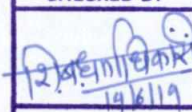
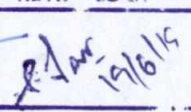
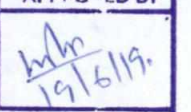
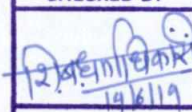
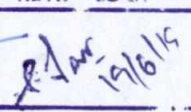
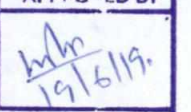
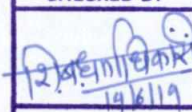
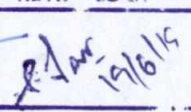
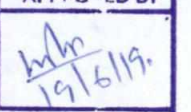
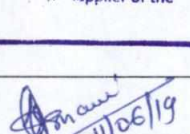
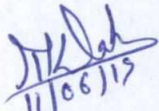
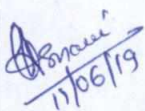


MAIN SUPPLIER'S NAME: BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL (A GOVERNMENT OF INDIA UNDERTAKING)											
NAME OF SUB-VENDOR: N/A											
NPCIL PO NO.: CMM/FTP/10-32-1-1152/e-PO/30447, DTD: 24.01.19											
QA REF. NOs.: MAIN VENDOR: 2190191 SUB VENDOR: N/A											
CUSTOMER: NUCLEAR POWER CORPORATION OF INDIA LIMITED (A GOVERNMENT OF INDIA ENTERPRISE)											
PROJECT: 2x700MW GORAKHPUR HARYANA ANU VIDYUT PARIYOJANA (UNIT 1&2)											
EQUIPMENT: MODERATOR HEAT EXCHANGER											
DOCUMENT NO.: BHEL / NPCIL / 30447 / ALLOY STEEL FASTENERS/ CDE-19-3152											
TITLE: TECHNICAL SPECIFICATION FOR LOW ALLOY STEEL FASTENERS											
 न्यूक्लियर पावर कॉर्पोरेशन ऑफ इंडिया लिमिटेड Nuclear Power Corporation of India Limited ☒ अनुमोदित / APPROVED ☐ टिप्पणी के अनुसार अनुमोदित / APPROVED AS NOTED ☐ संशोधन को आगे बढ़ाएं / PROCEED WITH / HOLD NOTIFICATION ☐ अंतिम ट्रांसपेरेंसी एवं प्रिंट भेजें / SEND FINAL TRANSPARENCY & PRINTS ☐ संशोधन करें एवं अनुमोदन के लिए पुनः प्रस्तुत करें / REVISE & RESUBMIT FOR APPROVAL <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 33%;">जाँचकर्ता / CHECKED BY</th> <th style="width: 33%;">समीक्षाकर्ता / REVIEWED BY</th> <th style="width: 33%;">अनुमोदनकर्ता / APPROVED BY</th> </tr> <tr> <td style="text-align: center;">  रिषभ चक्रवर्ती 19/6/19 </td> <td style="text-align: center;">  M. Wahab R. 19/6/19 </td> <td style="text-align: center;">  A. S. Nani 19/6/19 </td> </tr> </table> किए जानेवाले कार्य का अनुमोदन आपूर्तिकर्ता संविदाकार को विनिर्देशनों के अनुसार आपूर्ति करने के उत्तरदायित्व से मुक्त नहीं करता है। This approval of the work to be supplied does not release the supplier of the responsibility of supply accordingly.						जाँचकर्ता / CHECKED BY	समीक्षाकर्ता / REVIEWED BY	अनुमोदनकर्ता / APPROVED BY	 रिषभ चक्रवर्ती 19/6/19	 M. Wahab R. 19/6/19	 A. S. Nani 19/6/19
जाँचकर्ता / CHECKED BY	समीक्षाकर्ता / REVIEWED BY	अनुमोदनकर्ता / APPROVED BY									
 रिषभ चक्रवर्ती 19/6/19	 M. Wahab R. 19/6/19	 A. S. Nani 19/6/19									
01	11.06.2019	2+4 = 6	 Sd- (DK AUDH) 11.06.2019	 Sd- (M WAHAB R) 11/06/19	 Sd- (ASNANI L) 11/06/19						
00	12.03.2019	2+3 = 4									
REV NO.	DATE	PAGES	PREPARED BY	CHECKED BY	APPROVED BY						

