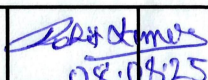
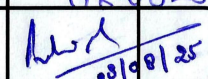
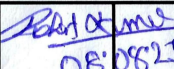
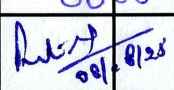


दिनांक एवं हस्ताक्षर SIGN & DATE SUPERSEDES INVENTORY NO समग्री सूची संख्या को उपक्रियित कल		उत्पाद क्रय विनिर्देश (हीप : हरिद्वार) PRODUCT PURCHASE SPECIFICATION (HEEP: HARIDWAR)		ST45015 पृष्ठ 6 का 1 Page 1 of 6	
		Based on standard: ASME PTC 6 2004 TECHNICAL SPECIFICATION FOR CALIBRATED FLOW NOZZLES (660 MW SETS)			
1.0 GENERAL This specification calls for supply of calibrated long radius, low beta ratio throat tap flow nozzle assembly 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 comprising primary flow element, flow straightener(s), end flanges, gaskets (including one extra set for future use), requisite zinc plated bolts/studs & nuts, single piece 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 2004-Flow Measurement" along with data in Sheet No. 5. The overall dimensions & design 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 separately conducted on each pairs of four taps & preferably consist of at least 20 separate 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.					
स्वत्वाधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत हेतु एलेक्ट्रिकल्स लिमिटेड की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग जो कि कम्पनी के हित में इतिहासिक हो न किया जाय।	दिनांक एवं हस्ताक्षर SIGN & DATE TSX ARVIND 08/08/25		नाम NAME अनुवादक TRANSLATED BY निर्माणक WORKED BY जांचक CHECKED BY पर्यवेक्षणकर्ता SUPERVISED BY		दिनांक एवं हस्ताक्षर SIGNATURE & DATE ROHIT KUMAR PREETAM SINGH
	सदस्य विभाग AGREED DEPTT. नाम NAME दिनांक एवं हस्ताक्षर DATE & SIGNATURE		स्वीकृति APPROVED : PRABHAT SINGH, AGM (STE) निर्माण PREPARED : STE-TC जारी ISSUED : TSX		दिनांक एवं हस्ताक्षर SIGNATURE & DATE 08/08/25 08/08/25
समग्री सूची संख्या INVENTORY NO P-4246	REV. NO. 00 Dt 08/08/2025 CHANGE ADVICE NO		Gr.NO. 2.83 दिनांक DATE : 08/08/2025		

दिनांक एवं हस्ताक्षर SIGN & DATE			उत्पाद क्रय विनिर्देश (हीप : हरिद्वार) PRODUCT PURCHASE SPECIFICATION (HEEP: HARIDWAR)		ST45015 पृष्ठ 6 का 2 Page 2 of 6
सामग्री सूची संख्या INVENTORY NO.	समय सीमा SUPERSIDES	समय सीमा INVENTORY NO.	d) The flow nozzle(s) shall be made from corrosion resistant material with known thermal expansion coefficient (as per clause 10 on page 5 of 6 of this document). Its surface should be hydraulically smooth and have a 0.4 microns or better finish and shall be free from all burrs, scratches, imperfections or ripples. For additional requirements on the design and manufacture of the nozzle(s) and its pressure taps, refer paras. 5.1, 5.2, 5.3, 5.4 of ASME PTC 19.5-2004 Flow Measurement & paras 4.8.6 & 4.8.7 of ASME PTC-6-2004. e) The flow straightener shall be of Perforated or tubed plate design with non-uniform hole distribution (also called Gallagher Straightener) as shown in Fig 4.5 & described in Para 4.8.4 & Table 4.1 on Pg. 30 & 32 of ASME PTC-6-2004. f) The bidder should confirm that in case the calibration curves are not within the limits prescribed in ASME PTC-6, they will manufacture fresh flow nozzle(s) and calibrate it to achieve the calibration regimes of ASME PTC-6 and supply the new piece(s) without any price / delivery implications. g) The total length of the flow assembly including flow straighteners; upstream & downstream pipe pieces; flanges of size Nb400 CL400 RF Weld neck type as per ANSI-B16.5 etc. is to be exactly as indicated in the sketch in sheet No.6 of this document. The upstream & downstream pipe should be without any weld joint and should be internally machined for a length of 4D & 2D respectively in accordance with clause no: 5-3 of ASME PTC-19.5 2004. h) All external surfaces of the assembly shall be painted with one coat of rust preventive primer and minimum one coat of heat resistive paint suitable for 160 Deg C application, to avoid