PROCESS DATA	FLUID	<input type="checkbox"/> CONDENSATE <input type="checkbox"/> FEED WATER	.....	
		<input type="checkbox"/> STEAM <input type="checkbox"/> DMCW <input checked="" type="checkbox"/> OTHER (Raw Water)	.....	
		MAX. NORMAL MINIMUM	.....	
	FLOW (T/HR)	4825 3710 1115	.....	
	PRESSURE (KG/CM <sup>2</sup> (A))	10 2.2 1.5	.....	
	TEMPERATURE (DEG. C.)	60 38 38	.....	
	DESIGN PRESS : TEMP	10 Kg/cm <sup>2</sup> (g) : 60 °C	.....	
	MAX. ALLOWABLE PRESS LOSS	0.15 Kg/cm <sup>2</sup>	.....	
	DIFF. PRESS AT MAX FLOW	Bidder to specify	.....	



# **DATA SHEET FOR FLOW ELEMENTS (ORIFICE) FOR 2 X 660 MW SURATGARH STPS**

SPECIFICATION NO.: PE-TS-392-145-I005A

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Tag No. : **GHD10BP001**

Data 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

813 X 10  
Carbon Steel IS 2062  
Bidder to specify

10 D : 5 D  
☒ HORIZONTAL ☐ VERTICAL UP  
☐ VERTICAL DOWN

.....  
.....  
.....  
.....  
.....

