

TECHNICAL SPECIFICATION FOR FLOW–NOZZLE (FOR RATE CONTRACT)

VOLUME II–B SECTION C & D

SPECIFICATION No's
PE–TS–20–145–I105B



TITLE
TECHNICAL SPECIFICATION
FLOW–NOZZLE (FOR RATE CONTRACT)

DOC. NO. PE–TS–20–145–I105B

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE	NAME	SIGN	DATE
DESIGN	SACHIN/MAYANK		08.03.17
CHD	DP		08.03.17
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TECHNICAL SPECIFICATION
FOR

FLOW-NOZZLE
Assembly with Accessories

(RATE CONTRACT)

VOLUME II-B

SECTION C & D

SPECIFICATION No. **PE-TS-20-145-I 105B**



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

	Technical specification for Flow Nozzle Assembly with Accessories (RATE CONTRACT)		SPEC NO.: PE-TS-20-145-I105B
			VOLUME II B
	REV. NO.	00	DATE 08.03.17

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SECTION – C

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SPECIFIC TECHNICAL REQUIREMENTS

- 1.0** This specification is intended for finalization of rate contract between BHEL PEM and Bidder. Standard technical detail as indicated in the specification shall be agreed upon between BHEL PEM and Bidder. Project specific technical detail shall be made available to the bidder along with project enquiry.
- 2.0** 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 Nozzle assembly along with accessories, Mandatory Spares as mentioned in different sections of this specification.
- 3.0** The bids shall be evaluated as per NIT. Ordering shall be done separately for each project.
- 4.0** The quality plan enclosed forms the minimum requirement but not limited to be adhered to by the bidder.

5.0 GENERAL TECHNICAL 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. **The bidder to quote for items as per price schedule attached. The quantity as mentioned in the BOQ is only for evaluation purpose. However actual ordered quantity may vary from project to project throughout the year.**
- vi. **These rates shall be applicable for a period of 2 years from the date of issue of rate contract for the equipment.**
- vii. During rate contract in force; any other BHEL unit may also make use of rates if their specification is identical to spec of rate contract.
- viii. Inspection shall be carried out in line with pre-approved drawings/data sheet/QP.
- ix. 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.**

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- x. Wherever in data sheet more than one options are marked, bidder to note that one option shall be selected by BHEL for a specific project and the same shall be supplied by bidder without any commercial implication with respect to rate contract.
- xi. Scope of supply shall include complete flow element nozzle assembly along with accessories like nipples, root valves, expanders etc. and Mandatory Spares as indicated in the specification.

6.0 Bidder to note that thickness of the pipe for various sizes may vary from project to project. Same shall be informed during project specific order. No commercial implication shall be acceptable for the same. Typical pipe sizes are indicated in Annexure – A for reference only.

7.0 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%). Bidder to comply with these tolerance variations without any commercial implication.

8.0 For vertical installation of Nozzles (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.

9.0 Process pressure, temperature & flow may vary for a particular service from project to project. Bidder to comply with these process parameters without any commercial implication. However maximum possible design pressure & temperature are indicated in the respective datasheet of each nozzle in Section-D Datasheet A&B of this specification.

10.0 Extra pressure tapping (in addition to three pairs of tapping) shall be provided in case to case basis for a specific project (if required) by the bidder without any commercial implication. Associated accessories for this particular extra tapping like root valve, nipple and expander shall be supplied by the bidder as per the unit price quoted in the price format.

11.0 If extra Root Valves, Nipples etc are to be provided, same shall be supplied by the bidder as per the unit price quoted in the price format.

12.0 Bidder to note that CALIBRATION TEST is required to be conducted on one type per size for a specific project and the requirement shall be informed during project specific order. BHEL reserves the right to withdraw the calibration test for any project based on customer requirements. Payments against calibration test shall be made only if the same is conducted.

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13.0 Inspection will be conducted by BHEL 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 rate contract. For all the type tests "Type Test Certificates" shall be furnished. In the absence of the same, such Type Tests shall be arranged at the Vendor's works in the presence of BHEL and/or their authorized representatives or in independent Test House/ Laboratory approved by BHEL.

14.0 Sea worthy packing (if applicable) for a specific project shall be provided by the bidder without any commercial implication. Same shall be informed by BHEL during project specific order. Inspection of the sea worthy packing shall be done as per the project specific sea worthy packing specification by Customer/BHEL/BHEL appointed Inspection party.

15.0 Refer Section-D Equipment specification for Code & Standards, Technical requirements, Tests & Inspection, Drawings & Documents, Packing, Marking & Applicable Datasheets.

16.0 The service description indicated in respective datasheets 1 to 6 are for reference only. The actual service description for each datasheet shall be informed during project execution after selection based on pipe size, design/process parameters & accessories requirements.



TECHNICAL SPECIFICATION FOR FLOW-NOZZLE

SPEC NO.: PE-TS-888-145-I105B

VOLUME II -B

SECTION A

REV. NO. 00

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SHEET 1 OF 5

ANNEXURE-A: PIPE SIZES FOR FLOW NOZZLE OF DIFFERENT SERVICES FOR REFERENCE PAGE (1 OF 2)

SL. NO.	DATASHEET NO.	TYPICAL PIPE SIZE		PIPE MATERIAL
		NB	OD (mm X mm)	
1	DS-1	500 NB	508 X 12.7	SA 106 GR. B/C
			508 X 9.53	
			457.2 X 12.7	
		450 NB	457.2 X 9.53	
			457 X 7.92	
			406.4 X 12.7	
		400 NB	406.4 X 9.53	
			406.4 X 7.92	
			355.6 X 12.7	
		350 NB	355.6 X 9.53	
			355.6 X 7.92	
			323.9 X 12.7	
		300 NB	323.9 X 9.53	
			323.9 X 7.92	
			323.9 X 6.35	
		250 NB	273 X 12.7	
			273 X 9.27	
			273 X 6.35	
		200 NB	219.1 X 12.7	
			219.1 X 8.18	
			219.1 X 6.35	
		150 NB	168.3 X 7.11	
			168.3 X 5.6	
		100 NB	114.3 X 9.53	
			114.3 X 8.56	
			114.3 X 6.02	
		80 NB	88.9 X 5.49	
			88.9 X 3.96	



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SPEC NO.: PE-TS-888-145-I105B

