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For tender documents (Technical)
Tender no B/4011/2015/4822V1

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Based on standard : ASME PTC 6 2004

TECHNICAL SPECIFICATION FOR CALIBRATED FLOW NOZZLES

1.0 GENERAL

This specification calls for supply of calibrated long radius, low beta ratio throat tap flow nozzle assembly(ies) for the accurate determination of primary flow in the Performance Guarantee test on the TG set of the project indicated in sheet-5.

2.0 SCOPE

Supply of calibrated flow nozzle assembly(ies) comprising primary flow element, flow straightener(s), end flanges, gaskets (including one extra set for future use), requisite zinc plated bolts, nuts, upstream and downstream pipe sections and suitable root valves for tap sets. Each of the four pressure tap sets shall be 90° apart and calibrated as per ASME PTC-6-2004.

3.0 TECHNICAL REQUIREMENTS

Long Radius, low beta ratio throat tap flow nozzle assembly is to be designed as per para 4.8.4 to 4.8.11 of "ASME PTC-6 2004", "ASME PTC 19.5 -Flow Measurement" along with data in Sheet No. 5. The overall dimensions of the flow meter(s) should match with those indicated in sketch in sheet No.6. Major technical requirements are reproduced as follows:


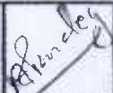

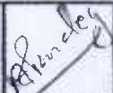

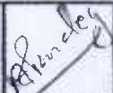

- a) The flow nozzle(s) shall be designed, manufactured and calibrated as per ASME PTC-6 2004.
- b) The supplier should calibrate the nozzle(s) preferably by Weigh tank method with Reynolds number, Water Temperature & other flow conditions as close to test conditions as possible. When it is not possible to calibrate at the test Reynolds number, the calibration Reynolds number should be obtained in accordance with para 4.8.16 of ASME PTC-6-2004. While calibrating, the transition region from 1.0 million to 4.0 million should be established .It is recommended that the value of the coefficient be established at the highest Reynolds No. possible, to minimize the effects of the transition region (in accordance with para 4.8.13 of ASME-PTC-6-2004). It is recommended that nozzles be sized to produce throat Reynolds Nos. beyond this range if possible to avoid effects of the Transition region as described in para 4.8.17, pg.37 of ASME-PTC-6-2004.
- c) The supplier should get the flow nozzle calibrated only at a recognized facility having international repute. Calibration should be conducted on all the pairs of taps & preferably consist of at least 20 acceptable points over a wide range of Reynolds Nos. For each set of selected taps, the calibration curve shall be within 0.25% of the reference curve and shall have the same slope. The reference curve is given in fig. 4.10 & table 4.2 on pg. 37 of ASME PTC-6-2004. The calibration of the flow nozzle shall comply with the conditions listed in clause 4-8.14 and 4-8.15 on pg. 36 & 37 of ASME PTC -6-2004


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स्वत्वाधिकार एवं गोपनीय
 इस दस्तावेज में दी गई सूचना भारत ही इलेक्ट्रिकल्स की संपत्ति है इसका प्रयोग एवं प्रसारण के बिना या इससे पूर्व के बिना की जा सकती है, जो कि इन केंद्रों के हित में सकारात्मक हो न कि हानिकारक

दिनांक एवं हस्ताक्षर
 SIGN & DATE
 4/10/11
 सामग्री सूची संख्या
 INVENTORY NO.
 P-6412

					नाम NAME	दिनांक एवं हस्ताक्षर SIGNATURE & DATE
TSX	B. CHOUHARY	अनुवादक	TRANSLATED BY	-	-	-
MEMBER-PSC	V.K. Chauhan	निर्माणकर्ता	DRAWN BY	-	-	-
QAX	S.K. CHAUHAN	जांचकर्ता	WORKED BY	ANURAG PANDEY	4/9/11	4/9/11
सहमत विभाग AGREED DEPT.	नाम NAME	दिनांक एवं हस्ताक्षर DATE & SIGNATURE	पर्यवेक्षककर्ता CHECKED BY	RAJEEV RAWAT	4/9/11	4/9/11
		स्वीकृति APPROVED :	S. BHATTACHARYA DGM (STE)			GP No. 2.83
REV.NO. 00		निर्माण PREPARED :	STE-TC	जारी ISSUED :	TSX	दिनांक DATE : 01.09.2011

दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक PRODUCT STANDARD	ST45009								
SUPERSEDES INVENTORY NO.			पृष्ठ 6 का 3	Page 3 of 6							
समीची सूची संख्या एवं अंकित/रिक्त बरताने		<p>4.0 DOCUMENTS TO BE SUBMITTED WITH OFFER</p> <ol style="list-style-type: none"> 1) A copy of the design calculation for the nozzle(s) indicating clearly the calculation formula & the various correction factors like Buoyancy factor, Density correction, scale expansion etc. the bidder intends to apply in the calculations. 2) A typical flow calibration curve for a flow nozzle supplied earlier as per ASME PTC-6 3) Preliminary drawing of nozzle assembly and nozzle cross sectional drawing. 4) A quality plan on prescribed format. 5) Details of Manufacturing, testing & calibration facilities. 6) Experience list of supply of flow nozzle for similar rating supercritical thermal sets. <p>5.0 DOCUMENTS TO BE SUBMITTED FOR DESIGN APPROVAL (after Placement of order)</p> <ol style="list-style-type: none"> 1) Drawings of the flow section with details of different components, material details and dimensions. 2) Final flow calculation as per ASME PTC-6. 3) An assembly drawing showing the location and assembly of all major components including the location of the marks showing tap set Nos. 4) Quality plan. <p>5.1 INSPECTION & TEST CERTIFICATES</p> <p>The following minimum tests shall be carried out as per applicable standards. 3 copies of test certificates and 1 reproducible shall be submitted for all the tests listed below before packing and dispatch of nozzles.</p> <ol style="list-style-type: none"> 1) Calibrations on nozzle as per ASME PTC-6. Copies of calibration for each tap set indicating nozzle/pipe diameter and calibration conditions, including curves and calculation data shall be submitted for review and acceptance. 2) Material tests for all major components (i.e.) Nozzle, Steel pipes, Flanges, fittings, etc 3) Magnetic particle or liquid penetrant examination for each pressure taps as per ASME Sect.V. 4) 100 % Radiographic examination of butt welds as per ASME Sect.VIII. 5) Hydrostatic pressure test of complete meter run at 1.5 times of design pressure for minimum 30 minutes with proof of test. 6) Surface finish measurement for Nozzles satisfying the requirements of ASME PTC-6 and ASME PTC 19.5 as stated in para 3(d) above. 									
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स्वत्वाधिकार एवं गोपनीय इस दस्तावेज में दी गई सूचना भारत भारती इंजीनियरिंग्स की सम्पत्ति है इसका प्रयोग एवं प्रसारण के बिना या बिना अनुमति के कहीं भी प्रकाशित नहीं किया जाये											
दिनांक एवं हस्ताक्षर SIGN & DATE 4-10-11											
समीची सूची संख्या INVENTORY NO. P-6412	REV. NO. 00		<table border="1"> <tr> <td>जांचकर्ता WORKED BY</td> <td>ANURAG PANDEY</td> <td></td> <td>1-9-11</td> </tr> <tr> <td>पर्यवेक्षणकर्ता CHECKED BY</td> <td>RAJEEV RAWAT</td> <td></td> <td>1-9-11</td> </tr> </table>	जांचकर्ता WORKED BY	ANURAG PANDEY		1-9-11	पर्यवेक्षणकर्ता CHECKED BY	RAJEEV RAWAT		1-9-11
जांचकर्ता WORKED BY	ANURAG PANDEY		1-9-11								
पर्यवेक्षणकर्ता CHECKED BY	RAJEEV RAWAT		1-9-11								

दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक								ST45009			
		PRODUCT STANDARD								पृष्ठ 6 का 4 Page 4 of 6			
SUPERSEDES INVENTORY NO.	<u>PRESCRIBED FORMAT FOR QUALITY PLAN</u>												
समग्री सूची संख्या को अधिकृतित करना है	S. No	COMPONENT OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY P W V			REMARKS
	1	2	3	4	5	6	7	8	9	10	11	12	13
COPYRIGHT AND CONFIDENTIAL <small>The information on this document is the property of Bharat Heavy Electrical. Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company</small>	<u>INSTRUCTIONS FOR FILLING QUALITY PLAN</u>												
	<p>The quality plan shall include all the quality control measures and check adopted by the vendor to ensure that the material/ components/ assembly/ services supplied by the vendor meet /will meet the requirements as per specifications and good practices. They shall include all stages of operation such as materials, process, assembly, packing & dispatch. The following guidelines for filling the Quality plan may be noted:</p> <p>Column 1- Serial Number</p> <p>Column 2- Component / operation. The component and / or operation being checked shall be given here.</p> <p>Column 3-Characteristics - The characteristic being checked shall be given here (e.g.) Chemical composition, mechanical properties, leak tightness, surface defects, etc.</p> <p>Column 4- Category CR stands for critical characteristic affecting the safety of equipment and personnel. MA stands for major characteristic affecting performance, reduction in life, large down time. MI stands for minor characteristic affecting appearance.</p> <p>Column 5-Type of check: like chemical analysis, tensile testing, hydraulic test, visual examination, radiography, etc.</p> <p>Column 6- Quantum of check such as 100%, 10%, 1 per Heat, etc.</p> <p>Column 7- Reference documents - Documents such as Technical specifications, drawings, standard specifications (BS, ANSI, ASME, DIN, IS, etc.), procedure etc. according to which the checks are done.</p> <p>Column 8- Acceptance norms-Standards etc. according to which the acceptability or otherwise of the characteristics being checked is decided.</p> <p>Column 9- Format of Records - Formats, log sheets, reports, etc. in which the observations are recorded. Standard log sheets, reports, format, etc. of the vendor shall be numbered and such reference numbers shall be included here.</p> <p>Column 10-12 -Agency - The agency which performs the test/inspection shall be written in the sub-column P. The agency which witnesses the tests shall be written in the sub-column W & the agency which verifies the tests certificates/inspection records shall be written in the sub-column V.</p>												
दिनांक एवं हस्ताक्षर SIGN & DATE	6.0 <u>CROSS REFERRED STANDARDS:</u> ASME PTC-6 2004, ASME PTC 19.5												
समग्री सूची संख्या INVENTORY NO.	REV. NO. 00						जांचकर्ता WORKED BY	ANURAG PANDEY					
P-6412							पर्यवेक्षणकर्ता CHECKED BY	RAJEEV RAWAT					

दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक PRODUCT STANDARD	ST45009 पृष्ठ 6 का 5 Page 5 of 6																	
SUPERSEDES INVENTORY NO.	DATA SHEET FOR FLOW MEASURING DEVICE 800 MW THERMAL POWER PLANT																			
समीची सूची संख्या को अधिकारित करता है	1) SERVICE : CONDENSATE FLOW TO DEAERATOR 2) TAG NO. : FP01 3) QUANTITY : 1 NO. 4) LINE FLUID : CONDENSATE (DM WATER) 5) OPERATING DATA																			
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company.	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 20%;">100 % LOAD (Design Point)</th> <th style="width: 20%;">80 % LOAD</th> <th style="width: 30%;">MAXIMUM LOAD</th> </tr> </thead> <tbody> <tr> <td>FLOW (T/Hr)</td> <td style="text-align: center;">1769.46</td> <td style="text-align: center;">1415.712</td> <td style="text-align: center;">1908.260</td> </tr> <tr> <td>PRESSURE(Kg/cm² abs)</td> <td style="text-align: center;">11.90</td> <td style="text-align: center;">9.93</td> <td style="text-align: center;">12.63</td> </tr> <tr> <td>TEMPERATURE (°C)</td> <td style="text-align: center;">150.3</td> <td style="text-align: center;">143.8</td> <td style="text-align: center;">152.5</td> </tr> </tbody> </table>					100 % LOAD (Design Point)	80 % LOAD	MAXIMUM LOAD	FLOW (T/Hr)	1769.46	1415.712	1908.260	PRESSURE(Kg/cm ² abs)	11.90	9.93	12.63	TEMPERATURE (°C)	150.3	143.8	152.5
		100 % LOAD (Design Point)	80 % LOAD	MAXIMUM LOAD																
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स्वतंत्राधिकार एवं गोपनीय इस प्रस्ताव में दी गई सूचना भारत भारती इंजीनियरिंग्स की संपत्ति है इस्तेमाल केवल इस अर्थव्यवस्था के लिए ही किया जाना चाहिए, जो कि किसी भी दस्तावेज में प्रकाशित नहीं होना चाहिए।	6) PIPE SIZE : O.D. = 457.00 mm : I.D. = 431.60 mm : Thickness = 12.70 mm 7) PIPE MATERIAL : SA106 Gr C. 8) PIPE STANDARD : ANSI B 36.10 9) TYPE OF FLOW ELEMENT : LOW BETA RATIO THROAT TAP NOZZLE 10) MATERIAL OF FLOW ELEMENT : 321 SS or Equivalent 11) TYPE OF MOUNTING : Flanged 12) TYPE OF TAPPING : Throat Taps 13) NO.OF TAPPING POINTS : FOUR Pairs 14) TYPE OF FLOW STRAIGHTENER : Perforated or Tubed plate (As per Fig. 4.5, ASME PTC- 6-2004) 15) GRADIENT : Horizontal 16) ALLOWABLE PRESSURE LOSS : Approx 1.0 Kg/cm ² at 100 % load 17) DESIGN & CALCULATIONS : As per ASME PTC-6-2004 & ASME PTC 19.5-2004 Flow Measurement 18) CALIBRATION CURVES & DATA : Required for each pair of tapings. Data indicating Cd _{theo} & Cd _{practical} to be furnished.																			
दिनांक एवं हस्ताक्षर SIGN & DATE 4-10-11	19) DIFFERENTIAL AT 100% LOAD : Preferably 1.5 Kg/cm ² 20) INSTRUMENT RANGE : 0-2.5 Kg/cm ² Dp transmitter																			
समीची सूची संख्या INVENTORY NO. P-6412	REV. NO. 00		जांचकर्ता WORKED BY	ANURAG PANDEY 																
			पर्यवेक्षणकर्ता CHECKED BY	RAJEEV RAWAT 																

दिनांक एवं हस्ताक्षर
SIGN & DATE



उत्पाद मानक

PRODUCT STANDARD

ST45009

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सुपरसेड्स
INVENTORY NO.