OTHER  
INFORMATION

IBR CERTIFICATION  
  
TOTAL WEIGHT OF FLOW ELEMENT  
AND ACCESSORIES

☐ REQUIRED ☒ NOT REQUIRED

TO BE REFLECTED IN THE VENDOR  
DOCUMENT

### **NOTES:**

1. FLOW ELEMENT ACCURACY IS REQUIRED BETWEEN 1115 T/HR TO 4825 T/HR.
2. RECOMMENDED RANGE IS 0 – 4825 T/HR.

	<b>DATA SHEET FOR FLOW ELEMENTS (ORIFICE) FOR 2 X 660 MW SURATGARH STPS</b>	SPECIFICATION NO.: PE-TS-392-145-I005A	
		VOLUME	
		SECTION	
		REV. NO. 06	DATE 27.02.14
		SHEET 38 of 43	
Tag No. : <b>GHD15BP001</b> <span style="float: right;">Data Sheet No. PES-145-05-DS1-0</span>			
<b>DATA SHEET – A &amp; B</b>			
<b>DATA SHEET – A (TO BE FILLED UP BY PURCHASER)</b>			<b>DATA SHEET – B (TO BE FILLED UP BY BIDDER)</b>
GENERAL	PROJECT	<b>RRUVNL - 2X660 MW SURATGARH</b>	.....
	OFFER REFERENCE	Bidder to specify	.....
GENERAL	QUANTITY	ONE (1) FOR STATION	.....
	SERVICE	<b>ASH WATER PUMP DISCHARGE HEADER</b>	.....
GENERAL	MAKE : MODEL	Bidder to specify	.....
			.....
ELEMENT	MAKE : MODEL	Bidder to specify	.....
	TYPE	<input type="checkbox"/> ORIFICE <input type="checkbox"/> NOZZLE	.....
ELEMENT	STANDARD	<input type="checkbox"/> ASME PTC 19.5 <input checked="" type="checkbox"/> BS 1042 <input type="checkbox"/> OTHER	.....
	DESIGN	<input checked="" type="checkbox"/> SQ EDGE ,CONCENTRIC TYPE	.....
ELEMENT		<input type="checkbox"/> SHORT RADIUS <input type="checkbox"/> LONG RADIUS	.....
		<input type="checkbox"/> LOW BETA <input type="checkbox"/> HIGH BETA	.....
ELEMENT	MATERIAL	<input checked="" type="checkbox"/> SS316 <input type="checkbox"/> OTHER	.....
	BETA RATIO	0.5 TO 0.7	.....
ELEMENT	BORE DIAMETER	Bidder to specify	.....
	VENT HOLE	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	.....
ELEMENT	DRAIN HOLE	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	.....
			.....
END CONNECTION	TYPE	<input checked="" type="checkbox"/> FLANGED <input checked="" type="checkbox"/> BUTT WELD END	.....
	FLANGE TYPE	<input checked="" type="checkbox"/> WELD NECK <input type="checkbox"/> SLIP ON <input type="checkbox"/> THREADED	.....
END CONNECTION	FLANGE RATING : MATERIAL	ANSI -300 # : ASTM A106	.....
	BRANCH PIPE	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	.....
END CONNECTION	BRANCH PIPE MATERIAL	NOT APPLICABLE	.....
	TAPPING LOCATION	<input type="checkbox"/> D&D/2 <input type="checkbox"/> CORNER <input type="checkbox"/> VENTA CONTRACTA	.....
END CONNECTION		<input checked="" type="checkbox"/> ON FLANGE	.....
		<input type="checkbox"/> ON PIPE <input type="checkbox"/> ON CARRIER RING	.....
END CONNECTION	NUMBER OF TAPPINGS	<input checked="" 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 checked="" type="checkbox"/> 6 <input type="checkbox"/> 4 : <input checked="" type="checkbox"/> 15 NB <input type="checkbox"/> 25 NB	.....
END CONNECTION	ROOT VALVE MATERIAL : RATING: TYPE	<input type="checkbox"/> CS <input type="checkbox"/> AS <input checked="" type="checkbox"/> SS : <input type="checkbox"/> ANSI # 800 : GLOBE	.....
	NIPPLE : SIZE/MATL/RATING/QTY	15NB/SS316/SCH.80/6 NOS. ; 250mm LONG	.....
END CONNECTION	EXPANDER : SIZE/MATL/QTY	NOT APPLICABLE	.....
			.....
PROCESS DATA	FLUID	<input type="checkbox"/> CONDENSATE <input type="checkbox"/> FEED WATER	.....
		<input type="checkbox"/> STEAM <input type="checkbox"/> DMCW <input checked="" type="checkbox"/> OTHER (Raw Water)	.....
PROCESS DATA		MAX. NORMAL MINIMUM	.....
	FLOW (T/HR)	875 670 205	.....
PROCESS DATA	PRESSURE (KG/CM <sup>2</sup> (A))	10 2.2 1.5	.....
	TEMPERATURE (DEG. C.)	60 38 38	.....
PROCESS DATA	DESIGN PRESS : TEMP	10 Kg/cm <sup>2</sup> (g) : 60 °C	.....
	MAX. ALLOWABLE PRESS LOSS	0.15 Kg/cm <sup>2</sup>	.....
PROCESS DATA	DIFF. PRESS AT MAX FLOW	Bidder to specify	.....
			.....



# **DATA SHEET FOR FLOW ELEMENTS (ORIFICE) FOR 2 X 660 MW SURATGARH STPS**

SPECIFICATION NO.: PE-TS-392-145-I005A

VOLUME

SECTION

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06

DATE 27.02.14

SHEET

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Tag No. : **GHD15BP001**

Data 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

355.6 X 7.1  
Carbon Steel IS 2062  
Bidder to specify

10 D : 5 D  
☒ HORIZONTAL ☐ VERTICAL UP  
☐ VERTICAL DOWN

.....  
.....  
.....  
.....  
.....