	CONDENSER & HEAT EXCHANGER ENGG. DIVISION BHEL BHOPAL	Document No. BHEL / NPCIL / 30447 / LOW ALLOY STEEL FASTENERS / CDE-19-3152
TECHNICAL SPECIFICATION FOR LOW ALLOY STEEL FASTENERS		

REVISION CONTROL SHEET

BHEL					
REV. No Date	PAGES	Description of Revision	Prepared By	Checked By	Approved By
00, 12.03.2019	2+3=5	Original submission.	-Sd- (DK AUDH)	-Sd- (M WAHAB R)	-Sd- (ASNANI L)
01, 11.06.2019	2+4=6	a. Numbering of clauses updated. b. Cl no. 2.1.1, 2.1.3, 3.0, 6.2, & 7.2 are revised. c. QAP-Annexure-1 added.	 11.06.2019	 11/06/19	 11/06/19

	CONDENSER & HEAT EXCHANGER ENGG. DIVISION BHEL BHOPAL	Document No. BHEL / NPCIL / 30447 / LOW ALLOY STEEL FASTENERS / CDE-19-3152
TECHNICAL SPECIFICATION FOR LOW ALLOY STEEL FASTENERS		

1.0 Scope

This specification covers the technical requirements of Low Alloy Steel Fasteners for use in manufacture & assembly of Heat exchangers designed and manufactured as per ASME Section-III NB / ND, as applicable.

2.0 Technical Requirements

2.1 Material

2.1.1 Low Alloy steel bars – rolled / forged & shall confirm to SA-540 Gr 23 Class 4 Q&T for studs material specification requirements & all other material shall be as per SA-540 Gr 23 Class 1.

2.1.2 Bars shall be free from injurious defects and shall have a workman like appearance confirming compliance to designated finish requirements.

2.1.3 Bars for the manufacture of fasteners shall be subjected to Non-Destructive Examination as per respective clause of ASME Section-III NB with supplementary requirements S2, S3, S6, S5 of SA-540.

2.1.4 All threads shall conform to ISO (dimensional standard for metric threads).

2.2 Manufacturing

Required fasteners shall be machined / formed from the accepted material with surface finish of 3.2 microns or, better.

2.3 Size & Quantity

Size & quantity of each component shall be as indicated in the purchase indent / Enquiry / Purchase Order/ drawing.

3.0 Heat Treatment

All Low alloy steel fasteners shall be supplied in heat treated condition as per the requirements indicated in the respective material specification & to suit respective property class requirements. **Heat treatment shall be carried out as per approved procedure.**

4.0 Repair

No repair of threads shall be attempted on any fastener. In case of any damage in the threaded area, same shall be rejected with appropriate marking for proper identification of rejected area.

5.0 Tolerances

Dimension Tolerances shall be as indicated in the respective standards/material specification applicable for the fasteners ordered.



TECHNICAL SPECIFICATION FOR LOW ALLOY STEEL FASTENERS

6.0 Testing(s)

6.1 **Product Analysis** shall be made from each shape, size and heat of fasteners & shall comply with the requirements specified in the respective material specifications.

6.2 Mechanical Test

Fasteners shall be subjected to all the mechanical tests as required for the respective property class of fasteners, namely;

Tensile strength test, Hardness, Lower Yield strength, Stress at 0.2% non-proportional elongation, % Elongation, Reduction in area, Carburized zone, Surface Integrity etc.

01

Impact Test:

- All material shall be Charpy V-Notched impact tested at 18°C (LST) as per ASME Section-III, NB-2333.
- Location and orientation of impact test requirements shall be as per ASME Sec III, NB-2322.
- Number of tests shall be carried out as per ASME Section-III, NB-2345.

