


	1 x 800 MW KOTHAGUDAM-FGD	SECTION: C
	TECHNICAL SPECIFICATION FOR FLOW ELEMENT ORIFICE	

**TECHNICAL SPECIFICATION
FOR
FLOW ELEMENT- ORIFICE
(ALONGWITH ACCESSORIES)**

	KOTHAGUDAM-FGD (1X800 MW)		DESG	RK
	JOB NO: 439		CHKD	CM
	REV. NO. 00	DATE: 20.10.2022	APPD	SSB

**TECHNICAL SPECIFICATION
FOR
FLOW ELEMENT ORIFICE
(ALONG WITH ACCESSORIES)**

1 X 800 MW KOTHAGUDAM-FGD

**VOLUME - IIB
SECTIONS-A, C & D**

SPECIFICATION No: PE-TS-439-145-I105A



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



TECHNICAL SPECIFICATION
FOR
FLOW ELEMENT ORIFICE

1X800MW KOTHAGUDAM-FGD

SPEC NO.: PE-TS-439-145-I105A

VOLUME II B


SECTION A

REV. NO. 00

DATE 20.10.2022

SHEET 1 OF 1

SECTION – A
SCOPE OF ENQUIRY

	TECHNICAL SPECIFICATION FOR FLOW ELEMENT-ORIFICE		SPEC NO.: PE-TS-439-145-I105A	
			VOLUME	II B
	1 X 800 MW KOTHAGUDAM-FGD		SECTION	A
			REV. NO.	00
			DATE	20.10.2022
			SHEET	2 OF 2

SCOPE OF ENQUIRY

1.0 SCOPE

- 1.1 This specification covers the Design, Manufacture, calibration, Inspection and Testing at manufacturer's works, proper packing for transportation and delivery to site of the Flow Element Orifice as mentioned in different sections of this specification for 1 X 800 MW KOTHAGUDAM-FGD.
- 1.2 The quality plan enclosed, forms the minimum requirement but not limited to be adhered to by the bidder. Bidder to sign and stamp the same and submit along with the offer as an acceptance.
- 1.3 Scope of supply shall be Flow Element Orifice Assembly along with Accessories as indicated in Specification
- 1.4 Following formats to be signed, stamped with company seal and submitted:
 - a) Complete offer including calculation sheets, catalogues, etc.
 - b) Quality Plan
 - c) Datasheets A & B, duly filled

2.0 GENERAL TECHNICAL INSTRUCTIONS

- 2.1 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.
- 2.2 The omission of specific reference to any component / accessory necessary for the proper performance of the equipment shall not relieve the supplier of the responsibility of providing such facilities to complete the supply within the quoted prices.
- 2.3 BHEL's/Customer's representative shall be given access to the shop in which the equipment is being manufactured or tested and all test records shall be made available to him.
- 2.4 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.



TECHNICAL SPECIFICATION FOR
FLOW ELEMENT ORIFICE

1 X 800 MW KOTHAGUDAM-FGD

SPEC NO.: PE-TS-439-145-I105A

VOLUME II B

SECTION C

REV. NO. 00

DATE 20.10.2022

SHEET

SECTION-C

- SPECIFIC TECHNICAL REQUIREMENT
- CUSTOMER'S SPECIFICATION



**TECHNICAL SPECIFICATION FOR
FLOW ELEMENT ORIFICE**

1 X 800 MW KOTHAGUDAM-FGD

SPEC NO.: PE-TS-439-145-I105A

VOLUME II B

SECTION C

REV. NO. 00

DATE 20.10.2022

SHEET

SPECIFIC TECHNICAL REQUIREMENTS

SPECIFIC TECHNICAL REQUIREMENTS

1.0 This specification covers the Design, Manufacture, Calibration (at approved labs), Inspection and testing at manufacturer's works, proper packing for transportation and delivery to site of the complete Orifice Plate assembly, Start-up/Commissioning Spares as mentioned in different sections of this specification.

2.0 GENERAL INSTRUCTIONS

I. 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.

II. The omission of specific reference to any component / accessory necessary for the proper performance of the equipment's shall not relieve the supplier of the responsibility of providing such facilities to complete the supply within the quoted prices.

III. BHEL's / Customer representatives shall be given access to the shop in which the equipment's are being manufactured or tested and all test records shall be made available to them.

