

Advanced Technology Products
High Pressure Boiler Plant

Generic QAP for Stud Assembly

CUSTOMER PROJECT W.O. Nuclear Power Corporation of India Limited (NPCIL)
Gorakhpur Haryana Anu Vidyut Pariyojana (GHAVP-1&2)
D157 to D160-001-1-93-171

BHEL / Quality Assurance & Engineering			NPCIL
Prepared by: O R NITHIN <i>NK</i> 27/10/18 <i>Nithin</i> 27/10/18 NITHIN K KRISHNAN	Reviewed by: <i>S. Lakshmi</i> 27/10/18 S LAKSHMI <i>M. Lakshminarasimhan</i> 27/10/18 M LAKSHMINARASIMHAN	Approved by: <i>A Sundararajan</i> 27/10/18 A SUNDARARAJAN	<i>R. Gupta</i> 22/11/2018 CRK Gupta

REVISIONS			
REVISION No.	DATE	DESCRIPTION	ORIGINATOR
00	21-09-2018	Initial Issue	Nithin K Krishnan
01	27-10-2018	R01	Nithin K Krishnan

QAP: GHAVP: STUD ASSEMBLY: 01

न्यूक्लियर पावर कॉर्पोरेशन ऑफ इंडिया लिमिटेड
NUCLEAR POWER CORPORATION OF INDIA LTD.

- ☒ अनुमोदित / APPROVED
☐ टिप्पणी के अनुसार अनुमोदित / APPROVED AS NOTED
☐ संशोधन को आगे बढ़ाएं / चोके ।
☐ PROCEED WITH / HOLD FABRICATION
☐ अंतिम ट्रांसपेरेंसी एवं प्रतियाँ भेजें
☐ SEND FINAL TRANSPARENCIES & PRINTS
☐ संशोधन करें एवं अनुमोदन के लिए पुनः प्रस्तुत करें।
☐ REVISE AND RESUBMIT FOR APPROVAL

जाँचकर्ता
CHECKED BY
Chait
21/10/18

समीक्षकर्ता
REVIEWED BY
M. Lakshminarasimhan
27/10/18

अनुमोदन कर्ता
APPROVED BY
R. Gupta
22/11/18

यदि जानकारी के अनुसार अनुमोदन के बिना ही काम शुरू किया जाता है तो अनुमोदन के बिना ही काम शुरू करने की जिम्मेदारी आपूर्तिकर्ता की होगी।
The Approval of the work to be done does not relieve the supplier of responsibility of supply according to specifications.

Supplier's LOGO	Supplier's Name and Address	Generic Quality Plan for Stud Assembly (QAP: GHAVP: STUD ASSEMBLY: 01)						Project: GHAVP 1& 2 W.O : D157 to D160-001-1-93-171 Rev: 01				
		Item: Stud Size: M27/M48 Material: 20NiCrMo14.5 II (1.6772) Sub-system: Steam Generator			QP No.: To be filled by Supplier Rev. No.: To be filled by Supplier Date: To be filled by Supplier Page No: 1 of 5							
Sl. No	Component & Operations	Characteristics	Type of Check	Quantum Of check	Reference Document	Acceptance Norms	Format of Record		Agency			Remarks
									M	B	N	
1.	2.	3.	4.	5.	6.	7.	8.	D *	9. **			10.
1.0 Raw Material :												
1.1	Steel Melting : Method to be mentioned & to be approved	Steel melting	Record Verification	100%	PC-M-965 Rev-00 VD TUV WB 337 MPP: To be submitted	TC	√		P	R	R	De-oxidising condition: Killed
1.2	Ladle Analysis	Chemistry	Chemical analysis	1/Heat	PC-M-965 Rev-00 MPP: To be submitted	TC	√		P	R	R	---
1.3	Semi product casting/ ingot formation	free from defects	Visual	100%	MPP: To be submitted	RD	--		P	R	R	---
2.0 In process Controls:												
2.1	Forming Process	Forming Process	Record Verification	100%	PC-M-965 Rev 00 MPP : To be submitted	TC	√		P	R	R	Type of forming: Forging or Hot rolling. To be specified by supplier.
2.2	Heat Treatment: [Hardening , Tempering, Stress Relieving(if any) as per VD TUV WB 337]	R.O.H , Soaking Temp & Time, R.O.C	Review of HT Chart	100%	PC-M-965 Rev 00 VD TUV WB 337 HT Plan To be submitted	TC	√		P	W	R	HT chart to be signed and submitted along with TC
2.3	Visual Inspection of bars/round	Free from Visual Defects	Visual Test	100%	Free from Visual Defects	RD	√		P	-	R	---

				LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: SUPPLIER B: BHEL, N: NPCIL/TPI P: PERFORM R: REVIEW W: WITNESS AND H: HOLD TC: TEST CERTIFICATE RD: RECORD
Prepared	Reviewed & Approved	Reviewed & Approved	Reviewed & Approved	
SUPPLIER'S NAME: To be filled		BHEL	NPCIL	

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2.4	Identification & cutting of Test Coupons and Machining of Specimens	Dimensions	Dimensions	100%	PC-M-965 Rev 00 MSTP : To be submitted.	RD	√	P	H	W	---
2.5	Machining to closest possible dimensions (Prior to Threading for conducting UT & MT Test)	Dimensions	Dimensions	100%	PC-M-965 Rev 00 & Drawing No.: To be filled	RD	--	P	R	R	---
2.6	Magnetic Particle Examination (MT) of bars	Surface and shallow subsurface defects	Magnetic particle test	100%	PC-M-965 Rev 00 PC-P-979 Rev 00 MT Procedure: To be submitted	TC	√	P	H	W	To be demagnetized to a residual magnetism < 2 oersted after test
2.7	Ultrasonic Inspection (UT) of bars	Internal soundness	Ultrasonic Test	100%	PC-M-965 Rev 00 ASME Sec-V: SA388 UT Procedure: To be submitted	TC	√	P	H	W	---
3.0 Mechanical and Metallurgical Tests:											
3.1	Hardness measurement	Hardness	Brinell Hardness	On both the ends of each bar	PC-M-965 Rev 00 MSTP/MPP: To be submitted	TC	√	P	W	W	Hardness survey report shall be submitted; 100% witness by BHEL & 10% Sample witness by NPCIL
3.2	Product Analysis of each bar at both ends	Chemistry	Chemical analysis	Refer Note-4	PC-M-965 Rev-00 MPP: To be submitted	TC	√	P	W	W	20% sample witness by BHEL & 10% Sample witness by NPCIL

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3.3	Tensile test at RT (Longitudinal)	Tensile Strength, Yield Strength (0.2% offset), % Elongation,% Reduction in area	Destructive Test	Refer Note-5	PC-M-965 Rev 00 DIN EN 10269 VD TUV WB 337 MSTP/MPP: To be submitted	TC	√	P	H	W	---			
3.4	Tensile test at 350°C (Longitudinal)	Tensile Strength, Yield Strength (0.2% offset), % Elongation,% Reduction in area	Destructive Test	Refer Note-5	PC-M-965 Rev 00 DIN EN 10269 VD TUV WB 337 MSTP/MPP: To be submitted	TC	√	P	H	W	---			
3.5	Impact Test at +20°C (Longitudinal)	absorbed energy, lateral expansion, % shear fracture	Destructive Test	Refer Note-6	PC-M-965 Rev 00 ASME SA-370 VD TUV WB 337 MSTP: To be submitted	TC	√	P	H	W	---			
3.6	Micrograph for Grain size & Structure	Micro structure, Grain Size	Micro test, Grain size check	Refer Note-7	PC-M-965 Rev 00	TC	√	P	W	W	Grain size at 100X magnification and microstructure at 200X magnification on impact tested specimens at each sampling position			
3.7	Final Machining and Threading	Dimensions, Thread profile & pitch	Measurement and thread gauge check	100%	PC-M-965 Rev 00 Thread: DIN 13 Thread End: DIN 78-K & Drawing No.: To be filled	TC	√	P	W	W	To be carried out on finished fasteners. All measurements shall be recorded. Approved Go & No-Go Gauge shall be used.			