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SECTION A

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SHEET 2 OF 5

ANNEXURE-A: PIPE SIZES FOR FLOW NOZZLE OF DIFFERENT SERVICES FOR REFERENCE PAGE 2 OF 2

SL.	DATASHEET NO.	TYPICAL PIPE SIZE		PIPE MATERIAL
NO.		NB	OD (mm X mm)	
2	DS-2	350 NB	355.6 X 54	SA 335 P91
		300 NB	323.9 X 48	
			323.9 X 31	
			ID 220 X 59	
		250 NB	273 X 30	
			ID 200 X 57	
			ID 180 X 50	
		200 NB	219.1 X 45	
			219.1 X 40	
			219.1 X 34	
			219.1 X 25	
		150 NB	168.3 X 27.5	
3	DS-3	600 NB	610 X 82	SA 106 GR C
			ID 440 X 75	
		550 NB	559 X 75	
			559 X 72	
			ID 420 X 68	
			ID 405 X 68	
		500 NB	508 X 71	
			508 X 64	
			508 X 52	
			508 X 48	
			508 X 47	
			368 X 48	
		350 NB	368 X 40	
			368 X 32	
4	DS-4	200 NB	219.1 X 40	SA 335 P22
		150 NB	168.3 X 27.5	
5	DS-5	300 NB	323.9 X 48	SA 335 P91
			323.9 X 31	
			ID 220 X 59	
		250 NB	273 X 30	
		200 NB	219.1 X 45	
			219.1 X 40	
			219.1 X 25	
6	DS-6	300 NB	323.9 X 48	SA 335 P92
			ID 200 X 57	
		250 NB	273 X 30	
		200 NB	219.1 X 45	

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CUSTOMER'S SPECIFICATION

Same shall be informed by BHEL during project specific order (if any)

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Tag No. : NOZZLE ASSEMBLY AS PER TYPE "T" OF THE PRICE FORMAT

Data Sheet No.-1

DATA SHEET – A		
ELEMENT	SERVICE MAKE : MODEL TYPE STANDARD * DESIGN MATERIAL BETA RATIO BORE DIAMETER	SHALL BE FURNISHED DURING PROJECT BIDDER TO FURNISH DURING PROJECT [■] ASME PTC 19.5 / [■] ISO 5167 LONG RADIUS : HIGH BETA SS316 ~ 0.7 BIDDER TO FURNISH DURING PROJECT
END CONNECTION	TYPE BRANCH PIPE BRANCH PIPE MATERIAL TAPPING LOCATION NUMBER OF TAPPINGS ROOT VALVE QTY : SIZE ROOT VALVE MATERIAL : RATING: TYPE NIPPLE : SIZE/MATL/RATING/QTY EXPANDER : SIZE/MATL/RATING/QTY	BUTT WELD END YES (IN BHEL SCOPE) SAME AS PIPE MATERIAL D&D/2 : ON PIPE 3 PAIR 06 : 25 NB SS316 : ANSI # 900 : GLOBE 25NB : SS316 : SCH.80 : 250mm LONG : 12 15NBx25NB : SS316 : CLASS 3000 : 50.8mm LONG : 6
PROCESS DATA	FLUID * FLOW (T/HR) PRESSURE (KG/CM ² (A)) TEMPERATURE (DEG. C.) MAX. ALLOWABLE PRESS LOSS DESIGN PRESS : TEMP DIFF. PRESS AT MAX FLOW	[■] STEAM / [■] CONDENSATE MAX. NORMAL MINIMUM SHALL BE FURNISHED DURING PROJECT 75 Kg/cm ² : 415 DEG C BIDDER TO FURNISH DURING PROJECT
PIPE LINE DATA	PIPE SIZE (OD X THK) mm PIPE MATERIAL * BORE DIAMETER MIN. AVAILABLE STRAIGHT LENGTH UPSTREAM:DOWNSTREAM FLOW DIRECTION *	<u>AS PER PRICE SCHEDULE</u> [■] SA106 GR B / [■] SA106 GR C BIDDER TO FURNISH DURING PROJECT 15D 10D : 5D [■] HORIZONTAL / [■] VERTICAL \$
OTHER DATA	IBR CERTIFICATION APPROX. WEIGHT OF ASSEMBLY	REQUIRED BIDDER TO FURNISH DURING PROJECT
PACKING	SEA WORTHY PACKING *	[■] YES / [■] NO

\$ S-bent to be provided for vertical flow direction

* Project specific data shall be informed by BHEL during project ordering

BIDDER TO QUOTE IN COLUMN "I" OF PRICE FORMAT FOR DETAILS SPECIFIED ABOVE

BIDDER TO NOTE THE FOLLOWING FOR EACH NOZZLE ASSEMBLY:

- A) In case additional pair of tappings is required, extra 2 no's root valves, 2 no's expanders, & 2 no's nipples per pair of tappings shall be supplied by the bidder. Additional price for the same shall be as per unit price quoted in the price schedule under column VII till XIII.
- B) In case design pressure is greater than 40 Kg/cm², extra 2 no's root valves & 2 no's nipples per pair of tappings shall be supplied by bidder. Additional price for the same shall be as per unit price quoted in the price schedule under column VII till XIII.

The above requirement shall be informed by BHEL during project specific ordering

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Tag No. : NOZZLE ASSEMBLY AS PER TYPE "II" OF THE PRICE FORMAT

Data Sheet No.-2

DATA SHEET – A		
ELEMENT	SERVICE MAKE : MODEL TYPE STANDARD * DESIGN MATERIAL BETA RATIO BORE DIAMETER	SHALL BE FURNISHED DURING PROJECT BIDDER TO FURNISH DURING PROJECT [■] ASME PTC 19.5 / [■] ISO 5167 LONG RADIUS : HIGH BETA SS316 ~ 0.7 BIDDER TO FURNISH DURING PROJECT
END CONNECTION	TYPE BRANCH PIPE BRANCH PIPE MATERIAL TAPPING LOCATION NUMBER OF TAPPINGS ROOT VALVE QTY : SIZE ROOT VALVE MATERIAL : RATING: TYPE NIPPLE : SIZE/MATL/RATING/QTY EXPANDER : SIZE/MATL/RATING/QTY	BUTT WELD END YES (IN BHEL SCOPE) SAME AS PIPE MATERIAL D&D/2 : ON PIPE 3 PAIR 12 : 25 NB SS316 : ANSI # 3500 SPL : GLOBE 25NB : SS316 : SCH.XXS : 1000mm LONG : 12 15NBx25NB : SS316 : CLASS 9000 : 50.8mm LONG : 6
PROCESS DATA	FLUID FLOW (T/HR) PRESSURE (KG/CM ² (A)) TEMPERATURE (DEG. C.) MAX. ALLOWABLE PRESS LOSS DESIGN PRESS : TEMP DIFF. PRESS AT MAX FLOW	STEAM MAX. NORMAL MINIMUM SHALL BE FURNISHED DURING PROJECT 296 Kg/cm ² : 608 DEG C BIDDER TO FURNISH DURING PROJECT
PIPE LINE DATA	PIPE SIZE (OD X THK) mm PIPE MATERIAL * BORE DIAMETER MIN. AVAILABLE STRAIGHT LENGTH UPSTREAM:DOWNSTREAM FLOW DIRECTION	<u>AS PER PRICE SCHEDULE</u> [■] SA 335 P91 / [■] SA335 P92 BIDDER TO FURNISH DURING PROJECT 15D 10D : 5D HORIZONTAL
OTHER DATA	IBR CERTIFICATION APPROX. WEIGHT OF ASSEMBLY	REQUIRED BIDDER TO FURNISH DURING PROJECT
PACKING	SEA WORTHY PACKING *	[■] YES / [■] NO