IV. 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.

V. Quality plan to be duly signed and stamped and to be furnished along with the bid as a token of acceptance. **Any deviation w.r.t Quality Plan shall not be acceptable and bid / offer shall be rejected.**

VI. In case of any discrepancy in the requirement within the same or different section, as noted by the bidder in the specification, the same will be brought to the notice of BHEL in the form of pre-bid clarification. In absence of any pre-bid clarification, the more stringent requirement as per interpretation of BHEL/customer shall prevail without any commercial implication.

VII. Scope of supply shall include flow element orifice assembly including flange with nut & bolt, stub, nipples, plug, pair of gasket, spares etc. as indicated in the specification.

3.0 For vertical installation of Orifices (if any), the S-bent impulse pipe shall be supplied by bidder without any commercial implication. The same shall be informed by BHEL during project specific order.

4.0 Inspection will be conducted by BHEL, end customer and/or their authorized representatives as per the agreed inspection schedule. The inspection schedule will be submitted by the bidder for BHEL's approval at contract stage. The cost of all tests and inspections will be deemed to have been included in the contract. For all the type tests "Type Test Certificates" shall be furnished. In the absence of the same, such Tests shall be conducted at the Vendor's works in the presence of BHEL, end customer and/or their authorized representatives or in independent Test House/ Laboratory approved by BHEL.



TECHNICAL SPECIFICATION FOR
FLOW ELEMENT ORIFICE

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SPEC NO.: PE-TS-439-145-I105A

VOLUME II B

SECTION C

REV. NO. 00

DATE 20.10.2022

SHEET

CUSTOMER SPECIFICATION

-
- | | | |
|----------------------------|---|--|
| 9. Cold end sealing | : | SS pot weal with colour coded PTFE headed sleeve insulated flexible tails.
Sealing compound Epoxy resin |
| 10. Minimum bending radius | : | 30 mm |
| 11. Length of T/C | : | 30 Mtr. (minimum) |

Notes:

The specification for thermocouples of bearings metal temp measurements can be as per their manufacturer standards. The manufacturer shall submit the adequate supporting documents for establishing their standard practice. However, type of thermocouples shall be K-type.

6.00.00 **FLOW ELEMENTS**

6.01.00 ORIFICE PLATE

6.01.01 The orifice plate shall be either concentric square edge type or segmental bored type as per type of process .

6.01.02 Manufacturing, installation and use will be in accordance to the standard BS1042.

6.01.03 Orifice plates will be made of type 316 stainless steel.

6.01.04 The plate thickness of the orifice shall be 3 mm minimum. However the orifice thickness shall be determined by the actual process parameter.

ORIFICE FLANGE

6.01.05 Orifice flange rating will be the same as the piping class.

6.01.06 Flange shall be Standard / Slip on / socket weld/ weld neck raised face as per ANSI B 16.5

6.01.07 Gasket shall be CAF type depend on application.

CARRIER RING

6.01.08 Male female carrier ring of SS316 material shall be provided.

-
- 6.01.09 Beyond line size 500 mm, disc type orifice plate will be used.
- PRESSURE TAP
- 6.01.10 Corner taps with Annular Grooves on Carrier Rings as per BS 1042
- 6.01.11 Numbers of tappings as per approved P&IDs of size ½“ NPT shall be provided. However, one pair spare tapping shall also be provided with each orifice.
- VENT HOLE/ DRAIN HOLE
- 6.01.12 Suitable Vent hole for water service shall be provided.
- BETA RATIO
- 6.01.13 The ratio of throat diameter to inlet diameter (beta ratio) of the Orifice will be limited between 0.30 and 0.70.
- ACCURACY
- 6.01.13 Accuracy (uncertainties on discharge coefficient 'c') of flow measurement shall be +/-1% for orifice plates according to BS 1042 except for critical measurement (performance calculation).
- ISOLATION VALVES
- 6.01.14 Each tapping point shall be equipped with one primary isolating valve for low pressure and two primary isolating valves for high pressure installations (greater than 40 bar and/or 450 deg c).
- 6.01.15 Material of isolating valve shall be SS316
- 6.01.16 ½ inch NPT (M) SS316 Nipples shall be used to interface valve with orifice.
- NUTS/BOLTS/ GASKETS
- 6.01.17 Jack bolt shall be provided for easier removal.
- 6.01.18 Studs and nuts material shall be ASTM A193 Gr. B7 / A194 Gr. 2H
- TAGGING
- 6.01.19 Orifice plate will be provided with a Handle. Tag number, orifice plate material, measured bore and id of the pipe will be stamped or deep engraved on the upstream face of the Handle.
-



Technical specification for
Flow Orifice Assembly with Accessories
1 X 800 MW KOTHAGUDAM-FGD

SPEC NO.: **PE-TS-439-145-I105A**

DOCUMENT NO.