OTHER  
INFORMATION

IBR CERTIFICATION  
  
TOTAL WEIGHT OF FLOW ELEMENT  
AND ACCESSORIES

☐ REQUIRED ☒ NOT REQUIRED

TO BE REFLECTED IN THE VENDOR  
DOCUMENT

### **NOTES:**

1. FLOW ELEMENT ACCURACY IS REQUIRED BETWEEN 205 T/HR TO 875 T/HR.
2. RECOMMENDED RANGE IS 0 – 875 T/HR.

	<b>DATA SHEET FOR FLOW ELEMENTS (ORIFICE) FOR 2 X 660 MW SURATGARH STPS</b>		SPECIFICATION NO.: PE-TS-392-145-I005A	
			VOLUME	
			SECTION	
			REV. NO. 06	DATE 27.02.14
			SHEET 40 of 43	
Tag No. : <b>GHD62BP001</b> <span style="float: right;">Data Sheet No. PES-145-05-DS1-0</span>				
<b>DATA SHEET – A &amp; B</b>				
<b>DATA SHEET – A (TO BE FILLED UP BY PURCHASER)</b>			<b>DATA SHEET – B (TO BE FILLED UP BY BIDDER)</b>	
GENERAL*	PROJECT	<b>RRUVNL - 2X660 MW SURATGARH</b>		.....
	OFFER REFERENCE	Bidder to specify		.....
ELEMENT	QUANTITY	ONE (1) FOR STATION		.....
	SERVICE	<b>CW M/UP PUMP DISCHARGE HEADER</b>		.....
END CONNECTION	MAKE : MODEL	Bidder to specify		.....
	MAKE : MODEL	<input type="checkbox"/> ORIFICE <input type="checkbox"/> NOZZLE <input type="checkbox"/> ASME PTC 19.5 <input checked="" type="checkbox"/> BS 1042 <input type="checkbox"/> OTHER <input checked="" type="checkbox"/> SQ EDGE ,CONCENTRIC TYPE <input type="checkbox"/> SHORT RADIUS <input type="checkbox"/> LONG RADIUS <input type="checkbox"/> LOW BETA <input type="checkbox"/> HIGH BETA		.....
PROCESS DATA	MATERIAL	<input checked="" type="checkbox"/> SS316 <input type="checkbox"/> OTHER		.....
	BETA RATIO	0.5 TO 0.7		.....
PROCESS DATA	BORE DIAMETER	Bidder to specify		.....
	VENT HOLE	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		.....
PROCESS DATA	DRAIN HOLE	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		.....
	TYPE	<input checked="" type="checkbox"/> FLANGED <input checked="" type="checkbox"/> BUTT WELD END <input checked="" type="checkbox"/> WELD NECK <input type="checkbox"/> SLIP ON <input type="checkbox"/> THREADED ANSI –300 #   :   ASTM A106 <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO NOT APPLICABLE <input type="checkbox"/> D&D/2 <input type="checkbox"/> CORNER <input type="checkbox"/> VENTA CONTRACTA <input checked="" type="checkbox"/> ON FLANGE <input type="checkbox"/> ON PIPE <input type="checkbox"/> ON CARRIER RING <input checked="" type="checkbox"/> 3 PAIR <input type="checkbox"/> 2 PAIR <input type="checkbox"/> OTHER <input type="checkbox"/> 12 <input type="checkbox"/> 8 <input checked="" type="checkbox"/> 6 <input type="checkbox"/> 4   : <input checked="" type="checkbox"/> 15 NB <input type="checkbox"/> 25 NB <input type="checkbox"/> CS <input type="checkbox"/> AS <input checked="" type="checkbox"/> SS : <input type="checkbox"/> ANSI # 800 : GLOBE 15NB/SS316/SCH.80/6 NOS. ; 250mm LONG NOT APPLICABLE		.....
PROCESS DATA	FLANGE TYPE	<input type="checkbox"/> CONDENSATE <input type="checkbox"/> FEED WATER <input type="checkbox"/> STEAM <input checked="" type="checkbox"/> CW <input type="checkbox"/> OTHER		.....
	FLANGE RATING : MATERIAL	MAX.                      NORMAL                      MINIMUM 4160                      3200                      960 10                      1.5                      1.0 60                      38                      38 10 Kg/cm <sup>2</sup> (g) : 60 °C 0.15 Kg/cm <sup>2</sup> Bidder to specify		.....
PROCESS DATA	BRANCH PIPE			.....
	BRANCH PIPE MATERIAL			.....
PROCESS DATA	TAPPING LOCATION			.....
	NUMBER OF TAPPINGS			.....
PROCESS DATA	ROOT VALVE NUMBER : SIZE			.....
	ROOT VALVE MATERIAL : RATING: TYPE			.....
PROCESS DATA	NIPPLE : SIZE/MATL/RATING/QTY			.....
	EXPANDER : SIZE/MATL/QTY			.....



