

1.0 MATERIAL SPECIFICATION - SA 194 Gr2H/Gr2HM/Gr4/Gr7 {latest on date of Purchase Order (P.O)}**2.0 GENERAL**

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

Shall be manufactured to the relevant drawing and P.O. requirements.

Nuts shall be hot/cold forged or manufactured from hot rolled/cold drawn bars. If made from hexagonal bars, 100% MT is to be done on bars. If made from round bars, the bars shall be machined to remove 2mm from surface, (ie 4mm in dia) to remove all surface defects. Atleast 10% of the machined bars shall be MT tested to ensure that the surface defects are fully removed.

Nuts shall be heat treated to meet the requirements of SA194 only in a salt bath, or controlled atmosphere furnace. After HT the threads shall be thoroughly cleaned to remove all deposits. When acid pickling is done for cleaning it shall be done as per Cl 7.3.

Cadmium plating as per (Cl 7.1) if specified in drg/P.O. or rust preventive fluid coating as per (Cl 7.2) shall be done.

3.0 CHEMICAL & MECHANICAL PROPERTIES

Mill certificate for chemical composition from steel manufacturer for conformance to the specification heat-wise. Additionally, product analysis shall be done for one piece/heat by the nut manufacturer.

HARDNESS

For SA194 2H, Gr4, & Gr7

Hardness check on finished nut as per SA194, using sampling plan (Cl.7.4).Hardness in the finished nut shall be 24 to 35 HRC or 248 to 352 BHN.

For SA194 Gr2HM:

Hardness check on 100% of nuts.Hardness must be within 159 to 237 BHN.

Proof load test shall be done as per SA194 for all grades.

After final heat treatment, sample nuts shall be heat treated as below and meet the corresponding hardness requirements.

Grade	Temp	TimeCooling	Hardness at room temp.
2H	540°C	24Hrs	Slow cool 179 BHN (min)
2HM	540°C	-do-	Slow cool 159 BHN (min)
Gr4/Gr7	590°C	-do-	Slow cool 201 BHN (min)

CONE STRIPPING TEST: This test shall be performed as per SA194 in case of visible surface discontinuities.On such cases Proof load shall be as per ASTM A194 (latest std).

4.0 FINAL INSPECTION

All inspection shall be as per drawing and SA194.

The threads shall be checked with calibrated plug gauge in the final heat-treated condition for black variety and in final plated condition for the plated variety.

Visual and Dimensional checks in the finished nuts and their acceptance shall be as per IS 2614 Table-I(latest).

5.0 MARKING & PACKING

Punch/emboss each finished nuts with material grade (2H/2HM/Gr4/Gr7); supplier's emblem.

Punch/emboss Sl.no also in **2HM** nuts in addition to the above to co-relate with hardness. In addition, the grade symbol shall be underlined.

Pack in wooden box of convenient size for easy handling & transportation.Mark quantity in each box.

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.heat no., Chem & Mech properties,HT parameters,surface coating with coating thickness, baking details and certify soundness & confirmation to P.O. requirements.

7.0 SPECIAL REQUIREMENTS

7.1 CADMIUM PLATING REQUIREMENTS

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

When pickling is considered essential, it shall be done as per CI 7.3.

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 RUST PREVENTIVE COATING REQUIREMENTS

Clean the nuts 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 7.3.

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

M/s Process Aids, Bangalore

(non-drying type)

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, Pudukkotai.

7. WICOR-P

M/s Western India Paint and Color Co P. Ltd, Madras-600 017

7.3 ACID PICKLING

When pickling is considered essential for cleaning, it shall be done using Hydrochloric acid of 5 to 10% acid concentration at 50 deg C 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 Anticorrosives, Madras. 4) M/s Mascot 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.

7.4 SAMPLING PLAN FOR HARDNESS CHECK AFTER HT

The following double sampling plan shall be used. Hardness values shall be 25 to 34 HRC after HT. IS 2500 (Double Sampling) Normal Inspection, Level 2.

No. of Pieces in the lot	Acceptable Quality Level (2.5%)						
	First sample number (n1)	Acceptance number (Ac)	Reject number (Rc)	Second sample number (n2)	Combined sample number (n1+n2)	Acceptance number (Ac)	Rejection number -
0 - 500	32	1	4	32	64	4	5
501 - 1200	50	2	5	50	100	6	7
1201 - 3200	80	3	7	80	160	8	9
3201 - 10000	125	5	9	125	250	12	13
10001 - 35000	200	7	11	200	400	18	19

Ac:-Acceptance number: Max. no. of defectives allowed in the sample for the acceptance of the lot.

Rc:-Rejection number: Min.no. of defectives in the sample resulting in the lot's rejection.

PROCEDURE FOR OPERATING THIS PLAN : Suppose the lot size is 1,000. From table chose the class, which includes 1,000 viz 501 - 1200. Hence, use the sampling plan given against this class. Take a sample of 50 pieces and test for hardness.

Revision record:

Rev:00/11.04.90 : First issue

Rev:01/21.06.90 : Editorial corrections

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Rev:03/20.10.96 : NDT, Acid pickling added & rewritten

Rev:04/13/01/99 : Studs/bolts changed as nuts in Cl.5,7.1,7.2

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Technical Delivery Conditions

Product: **CARBON & ALLOY STEEL NUTS TO SPECN. SA194 Gr. 2H/2HM/Gr.4/Gr.7 FOR VALVES, OIL FIELD EQUIPMENTS AND OTHER APPLICATIONS.**

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TEST CERTIFICATE FOR NUTS - SAMPLE FORMAT

TC NO:

DATE:

CUSTOMER :

P.O.NO:

Dt:

D.C.NO:

Dt:

PRODUCT :

Specn :

SIZE OF BAR USED:

RAW MATL TC NO:

TDC NO:

HEAT NO.:

DRG NO:

LOT NO:

Thread specn:

QUANTITY:

CHEMICAL COMPOSITION(%) :

C	Si	Mn	P	S	Cr	Ni	Others
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HEAT TREATMENT:

HARDENING: TEMP: Deg.C; SOAKING TIME: Minutes; COOLING MEDIUM:

TEMPERING: TEMP: Deg.C; SOAKING TIME: Minutes; COOLING MEDIUM:

BAKING TEMP : Deg.C; BAKING TIME: Minutess.

MECHANICAL TESTING:

HARDNESS AFTER HT (MIN & MAX) :

BHN NO OF SAMPLES TESTED :

HARDNESS AFTER 24 HRS TEMPERING ON SAMPLE NUT :

BHN

PROOF LOAD APPLIED : Kgf

CONE PROOF LOAD TEST :

LOAD APPLIED:

MAGNETIC TESTING (IN PROCESS):

FINAL INSPECTION (VISUAL):

SURFACE COATING :

COATING THICKNESS :

Microns

IDENTIFICATION :

It is certified that the above results are correct and the parts are as per specification & P.O. requirements.