* Project specific data shall be informed by BHEL during project ordering

BIDDER TO QUOTE IN COLUMN "II" OF PRICE FORMAT FOR DETAILS SPECIFIED ABOVE

BIDDER TO NOTE THE FOLLOWING FOR EACH NOZZLE ASSEMBLY:

- A) In case additional pair of tappings is required, extra 4 no's root valves, 2 no's expanders, & 4 no's nipples per pair of tappings shall be supplied by the bidder. Additional price for the same shall be as per unit price quoted in the price schedule under column VII till XIII.
- B) In case root valves of 4500 SPL class is required (based on parameters) then the differential price of 3500 SPL and 4500 SPL class shall be added, based on the unit price quoted for respective class of root valves under column VIII and Column IX

The above requirement shall be informed by BHEL during project specific ordering

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Data Sheet No.-3

DATA SHEET – A		
ELEMENT	SERVICE MAKE : MODEL TYPE STANDARD * DESIGN MATERIAL BETA RATIO BORE DIAMETER	SHALL BE FURNISHED DURING PROJECT BIDDER TO FURNISH DURING PROJECT [■] ASME PTC 19.5 / [■] ISO 5167 LONG RADIUS : HIGH BETA SS316 ~ 0.7 BIDDER TO FURNISH DURING PROJECT
END CONNECTION	TYPE BRANCH PIPE BRANCH PIPE MATERIAL TAPPING LOCATION NUMBER OF TAPPINGS ROOT VALVE QTY : SIZE ROOT VALVE MATERIAL : RATING: TYPE NIPPLE : SIZE/MATL/RATING/QTY EXPANDER : SIZE/MATL/RATING/QTY	BUTT WELD END YES (IN BHEL SCOPE) SAME AS PIPE MATERIAL D&D/2 : ON PIPE 3 PAIR 12 : 25 NB SS316 : ANSI # 3500 SPL : GLOBE 25NB : SS316 : SCH.XXS : 250mm LONG : 12 15NBx25NB : SS316 : CLASS 9000 : 50.8mm LONG : 6
PROCESS DATA	FLUID FLOW (T/HR) PRESSURE (KG/CM ² (A)) TEMPERATURE (DEG. C.) MAX. ALLOWABLE PRESS LOSS DESIGN PRESS : TEMP DIFF. PRESS AT MAX FLOW	FEEDWATER MAX. NORMAL MINIMUM SHALL BE FURNISHED DURING PROJECT 525 Kg/cm ² : 300 DEG C BIDDER TO FURNISH DURING PROJECT
PIPE LINE DATA	PIPE SIZE (OD X THK) mm PIPE MATERIAL BORE DIAMETER MIN. AVAILABLE STRAIGHT LENGTH UPSTREAM:DOWNSTREAM FLOW DIRECTION	<u>AS PER PRICE SCHEDULE</u> SA 106 GR. C BIDDER TO FURNISH DURING PROJECT 15D 10D : 5D HORIZONTAL
OTHER DATA	IBR CERTIFICATION APPROX. WEIGHT OF ASSEMBLY	REQUIRED BIDDER TO FURNISH DURING PROJECT
PACKING	SEA WORTHY PACKING *	[■] YES / [■] NO

* Project specific data shall be informed by BHEL during project ordering

BIDDER TO QUOTE IN COLUMN "III" OF PRICE FORMAT FOR DETAILS SPECIFIED ABOVE

BIDDER TO NOTE THE FOLLOWING FOR EACH NOZZLE ASSEMBLY:

A) In case additional pair of tappings is required, extra 4 no's root valves, 2 no's expanders, & 4 no's nipples per pair of tappings shall be supplied by the bidder. Additional price for the same shall be as per unit price quoted in the price schedule under column VII till XIII.

The above requirement shall be informed by BHEL during project specific ordering

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Data Sheet No.-4

DATA SHEET – A		
ELEMENT	SERVICE MAKE : MODEL TYPE STANDARD * DESIGN MATERIAL BETA RATIO BORE DIAMETER	SHALL BE FURNISHED DURING PROJECT BIDDER TO FURNISH DURING PROJECT ☐ ASME PTC 19.5 / ☐ ISO 5167 LONG RADIUS : HIGH BETA SS316 ~ 0.7 BIDDER TO FURNISH DURING PROJECT
END CONNECTION	TYPE BRANCH PIPE BRANCH PIPE MATERIAL TAPPING LOCATION NUMBER OF TAPPINGS ROOT VALVE QTY : SIZE ROOT VALVE MATERIAL : RATING: TYPE NIPPLE : SIZE/MATL/RATING/QTY EXPANDER : SIZE/MATL/RATING/QTY	BUTT WELD END YES (IN BHEL SCOPE) SAME AS PIPE MATERIAL D&D/2 : ON PIPE 3 PAIR 12 : 25 NB SS316 : ANSI # 3500 SPL: GLOBE 25NB : SS316 : SCH.XXS : 1000mm LONG : 12 15NBx25NB : SS316 : CLASS 9000 : 50.8mm LONG : 6
PROCESS DATA	FLUID FLOW (T/HR) PRESSURE (KG/CM ² (A)) TEMPERATURE (DEG. C.) MAX. ALLOWABLE PRESS LOSS DESIGN PRESS : TEMP DIFF. PRESS AT MAX FLOW	STEAM MAX. NORMAL MINIMUM SHALL BE FURNISHED DURING PROJECT 190 Kg/cm ² : 545 DEG C BIDDER TO FURNISH DURING PROJECT
PIPE LINE DATA	PIPE SIZE (OD X THK) mm PIPE MATERIAL BORE DIAMETER MIN. AVAILABLE STRAIGHT LENGTH UPSTREAM:DOWNSTREAM FLOW DIRECTION	<u>AS PER PRICE SCHEDULE</u> SA 335 P22 BIDDER TO FURNISH DURING PROJECT 15D 10D : 5D HORIZONTAL
OTHER DATA	IBR CERTIFICATION APPROX. WEIGHT OF ASSEMBLY	REQUIRED BIDDER TO FURNISH DURING PROJECT
PACKING	SEA WORTHY PACKING *	☐ YES / ☐ NO

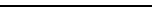
* Project specific data shall be informed by BHEL during project ordering

BIDDER TO QUOTE IN COLUMN “IV” OF PRICE FORMAT FOR DETAILS SPECIFIED ABOVE

BIDDER TO NOTE THE FOLLOWING FOR EACH NOZZLE ASSEMBLY:

A) In case additional pair of tappings is required, extra 4 no's root valves, 2 no's expanders, & 4 no's nipples per pair of tappings shall be supplied by the bidder. Additional price for the same shall be as per unit price quoted in the price schedule under column VII till XIII.