VOLUME II B

SECTION C

ISSUE NO. 2

REV. NO. 00

DATE 20.10.2022

COMPLIANCE CERTIFICATE

	<p align="center">Technical specification for Flow Orifice Assembly with Accessories 1 X 800 MW KOTHAGUDAM-FGD</p>	SPEC NO.: PE-TS-439-145-I105A	
		DOCUMENT NO.	
		VOLUME	II B
		SECTION	C
		ISSUE NO.	2
REV. NO.	00	DATE	20.10.2022

COMPLIANCE CERTIFICATE

We shall comply with the following: -

1. All the requirements as stated in Technical Specification / Specific Technical requirement / Data sheets / 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, Nipples, Reducers are suitable for the applicable process parameters.

**(To be Signed &
Stamped by the Bidder)**

Signature with date	
Name	
Company seal	



TECHNICAL SPECIFICATION
FOR
FLOW ELEMENT ORIFICE

1 X 800 MW KOTHAGUDEM FGD

SPEC NO.: PE-TS-439-145-I105A

VOLUME II B

SECTION D

REV. NO. 00

DATE : 20.10.2022

SHEET

SECTION-D

- EQUIPMENT SPECIFICATION
- DATA SHEETS – A & B
- QUALITY PLAN
- BOQ-MAIN SUPPLY
- SPARES



**TECHNICAL SPECIFICATION
FOR
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1 X 800 MW KOTHAGUDEM FGD

SPEC NO.: PE-TS-439-145-I105A

VOLUME II B

SECTION D

REV. NO. 00

DATE : 20.10.2022

SHEET

1.0 SCOPE

This specification covers the design, manufacture, calibration, inspection and testing at the manufacturer's works, proper packing for transportation and delivery to site of flow measuring devices (orifices) 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, ISO 5167 / BS 1042 standard shall be complied with for Flow Orifices.

3.0 TECHNICAL REQUIREMENTS

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

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 BS-1042 / ISO 5167. 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, unless otherwise specified.

3.1.3 Orifice Plate thickness shall be ≥ 3 mm (min.) for pipes having diameter ≤ 250 mm and shall be ≥ 6 mm (min.) for pipes having diameter up to 500 mm and shall be ≥ 10 mm (min.) for pipes having diameter up to 1000mm unless otherwise specified for a specific project.

3.1.4 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 along with corner taps for orifice assembly having sizes ≤ 2 inches (max.), if specified in the data sheet. End flanges along with Counter flanges shall be provided as per requirement. Concentric Square edge orifice shall be provided with downstream beveled edge.

Each flow orifice assembly shall be provided with minimum three pairs of pressure tapping 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.

Extra pressure tapping (other than the three tapping's mentioned above) and other accessories shall be provided.

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

3.1.5 Flanges: The flanges shall conform to latest revisions of ASME B16.36 / ASME B16.47 (B). 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.



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SPEC NO.: PE-TS-439-145-I105A

VOLUME II B

SECTION D

REV. NO. 00

DATE : 20.10.2022

SHEET

3.1.6 Hydraulic test pressure for Assembly shall be 1.5 times of the design pressure at normal temperature.

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

3.2 Guarantee & Performance

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

4.0 TESTS & INSPECTION

4.1 The equipment covered under this specification shall be subject to vendor's quality plan to be approved by the purchaser before start of manufacturing. 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 of each type and size for each project unless specified shall be tested and calibrated by the bidder at customer/BHEL approved laboratory, within his quoted price. Details of the calibration test i.e., type of test, equipment's employed etc. shall be submitted in the bid.

4.4 IBR certification, if required for the specified service shall be obtained by the successful bidder from the concerned authority for submission to the purchaser.

4.5 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 DRAWINGS & DOCUMENTS

(A) With the Technical Bid along with the Enquiry:

Following documents shall be submitted:

- Quality plan duly signed and stamped.
- Datasheet A duly signed and stamped.
- Schedule of submission of Drg. / Doc, Equip. Manufacture, Inspection and Dispatch.
- Inspection schedule.
- Unpriced bid format of Price Schedule.