rusting due to sea transportation (if applicable) and open storage at site for period up to one year. The end faces shall be provided with suitable covers and conservation shall be done by filling Nitrogen and blanking the nozzle at the ends to avoid rusting/damage of the pipe internals. The nozzle shall remain filled with nitrogen until installation for Performance Test. Alternatively if supplier is not able to provide Nitrogen filling then the internals of the pipe should be provided with suitable conservation (like Volatile Corrosion Inhibitor). Open ends of upstream and downstream taps should be sealed with covers to prevent damages to thread. The nozzles shall be packed in suitable seaworthy crates to avoid damage during transport and temporary storage before use. i) Serial No. of the nozzle, tag FP01 should be clearly indicated on a name plate permanently affixed to the assembly. Tap set identification mark(s) shall also be hard punched as well as painted in large letters on the assembly so that they can be easily identified by the customer at site. These should also be clearly indicated in the assembly drawing. j) The nozzle should be placed in box with name plate facing upward. The box should have arrow mark indicating upper direction and should at least carry Name of supplier, S.No. Of nozzle, Name of the project, package size, gross weight and net weight. k) To avoid loss of Root Valves and/ or Spare Gaskets packed with nozzles, Supplier should tie these loose items to the pipe body using wire or other suitable sturdy material.		
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स्वतंत्रता एवं गोपनीय इस प्रलेख में दी गई सूचना भारत की संसदीय प्रणाली के अंतर्गत गोपनीय है। इसका प्रयोग केवल उद्देश्य के लिए ही किया जा सकता है।					
दिनांक एवं हस्ताक्षर SIGN & DATE	13/8/25	Sandeep			
सामग्री सूची संख्या INVENTORY NO.	P4246	REV. NO.:00	निर्माणकर्ता WORKED BY	ROHIT KUMAR	 08.08.25
			जांचकर्ता CHECKED BY	PREETAM SINGH	 08/08/25

दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद क्रय विनिर्देश (हीप : हरिद्वार) PRODUCT PURCHASE SPECIFICATION (HEEP: HARIDWAR)		ST45015 पृष्ठ 6 का 3 Page 3 of 6	
SUPERSEDES INVENTORY NO. समग्री सूची संख्या को अधिकतम करता	4.0 DOCUMENTS TO BE SUBMITTED WITH OFFER 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 2004 requirements. 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. 5.0 DOCUMENTS TO BE SUBMITTED FOR DESIGN APPROVAL (after Placement of order) 1) Drawings of the flow section with details of different components, material details and dimensions. 2) Final flow calculation as per ASME PTC-6 2004. 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. 5) Supplier shall not make any changes in drawings & materials after approval of documents without permission of BHEL. 5.1 Flow nozzle assembly should be manufactured based on drawings approved by BHEL as per 5.0 above. 5.2 INSPECTION & TEST CERTIFICATES The following minimum tests shall be carried out as per BHEL approved drawings and applicable standards. 3 hard copies of test certificates and 1 soft copy in pdf format shall be submitted for all the tests listed below before packing and dispatch of nozzles. 1) Material tests for all major components (i.e.) Nozzle, Steel pipes, Flanges, fittings, etc 2) Magnetic particle or liquid penetrant examination for each pressure taps as per ASME Sect.V. 3) 100 % Radiographic examination of butt welds as per ASME Sect.VIII. 4) Hydrostatic pressure test of complete meter run at 1.5 times of design pressure for minimum 30 minutes with proof of test. 5) Surface finish measurement for Nozzles satisfying the requirements of ASME PTC-6 2004 and ASME PTC-19.5 2004 as stated in para 3(d) above. 5.3 WET CALIBRATION Calibrations on nozzle as per ASME PTC-6 2004. 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 before packing and dispatch of nozzles.				
