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SECTION – C

▪ SPECIFIC TECHNICAL REQUIREMENTS

▪ CUSTOMER’s SPECIFICATION

▪ DATA SHEETS – A

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▪ QUALITY PLAN

▪ BOQ-MAIN SUPPLY

▪ BOQ-SPARES
SPECIFIC TECHNICAL REQUIREMENTS
## Technical specification for Flow Nozzle Assembly with Accessories

**SERVICE** | BIDDER TO FURNISH DURING DOCUMENT APPROVAL
---|---
**MAKE : MODEL TYPE** | [ ]...........
**STANDARD** | BIDDER TO FURNISH DURING DOCUMENT APPROVAL
**DESIGN** | [ ] ASME PTC 19.5 / [ ] ISO 5167
**MATERIAL** | LONG RADIUS : HIGH BETA
**BETA RATIO** | SS316
**BORE DIAMETER** | ~ 0.7

### END CONNECTION

**TYPE** | BUTT WELD END
**BRANCH PIPE** | YES ( BY BHEL )
**BRANCH PIPE MATERIAL** | SAME AS PIPE MATERIAL
**TAPPING LOCATION** | D&D/2 : ON PIPE
**NUMBER OF TAPPINGS** | [ ] 3 PAIR / [ ] 4 PAIR

#### ROOT VALVE:

**QTY** | [ ] 06 / [ ] 08 / [ ] 12 / [ ] 16
**SIZE** | 25 NB
**TYPE** | GLOBE TYPE
**MATERIAL** | SS316
**RATING** | [ ] ANSI # 900 / [ ] ANSI # 2500 / [ ] ANSI # 3000 SPL / [ ] ANSI # 3500

#### NIPPLE:

**QTY** | [ ] 06 / [ ] 08 / [ ] 12 / [ ] 16
**SIZE** | 25NB
**MATERIAL** | SS316
**RATING** | [ ] SCH 80 250mm Long / [ ] SCH XXS 250mm Long / [ ] SCH XXS 1000mm Long

#### EXPANDER:

**QTY** | [ ] 06 / [ ] 08
**SIZE** | 15NB x 25NB
**MATERIAL** | SS316
**RATING** | [ ] CLASS 3000 : 50.8mm Long / [ ] CLASS 9000 : 50.8mm Long

### PROCESS DATA

**FLUID** | STEAM
**FLOW (T/HR)** | MAX. NORMAL MINIMUM
**PRESSURE (KG/CM² (A))** | (NR at 40% load) (NR at 100% load)
**TEMPERATURE (DEG. C.)** | BIDDER TO FURNISH DURING DOCUMENT APPROVAL
**MAX. ALLOWABLE PRESS LOSS** | BIDDER TO FURNISH DURING DOCUMENT APPROVAL
**DESIGN PRESS : TEMP** |
**DIFF. PRESS AT MAX FLOW** |

### PIPE LINE DATA

**PIPE SIZE (OD X THK) mm** | AS PER PRICE SCHEDULE
**PIPE MATERIAL** | [ ] SA106 GR B / [ ] SA106 GR C / [ ] SA 335 P91 / [ ] SA335 P22
**BORE DIAMETER** | BIDDER TO FURNISH DURING DOCUMENT APPROVAL
**MIN. AVAILABLE STRAIGHT LENGTH** | 15D
**UPSTREAM:DOWNSTREAM** | 10D : 5D
**FLOW DIRECTION** | [ ] HORIZONTAL / [ ] VERTICAL

### OTHER DATA

**IBR CERTIFICATION** | [ ] REQUIRED / [ ] NOT REQUIRED

### PACKING

**SEA WORTHY PACKING** | [ ] YES / [ ] NO

$ S-bent to be provided for vertical flow direction
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  
TYPE  
MATERIAL  
RATING  

**NIPPLE:**  
QTY  
SIZE  
MATERIAL  
RATING  

**EXPANDER:**  
QTY  
SIZE  
MATERIAL  
RATING  

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

| 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  
|---------|-------------------|
### STANDARD QUALITY PLAN FOR FLOW NOZZLE ASSEMBLY

**QUALITY PLAN NO.**: PE-QP-XXX-145-I105B  
**VOLUME**: IIB  
**SECTION**: C  
**REV. NO.**: 01  
**DATE**: 15.06.16  
**SHEET**: 1 OF 3