(B) After the award of project specific contract:

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

- Assembly drawing of all type of Flow Element assemblies complete with all accessories indicating detailed dimensions, BOM and weights.
- Flow Element Edge preparation details.
- Installation drawings for the flow elements.
- Technical Data sheet-C completely filled-up.
- Quality Plan duly signed and stamped.
- Bore size calculations for Flow orifices for all the conditions indicated in the data sheets.
- Differential Pressure Vs Flow, curve for each Orifice.



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SPEC NO.: PE-TS-439-145-I105A

VOLUME II B

SECTION D

REV. NO. 00

DATE : 20.10.2022

SHEET

- 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 for a project:

Final documentation shall contain 20 sets with 4 CD-ROMS of each of the following:

1. Category –I & IV Approved final drawings/data sheets, Bore sizing calculations, DP Vs Flow Curve for each Orifice.
2. Verified test certificates
3. Approved Quality Plan
4. Calibrations Reports
5. Quality Inspection Report
6. Operation & Maintenance Manuals for Flow Element Assemblies and all the accessories (Containing storage & commissioning instructions).

6.0 PACKING & MARKING

6.1 Packing:

Each orifice plate 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).

Sea Worthy packing (if applicable) shall be provided by the bidder without any commercial implication.

Inspection of the sea worthy packings shall be done as per project specific sea worthy packing specification by BHEL / BHEL appointed inspection agency.

6.2 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

7.0 APPLICABLE DATA SHEET FORMS

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

- Data sheet A for Flow Orifice:



TECHNICAL SPECIFICATION
FOR
FLOW ELEMENT ORIFICE

1 X 800 MW KOTHAGUDEM FGD

SPEC NO.: PE-TS-439-145-I105A

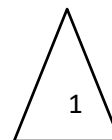
VOLUME II B

SECTION D

REV. NO. 00 DATE : 20.10.2022

SHEET

DATA SHEETS – A & B




GENERAL TECHNICAL REQUIREMENTS FOR FLOW ELEMENT ASSEMBLIES:

1. ORIFICE PLATE THICKNESS SHALL BE ≥ 3 mm FOR PIPES HAVING DIAMETER ≤ 250 mm, ≥ 6 MM FOR DIAMETER > 250 MM AND 10 MM for DIAMETER > 500 mm
2. WELDNECK FLANGES FOR ORIFICE PLATE ASSEMBLIES SHALL BE COMPLETE WITH TAPPINGS, NIPPLES ETC. AS PER ANSI 16.36 / ANSI 16.50
3. PERTINENT INFORMATION REGARDING INTET SIDE IDENTIFICATION, DIAMETER, NPS (Nominal pipe size), RATING, MATERIAL, TAG NO., JOB No., LOT No. ETC. SHALL BE STAMPED ON THE HANDLE OF THE ORIFICE PLATES.
4. ROOT VALVES AND NIPPLES FOR FLOW ORIFICE PLATE ASSEMBLIES SHALL BE SUPPLIED LOOSE FOR ERECTION.
5. THE DATA SHEETS SHALL USED BY THE VENDOR AS INPUTS FOR DESIGNING OF FLOWASSEMBLIES.
6. INFORMATION AGAINST "BIDDER TO SPECIFY" IS VENDOR SPECIFIC AND SHALL BE INCORPORATED BY THE VENDOR IN THE FINAL DOCUMENTATION.
7. FLOW ELEMENT ASSEMBLIES DRAWING / DOCUMENT / DATASHEETS/ SIZING CALCULATION OF THE SUCCESSFUL BIDDER SHALL BE SUBMITTED FOR REVIEW, INFORMATION AND RECORD DURING ENGINEERING AND SUPPLIES.
8. APPROVED QUALITY PLAN FOR FLOW ELEMENT (PE-DS-439-145-I005) SHALL BEUSED.
9. THIS DOCUMENT COVERS FLOW ELEMENTS OF BHEL-PEM ONLY AND IT DOES NOT INCLUDE THE FLOW MEASURING DEVICES FOR PERFORMANCE TESTING.
10. ONE FLOW ELEMENT OF EACH TYPE SHALL BE CALIBRATED IN THE TEST LABORATORY FOR VALIDATION OF COMMUTATED FLOW CALCULATIONS.