The above requirement shall be informed by BHEL during project specific ordering

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Data Sheet No.-5

DATA SHEET – A		
ELEMENT	SERVICE MAKE : MODEL TYPE STANDARD * DESIGN MATERIAL BETA RATIO BORE DIAMETER	SHALL BE FURNISHED DURING PROJECT BIDDER TO FURNISH DURING PROJECT [■] ASME PTC 19.5 / [■] ISO 5167 LONG RADIUS : HIGH BETA A182 F91 ~ 0.7 BIDDER TO FURNISH DURING PROJECT
END CONNECTION	TYPE BRANCH PIPE BRANCH PIPE MATERIAL TAPPING LOCATION NUMBER OF TAPPINGS ROOT VALVE QTY : SIZE ROOT VALVE MATERIAL : RATING: TYPE NIPPLE : SIZE/MATL/RATING/QTY EXPANDER : SIZE/MATL/RATING/QTY	BUTT WELD END YES (IN BHEL SCOPE) SAME AS PIPE MATERIAL D&D/2 : ON PIPE 3 PAIR 12 : 25 NB SS316 : ANSI # 3500 SPL : GLOBE 25NB : SS316 : SCH.XXS : 1000mm LONG : 12 15NBx25NB : SS316 : CLASS 9000 : 50.8mm LONG : 6
PROCESS DATA	FLUID FLOW (T/HR) PRESSURE (KG/CM ² (A)) TEMPERATURE (DEG. C.) MAX. ALLOWABLE PRESS LOSS DESIGN PRESS : TEMP DIFF. PRESS AT MAX FLOW	STEAM MAX. NORMAL MINIMUM SHALL BE FURNISHED DURING PROJECT 270 Kg/cm ² : 593 DEG C BIDDER TO FURNISH DURING PROJECT
PIPE LINE DATA	PIPE SIZE (OD X THK) mm PIPE MATERIAL BORE DIAMETER MIN. AVAILABLE STRAIGHT LENGTH UPSTREAM:DOWNSTREAM FLOW DIRECTION	<u>AS PER PRICE SCHEDULE</u> SA 335 P91 BIDDER TO FURNISH DURING PROJECT 15D 10D : 5D HORIZONTAL
OTHER DATA	IBR CERTIFICATION APPROX. WEIGHT OF ASSEMBLY	REQUIRED BIDDER TO FURNISH DURING PROJECT
PACKING	SEA WORTHY PACKING *	[■] YES / [■] NO

* Project specific data shall be informed by BHEL during project ordering

BIDDER TO QUOTE IN COLUMN “V” OF PRICE FORMAT FOR DETAILS SPECIFIED ABOVE

BIDDER TO NOTE THE FOLLOWING FOR EACH NOZZLE ASSEMBLY:

- A) In case additional pair of tappings is required, extra 4 no's root valves, 2 no's expanders, & 4 no's nipples per pair of tappings shall be supplied by the bidder. Additional price for the same shall be as per unit price quoted in the price schedule under column VII till XIII.
- B) In case root valves of 4500 SPL class is required (based on parameters) then the differential price of 3500 SPL and 4500 SPL class shall be added, based on the unit price quoted for respective class of root valves under column VIII and Column IX

The above requirement shall be informed by BHEL during project specific ordering

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Tag No. : NOZZLE ASSEMBLY AS PER TYPE “VI” OF THE PRICE FORMAT

Data Sheet No.-6

DATA SHEET – A		
ELEMENT	SERVICE MAKE : MODEL TYPE STANDARD * DESIGN MATERIAL BETA RATIO BORE DIAMETER	SHALL BE FURNISHED DURING PROJECT BIDDER TO FURNISH DURING PROJECT ☐ ASME PTC 19.5 / ☐ ISO 5167 LONG RADIUS : HIGH BETA A182 F92 ~ 0.7 BIDDER TO FURNISH DURING PROJECT
END CONNECTION	TYPE BRANCH PIPE BRANCH PIPE MATERIAL TAPPING LOCATION NUMBER OF TAPPINGS ROOT VALVE QTY : SIZE ROOT VALVE MATERIAL : RATING: TYPE NIPPLE : SIZE/MATL/RATING/QTY EXPANDER : SIZE/MATL/RATING/QTY	BUTT WELD END YES (IN BHEL SCOPE) SAME AS PIPE MATERIAL D&D/2 : ON PIPE 3 PAIR 12 : 25 NB SS316 : ANSI # 4500 SPL : GLOBE 25NB : SS316 : SCH.XXS : 1000mm LONG : 12 15NBx25NB : SS316 : CLASS 9000 : 50.8mm LONG : 6
PROCESS DATA	FLUID FLOW (T/HR) PRESSURE (KG/CM ² (A)) TEMPERATURE (DEG. C.) MAX. ALLOWABLE PRESS LOSS DESIGN PRESS : TEMP DIFF. PRESS AT MAX FLOW	STEAM MAX. NORMAL MINIMUM SHALL BE FURNISHED DURING PROJECT 296 Kg/cm ² : 608 DEG C BIDDER TO FURNISH DURING PROJECT
PIPE LINE DATA	PIPE SIZE (OD X THK) mm PIPE MATERIAL BORE DIAMETER MIN. AVAILABLE STRAIGHT LENGTH UPSTREAM:DOWNSTREAM FLOW DIRECTION	<u>AS PER PRICE SCHEDULE</u> SA 335 P92 BIDDER TO FURNISH DURING PROJECT 15D 10D : 5D HORIZONTAL
OTHER DATA	IBR CERTIFICATION APPROX. WEIGHT OF ASSEMBLY	REQUIRED BIDDER TO FURNISH DURING PROJECT
PACKING	SEA WORTHY PACKING *	☐ YES / ☐ NO

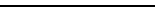
* Project specific data shall be informed by BHEL during project ordering

BIDDER TO QUOTE IN COLUMN “VI” OF PRICE FORMAT FOR DETAILS SPECIFIED ABOVE

BIDDER TO NOTE THE FOLLOWING FOR EACH NOZZLE ASSEMBLY:

A) In case additional pair of tappings is required, extra 4 no's root valves, 2 no's expanders, & 4 no's nipples per pair of tappings shall be supplied by the bidder. Additional price for the same shall be as per unit price quoted in the price schedule under column VII till XIII.

