

## 1.0 MATERIAL SPECIFICATION

SA 193 Gr B7/B7M/B16{latest material standard as per Purchase Order (P.O.)}

## 2.0 GENERAL

This TDC is suitable for API 6A applications including NACE MR-01-75 Cl.II & Cl.III also.

Shall be manufactured to the relevant size in the drawing & P.O.requirements.

Hot rolled & Cold drawn bars, if used shall be machined at least 2mm(minimum)in radius (ie 4mm in dia) to remove the seams completely. After machining atleast 10% of the bars shall be tested by MPI to ensure that the surface defects are fully removed.

For HT of finished studs/bolts, salt bath or controlled atmosphere furnace to be used,

After HT, the threads shall be thoroughly cleaned to remove all deposits. If acid pickling is done for cleaning, it shall be as per Cl.7.4.

Cadmium plating(Cl.7.1)/Galvanising(Cl.7.2) if specified in Drg/P.O.For all other cases rust preventive fluid coating (Cl.7.3) shall be done.

## 3.0 CHEMICAL & MECHANICAL PROPERTIES

Mill certificate from steel manufacturer for conformance to the chemistry heat-wise. Additionally, product analysis shall be done for one piece/heat by the stud/bolt manufacturer.

One Tensile test/heat/size/ HT batch in the finished heat-treated condition as per SA193.

### HARDNESS

For SA193 B7 & B16:

Hardness check shall be carried out on finished stud/bolt as per SA193,at least in 10% of the lot.Hardness in the finished stud/bolt shall be 25 to 34 HRC or 253 to 319 BHN.For other grades hardness value shall be as per the material specification.

### NDE

Magnetic particle inspection shall be carried out in atleast 10% of the finished stud/bolt of all grades.Cracks/Linear indications are unacceptable.

For SA193 B7M:

Hardness check on 100% of stud/bolt.Hardness must be within 201 to 235 BHN.

## 4.0 FINAL INSPECTION

All inspection shall be in accordance with relevant drawing or BPS and SA193.

The threads shall be checked with calibrated ring gauges in the final heat-treated condition for black variety and in final plated condition for the plated/galavanised variety.

Visual & dimensional checks and acceptance shall be as per IS 2614 Table-I (latest).

## 5.0 MARKING & PACKING

Punch/emboss each finished stud/bolt with material grade (B7/B7M/B16, etc.,) and supplier's emblem underlining the grade symbol.

Punch/emboss Sl.no also in B7M studs/bolts in addition to the above to correlate with hardness.

Protect the threaded ends with plastic end caps.Pack in wooden box/gunny bag of convenient size for easy handling and transportation.Mark quantity in each box/gunny bag.

## 6.0 CERTIFICATION

The manufacturer shall provide TC (ref. page 3) duly countersigned by the Authorised Inspecting Authority nominated by BHEL in P.O. (if specified) along with Raw Material TC from Steel Maker.Manufacturer's TC shall contain P.O.No,TDC No.,Heat No., Chemical and Mechanical properties,HT parameters,surface coating with coating thickness, baking details,manufacturers' identification mark and certify soundness & confirmation to P.O. requirements.

## 7.0 SPECIAL REQUIREMENTS

### 7.1 CADMIUM PLATING REQUIREMENTS

Clean the studs/bolts to make it free from rust, grease, oil, scale, etc.,before plating.

When pickling is considered essential, it shall be done as per Cl 7.4.

Apply Cadmium Plating to the specified thickness on specified areas.

After plating, bake the parts at 175 Deg.C to 205 Deg.C for a minimum period of 3 hours. The elapsed time between plating and baking shall not exceed 8 hours.

Apply a Chromate Conversion coating after plating and baking.

## 7.2 GALVANISING

Clean the studs/bolts to make it free from rust, grease, oil, scale, etc., before galvanising

When pickling is considered essential, it shall be done as per CI 7.4.

The fasteners shall be galvanised by electroplating process to obtain the minimum coating thickness as specified in PO/drawing.

After galvanising bake the parts at 175 to 205 deg.C for a minimum period of 3 hours. The elapsed time between plating and baking shall not exceed 8 hours.

Apply a Chromate Conversion coating after plating and baking.