MANDATORY SPARE: -

- **NIL**

	FLOW ELEMENTS DESIGN PARAMETERS KOTHAGUDAM-FGD	SPECIFICATION NO.: PE-TS-439-145-I105	
		VOLUME	
		SECTION	
		REV. NO.	00
		DATE	

Tag No.: PCB40CF100

DATA SHEET – A & B

DATA SHEET – A			DATA SHEET – B (TO BE FILLED BY VENDOR)
ELEMENT	SERVICE MAKE: MODEL TYPE QUANTITY STANDARD DESIGN MATERIAL BETA RATIO BORE DIAMETER VENT HOLE DRAIN HOLE	ACW SUPPLY HDR FLOW BIDDER TO SPECIFY ORIFICE ONE (1) ASME PTC 19.5 (PART-II)/ ISA RP-3.2/ BS-1042, PART-I CONCENTRIC SQ EDGE SS316 0.4 – 0.7 BIDDER TO SPECIFY YES NO	
END CONNECTION	TYPE FLANGE TYPE FLANGE RATING: MATERIAL TAPPING LOCATION NUMBER OF TAPPINGS ROOT VALVE NUMBER: SIZE ROOT VALVE MATERIAL: RATING NIPPLE : SIZE/MATL/RATING/QTY	FLANGED; BUTT WELD END WELD NECK ANSI – 300 : ASTM A 105 ON FLANGE 3 PAIR 6: 15 NB SS316; ANSI # 800: GLOBE (BHEL SCOPE) 15NB; SS316; SCH.80; 250mm LONG; 6 NOS	
PROCESS DATA	FLUID FLOW (T/HR) PRESSURE (KG/CM ² (G)) TEMPERATURE (DEG. C.) DESIGN PRESS: TEMP MAX. ALLOWABLE PRESS LOSS DIFF. PRESS AT RANGE FLOW	ACW WATER MAX. NORMAL MINIMUM 230 176 40 1.0 1.5 2.0 33 33 33 10.0 KG/CM2(g): 60 DEG.C 0.2 KG/CM ² BIDDER TO SPECIFY	
PIPE LINE DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL BORE DIAMETER mm MIN. AVAILABLE STRAIGHT LENGTH UPSTREAM: DOWNSTREAM FLOW DIRECTION	219.1 X 6.0 CARBON STEEL BIDDER TO SPECIFY 10 D : 5 D HORIZONTAL	
OTHER DATA	IBR CERTIFICATION WEIGHT OF FLOW ELEMENT ASSEMBLY ACCURACY DOWNTURN RATIO	NOT REQUIRED BIDDER TO SPECIFY ± 1% BIDDER TO SPECIFY	

NOTES:

1. FLOW ELEMENT ACCURACY IS REQUIRED BETWEEN 40 T/HR TO 230 T/HR
2. RECOMMENDED RANGE IS 0 – 300 T/HR

	FLOW ELEMENTS DESIGN PARAMETERS KOTHAGUDAM-FGD	SPECIFICATION NO.: PE-TS-439-145-I105	
		VOLUME	
		SECTION	
		REV. NO. 00	DATE 09.12.2021
		SHEET 1	OF 1

Tag No.: PGB04CF100

DATA SHEET – A & B

DATA SHEET – A			DATA SHEET – B (TO BE FILLED BY VENDOR)
ELEMENT	SERVICE MAKE: MODEL TYPE QUANTITY STANDARD DESIGN MATERIAL BETA RATIO BORE DIAMETER VENT HOLE DRAIN HOLE	ECW SUPPLY HDR FLOW BIDDER TO SPECIFY ORIFICE ONE (1) ASME PTC 19.5 (PART-II)/ ISA RP-3.2/ BS-1042, PART-I CONCENTRIC SQ EDGE SS316 0.4 – 0.7 BIDDER TO SPECIFY YES NO	
END CONNECTION	TYPE FLANGE TYPE FLANGE RATING: MATERIAL TAPPING LOCATION NUMBER OF TAPPINGS ROOT VALVE NUMBER: SIZE ROOT VALVE MATERIAL: RATING NIPPLE : SIZE/MATL/RATING/QTY	FLANGED; BUTT WELD END WELD NECK ANSI – 300 : ASTM A 105 ON FLANGE 3 PAIR 6: 15 NB SS316; ANSI # 800: GLOBE (BHEL SCOPE) 15NB; SS316; SCH.80; 250mm LONG; 6 NOS	
PROCESS DATA	FLUID FLOW (T/HR) PRESSURE (KG/CM ² (G)) TEMPERATURE (DEG. C.) DESIGN PRESS: TEMP MAX. ALLOWABLE PRESS LOSS DIFF. PRESS AT RANGE FLOW	DMCW WATER MAX. NORMAL MINIMUM 230 175 40 5.0 6.0 8.0 38 38 38 10.0 KG/CM2(g): 60 DEG.C 0.2 KG/CM ² BIDDER TO SPECIFY	
PIPE LINE DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL BORE DIAMETER mm MIN. AVAILABLE STRAIGHT LENGTH UPSTREAM: DOWNSTREAM FLOW DIRECTION	219.1 X 6.0 CARBON STEEL BIDDER TO SPECIFY 10 D : 5 D HORIZONTAL	
OTHER DATA	IBR CERTIFICATION WEIGHT OF FLOW ELEMENT ASSEMBLY ACCURACY DOWNTURN RATIO	NOT REQUIRED BIDDER TO SPECIFY ± 1% BIDDER TO SPECIFY	