The above requirement shall be informed by BHEL during project specific ordering

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Tag No.			
DATA SHEET – C			
ELEMENT	SERVICE MAKE : MODEL TYPE STANDARD * DESIGN MATERIAL BETA RATIO BORE DIAMETER		
END CONNECTION	TYPE BRANCH PIPE BRANCH PIPE MATERIAL TAPPING LOCATION NUMBER OF TAPPINGS ROOT VALVE QTY : SIZE ROOT VALVE MATERIAL : RATING: TYPE NIPPLE : SIZE/MATL/RATING/QTY EXPANDER : SIZE/MATL/RATING/QTY		
PROCESS DATA	FLUID FLOW (T/HR) PRESSURE (KG/CM ² (A)) TEMPERATURE (DEG. C.) MAX. ALLOWABLE PRESS LOSS DESIGN PRESS : TEMP DIFF. PRESS AT MAX FLOW	MAX.	NORMAL
			MINIMUM
PIPE LINE DATA	PIPE SIZE (OD X THK) mm PIPE MATERIAL BORE DIAMETER MIN. AVAILABLE STRAIGHT LENGTH UPSTREAM:DOWNSTREAM FLOW DIRECTION		
OTHER DATA	IBR CERTIFICATION APPROX. WEIGHT OF ASSEMBLY		
PACKING	SEA WORTHY PACKING		
\$ S-bent to be provided for vertical flow direction			

 PEM :: C&I		STANDARD QUALITY PLAN FOR FLOW NOZZLE ASSEMBLY							QUALITY PLAN NO.: PE-QP-888-145-I105B			
									VOLUME IIB			
									SECTION D			
									REV. NO. 00		DATE: 17.01.15	
									SHEET 1		OF 3	
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks
									P	W	V	
1.0	RAW MATERIAL Flow Nozzle, pipe, adapter	Physical, Chemical properties	MA	Physical, Chemical tests	One / Heat	AP / DP / SP	AP / DP / SP	TC	3/2	---	2,1	Refer Note-1
		Ultrasonic testing (nozzle only)	MA	Ultrasonic test	100%	ASTMA388 & ANSI B 16.34	ASTMA388 & ANSI B 16.34	TC	3	2	1	
2.0	IN PROCESS											
2.1	Welding procedure specification (WPS)	Correctness	MA	Scrutiny	100%	IS:7307 / ASME IX	IS:7307 / ASME IX	Format of IS / ASME	3/2	---	2,1	IBR certification to be verified by BHEL, if applicable
2.2	Procedure Qualification Record(PQR) & Welders qualification	Weld soundness	MA	Physical test / Radiographic Test	IS:7307/ IS:7310/ ASME IX	IS:7307/ IS:7310/ ASME IX	IS:7307/ IS:7310/ ASME IX	Format of IS / ASME	3/2	2	1	
2.3	Weld FIT-UPS	Dimension, Alignment, Orientation.	MA	Measurement & Visual	100%	WPS/Approved drg.	WPS/Approved drg.	IR / Log Book	3/2	---	2	Refer Note-3
2.4	Weldments final run	1. Surface defects	MA	Penetrant Test	100%	IS:3658 / ASTM 165/ ASME VIII Div. I	ASTM. / 165ASME VIII Div I	IR / Log Book	3/2	2	1	
		2. Sub Surface defects(After PWHT)	MA	Radiographic Test	100%	ASME SEC. V	ASME SEC. VIII	IR	3/2	2	1	100% by Vendor, 10 % by BHEL Films to be reviewed by BHEL.

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

 PEM :: C&I		STANDARD QUALITY PLAN FOR FLOW NOZZLE ASSEMBLY							QUALITY PLAN NO.: PE-QP-888-145-I105B			
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									SHEET 2		OF 3	
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks
									P	W	V	
		3 Heat Treatment	MA	Review of HT Chart	100%	ASME SEC. VIII	ASME SEC. VIII	HT Chart	3/2	2	1	100% by Vendor, 10% by BHEL
2.5	1. Flow Nozzle (machined)	1. Dimensions	MA	Measurement	100%	AP / DS	AP / DS	IR	3/2	2	1	
		2. Profile	MA	Measurement	100%	AP / DS	AP / DS	IR	3/2	2	1	
		3. Surface finish	MA	Visual	100%	-----	Mirror finish.	IR / Mfd Records	3/2	2	1	
	2. Pipe, Adapter	1. Machining of pipe ID	MA	Measurement	100%	AP / DS	AP / DS	IR	3/2	2	1	
		2. Dimensions	MA	Measurement	100%	AP / DS	AP / DS	IR	3/2	2	1	
		3. Surface flaw on weld edge preparation (for shop welding)	MA	Penetrant Test	100%	ASTM 165/ IS-3658	ASTM 165/ IS-3658	IR / TC	3/2	2	1	
		4. IBR Clearance	MA	Review	100%	IBR Compliance	IBR Compliance	Form III C	3/2		1	
3.0	ROUTINE TEST	1. Leak tightness	CR	Hydraulic test (1.5 times Design pressure)	100%	AP / DS	No Leakage	Test Certificate	3/2	2,1	---	Minimum time duration of test shall be ½ hours.

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

 PEM :: C&I		STANDARD QUALITY PLAN FOR FLOW NOZZLE ASSEMBLY							QUALITY PLAN NO.: PE-QP-888-145-I105B			
									VOLUME	IIB		
									SECTION	D		
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									SHEET	3	OF	3
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks
									P	W	V	
		2. Calibration	CR	Measurement	1 per type per size	----	Tech Spec.	TC	2	---	1	Refer note-4
4.0	FINAL ASSEMBLY	1. Marking – Tag No., direction of flow	MI	Visual	100%	AP / DS	AP / DS	IR	2	---	1	Refer Note-2 before dispatch
		2. Workmanship, surface flaw on weld edge preparation on end of pipe (for site welding)	MA	Visual, Penetrant test	100%	ASTM165 / IS: 3658	No Surface Flaw	TC /IR	3/2	2	1	
		3. Overall Dimensions and end connection	MA	Measurement	100%	AP / DS	AP / DS	IR	3/2	2/1	---	
5.0	PACKING & DISPATCH	Soundness of Packing against transit damage	MA	Visual	100%	SP / MS	SP /MS		2	---	---	Refer Note-5

NOTE:

- Test Certificates to be verified by BHEL at final inspection stage. Positive Material Identification (PMI) testing shall be performed by vendor and same shall be witnessed by Customer/BHEL.
- Minimum 2 coats of primer paint to be applied before dispatch.
- In case of NTPC / LLOYDS / BHEL qualified welders available, then prequalification and WPS, PQR not required, only TC to be verified.
- CALIBRATION Test to be carried out at IIT-DELHI / FCRI or BHEL approved laboratory.
- Sea Worthy packing (if applicable) shall be provided by bidder without any commercial implication.
- Qualification records of the Vendors can be verified.