सामग्री सूची संख्या को
अधिकारित करना है

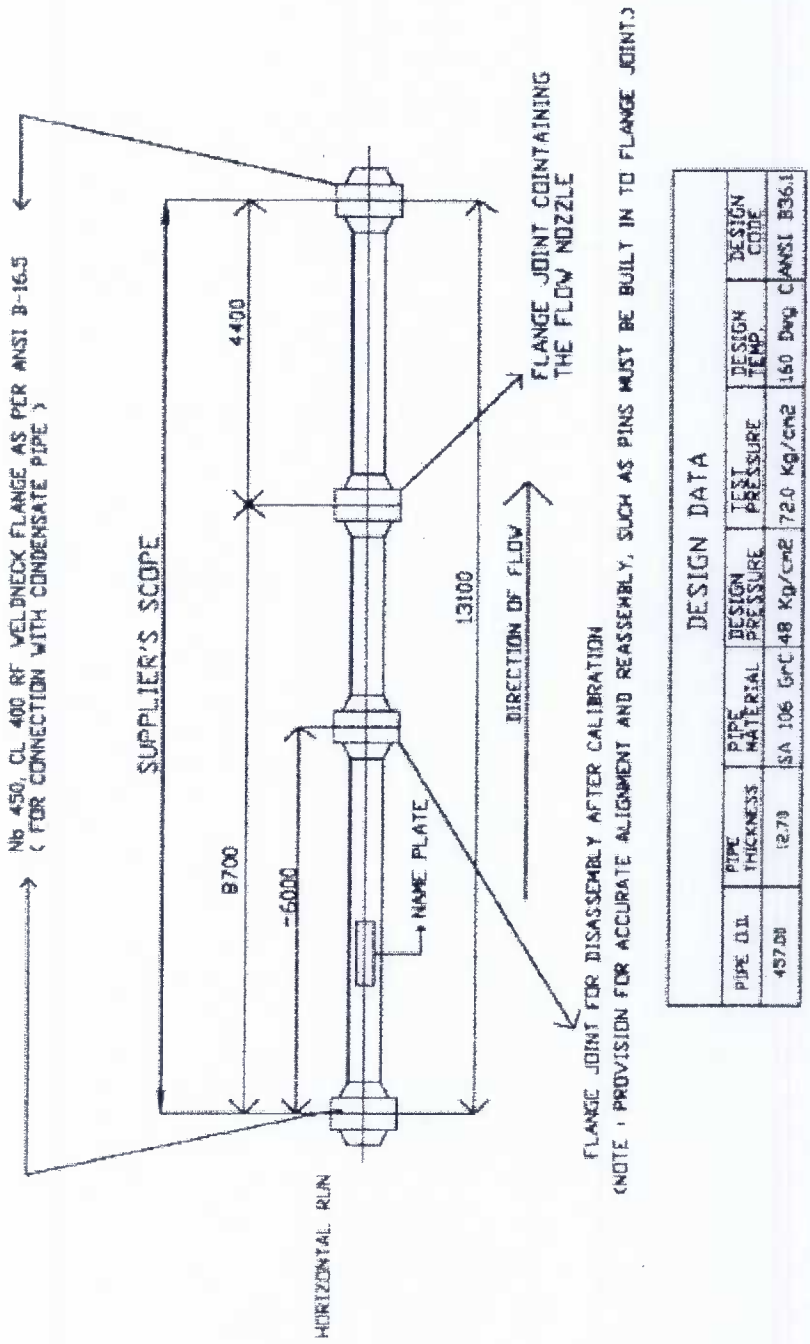
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स्वतंत्राधिकार एवं गोपनीय
एन प्रोडक्ट में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की संपत्ति है इस्तेमाल परतक एवं अनाधिकृत रूप से किसी भी तरह प्रयोग, जो की किसी कंपनी के हित में प्रतिस्पर्धाक हो न किया जाए

दिनांक एवं हस्ताक्षर
SIGN & DATE
4/10/11

सामग्री सूची संख्या
INVENTORY NO.
P-6412

REV. NO. 00



DESIGN DATA					
PIPE O.D.	PIPE THICKNESS	PIPE MATERIAL	DESIGN PRESSURE	TEST PRESSURE	DESIGN TEMP
487.00	12.79	ISA 106 GrC 48	48 Kg/cm ²	72.0 Kg/cm ²	160 Deg C/ANSI B36.1

All Dimensions in mm

जांचकर्ता
WORKED BY
पर्यवेक्षणकर्ता
CHECKED BY

ANURAG PANDEY
RAJEEV RAWAT

4/10/11
19/11