NOTES:

1. FLOW ELEMENT ACCURACY IS REQUIRED BETWEEN 40 T/HR TO 230 T/HR
2. RECOMMENDED RANGE IS 0 – 300 T/HR

	FLOW ELEMENTS DESIGN PARAMETERS KOTHAGUDAM-FGD		SPECIFICATION NO.: PE-TS-439-145-I105	
			VOLUME	
			SECTION	
			REV. NO.	00
			DATE	09.12.2021
		SHEET	1	OF 1

Tag No.: PCB47CF100

DATA SHEET – A & B

DATA SHEET – A			DATA SHEET – B (TO BE FILLED BY VENDOR)
ELEMENT	SERVICE MAKE: MODEL TYPE QUANTITY STANDARD DESIGN MATERIAL BETA RATIO BORE DIAMETER VENT HOLE DRAIN HOLE	FGD MAKE-UP SUPPLY HDR FLOW BIDDER TO SPECIFY ORIFICE ONE (1) ASME PTC 19.5 (PART-II)/ ISA RP-3.2/ BS-1042, PART-I CONCENTRIC SQ EDGE SS316 0.4 – 0.7 BIDDER TO SPECIFY YES NO	
END CONNECTION	TYPE FLANGE TYPE FLANGE RATING: MATERIAL TAPPING LOCATION NUMBER OF TAPPINGS ROOT VALVE NUMBER: SIZE ROOT VALVE MATERIAL: RATING NIPPLE : SIZE/MATL/RATING/QTY	FLANGED; BUTT WELD END WELD NECK ANSI – 300 : ASTM A 105 ON FLANGE 3 PAIR 6: 15 NB SS316; ANSI # 800: GLOBE (BHEL SCOPE) 15NB; SS316; SCH.80; 250mm LONG; 6 NOS	
PROCESS DATA	FLUID FLOW (T/HR) PRESSURE (KG/CM ² (G)) TEMPERATURE (DEG. C.) DESIGN PRESS: TEMP MAX. ALLOWABLE PRESS LOSS DIFF. PRESS AT RANGE FLOW	CLARIFIED WATER MAX. NORMAL MINIMUM 200 150 40 4.0 5.0 6.0 33 33 33 10.0 KG/CM2(g): 60 DEG.C 0.2 KG/CM ² BIDDER TO SPECIFY	
PIPE LINE DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL BORE DIAMETER mm MIN. AVAILABLE STRAIGHT LENGTH UPSTREAM: DOWNSTREAM FLOW DIRECTION	166.5 X 5.4 CARBON STEEL BIDDER TO SPECIFY 10 D : 5 D HORIZONTAL	
OTHER DATA	IBR CERTIFICATION WEIGHT OF FLOW ELEMENT ASSEMBLY ACCURACY DOWNTURN RATIO	NOT REQUIRED BIDDER TO SPECIFY ± 1% BIDDER TO SPECIFY	

NOTES:

1. FLOW ELEMENT ACCURACY IS REQUIRED BETWEEN 40 T/HR TO 200 T/HR
2. RECOMMENDED RANGE IS 0 – 250 T/HR



TECHNICAL SPECIFICATION FOR
FLOW ELEMENT ORIFICE
1 X 800 MW KOTHAGUDEM FGD

SPEC NO.: PE-TS-439-145-I105A

VOLUME II B


SECTION D

REV. NO. 00 DATE : 20.10.2022

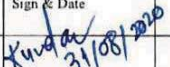
SHEET


SECTION-D

QUALITY PLAN

	MANUFACTURER / BIDDER / SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO:	DATE:
		CUSTOMER :		QP NO.: PE-QP-999-145-1024, Rev No.: 00	DATE: 17.04.2020
		PROJECT:		PO NO.:	DATE:
		ITEM: FLOW ORIFICE	SYSTEM: C&I	SECTION:	SHEET 1 OF 2