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<td>RAW MATERIAL</td>
<td>Physical, Chemical properties</td>
<td>MA</td>
<td>Physical, Chemical tests</td>
<td>One / Heat</td>
<td>AP / DS /SP</td>
<td>AP / DP /SP</td>
<td>TC</td>
<td>3/2</td>
<td>--- 2,1</td>
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<td></td>
<td>Ultrasonic testing (nozzle only)</td>
<td>MA</td>
<td>Ultrasonic test</td>
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<td>ASTMA388 &amp; ANSI B 16.34</td>
<td>ASTMA388 &amp; ANSI B 16.34</td>
<td>TC</td>
<td>3</td>
<td>2 1</td>
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<td>2.0</td>
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<td>Correctness</td>
<td>MA</td>
<td>Scrutiny</td>
<td>100%</td>
<td>IS:7307 / ASME IX</td>
<td>IS:7307 / ASME IX</td>
<td>Format of IS / ASME</td>
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<td>Weld FIT-UPS</td>
<td>Dimension, Alignment, Orientation.</td>
<td>MA</td>
<td>Measurement &amp; Visual</td>
<td>100%</td>
<td>WPS/Approved drg.</td>
<td>WPS/Approved drg.</td>
<td>IR / Log Book</td>
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<td>Penetrant Test</td>
<td>100%</td>
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<td>ASTM / 165ASME VIII Div I</td>
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<td>ASME SEC. V</td>
<td>ASME SEC. VIII</td>
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**LEGEND**:  
* CR - Critical characteristics  
MA - Major characteristics  
MI - Minor characteristics  
IR - Inspection Reports  
DS - Data Sheet  
SP - Tech. Spec.  
MR - Manufacturer records  
MS - Manufacturer standards  
$P$ - Agency Performing the Test.  
$W$ - Agency Witnessing the Test.  
$V$ - Agency Verifying the Test.  
$1$ - BHEL  
$2$ - Vendor  
$3$ - Sub-vendor
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<td>IR / Mfd Records</td>
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<td>MA</td>
<td>Measurement</td>
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## STANDARD QUALITY PLAN
FOR
FLOW NOZZLE ASSEMBLY

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<td>AP / DS</td>
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<td>3/2</td>
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<td>SP / MS</td>
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**NOTE:**

1. Test Certificates to be verified by BHEL at final inspection stage.
2. Positive Material Identification (PMI) testing shall be performed by vendor in accordance with ASTM-E1916 and API practice 578 on the finished nozzle element, nipples & root valve. Same shall be witnessed (if required) by Customer/BHEL.
3. Minimum 2 coats of primer paint to be applied before dispatch.
4. In case of NTPC / LLOYDS / BHEL qualified welders available, then prequalification and WPS, PQR not required, only TC to be verified.
5. CALIBRATION Test to be carried out at IIT-DELHI / FCRI or BHEL approved laboratory.
6. Sea Worthy packing (if applicable) shall be provided by vendor without any commercial implication.
7. Qualification records of the Vendors can be verified.
8. For P91 & P22 material welding shall be done continuously. No interruptions are allowed.

**LEGEND:**

* - Critical characteristics
MA - Major characteristics
MI - Minor characteristics
CR - Critical characteristics
IR - Inspection Reports
DS - Data Sheet
SP - Tech. Spec.
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.
BILL OF QUANTITY-MAIN SUPPLY
BILL OF QUANTITY-SPARES

[A] LIST OF COMMISSIONING SPARES

[B] LIST OF MANDATORY SPARES
SECTION – D

- EQUIPMENT SPECIFICATION
- EDGE PREPARATION DETAILS
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 all Flow Nozzles. ASME PTC 6 shall be complied with for specific Flow nozzles (if any) with high accuracy requirements.

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 unless specified in datasheet.

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 > 40Kg/Cm² 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.
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 machining & other related 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 (Drawing No. 3-80-300-19825)

3.2 For vertical installation of nozzles (if any), the S-bent impulse pipe shall be supplied by the supplier without any commercial implication.

3.3 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 for a project 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 and submit QP for final approval by BHEL / Customer.
4.7 PMI Test

100% positive material identification test shall be performed according to ASTM-E1916 and API practice 578 using either "Portable X-ray Fluorescence" or "Optical Emission" type instrument. This shall be applicable for element, nipples & root valves.

5.0 DRAWINGS & DOCUMENTS

5.1 With the Technical bid during enquiry:

Following documents shall be submitted:

a) Quality plan duly signed and stamped.

b) Datasheet A duly signed and stamped.


d) Inspection schedule.

e) 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:

1. Technical data sheets for each flow nozzle and accessories, in the proforma enclosed under Data sheet-C.

2. The calculation of proper flow nozzle bore for the process conditions indicated in the data sheet.

3. Assembly drawing of each type of flow nozzle complete with all accessories indicating detailed dimensions, B.O.M. and weights.

4. Detailed dimensional drawings of each flow nozzle, root valves, branch pipes, pressure connections, nipples etc.

5. Installation drawings for the flow elements.

6. Quality Plan duly signed and stamped.

7. Edge preparation details.

8. Differential pressure vs flow curve for each Nozzle.

5.2.2 for information:

1. Storage & commissioning instructions.

2. All relevant catalogues for the models of the Nozzle Assemblies as well as accessories finalized.

3. O&M manuals.
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).

6.1.1 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 NOZZLE: Data sheet no. “X” (X= 1 to “N”)