For P91 & P22 material welding should be continuously done. No interruptions shall be allowed.

LEGEND: * CR - Critical characteristics IR - Inspection Reports DS – Data Sheet MR- Manufacturer records \$ P - Agency Performing the Test. 1 - BHEL
 MA - Major characteristics TC - Test Certificates SP – Tech. Spec. MS- Manufacturer standards W - Agency Witnessing the Test. 2 - Vendor
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Technical specification for
Flow Nozzle Assembly with Accessories
 (RATE CONTRACT)

SPECIFICATION NO.: PE-TS-20-145-I105B

VOLUME IIB

SECTION C

REV. NO. 00

DATE : 08.03.17

BILL OF QUANTITY-MAIN SUPPLY

PRICE FORMAT RATE CONTRACT NOZZLE 2017-18																												
SERVICE	I			II			III			IV			V			VI			VII	VIII	IX	X	XI	XII	XIII			
	DATASHEET NO. DS-1			DATASHEET NO. DS-2			DATASHEET NO. DS-3			DATASHEET NO. DS-4			DATASHEET NO. DS-5			DATASHEET NO. DS-6			Items to be included as additional requirement (applicable for any nozzle assembly of any line size as indicated in Column I to VI)									
SL NO	A1	A2	A5	B1	B2	B5	C1	C2	C5	D1	D2	D5	E1	E2	E5	E8	E9	E12	F1	G1	H1		I1	J1	K1	L1		
	PIPE SIZE (INCH)	SCHEDULE OF PRICES for Complete Nozzle assembly of nozzle material SS316, pipe material SA106GRB / SA106GRC with tappings and accessories like Root Valves (SS316) , Nipples (SS316) , Expanders (SS316) , Pressure Take off points etc (Ex-Works)	CALIBRATION CHARGES for Complete Nozzle assembly (Ex-Works)	PIPE SIZE (INCH)	SCHEDULE OF PRICES for Complete Nozzle assembly of nozzle material SS316, pipe material SA335 P91 / P92 with tappings and accessories like Root Valves (SS316) , Nipples (SS316) , Expanders (SS316) , Pressure Take off points etc (Ex-Works)	CALIBRATION CHARGES for Complete Nozzle assembly (Ex-Works)	PIPE SIZE (INCH)	SCHEDULE OF PRICES for Complete Nozzle assembly of nozzle material SS316, pipe material SA106GRC with tappings and accessories like Root Valves (SS316) , Nipples (SS316) , Expanders (SS316) , Pressure Take off points etc (Ex-Works)	CALIBRATION CHARGES for Complete Nozzle assembly (Ex-Works)	PIPE SIZE (INCH)	SCHEDULE OF PRICES for Complete Nozzle assembly of nozzle material SS316, pipe material SA335 P22 with tappings and accessories like Root Valves (SS316) , Nipples (SS316) , Expanders (SS316) , Pressure Take off points etc (Ex-Works)	CALIBRATION CHARGES for Complete Nozzle assembly (Ex-Works)	PIPE SIZE (INCH)	SCHEDULE OF PRICES for Complete Nozzle assembly of nozzle material A182F91, pipe material SA335 P91 with tappings and accessories like Root Valves (SS316) , Nipples (SS316) , Expanders (SS316) , Pressure Take off points etc (Ex-Works)	CALIBRATION CHARGES for Complete Nozzle assembly (Ex-Works)	PIPE SIZE (INCH)	SCHEDULE OF PRICES for Complete Nozzle assembly of nozzle material A182F92, pipe material SA335 P92 with tappings and accessories like Root Valves (SS316) , Nipples (SS316) , Expanders (SS316) , Pressure Take off points etc (Ex-Works)	CALIBRATION CHARGES for Complete Nozzle assembly (Ex-Works)	ROOT VALVE SS316 25Nb # 900	ROOT VALVE SS316 25Nb # 3500 SPL	ROOT VALVE SS316 25Nb # 4500 SPL	EXPANDER 15NB X 25NB , SS316 , MATERIAL CLASS 3000 / 9000	NIPPLE 25Nb , SS316 , 250mm long, SCH XXS	NIPPLE 25Nb , SS316 , 1000mm long, SCH XXS	NIPPLE 25Nb , SS316 , 250mm long, SCH 80			
																										QTY	No.	QTY
1	03" (80 NB)	1	1	06" (80 NB)	1	1	14" (150 NB)	1	1	06" (150 NB)	1	1	08" (200 NB)	2	1	08" (200 NB)	3	2	225	45	15	40	40	30	225			
2	04" (100 NB)	7	5	08" (200 NB)	3	2	20" (500 NB)	1	1	08" (200 NB)	1	1	10" (250 NB)	1	1	10" (250 NB)	6	2										
3	06" (150 NB)	1	1	10" (250 NB)	4	1	22" (550 NB)	2	1				12" (300 NB)	4	1	12" (300 NB)	1	1										
4	08" (200 NB)	2	1	12" (300 NB)	4	2	24" (600 NB)	4	3																			
5	10" (250 NB)	12	4	14" (350 NB)	1	1																						
6	12" (300 NB)	1	1																									
7	14" (350 NB)	1	1																									
8	16" (400 NB)	35	10																									
9	18" (450 NB)	5	3																									
10	20" (500 NB)	7	5																									



Technical specification for
Flow Nozzle Assembly with Accessories
 (RATE CONTRACT)

SPECIFICATION NO.: PE-TS-20-145-I105B

VOLUME IIB

SECTION C

REV. NO. 00

DATE : 08.03.17

BILL OF QUANTITY-SPARES

[A] LIST OF COMMISSIONING SPARES

NONE

[B] LIST OF MANDATORY SPARES

NONE

	Technical specification for Flow Nozzle Assembly with Accessories (RATE CONTRACT)		SPEC NO.: PE-TS-20-145-I105B
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SECTION – D

EQUIPMENT SPECIFICATION

	Technical specification for Flow Nozzle Assembly with Accessories (RATE CONTRACT)	SPEC NO.: PE-TS-20-145-I105B	
		VOLUME	II B
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		REV. NO.	00
		DATE : 08.03.17	

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 nozzles along with Branch pipes 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 / ISO 5167 standard shall be complied with for Flow Nozzles.

3.0 TECHNICAL REQUIREMENTS

The 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 Flow Nozzles

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

- 3.1.1 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 / ISO 5167. 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.
- 3.1.2 Material : The Flow nozzles shall be constructed of stainless steel type SS 316/ F91 / F 92 as indicated in the data sheet A & B .
- 3.1.3 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 minimum 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 shall be 25 NB. Two numbers of root valves to be provided for pressure $\geq 40\text{Kg/Cm}^2$ for each tapping.