SNo.	Component & Operations	Characteristics	Class	Type of Check	Quantum of check		Reference document	Acceptance norms	Format of record		Agency				Remarks
1.0	2	3	4	5	6		7	8	9	*	**				10
1.1	MATERIAL				M	C/N				D	M	C	N		
	Orifice Plate	Physical, Chemical properties	MA	Physical, Chemical tests	1/Heat	---	Approved Drg / Data Sheet	Approved Drg / data Sheet	Test Certificate	√	P, V	V	-		Refer Note-1, IBR certification (if applicable) to be verified by BHEL.
		Dimensions	MA	Measurement	100%	---	Approved Drg / Data Sheet	Approved Drg / Data Sheet	Inspection Reports	√	P, V	V	-		
1.2	FLANGES														
	a. Forgings	Chemical, Mech Properties, & Heat Treatment	MA	Chemical, Mech Properties, & Heat Treatment	100%	---	ANSI B 16.34	ANSI B 16.34	MTC Cert, HT certificate	√	P, V	V	-		Refer Note-1 & 2
		UT	MA	UT test	100%	---	Material Spec as per ASTM A 388	Material Spec as per ASTM A 388	UT Certificate	√	P, V	V	-		
	b. Machining	Dimensions	MA	Measurement	100%	---	Approved Drg / Data Sheet	Approved Drg / Data Sheet	Inspection Reports	√	P, V	V	-		
2.0	IN PROCESS														
	Machine	Dimension	MA	Measurement	100%	---	Approved Drg / Data Sheet	Approved Drg / data Sheet	Inspection Reports	√	P, W	V	-		
		Surface finish	MA	Visual	100%	---	---	Mirror Finish	---	√	P, W	V	-		
		Surface flaw on machined surface	MA	Penetrant test	100%	---	ASTM 165 / IS 3658	ASTM 165 / IS 3658	Inspection Reports / Test Certificate	√	P, W	V	-		
3.0	ASSEMBLY and FINAL INSPECTION														
		Overall dimensions	MA	Measurement	100%	100%	Approved Drg / Data Sheet	Approved Drg / data Sheet	Inspection Reports	√	P, W	W	-		
		Marking, Tag no. Direction of flow	MA	Visual	100%	100%	Approved Drg / Data Sheet	Approved Drg / data Sheet	Inspection Reports	√	P, W	W	-		

BHEL				BIDDER/ SUPPLIER				FOR CUSTOMER REVIEW & APPROVAL							
ENGINEERING		QUALITY		Sign & Date		Seal		Doc No:		Sign & Date		Name		Seal	
Prepared by:	 31/8/2020	Name	PRAG JAIN / MAYANK KESHARWANI	Checked by:	 31/8/2020	Name	KUNDAN PRASAD		Reviewed by:						
Reviewed by:	 31/8/2020	Name	BHARAT SINGH	Reviewed by:	 31/8/2020	Name	RITESH KUMAR JAISWAL		Approved by:						

	MANUFACTURER / BIDDER / SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO.	DATE:
		CUSTOMER :		QP NO.: PE-QP-999-145-1024, Rev No.:00	DATE: 17.04.2020
		PROJECT:		PO NO.:	DATE:
		ITEM: FLOW ORIFICE	SYSTEM: C&I	SECTION:	SHEET 2 OF 2

SNo.	Component & Operations	Characteristics	Class	Type of Check	Quantum of check		Reference document	Acceptance norms	Format of record		Agency				Remarks
1	2	3	4	5	6		7	8	9	*	**				10
					M	C/N				D	M	C	N		
		Calibration	MA	Performance test	One per type	---	Approved Data Sheet	Approved Data Sheet	Test Certificate	√	P, W	V	-	-	Refer Note 4
		Painting	MA	Visual	100%	---	Manufacturer standards	Manufacturer standards	Inspection Reports / Manufacturer records	√	P, W	V	-	-	
		Root valve BOQ & Access.	MA	Measurement	100%	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	Inspection Reports	√	P, W	W	-	-	Quantity to be checked physically
4.0	PACKING & DISPATCH	Soundness of Packing against transit damage	MA	Visual	100%	100%	Tech. Spec / Manufacturer standards	Tech. Spec / Manufacturer standards	---	√	P	W	-	-	Refer Note 10