# **DATA SHEET FOR FLOW ELEMENTS (ORIFICE) FOR 2 X 660 MW SURATGARH STPS**

SPECIFICATION NO.: PE-TS-392-145-I005A

VOLUME

SECTION

REV. NO.

06

DATE 27.02.14

SHEET

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Tag No. : **GHD62BP001**

Data 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

711 X 10  
Carbon Steel IS 2062  
Bidder to specify

10 D : 5 D  
☒ HORIZONTAL ☐ VERTICAL UP  
☐ VERTICAL DOWN

.....  
.....  
.....  
.....  
.....

OTHER  
INFORMATION


IBR CERTIFICATION  
  
TOTAL WEIGHT OF FLOW ELEMENT  
AND ACCESSORIES

☐ REQUIRED ☒ NOT REQUIRED

TO BE REFLECTED IN THE VENDOR  
DOCUMENT

### **NOTES:**

1. FLOW ELEMENT ACCURACY IS REQUIRED BETWEEN 960 T/HR TO 4160 T/HR.
2. RECOMMENDED RANGE IS 0 – 4160 T/HR.


	<p>Technical specification for <b>FLOW ELEMENT ASSEMBLIES</b> (ORIFICE)</p> <p>SURATGARH, STAGE-V, UNIT # 7 &amp; 8 (2 x 660 MW) THERMAL POWER</p>	SPECIFICATION NO. <b>PE-TS-392-145-I 005A</b>	
		VOLUME <b>II-B</b>	
		SECTION <b>D</b>	
		REV. NO. 00	DATE: 07.04.2014
		SHEET	


## SECTION – D

## DATA SHEETS - C

	<b>DATA SHEET FOR FLOW MEASURING DEVICES (ORIFICE)</b>  <b>SURATGARH, STAGE-V, UNIT # 7 &amp; 8 (2 x 660 MW) THERMAL POWER.</b>		SPECIFICATION NO.: <b>PE-TS-392-145-I 005A</b>	
			VOLUME III	
			SECTION	
			REV. NO. 00	DATE: 05.04.2014
			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) (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 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			

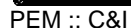


	<b>DATA SHEET FOR FLOW MEASURING DEVICES (ORIFICE)</b>  <b>SURATGARH, STAGE-V, UNIT # 7 &amp; 8 (2 x 660 MW) THERMAL POWER.</b>			SPECIFICATION NO.: <b>PE-TS-392-145-I 005A</b>	
				VOLUME III	
				SECTION	
				REV. NO. 00	DATE: 05.04.2014
				SHEET 2 OF 2	
TAG No. .... Qty.....			Data Sheet No.: <b>PES-145-05-DS2-0</b>		
<b>Data Sheet C</b>					
DATA SHEET-C FOR FLOW MEASURING DEVICES (ORIFICE & NOZZLES) (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	

	<b>Technical specification for FLOW ELEMENT ASSEMBLY (ORIFICE)</b>		SPECIFICATION NO. <b>PE-TS-392-145-I 005A</b>	
			VOLUME <b>II-B</b>	
			SECTION <b>D</b>	
			REV. NO. 00	DATE: 07.04.2014
	<b>SURATGARH, STAGE-V, UNIT # 7 &amp; 8 (2 x 660 MW) THERMAL POWER</b>		SHEET	

