

	BHEL – Tiruchirappalli - 620014, India. Quality Assurance Department TECHNICAL DELIVERY CONDITIONS	DOC No: TDC : 6 : 388 / Rev: 02 Effective Date: 16/05/2018 Page: 1 of 3
Product: High Strength Friction Grip Fasteners For Structural (Property class Bolt 8.8, 10.9/Nut 8, 10)		
CUST: 1725 & 1726		PROJECT: MAITREE (2x660 MW)

Revision record:

Rev 00: Dt:- 29/07/2017 - Fresh Issue

Rev 01: Dt:- 08/05/2018 – Cl.1 and Cl.7 modified to include seaworthy rust preventive coating.

Rev 02: Dt:- 16/05/2018 – Cl.1 and Cl.7 modified to include plant lab document reference.

1. SCOPE:

This technical delivery condition covers the requirements for the High strength structural steel bolts, Nuts and Washers applicable for boiler structures. The product shall conform to the mandatory requirements, test methods and procedures as called for in the applicable standards. The requirements stated herein are in addition to material specification requirements.

Size, Specification and Quantity: As per the BHEL Purchase order (PO) / BHEL Drawing. The bolts, nuts and washers shall be supplied in the dull black heat-treated condition *with one coat of seaworthy rust preventive coating as per PR:CHEM:09-06 (latest revision).*

For Bolts: EN: 14399-3 (Latest) Property class: 8.8 or 10.9 & EN ISO 898 -1 for Mechanical properties.

For Nuts: EN: 14399-3 (Latest) Property Class: 8 or 10, Regular nut Style 1, Coarse thread & EN ISO 898 -2 for Mechanical properties

For Washers: EN: 14399-5 (Latest)

2. RAW MATERIAL:

- Chemical composition:** Shall be checked on receipt of raw material at supplier works for every heat/cast. In case of disputes, product analysis applies.

Bolts: Carbon steel with additives (eg B, Mn or Cr)– As per Table 2 of ISO 898 -1 (Latest)

Nuts: Carbon steel as per Table 3 of ISO 898 -2 (Latest)

Washers: Steel as per EN: 14399-5 (Latest)

3. DIMENSIONS AND TOLERANCES:

- Threads on the bolts shall be checked with a properly calibrated ring gauge with a tolerance class 6g. Threads on the nuts shall be checked with a properly calibrated plug gauge with tolerance class 6H (in an NABL accredited LAB).
- Dimensions of the Bolts shall be as per Figure 1 and Table 2 of EN: 14399-3
- Dimensions of the Nuts shall be as per Figure 3 and Table 4 of EN: 14399-3
- Dimensions of the Washers shall be as per Figure 1 and Table 2 of EN: 14399-5
- The tolerances of the bolts and nuts shall be checked by appropriate gauges or measuring equipment of the required accuracy as specified in table 2 and Table 3 of EN 14399-1.

4. Post Forming Heat Treatment (HT):

- Bolt: After forming shall be quenched and tempered as per Table-2 of EN ISO 898-1 (Latest)
- Nut: Shall be quenched and tempered as per Table-3 of EN ISO 898-2 (Latest)
- Washer: Shall be hardened and tempered. Carburized washers are not permitted.

5. MECHANICAL&NDE:(on Heat Treated finished product)

Sample Size for Mechanical test: & NDE: As per Sampling Plan (refer to Clause 9 below)

BOLT :
Mechanical:

- The mechanical and physical properties shall be according to Tables 3 to 7 of EN: 14399-3 for the respective property class
- Bolts shall be tested for the series FF1 and MP2 for full loadability, using the test methods described in Clause 9 EN ISO 898 -1.
- Bolts shall be subject to the following tests:
 - Hardness test
 - Strength under wedge load test (if wedge load test is satisfactory, axial tensile test is not required)
 - Minimum Tensile Strength
 - Proof load test
 - Decarburization test

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- Hardness after Re-Tempering (test not mandatory, to be applied in case of dispute only)

NDE:

- Surface Quality shall meet the requirements of ISO 6157-1

NUT :

Mechanical:

- The mechanical and physical properties shall be according to Tables 4 and 6 of EN: 14399-3 and to be tested using methods described in Clause 9 EN ISO 898 -2.
- Nuts shall be subject to the following tests:
 - Hardness test
 - Proof Load test

NDE:

- Surface Quality shall meet the requirements of ISO 6157-2

WASHERS :

- Hardness range 300HV to 370HV.