COPYRIGHT AND CONFIDENTIAL The information on this documents 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					
स्वाधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत हेवी एलेक्ट्रिकल्स लिमिटेड की सम्पत्ति है। इस प्रलेख में दी गई सूचना भारत हेवी एलेक्ट्रिकल्स लिमिटेड की सम्पत्ति है। इस प्रलेख में दी गई सूचना भारत हेवी एलेक्ट्रिकल्स लिमिटेड की सम्पत्ति है। इस प्रलेख में दी गई सूचना भारत हेवी एलेक्ट्रिकल्स लिमिटेड की सम्पत्ति है।					
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समग्री सूची संख्या INVENTORY NO. P4216	REV. NO.: 00		निर्माणकर्ता WORKED BY जांचकर्ता CHECKED BY	ROHIT KUMAR PREETAM SINGH	 

दिनक एवं हस्ताक्षर SIGN & DATE सामग्री सूची संख्या INVENTORY NO. P-9216		उत्पाद क्रय विनिर्देश (हीप: हरिद्वार) PRODUCT PURCHASE SPECIFICATION (HEEP: HARIDWAR)		ST45015 पृष्ठ 6 का 4 Page 4 of 6																																								
		<u>PRESCRIBED FORMAT FOR QUALITY PLAN</u>																																										
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.		<u>INSTRUCTIONS FOR FILLING QUALITY PLAN</u> 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, machining, assembly, calibration, painting, packing & dispatch. The following guidelines for filling the Quality plan may be noted: Column 1- Serial Number Column 2- Component / operation. The component and / or operation being checked shall be given here. Column 3-Characteristics - The characteristic being checked shall be given here (e.g.) Chemical composition, mechanical properties, leak tightness, surface defects, etc. 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. M1 stands for minor characteristic affecting appearance. Column 5-Type of check: like chemical analysis, tensile testing, hydraulic test, visual examination, radiography, etc. Column 6- Quantum of check such as 100%, 10%, 1 per Heat, etc. 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. Column 8- Acceptance Norms-BHEL approved drawings, standards etc. according to which the acceptability or otherwise of the characteristics being checked is decided. 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. 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.																																										
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				पृष्ठ 6 का 5 Page 5 of 6																	
SUPERSEDES INVENTORY NO	DATA SHEET FOR FLOW MEASURING DEVICE 660 MW THERMAL SETS																				
सामग्री सूची संख्या को अधिकतम करता	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"> <thead> <tr> <th></th> <th>100 % LOAD (Design Point)</th> <th>80 % LOAD</th> <th>MAXIMUM LOAD</th> </tr> </thead> <tbody> <tr> <td>FLOW (T /Hr)</td> <td>1463.661</td> <td>1182.861</td> <td>1610.982</td> </tr> <tr> <td>PRESSURE(Kg/cm² abs)</td> <td>12.11</td> <td>12.00</td> <td>14.00</td> </tr> <tr> <td>TEMPERATURE (°C)</td> <td>153.8</td> <td>147.1</td> <td>154.8</td> </tr> </tbody> </table>						100 % LOAD (Design Point)	80 % LOAD	MAXIMUM LOAD	FLOW (T /Hr)	1463.661	1182.861	1610.982	PRESSURE(Kg/cm ² abs)	12.11	12.00	14.00	TEMPERATURE (°C)	153.8	147.1	154.8
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दिनांक एवं हस्ताक्षर SIGN & DATE Sander 13/8/25	REV. NO.: 00																				
सामग्री सूची संख्या INVENTORY NO P-4746	निर्माणकर्ता WORKED BY ROHIT KUMAR		जांचकर्ता CHECKED BY PREETAM SINGH																		

