

No. T-23:2021

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(RAILWAY BOARD)



सत्यमेव जयते

INDIAN RAILWAYS
STANDARD SPECIFICATION
FOR
TRACK BOLTS AND NUTS

(Having Metric Screw Threads with I.S.O. Profile)

Serial No. T -23: 2021 (Redrafted).



RESEARCH DESIGNS AND STANDARDS ORGANISATION
LUCKNOW-226011

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0. FOREWORD.

- 0.1 This specification is issued under the fixed Serial No. T 23; the final number indicates the year of original adoption as standard, or in the case of revision, the year of last revision.

ADOPTED-1964; FIRST REVISION-1967; REDRAFTED-2021.

- 0.2 The Indian Railways Standard Specification (Serial No. T-23) was originally published in 1964 and subsequently revised in 1967. Further, five corrigenda were issued in 1968, 1974, 1982, 1985 & 1987 respectively. Now, this specification has been redrafted and issued in 2021 in line with latest IS Codes.

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1. SCOPE.

- 1.1 This specification covers the requirements of material, quality and tests etc. for all track bolts and nuts except for fang bolts, hook bolts and high tensile track bolts. All these track bolts and nuts have to pass tests as specified in this specification.

2. MATERIAL.

- 2.1 The steel used in the manufacture of the bolts and nuts shall be made by the Open-Hearth, Duplex, Electric Furnace or Basic Oxygen process. The 'Property Class' for Bolts under this specification shall be 5.6 as specified in IS 1367 (Part-3): 2017 "Technical Supply conditions for Threaded Steel Fasteners" and 'Property Class' for Nuts shall be 5 as specified in IS 1367 (Part-6): 2018 "Technical Supply conditions for Threaded Steel Fasteners". Chemical composition and mechanical properties of steel shall conform to above mentioned IS 1367 specifications corresponding to prescribed property class as given in Table-1 & 2 below:

Table 1: Chemical Composition- Steel

Material	Property Class	Chemical composition*			
		C		P	S
		Min.	Max.	Max.	Max.
Steel for Bolts	5.6	0.13%	0.55%	0.050%	0.060%
Steel for Nuts	5	-	0.58%	0.060%	0.15%

*Based on Table 2- Steels of IS 1367(Part-3): 2017 and Table 3- Steels of IS 1367(Part-6): 2018.

Table 2: Mechanical Properties– Steel*

Ultimate Tensile Strength (Min.)	500MPa
Yield Strength (Min.)	300MPa
% Elongation (Min.)	20
Impact Strength, Kv (Min)	27 J

* Based on Table 3 of IS 1367(Part-3): 2017.

3. MATERIAL PROPERTY TESTS.

- 3.1 The specified tests on the steel used in the manufacture of bolts and nuts shall be made on the test pieces taken from the bars as stated in clause 2.1 above.
- 3.2 One of each test shall be taken for steel rolled from the same cast/heat.

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- 3.3 Where the cast/heat no. of rolled steel bars from which the bolts are to be fabricated cannot be identified, the number of test pieces to be taken for material property tests shall be according to single sampling plan as detailed in tables 1 and 2-A of IS 2500 (Part-1): 2000 assuming AQL (Accepted Quality Level) of 2.5% and Inspection Level I for a lot of size of 150 rolled steel bars (which correspond to about 10,000 nos. of bolts). The fabrication of bolts shall be done only from those lots of rolled steel bars which pass the prescribed mechanical tests.

The detailed procedure shall be as indicated below:

150 rolled steel bars shall be taken in one lot. Eight number of test pieces shall be taken from this lot at random for carrying out tensile/elongation test. Similarly, eight samples each should be drawn for carrying out impact strength and surface integrity tests. The lot shall be accepted if all the test pieces pass these tests. If one or more test pieces fail in any of the test, the whole lot shall stand rejected.

- 3.4 Following tests, as per specified test method given below in Table-3, shall be conducted for the determination of the material property of the Track Bolts and Nuts, using machined test pieces and test results shall comply the mechanical properties as mentioned in the Table-2 of this specification:

Table 3: Material Property Test*

Material Property	Name of Test	Test Method (As per mentioned sub-clause of IS 1367(Part-3): 2017)
Tensile Strength	Tensile Test	Sub-clause 9.7
% Elongation		
Impact Strength	Impact Test	Sub-clause 9.14
Surface integrity	Surface discontinuity inspection	Sub-clause 9.15

* Based on Table 12 of IS 1367 (Part-3): 2017.