6. MARKING, PRESERVATION AND PACKING:

- The following to be hot stamped or embossed on the top surface of the bolt and nut:
 - Bolt – Manufacturer's Identification mark with marking symbol HR8.8/HR10.9 as per clause 10.3 of EN ISO 898 -1.
 - Nut – Manufacturer's Identification Symbol and HR8/ HR10 as per clause 10.3 of EN ISO 898 -2
 - Washers Manufacturer's Identification mark and letter H as per clause 4 of EN: 14399-5
- The following details shall be clearly indicated in the tags tied to the bundle:
 - 1) Customer Name
 - 2) Manufacturer's Name
 - 3) Vendor Code
 - 4) Purchase Order No and Supplier internal W.O No
 - 5) Quantum and Weight
 - 6) BHEL Material Code
 - 7) Item Description with diameter, length
- Shall be packed in bituminous-coated Polythene lined Hessian Cloth/Bag. Each bag shall contain only the same size of bolts/nuts/washers respectively and the same shall be indicated in the tags. The weight of each bag shall be limited to 25 Kg (approximately) for ease of handling.

7. INSPECTION AND CERTIFICATION:

All the finished components shall be visually and dimensionally inspected as per sampling plan. All the test results shall be documented and maintained. Products to be inspected at works & test certificates (in English) shall be submitted with the following details counter signed by BHEL/BHEL Authorized Inspection agency as indicated in the PO. Manufacturers Test certificate (MTC) shall contain the following:

- 1) Purchase Order No.(BHEL), TDC No, Specification and Grade with year of code.
- 2) Name of raw material bar supplier.
- 3) Forming process
- 4) Dimensional reports for each product.
- 5) Chemistry including incidental elements.
- 6) HT details of materials temperature, soaking time, cooling medium etc.
- 7) All Mechanical test result report including hardness.
- 8) MPI, Micro examination and decarburization test report with the reference & acceptance standard.
- 9) TC of raw material shall accompany the MTC.
- 10) *Certification of seaworthy rust preventive coating inline with PR:CHEM:09-06 (latest revision).*

8. AUDITS BY BHEL:

BHEL reserves the right to reject any item found to be not meeting the requirements during tests at supplier works or during subsequent processing at BHEL.



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Department

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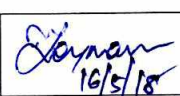
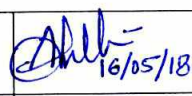
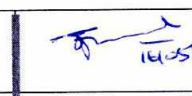
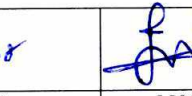
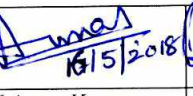
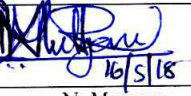
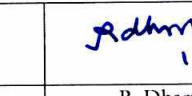
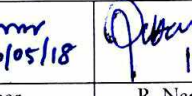
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9. SAMPLING PLAN:

S.No.	Lot Size (Nos.)	Sample Size (as per ISO2859- 1)	Acceptance Number/ Rejection Number, (Ac/Re) @AQL=1%	SAMPLE SIZE									Remarks
				Visual (Nos.)	Dimensional (Nos.)	NDE (Nos)	Physical Tests						
							Hardness	Hardness after Re- tempering	Proof Load (nos.) S	Wedge Load (nos.) S	Min Tensile Strength	Decarburization	
1	Upto 280	15	0/1	15	15	15	15	15	5	5	5	5	For tests marked with 'S', Ac/Re=0/1
2	281-500	20	0/1	20	20	20	20	20	5	5	5	5	
3	501- 1200	32	1/2	32	32	32	32	32	5	5	5	5	
4	1201- 3200	50	1/2	50	50	50	50	50	5	5	5	5	
5	3201- 10000	80	2/3	80	80	80	80	80	10	10	10	10	
6	10001 to 35000	125	3/4	125	125	125	125	125	10	10	10	10	
7	35001 to 150000	200	5/6	200	200	200	200	200	10	10	10	10	
8	150001 to 500000	315	7/8	315	315	315	315	315	10	10	10	10	
9	>500000	500	10/11	500	500	500	500	500	10	10	10	10	
	Inspection by BHEL/BHEL AIA			W	W	W	W	W	W	W	W	W	
Note: Inspection by BHEL / BHEL AIA shown as “W” shall be witnessed for the sample size indicated against the lot size.													

 16/5/18	 16/05/18	 16/5/18	 16/5/2018	 16/5/18	 16/05/18	 16/5/2018	 16/5/18
M Jeyaram Dy. Mgr/QA	Abdur Rahman Sr. Engr/QA	G. Panneer Selvam DGM/QA	J V V Aruna Kumar DGM/QA	N. Murugan SDGM/PE(FB)	R. Dharmar AGM/QC	R. Narayanan SDGM/MM	Amit Roy AGM/QA & BE
Prepared By				Reviewed By			Approved By