## 7.3 RUST PREVENTIVE COATING REQUIREMENTS

Clean the studs/bolts to make it free from rust, grease, oil, scale, etc., before applying protective coating. When pickling is considered essential it shall be done as per CI 7.4.

One coat of rust preventive fluid of any of the following vendors shall be applied.

CHEMICAL	VENDOR
1. BONITA-RPF	M/s Bonita Chemicals, 64, Industrial Estate, Nunhai, Agra-282 006.
2. CHAMPION-RPF	M/s Guardian Chemicals, 8, Rajaji Ind st, West Lake Area, Nungambakkam, Madras-600 034
3. ECONOL RPF (non-drying type)	M/s Process Aids, Bangalore
4. TECTYL 506	M/s Plastipeel Chemicals and Plastics (P) Ltd, Thane-400 604
5. TRPF	M/s Sundaram Paints Pvt. Ltd., Thanjavur-613 004
6. TRPF	M/s Solar Paints, Pudukkottai.
7. WICOR-P	M/s Western India Paint and Color Co P. Ltd, Madras-600 017

## 7.4 ACID PICKLING

When pickling is considered essential for cleaning, it shall be done using Hydrochloric acid of 5 to 10% acid concentration at room temperature with inhibitor.

The concentration and type of inhibitors shall be as recommended by any of the following vendors.

1) M/s Agromore Ltd. Bangalore. 2) M/s Prosol Corporation, Hyderabad. 3) M/s Guardian Anti-corrosives, Madras. 4) M/s Mascat Chemicals, Bombay.

After pickling thorough rinsing shall be carried out with water to remove acid residues.

Immediately after pickling, the components shall be dried and baked at 175 to 205 deg C for 3 hours before taking up the next operation (plating).

## Revision Record:

Rev:00/17.01.90: First issue, Rev:01/21.06.90: Editorial corrections, Rev:02/21.04.91: TC for studs/bolts added

Rev:03/04.04.96: Annexure-I amended. CI 3.3.3 & 5.3 modified, Rev:04/20.10.96: NDT, Acid pickling added & re-written, Rev:05/28.04.98: CI 3 modified to include MPI, certificate modified & CI 7.4 deleted

Rev:06/15.06.99: Title, CI 1 to 5 & 7.1 modified. CI 7.2 changed to CI 7.3. CI 7.3 changed to 7.4 & modified. CI 7.2 Galvanising added. Test certificate sample format modified.

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## TEST CERTIFICATES FOR STUDS/BOLTS - SAMPLE FORMAT

TC NO:

DATE:

CUSTOMER :	PO No/Amd :
TDC No/Rev. :	DC No :
PRODUCT :	DRG.No :
DESCRIPTION : (Spec, dia, pitch, length)	THREAD SPEC:
QUANTITY :	

Requirement	Records/observations
size of bar - Before m/c ing :	
- After m/c ing :	
Type of furnace used for hardening :	

Mill TC for raw material	TC No:
TDC Cl No Melt Number.	

Product analysis for chemistry.	Report No:
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Spec	C	Si	Mn	P	S	Cr	Mo	V	Others
(min,max)									
Actual									

Hardening Heat treatment	Temperature:	Deg C.	Soaking time
Tempering after hardening	Temperature:	Deg C.	Soaking time

Tensile test after H&T & final drying(Finished heat treated condition
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3.0		Tensile	Yield	%Elongation on 2"GL	%Reduction in area
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Spec	
(mini,max)	
Actual	

Hardness measured
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10 % MPI on the finished studs.	Report No:
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4.0	Visual & dimensional checking as per IS 2614 table 1
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5.0	Punching details(identification)
	End cap for threaded portion

7.0	Pickling.	Acid:	Concentration:
	Drying after pickling.	Temperature:	Deg C. Soaking time
	Type of coating	Cadmium/Galvanising/Rust preventive	
	Coating thickness		
	Chromate conversion coating.		
	Drying after coating.	Temperature:	Deg C. Soaking time

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This confirms that the above results are correct and the parts are as per speccification and P.O requirements.  
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Signature  
BHEL/Authorised Inspection agency

Signature  
Incharge of Quality