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SUPPLIER'S NAME: To be filled		BHEL	NPCIL	

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			Item: Stud	QP No.: To be filled by Supplier								
			Size: M27/M48	Rev. No.: To be filled by Supplier								
			Material: 20NiCrMo14.5 II (1.6772)	Date: To be filled by Supplier								
			Sub-system: Steam Generator	Page No.: 4 of 5								

3.8	PT on threaded portion	NDE Examination of thread	Non destructive Test	100%	PC-P-979 Rev 00	TC	√	P	W	W	20% sample witness by BHEL & 10% Sample witness by NPCIL
3.9	Mix up test	Mix up	PMI	100%	PC-M-965 Rev 00	TC	√	P	W	W	20% sample witness by BHEL & 10% Sample witness by NPCIL
4.0	Assembly of Stud and Stud measuring pin										
4.1	Receive finished stud measuring pin	TC verification of stud measuring pins	Document verification	100%	PC-M-965 Rev 00, Documents and TC of stud measuring pin	RD	--	P	R	R	---
4.2	Assembly of Stud and Stud Measuring Pin	Visual and dimensions	Visual and dimensional measurement	100%	Drawing No.: To be filled	TC	√	P	W	W	1) Stud and measuring pin to be surface ground after successful assembling and pinning of measuring pin with stud to be ensured. 2) 20% sample witness by BHEL & 10% sample witness by NPCIL.
5.0	Final Inspection										
5.1	Visual Inspection of assembly	Free from visual defects	Verification and Visual	100%	PC-M-965 Rev 00 and as per Drg. No.: To be filled	TC	√	P	R	R	---

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5.2	Marking and Identification of assembly	Melt No., Manufacturer's identification, Steel grade, Inspection Agency stamp, Sl. No. (unique identification number) of assembly	Verification and visual	100%	PC-M-965 Rev 00	TC	√	P	R	R	All fasteners shall be marked with identifications.	
5.3	Preservation	Appearance	Verification and Visual	100%	PC-M-965 Rev 00	TC	√	P	R	R	Refer Note-2	
5.4	Certification and Documentation Control	Order compliance	Certificate compilation	100%	PC-M-965 Rev 00	TC	√	P	R	R	---	
5.5	Documents (Test Certificates) shall be sent to BHEL/Trichy prior to dispatch. Dispatch clearance will be given after Acceptance of Test Certificates by BHEL&NPCIL					RD	--	P	H	H	---	
5.6	Packing & Shipment	Packing	Visual	100%	PC-M-965 Rev 00	---	--	P	-	R	Ensure Sea worthiness and right quantity of supply. Material for each unit shall be packed separately.	

- Note: 1. MSTP (Material Sampling and Testing Plan), MPP (Manufacturing Process plan), Heat Treatment Plan, Ultrasonic & Magnetic Particle Test Procedure etc. shall be submitted by Supplier and the same will be subjected to both BHEL&NPCIL approval.
2. Before shipment, suitable rust preventive coating shall be applied (including threads) to ensure sea-worthiness and tropical storage for two years at appropriate stages.
3. MPP (Manufacturing Process plan) shall indicate detailed sequence of operations at various stages.
4. Test coupons for product analysis shall be taken from both the ends of each bars.
5. At each sampling position, two tensile test specimens shall be taken for tests at RT and at +350° from softest and hardest bars from each melt/heat treatment batch. If the length of bar is 4 meter and above, testing shall be carried out at both the ends.
6. Three impact specimens shall be taken from softest and hardest bars from each melt/heat treatment batch. If the length of bar is 4 meter and above, testing shall be carried out at both the ends.
7. Specimen per softest and hardest bars from each melt/heat treatment batch. If the length of bar is 4 meter and above, testing shall be carried out at both the ends.

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