## SECTION – D

# QUALITY PLAN



QUALITY PLAN NO.: PE-QP-392-145-I024

IIB

D

00

DATE: 24.06.13

6

OF

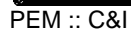
6

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency <sup>\$</sup>			Remarks
									P	W	V	
1.0	<b>MATERIAL</b> Orifice Plate	1. Physical, Chemical properties	MA	Physical, Chemical Tests	One / Plate OR One/ Heat	AP / DS / SP	AP / DS / SP	Lab Report	3/2	---	2,1	IBR certification (if applicable) to be verified by BHEL
1.1		2. Dimensions	MA	Measurement	100%	AP	AP	IR	3/2	---	1	
1.2	<b>Flanges</b> A. Forgings	Chemical, Mech Properties, UT & Heat Treatment	MA	Chem & Mech UT test	Sample	Material Spec as per ASTM A 388 for UT	ANSI B 16.34	MTC, UT cert, HT cert	3/2	---	1	
	B. Machining	Dimensions	MA	Measurement	100 %	AP / DS	AP / DS	IR	3/2	----	1	
2.0	<b>IN PROCESS</b> Machine	1. Dimension	MA	Measurement	100%	AP	AP	IR	3/2	2	2	
		2. Surface finish	MA	Visual	100%	-----	Mirror Finish	-----	3/2	2	---	
		3. Surface flaw on machined surface	MA	Penetrant test	100%	ASTM 165 / IS:3658	No surface flaw	IR / TC	3/2	2	1	
3.0	<b>ASSEMBLY and FINAL INSPECTION</b>	1. Overall dimensions	MA	Measurement	100%	AP	AP	IR	3/2	2,1	----	
		2. Marking, Tag no. Direction of flow	MA	Visual	100%	AP / DS	AP / DS	IR	3/2	2	1	
		3. Calibration	MA	Performance Test	One per type	-----	SP	TC	3/2	---	1	
		4. Painting	MA	Visual	100%	SP / MS	SP / MS	IR / MR	3/2	-----	1	

IR - Inspection Reports      DS – Data Sheet  
TC - Test Certificates      SP – Tech. Spec.  
AP – Approved Drawings/doc

\$ P - Agency Performing the Test.  
W - Agency Witnessing the Test.  
V - Agency Verifying the Test.

- 1 - BHEL
- 2 - Vendor
- 3 - Sub-vendor



QUALITY PLAN NO.: PE-QP-392-145-I024

VOLUME	IIB
--------	-----

SECTION	D
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REV. NO. 00

DATE: 24.06.13

SHEET 7

OF 7

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency <sup>\$</sup>			Remarks
									P	W	V	
4.0	PACKING	Soundness of Packing against transit damage	MA	Visual	100%	SP / MS	SP / MS	----	3/2	----	----	Refer Note 4

**NOTE:**


1. All test reports & dimension reports shall be verified by BHEL wherever verification is by BHEL at the time of Final Inspection.
2. Minimum 2 coats of primer paint to be applied before dispatch.
3. CALIBRATION Test to be carried out at IIT-DELHI / FCRI or BHEL approved laboratory.
4. Sea Worthy packing, if applicable.

LEGEND: \* CR - Critical characteristics IR - Inspection Reports DS – Data Sheet  
MA - Major characteristics TC - Test Certificates SP – Tech. Spec.  
MI - Minor characteristics AP – Approved Drawings/doc

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


	<b>Technical specification for FLOW ELEMENT ASSEMBLIES (ORIFICE)</b>		SPECIFICATION NO. <b>PE-TS-392-145-I 005A</b>	
			VOLUME <b>II-B</b>	
			SECTION <b>D</b>	
			REV. NO. 00	DATE: 07.04.2014
	<b>SURATGARH, STAGE-V, UNIT # 7 &amp; 8 (2 x 660 MW) THERMAL POWER</b>		SHEET	