All test shall be carried out as per approved material sampling & testing plan.

01

6.3 Non-Destructive Examination

All fasteners shall be MP tested as per ASME Section-III, NB-2583.

The area of threads, shank, and heads of final machined parts shall be visually examined. Harmful discontinuities such as laps, seams or crack that would be detrimental to the intended service are unacceptable.

NDE shall be carried out as per approved procedure.

Time of examination shall be as per ASME Section-III, NB-2587.

7.0 Inspection & Certification

01

7.1 All the fasteners shall be subjected to inspection at manufacturing shop by BHEL & NPCIL or his authorised inspection agency as per approved QAP. QAP shall be submitted for approval based on reference QAP(refer Annexure-A). Fasteners to be checked using calibrated Ring Gauges only.

7.2 All the Test Certificates shall be co-related with respective fasteners and shall be duly signed by inspecting authority.

COPY RIGHT AND CONFIDENTIAL

The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. Hence not be used directly or indirectly in any way detrimental in the interest of the company

	CONDENSER & HEAT EXCHANGER ENGG. DIVISION BHEL BHOPAL	Document No. BHEL / NPCIL / 30447 / LOW ALLOY STEEL FASTENERS / CDE-19-3152
TECHNICAL SPECIFICATION FOR LOW ALLOY STEEL FASTENERS		

7.3 Important Instruction for vendors

Page 4 of 6

Fasteners received at our works shall be subjected to random sampling destructive test to ensure compliance as per drawing & specification requirements. Acceptance/ rejection of fasteners shall be done based on the test results of sampling test. Rejected fasteners shall be damaged by destroying the threaded area.

8.0 Protection & Packing

- 8.1 Threaded portion of each fastener (Bolt/Stud/Screw/Nut etc.) shall be protected by applying **graphite grease** to prevent threaded area from corrosion attack.

Balance (unthreaded areas) shall be protected by applying oil based rust preventive.

- 8.2 **Bolts / Studs with Nuts & washers, as a unit** (i.e. nuts / washers on the respective bolts), shall be packed item wise separately in appropriate boxes / bags with proper identification marking to avoid mixing & damage of threads due to rubbing during handling, transportation & storage. **Preferably each bolt unit/assy. shall be protected by bubble sheet.**

Fasteners of size M24 & above shall be packed in wooden boxes/crates.

9.0 Test Certificates

Four (4) copies of co-related Test Certificates shall be furnished in line with the respective material specifications & its Property Class.

Vendor shall also furnish a Certificate of compliance listing applicable drawings & specifications.

10.0 Identification Marking

Each fastener (Bolt/Stud/nut etc.) shall be stamped as per the respective code requirements. Material property class shall be essentially stamped on each fastener. Each packing case of fasteners shall also be identified with following markings;

- Manufacture's name.
- BHEL purchase order number.
- Item Description: Bolt/Nut, Size & Property Class.

Note: **Vendor shall clearly spell out the details of the deviation(s), if any**

Page 5 of 6



**CONDENSER & HEAT EXCHANGER ENGG. DIVISION
BHEL BHOPAL**

Document No.