NOTE:

- All test reports & dimension reports shall be verified by BHEL wherever verification is by BHEL at the time of Final Inspection.
- Positive material identification testing (One per type) shall be performed by vendor and the same shall be witnessed by BHEL at the time of final inspection
- Minimum 2 coats of primer paint to be applied before dispatch (Painting thickness shall be as per Manufacturer's standard)
- CALIBRATION Test to be carried out at IIT-DELHI / FCRI or NABL approved laboratory.
- BHEL reserves the right to conduct repeat tests, if required.
- In case of foreign supplier, all test certificates shall be furnished by the supplier, duly witnessed / verified by supplier's TPI.
- Project specific QP will be prepared based on customer requirement
- The latest revisions / year of issue of all the standard indicated in the QP shall be referred.
- Quantum of check by BHEL / BHEL nominated inspection agency shall be indicated during project specific enquiry.
- Following to be noted for packing:
 - Material shall be packed suitably in order to avoid damage during transit and also during storage at site.
 - Photograph of flow element shall be provided, duly packed inside the wooden box just before final packing
 - Photographs of the packing (with LR No.) shall be provided as per approved packing procedure (if applicable) just before dispatch.
 - Clearance for dispatch will be given only after receipt of the photos
 - Sea worthy packing shall be provided, if called for in the Data Sheet. Acceptance norms shall be in line with technical / packing specification.

LEGEND:

*RECORDS, IDENTIFIED WITH "TICK"(√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. D: DOCUMENTATION

** M: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, C: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, N: CUSTOMER,

P: PERFORM, W: WITNESS, V: VERIFICATION, AS APPROPRIATE, MA: MAJOR, MI: MINOR, CR: CRITICAL.

BHEL				BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING		QUALITY		Sign & Date		Doc No:			
	Sign & Date	Name		Sign & Date	Name		Sign & Date	Name	Seal
Prepared by:		PRAG JAIN / MAYANK KESHARWANI	Checked by:		KUNDAN PRASAD		Reviewed by:		
Reviewed by:		BHARAT SINGH	Reviewed by:		RITESH KUMAR JAISWAL		Approved by:		



TECHNICAL SPECIFICATION FOR
FLOW ELEMENT ORIFICE
1X800MW KOTHAGUDEM FGD

SPEC NO.: PE-TS-439-145-I105A

VOLUME II B

SECTION D


REV. NO. 00

DATE : 20.10.2022

SHEET 1 OF 3

SECTION-D

BILL OF QUANTITY

	Technical specification for FLOW ELEMENT ORIFICE 1 X 800 MW KOTHAGUDEM FGD	SPECIFICATION NO. PE-TS-439-145-II05A	
		VOLUME II-B	
		SECTION D	
		REV. NO. 00	DATE 20.10.2022
		SHEET 1 OF 1	

BILL OF QUANTITY

(A) FLOW ELEMENT ASSEMBLIES COMPLETE WITH Three (3) pairs of tappings, ACCESSORIES, like Gasket, Pressure take-off points, Nipples etc. and commissioning spare of 1 No. of gasket for EACH TAG FOR EACH UNIT

ROOT VALVES shall be under BHEL scope of supply

S. No.	KKS	SERVICE/ ITEM DESCRIPTION	FLUID	Quantity for 1 Units (in Nos.)
1	PGB04CF100	ACW SUPPLY HEADER FLOW	ACW	1
2	PCB40CF100	ECW SUPPLY HEADER FLOW	ECW	1
3	PCB47CF100	FGD MAKE-UP SUPPLY HDR FLOW	CLARIFIED WTR	1
TOTAL QUANTITY				3

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

SNo	DESCRIPTION	TOTAL QUANTITY
1	PAIR OF GASKETS FOR FLOW ORIFICES	ONE (1) PAIR FOR EACH TAG FOR EACH UNIT

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

S. No.	KKS	SERVICE/ ITEM DESCRIPTION	FLUID	Quantity for 1 Units (in Nos.)
1	PGB04CF100	ACW SUPPLY HEADER FLOW	ACW	1
2	PCB40CF100	ECW SUPPLY HEADER FLOW	ECW	1
3	PCB47CF100	FGD MAKE-UP SUPPLY HDR FLOW	CLARIFIED WTR	1
TOTAL QUANTITY				3