## **SECTION – D**

# **BILL OF QUANTITY**

## **INCLUDING**

## **SPARES**

	<b>Technical specification for FLOW ELEMENT ASSEMBLIES (Orifice)</b>		SPECIFICATION NO. PE-TS-392-145-I 005A	
			VOLUME <b>II-B</b>	
	<b>SURATGARH, STAGE-V, UNIT # 7 &amp; 8 (2 x 660 MW) THERMAL POWER</b>		SECTION <b>D</b>	
			REV. NO. 00	DATE: 07.04.2014
			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 For 2 units
i)	LCA01BP001, LCA02BP001, LCA03BP001	CEP A/B/C DISCHARGE FLOW	ORIFICE	03	06
ii)	LCA20BP001	CONDENSATE FLOW D/S OF GSC	ORIFICE	01	02
iii)	LCR80BP001	DM M/UP TO HOTWELL	ORIFICE	01	02
iv)	LCP01BP001	DM WATER TO CST INLET	ORIFICE	01	02
v)	PCB10BP011	SCS DISCHARGE HEADER	ORIFICE	01	02
vi)	PGC10BP100	DMCW (TG) PUMP DISCHARGE HEADER	ORIFICE	01	02
vii)	PGC40BP100	DMCW (SG) PUMP DISCHARGE HEADER	ORIFICE	01	02
viii)	00GHD10BP011	RAW WATER PUMP DISCHARGE HEADER (Common for 2 units)	ORIFICE	01	01
ix)	00GHD15BP011	ASH WATER PUMP DISCHARGE HEADER (Common for 2 units)	ORIFICE	01	01
x)	00GHD62BP011	CW M/UP PUMP DISCHARGE HEADER (Common for 2 units)	ORIFICE	01	01
xi)	LCA92BP001	CONDENSATE FLOW TO DEAERATOR	ORIFICE	01	02

**[B] START-UP / COMMISSIONING SPARES FOR FLOW ELEMENT ASSEMBLIES**

S.No	DESCRIPTION	TOTAL QTY
1	PAIR OF GASKETS FOR FLOW ORIFICES	ONE (1) PAIR FOR EACH TAG FOR EACH UNIT

**[C] MANDATORY SPARES FOR FLOW ELEMENT – ORIFICE PLATE**

S. No.	SERVICE	TYPE OF ASSY	TOTAL QTY (IN NOS.)
i)	CEP A/B/C DISCHARGE FLOW	ORIFICE	02
ii)	CONDENSATE FLOW D/S OF GSC	ORIFICE	02
iii)	DM M/UP TO HOTWELL	ORIFICE	02
iv)	DM WATER TO CST INLET	ORIFICE	02
v)	SCS DISCHARGE HEADER	ORIFICE	02
vi)	CW M/UP PUMP DISCHARGE HEADER	ORIFICE	02
vii)	DMCW (TG) PUMP DISCHARGE HEADER	ORIFICE	02
viii)	DMCW (SG) PUMP DISCHARGE HEADER	ORIFICE	02
ix)	RAW WATER PUMP DISCHARGE HEADER	ORIFICE	02
x)	ASH WATER PUMP DISCHARGE HEADER	ORIFICE	02
xi)	CONDENSATE FLOW TO DEAERATOR	ORIFICE	02

	<b>Technical specification for FLOW ELEMENT ASSEMBLIES</b>		SPECIFICATION NO. <b>PE-TS-392-145-I 005A</b>	
			VOLUME <b>III</b>	
	<b>SURATGARH, STAGE-V, UNIT # 7 &amp; 8 (2 x 660 MW) THERMAL POWER</b>		SECTION	
			REV. NO. 00	DATE: 07.04.2014
			SHEET 1	OF 1

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

<b>1. <u>ZERO DATE</u></b>	<b><u>DATE of LOI / FOI / TOI</u></b>
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 ASSEMBLIES  
(ORIFICE)**