4. TESTS ON FINISHED TRACK BOLTS AND NUTS.

- 4.1 Following tests, as per specified test method given below in Table-4, shall be conducted for determination of properties of finished Track Bolts and Nuts with full head strength and test results shall comply with the mechanical properties of finished Track Bolts and Nuts as mentioned in the Table-5 of this specification:

Table 4: Property Test of Finished Track Bolts and Nuts **

BOLTS	Name of Test	Test Method (As per mentioned sub-clause of IS 1367 Part-3: 2017)
Tensile strength	Tensile Test	Sub-clause 9.2
Nominal stress under proof load	Proof load test	Sub-clause 9.6
Hardness	Hardness Test(HBW)	Sub-clause 9.9
Surface integrity	Surface discontinuity inspection	Sub-clause 9.15
NUTS	Name of Test	Test Method (As per mentioned sub-clause of IS 1367 Part-6: 2018)
Proof Load	Proof Load Test	Sub-clause 9.1
Hardness	Hardness Test	Sub-clause 9.2

Table 5: Mechanical Properties of finished Track Bolts and Nuts**

Bolts	Ultimate Tensile Strength (Min.)		500MPa
	Yield Strength (Min.)		300MPa
	Stress under proof load(Nom.)		280MPa
	Brinell Hardness (HBW)		Min - 147
			Max - 238
Nuts	Proof Load	For Dia. 18mm	1,21,000 N
		For Dia. 22mm	1,90,900 N
		For Dia. 25mm	2,43,500 N
	Brinell Hardness		139-287 HBW

** Based on Table 3 of IS 1367(Part-3): 2017 and Table 4 & 6 of IS 1367(Part-6): 2018 and including 25mm size with 3mm pitch.

5. HEAT TREATMENT OF TEST PIECES.

- 5.1 The test pieces shall not be subjected to heat treatment of any kind before being tested.

6. TESTS BY CHEMICAL ANALYSIS.

- 6.1 The Contractor shall supply a complete analysis of each cast of steel when required to do so by the Purchaser or the Inspecting Officer. Samples shall also be taken by the Purchaser or the Inspecting Officer from the bars or the finished

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bolts and nuts and shall be subjected to complete analysis, if necessary, at the expense of the Purchaser. Chemical composition of the steel shall meet the requirements as specified in Table-1 of this specification.

7. QUALITY OF BOLTS AND NUTS.

- 7.1 The bolts and nuts shall conform to the dimensions shown on the drawings and samples shall be drawn at random as per Table-9. The bolt heads shall be formed by upsetting the bars when hot and shall be concentric and square with the shank. The nuts shall be hot forged from solid, the threads being central and the bearing faces smooth and square with the axis of the nut thread. The bolts and nuts shall be neatly formed, free from harmful defects and shall have a workman-like finish.

8. SCREW THREADS.

- 8.1 The track- bolts and nuts shall pass tests specified in clause 4. The threads of the bolts and nuts shall be cut to the design profile of the I. S. O. metric screw threads as referred to in IS 4218 (Part-1, 2 & 4): 2001 and IS 4218 (Part-3): 1999 “ISO General Purpose Metric Screw Threads” and having dimensions as given in table 6 of this specification.
- 8.2 When the nuts used in track bolts are ordered independently of the bolts or vice versa, the threads of the bolts or nuts as the case may be, shall be cut to the design profile of the I.S.O. metric screw threads as referred to in IS 4218(Part-1, 2 & 4): 2001 and IS 4218 (Part-3): 1999 “ISO General Purpose Metric Screw Threads” and having dimensions and tolerances as given in table 7 and 8 of this specification.

TABLE 6

***Main Design Dimensions of I.S.O. Metric Screw Threads-Bolts and Nuts
(Clause 8.1)**

Size (Nominal dia.)	Pitch	Depth of thread (Bolt/Nut).	Major Diameter		Pitch Diameter		Minor Diameter	
			Bolt.	Nut.	Bolt.	Nut.	Bolt.	Nut.
18	2.5	1.353	17.958	18.000	16.334	16.376	15.252	15.294
22	2.5	1.353	21.958	22.000	20.334	20.376	19.252	19.294
25	3	1.624	24.952	25.000	23.003	23.051	21.704	21.752

All figures are in millimetres.

*Based on IS 4218 (Part 3):1999 and IS 14962 (Part-1): 2018 & IS 14962 (Part- 2 & 3): 2001 and including 25mm size with 3mm pitch.

TABLE 7
***Dimensions and Tolerances for I.S.O. Metric Screw Threads-Bolts.**
(Clause 8.2)

Size (Nominal dia.)	Pitch	Major Diameter			Pitch Diameter			Minor Diameter		
		Max.	Tolerance	Min.	Max.	Tolerance	Min.	Max.	Tolerance	Min.
18	2.5	17.958	0.335	17.623	16.334	0.170	16.164	15.252	0.319	14.933
22	2.5	21.958	0.335	21.623	20.334	0.170	20.164	19.252	0.319	18.933
25	3	24.952	0.375	24.577	23.003	0.200	22.803	21.704	0.385	21.319

All figures are in millimetres.