Extra pressure tapping (other than the three tapping's mentioned above) shall be provided in case to case basis for a specific project (if required) by the bidder without any commercial implication. Associated accessories for this particular extra tapping like root valve, nipple and expander shall be considered as per the unit price quoted by the bidder in the price format.

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

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3.1.4 Branch pipe:

The branch pipe for mounting the flow Nozzle will be supplied as a free issue item by BHEL. However the successful bidder shall collect the branch pipe from any of BHEL Units or Site, to be intimated by the BHEL 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 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 and no commercial implication shall be accepted for the same.**

3.1.5 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.

3.1.6 **Edge preparation details shall be as per Annexure-B (Drawing No. 3-80-300-19825)**

3.1.7 **Root Valve material should not have Carbon Content less than 0.04 %.**

3.2 Guarantee & Performance

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

4.0 TESTS & INSPECTION

4.1 The equipment covered under this specification shall be subject to vendor's quality plan to be approved by the purchaser before start of 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 flow nozzle of each type and size of a specific service 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, equipment's 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 and submit QP for final approval by BHEL / Customer.

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5.0 DRAWINGS & DOCUMENTS

5.1 For RATE CONTRACT:

Following documents shall be submitted:

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

5.2 After the award of project specific contract:

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

5.2.1 for approval:

- Technical data sheets for each flow nozzle and accessories, in the proforma enclosed under Data sheet-B.
- The calculation of proper flow nozzle bore for the process conditions indicated in the data sheet.
- Assembly drawing of each type of flow nozzle complete with all accessories indicating detailed dimensions, B.O.M. and weights.
- Detailed dimensional drawings of each flow nozzle, root valves, flow nozzles, branch pipes, pressure connections, nipples etc.
- Installation drawings for the flow elements.
- Quality Plan duly signed and stamped.
- Edge preparation details.
- Differential pressure vs flow curve for each Nozzle.

5.2.2 for information:

- Storage & commissioning instructions.
- All relevant catalogues for the models of the Nozzle Assemblies as well as accessories finalized.
- O&M manuals.



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5.3 Final documentation for a project specific contract:

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

1. Category –I & IV Approved final drawings/data sheets, sizing calculations, DP vs Flow Curve for each nozzle.
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 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).

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&B for Flow NOZZLE: **Data sheet no. DS-"X" (X== 1 to 6)**

CAUTION THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LTD. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

3-80-300-19825

DRAWING No.

NOTES: -

01. APPLICABLE FOR P91 MATERIAL
02. FOR OD MISMATCHING REF. FIGURE-Xa.
03. $\alpha = 6^\circ$ FOR WALL THICKNESS ≤ 30 mm
04. $\alpha = 10^\circ$ FOR WALL THICKNESS > 30 mm

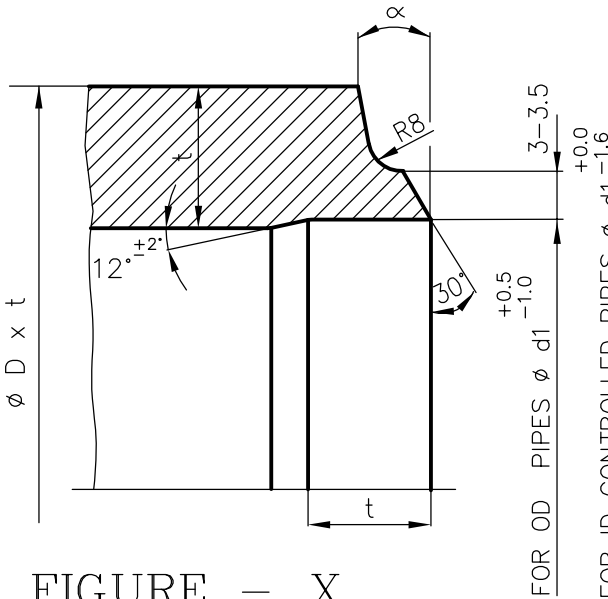


FIGURE - X

MATCHING EDGE PREPARATION FOR MISMATCH OD
DIAMETRICALLY GREATER THAN 8 mm
(ie OD1 - OD2 > 8mm) APPLICABLE FOR
BENDS/FITTINGS OF P91 MATERIALS

NOTES: -

01. OD OF STRAIGHT TO BE PHYSICALLY
MEASURED/VERIFIED.
02. $\alpha = 6^\circ$ FOR WALL THICKNESS ≤ 30 mm
03. $\alpha = 10^\circ$ FOR WALL THICKNESS > 30 mm

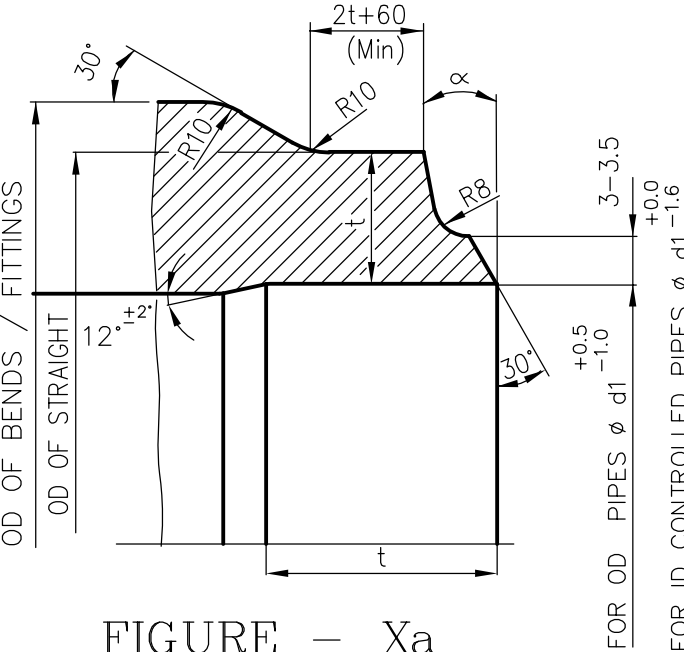
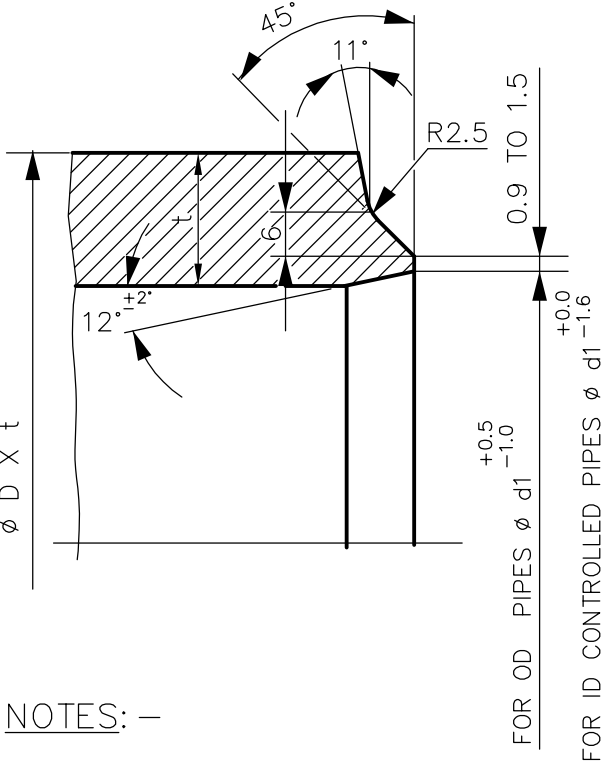