**VOLUME III**

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



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



	<p>Technical specification for <b>FLOW ELEMENT ASSEMBLIES (ORIFICE)</b></p> <p><b>SURATGARH, STAGE-V, UNIT # 7 &amp; 8 (2 x 660 MW) THERMAL POWER</b></p>	SPECIFICATION NO. <b>PE-TS-392-145-I 005A</b>	
		VOLUME <b>III</b>	
		SECTION	
		REV. NO. 00	DATE: 07.04.2014
		SHEET	

## CONTENTS

### VOL-III

S. No.	DESCRIPTION	No. of sheets
1	COMPLAINCE CERTIFICATES	1
2	SCHEDULE OF PRICES	1
3	SCHEDULE OF UNIT PRICES	1
4	INSPECTION SCHEDULE	1
5	CALIBERATION CHARGES	1

## COMPLIANCE CERTIFICATE

For

Flow Elements assemblies

**(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 005A**

**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	

	<b>Technical specification for FLOW ELEMENT ASSEMBLIES (Orifice)</b>		SPECIFICATION NO. <b>PE-TS-392-145-I 005A</b>	
			VOLUME <b>III</b>	
	<b>SURATGARH, STAGE-V, UNIT # 7 &amp; 8 (2 x 660 MW) THERMAL POWER</b>		SECTION	
			REV. NO. 00	DATE: 07.04.2014
			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)	LCA01BP001, LCA02BP001, LCA03BP001	CEP A/B/C DISCHARGE FLOW	ORIFICE		
ii)	LCA20BP001	CONDENSATE FLOW D/S OF GSC	ORIFICE		
iii)	LCR80BP001	DM M/UP TO HOTWELL	ORIFICE		
iv)	LCR70BP001	DM WATER TO CST INLET	ORIFICE		
v)	PCB10BP011	SCS DISCHARGE HEADER	ORIFICE		
vi)	00GHD62BP001	CW M/UP PUMP DISCHARGE HEADER	ORIFICE		
vii)	PGC10BP100	DMCW (TG) PUMP DISCHARGE HEADER	ORIFICE		
viii)	PGC40BP100	DMCW (SG) PUMP DISCHARGE HEADER	ORIFICE		
ix)	00GHD10BP011	RAW WATER PUMP DISCHARGE HEADER	ORIFICE		
x)	00GHD15BP011	ASH WATER PUMP DISCHARGE HEADER	ORIFICE		
xi)	LCA92BP001	CONDENSATE FLOW TO DEAERATOR	ORIFICE		

**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.



Technical specification for  
**FLOW ELEMENT ASSEMBLIES**  
(ORIFICE)

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

SPECIFICATION NO. **PE-TS-392-145-I 005A**

VOLUME **III**

SECTION

REV. NO. 00

DATE: 07.04.2014


SHEET

**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

	<b>Technical specification for FLOW ELEMENT ASSEMBLIES (ORIFICE)</b>		SPECIFICATION NO. <b>PE-TS-392-145-I 005A</b>	
			VOLUME <b>III</b>	
	<b>SURATGARH, STAGE-V, UNIT # 7 &amp; 8 (2 x 660 MW) THERMAL POWER</b>		SECTION	
			REV. NO. 00	DATE: 07.04.2014
			SHEET	

### SCHEDULE OF PRICES FOR FLOW ELEMENT (ORIFICE)

**[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	Unit Price for each ASSY. (Rs) (Ex-works)	Total price of flow assemblies (Rs.) (PER UNIT) (Ex-works)
i)	LCA01BP001	CEP A DISCHARGE FLOW	ORIFICE		
ii)	LCA02BP001	CEP B DISCHARGE FLOW	ORIFICE		
iii)	LCA03BP001	CEP C DISCHARGE FLOW	ORIFICE		
iv)	LCA20BP001	CONDENSATE FLOW D/S OF GSC	ORIFICE		
v)	LCR80BP001	DM M/UP TO HOTWELL	ORIFICE		
vi)	LCP01BP001	DM WATER TO CST INLET-1	ORIFICE		
vii)	PCB10BP011	SCS DISCHARGE HEADER	ORIFICE		
viii)	PGC10BP100	DMCW (TG) PUMP DISCHARGE HEADER	ORIFICE		
ix)	PGC40BP100	DMCW (SG) PUMP DISCHARGE HEADER	ORIFICE		
x)	00GHD10BP011	RAW WATER PUMP DISCHARGE HEADER (COMMON FOR 2 UNITS)	ORIFICE		
xi)	00GHD15BP011	ASH WATER PUMP DISCHARGE HEADER (COMMON FOR 2 UNITS)	ORIFICE		
xii)	00GHD62BP001	CW M/UP PUMP DISCHARGE HEADER (COMMON FOR 2 UNITS)	ORIFICE		
xiii)	LCA92BP001	CONDENSATE FLOW TO DEAERATOR	ORIFICE		