BHEL / NPCIL / 30447 // LOW ALLOY STEEL
FASTENERS / CDE-19-3152

TECHNICAL SPECIFICATION FOR LOW ALLOY STEEL FASTENERS

ANNEXURE - A

01

REFERENCE QUALITY ASSURANCE PLAN

Sr.No.	Component & Operation	Characteristic	Class	Type of check	Quantum of check	Reference Document	Acceptance Norms	Format of Record	Inspection Agency				Remarks
									P	W	R	H	
1.0 LOW ALLOY STEEL FASTENERS													
1.1	Material Inspection & Identification	Chemical Composition	Major	Co-relation & verification of MTC / Lab TC, all stage-wise records	100%	ASME Sec.III /II / NPCIL approved Spec. (doc. No. BHEL/NPCIL/30447/LOW ALLOY STEEL FASTENERS /CDE-19-3152)/Drawing	ASME Sec.III /II / NPCIL approved Spec. (doc. No. BHEL/NPCIL/30447/LOW ALLOY STEEL FASTENERS /CDE-19-3152)/Drawing	Certificate of compliance / SR/ MTC / Lab Report / Inspection Report duly endorsed by authorised QS.	4	2,3	2	1,1	
		Heat Treatment							4	2,3	2	1,1	
		Mechanical Properties							4	2,3	2	1,1	
	Inprocess inspection	NDE	Major	Visual, NDE	100%	ASME Sec.III /II / NPCIL approved Spec. (doc. No. BHEL/NPCIL/30447/LOW ALLOY STEEL FASTENERS /CDE-19-3152)/Drawing	ASME Sec.III /II / NPCIL approved Spec. (doc. No. BHEL/NPCIL/30447/LOW ALLOY STEEL FASTENERS /CDE-19-3152)/Drawing	Inspection report	3	2,3	2	1,1	
		Surface Quality and Dimensional check	Major	Visual and Measurements	100%	BHEL/NPCIL/30447/LOW ALLOY STEEL FASTENERS /CDE-19-3152)/Drawing	BHEL/NPCIL/30447/LOW ALLOY STEEL FASTENERS /CDE-19-3152)/Drawing		3	2,3	2	1,1	

NOTES :

- 1 Co-related original material test certificate is acceptable. In absence of co-related original material test certificate, 100 % sample per lot (lot means, all material having same heat mark / batch mark / same size material specification requirements) for chemical and physical test shall be drawn and witnessed by vendors (BHEL) and NPCIL or his authorised inspection agency. Chemical and physical test shall be carried out in NPCIL approved labs only and NPCIL QS/ Authorised inspection agency shall witness physical tests. Vendor shall submit all material verification reports as per material specification to NPCIL-QS for review. NPCIL-QS however, reserves the right to physically verify such activities by surprise visits and by retesting the material.
- 2 Calibrated instruments shall be used during inspection, examination and testing. Use of calibrated equipment including ovens needed.
- 3 Non-destructive examinations shall be performed by personnel qualified to Level - I or II ,Witnessing, Interpretation/Evaluation, & Review of NDT Procedures shall be done by Level II or Level III ISNT/ASNT.All NDT Procedures shall be Approved by ISNT/ASNT Level III.
- 4 Chemical & mechanical tests on the material shall be performed in laboratories approved by NABL.
- 5 All latest applicable codes & standards shall be used.

ABBREVIATIONS :

- 1 NPCIL QS or NPCIL approved TPIA
- 2 BHEL / BHEL authorised agency
- 3 Sub-Vendors / Sub-Vendors Authorised agency for imported material
- 4 External laboratory / sub-vendor

P Performed by :

H Hold point : This activity shall be kept under hold till Report is signed off or written waiver is obtained from the agency responsible for this stage (NPCIL QS / its Authorised Representative).

W Witness point : Witness points are critical steps in manufacturing and examination / inspection / testing. Where the supplier is obliged to notify in sufficient advance of the start of the operation / test so that it may be witnessed. The Supplier may proceed with the work past a witness point, if the NPCIL-QS or its authorised representative is not available at the appointed time.

R Document Review : Review / Verification of documents carried out by agency for compliance and acceptance.

DEFINITIONS :

Critical : The characteristic of a component, process or operation failure of which will surely cause operating failure

Major : The characteristic of a component, process or operation whose failure may cause operating failure which cannot be readily corrected at site or cause substandard performance, increased erection and maintenance cost, reduced life or seriously affect the aesthetics.

Minor : The characteristic of a component, process or operation whose failure neither materially reduce the usability of the product in operation, nor does it affect the aesthetics.

COPY RIGHT AND CONFIDENTIAL

The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. Hence not be used directly or indirectly in any way detrimental in the interest of the company