FIGURE - Xa



NOTES: -

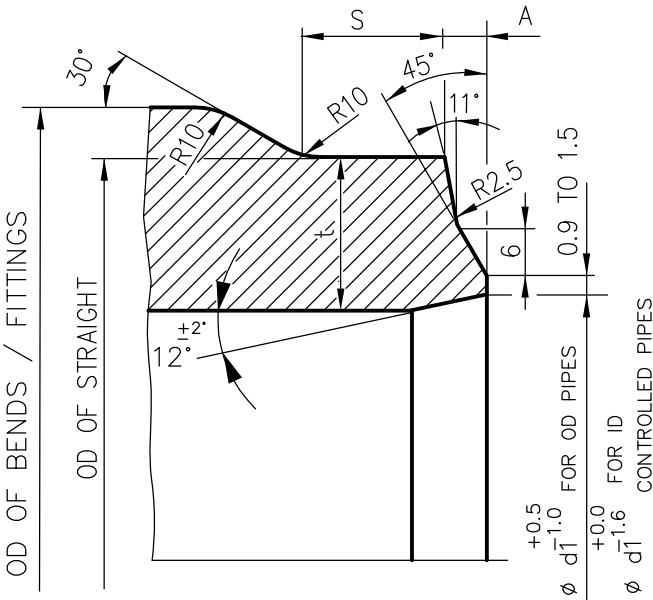
01. USE WHEN $t \geq 14.2$ mm.
02. FOR OD MISMATCHING REF. FIGURE-Pa

STYLE - P

MATCHING EDGE PREPARATION FOR MISMATCH OD
DIAMETRICALLY GREATER THAN 8 mm
(ie OD1 - OD2 > 8mm) APPLICABLE FOR
BENDS/FITTINGS OTHER THAN P91 MATERIALS

NOTES: -

01. OD OF STRAIGHT TO BE PHYSICALLY
MEASURED/VERIFIED.
02. WHEN $t < 65$, $S+A = 65$ Min. & $t > 65$, $S=65$ Min.
WHERE t =THK OF CONN.PIPE(STRAIGHT).



STYLE - Pa

MATCHING EDGE PREPARATION FOR MISMATCH OD
DIAMETRICALLY GREATER THAN 8 mm
(ie OD1 - OD2 > 8mm) APPLICABLE FOR
ELBOWS OTHER THAN P91 MATERIALS

NOTES: -

01. OD = OUTSIDE DIA OF CONNECTING PIPE
(STRAIGHT) TO BE PHYSICALLY MEASURED/VERIFIED.
02. t = THK OF CONN.PIPE (STRAIGHT)

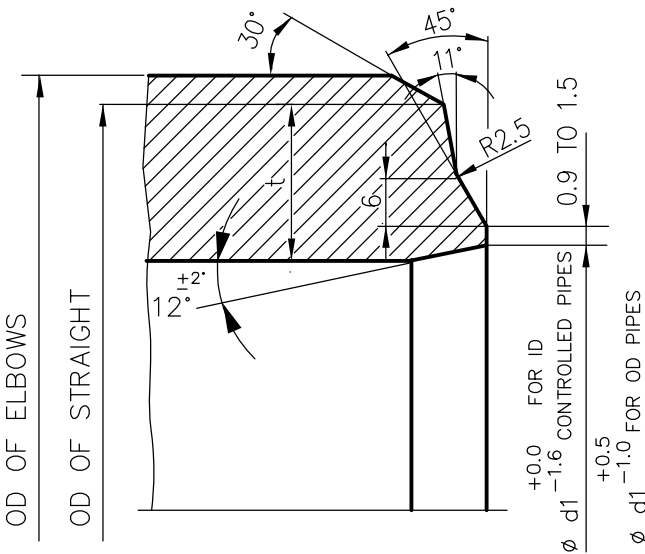
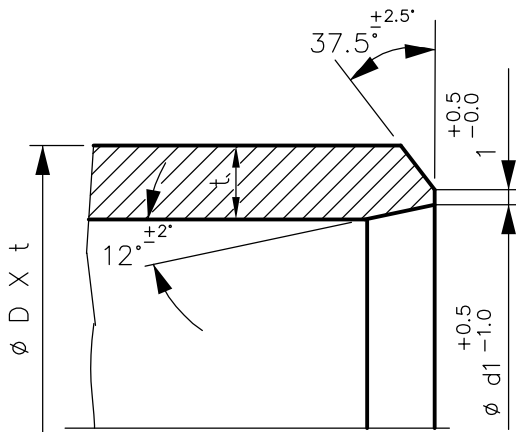


FIGURE - Z



STYLE - D

NOTES: -

01. USE WHEN $t < 14.2$ mm.

GENERAL NOTES :

- 01.THE MINIMUM THICKNESS AT WELD END SHALL NOT BE LESS THAN
a) 0.875 TIMES t NOM. FOR OD PIPES.
b) t MIN. FOR ID CONTROLLED PIPES.
02. t NOM & t MIN SHALL BE AS PER SPECIFIED PIPE SIZE.

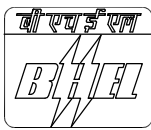
NOTES FOR WELDING:

01. WELD REINFORCEMENT TO BE FLUSH GROUND AND MERGED WITH PARENT METAL WITHOUT ANY UNEVENNESS.

ANNEXURE-B
PAGE 1 OF 2

TYPE OF PRODUCT
OR NAME OF
CUSTOMER/PROJECT

STANDARD



BHARAT HEAVY ELECTRICALS LTD.,
PIPING CENTRE, MADRAS

DRN	NAME	SIGN	DATE	NO OF
CHD	K.B.RAGUNATH		11.10.01	ITEMS
APPD	M.C.SEKARAN		11.10.01	
	A VELAYUTHAM		11.10.01	

DEPT.	GRADE OF UN TOL. DIM	SCALE	WEIGHT (Kg).	NAME OF ORIGINAL ORGANISATION	ITEM No.
CODE	C/M/F				
TITLE	EDGE PREPARATION DETAILS		CARD CODE	DRAWING No.	REV
			U 01	3-80-300-19825	01



TP062 05 99

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ALL DIMENSIONS ARE IN MM.