### **[B] START-UP / COMMISSIONING SPARES FOR FLOW ELEMENT ASSEMBLIES**


S. No.	DESCRIPTION	TOTAL QUANTITY
i)	PAIR OF GASKETS FOR FLOW ORIFICES	ONE (1) PAIR FOR EACH TAG FOR EACH UNIT

### **[C] CALIBRATION CHARGES (SEPARATE LIST TO BE ATTACHED)**

### **[D] MANDATORY SPARE (SEPARATE LIST TO BE ATTACHED)**

### **[E] DOCUMENTATION CHARGES**

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

	<b>Technical specification for FLOW ELEMENT ASSEMBLIES (ORIFICE)</b>		SPECIFICATION NO. <b>PE-TS-392-145-I 005A</b>	
			VOLUME <b>III</b>	
	<b>SURATGARH, STAGE-V, UNIT # 7 &amp; 8 (2 x 660 MW) THERMAL POWER</b>		SECTION	
			REV. NO. 00	DATE: 07.04.2014
			SHEET	

## SCHEDULE OF UNIT PRICES

### [A] Unit prices for Gaskets


S.No	DESCRIPTION	For Orifice Tag Nos	Unit Rate (Rs) (ExWorks)
1	PAIR OF GASKETS	LCA01BP001	
		LCA02BP001	
		LCA03BP001	
		LCA20BP001	
		LCR80BP001	
		LCP01BP001	
		PCB10BP011	
		PGC10BP100	
		PGC40BP100	
		00GHD10BP011	
		00GHD15BP011	
		00GHD62BP001	
		LCA92BP001	

### [B] MANDATORY SPARES FOR FLOW ELEMENT: ORIFICE PLATE

SNO	SERVICE (A)	TYPE (B)	Unit price (Ex Works)	Qty (Nos.)	Total Price (Ex- works)
1	CEP DISCHARGE FLOW	ORIFICE		2	
2	CONDENSATE FLOW D/S OF GSC	ORIFICE		2	
3	DM M/UP TO HOTWELL	ORIFICE		2	
4	DM WATER TO CST INLET	ORIFICE		2	
5	SCS DISCHARGE HEADER	ORIFICE		2	
6	CW M/UP PUMP DISCHARGE HEADER	ORIFICE		2	
7	DMCW (TG) PUMP DISCHARGE HEADER	ORIFICE		2	
8	DMCW (SG) PUMP DISCHARGE HEADER	ORIFICE		2	
9	RAW WATER PUMP DISCHARGE HEADER	ORIFICE		2	
10	ASH WATER PUMP DISCHARGE HEADER	ORIFICE		2	
11	CONDENSATE FLOW TO DEAERATOR	ORIFICE		2	

### [C] UNIT PRICES FOR ROOT VALVES AND NIPPLES

S.No	DESCRIPTION	Tag Nos	Unit Rate (Rs) (ExWorks)
1	ROOT VALVES	SS, 15 NB, SW, # 800	
2	NIPPLE	15 NB/SS/SCH 40/12 Nos. 250 mm long	

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		VOLUME <b>III</b>	
		SECTION	
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**[D] DOCUMENTATION CHARGES**

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