*Based on IS 14962 (Part-1): 2018 & IS 14962 (Part- 2 & 3): 2001 and including 25mm size with 3mm pitch.

TABLE 8
***Dimensions and Tolerances for I.S.O. Metric Screw Threads-Nuts.**
(Clause 8.2)

Size (Nominal dia.)	Pitch	Major Diameter	Pitch Diameter			Minor Diameter		
			Max.	Tolerance	Min.	Max.	Tolerance	Min.
18	2.5	Min. 18.000	16.600	0.224	16.376	15.744	0.450	15.294
22	2.5	22.000	20.600	0.224	20.376	19.744	0.450	19.294
25	3	25.000	23.316	0.265	23.051	22.252	0.500	21.752

All figures are in millimetres.

*Based on IS 14962 (Part-1): 2018 & IS 14962 (Part- 2 & 3): 2001 and including 25mm size with 3mm pitch.

9. SAMPLING PLAN FOR INSPECTION OF TRACK BOLTS AND NUTS.

- 9.1 Sampling plan for inspection of finished Track Bolts and Nuts shall be followed as specified in Table-9. Inspection of mechanical & physical properties and dimensional checks of finished Track Bolts and Nuts, as per requirement specified in the drawings, shall be carried out as per Table-10.

Table 9

Lot Size	Category 1:	Category 2:	
	Number of samples for Mechanical and physical property	Number of samples for Dimensions as per required drawing	
		Initial sample	Additional sample
	Ac*=0 Re*=1	Ac*=0 Re*=2	Ac*=0 Re*=1
Up to 3,200	2	13	13
3,201 to 35,000	3	15	15
35,001 to 5,00,000	5	20	20
Over 5,00,000	8	20	20

*Ac-Acceptance number, Re-Rejection number.

(Sampling plan is based Table 1 of ISO 3269:2019(E))

Table 10

Characteristics of Track Bolts and Nuts		Bolt (Inspection category)	Nut (Inspection category)
Mechanical and physical properties	Tensile Strength and % Elongation	Category 1 of Table 9	-
	Proof load	-	Category 1 of Table 9
	Brinell Hardness	Category 1 of Table 9	Category 1 of Table 9
	Surface discontinuity inspection	Category 1 of Table 9	-
Dimensions	As specified in required drawing and Table-6 or 7 & 8 of the specification	Category 2 of Table 9	Category 2 of Table 9

(Inspection category based on Table 2 of ISO 3269:2019(E))

The mechanical & physical property tests shall meet the requirements specified in Table-5 of this specification and measured dimensions shall be according to the required drawings of Track Bolts and Nuts.

10. PAYMENT.

10.1 The actual weight shall be paid for provided selected samples are within the permissible dimensional tolerances. Those beyond the tolerances will be rejected.

11. MARKING.

11.1 The bolts shall be marked with Maker's initial/mark and the IRS part number shown on the drawings. In addition, two raised hemispherical dots of not less than 1mm radius symmetrically opposite to each other, or any other features specified in IS 1367(Part 3): 2017 'Technical Supply Conditions for Threaded Steel Fasteners (Fifth Revision)' shall also be marked on bolt heads and non-bearing surfaces of nuts to distinguish metric fasteners from others.

12. INSPECTION.

- 12.1 The Inspecting Officer or the Purchaser shall have free access at all reasonable times to the works in which the material is made and also to the works where the bolts and nuts are manufactured. He shall be at liberty to inspect the manufacture at any stage and to reject any material or bolts and nuts that do not conform to the terms of this specification.

13. TESTING FACILITIES.

- 13.1 *When Inspection is carried out during manufacture :-* The contractor shall supply the material and samples required for testing free of charge and shall, at his own cost, furnish and prepare the necessary test pieces and supply labour and appliances for such testing as may be carried out in his own premises in accordance with this specification. Failing facilities at his own works for making the prescribed tests, the Contractor shall bear the cost of carrying out the tests elsewhere.
- 13.2 *Where bolts and nuts are taken from Stock :-* The Contractor shall provide the samples required for testing free of charge and shall, at his own cost, forward, if necessary, and as may be directed by the Purchaser or the Inspecting Officer, such samples as may have been tested in his own premises or are required for testing elsewhere.

14. PROTECTION.

- 14.1 After inspection and approval, the bolts and nuts shall be protected with one coat of boiled linseed oil to IS 77-1976 or with any other approved rust preventive compound and shall not be packed until the oil has dried to an elastic film, free from tackiness.

15. PACKING.

- 15.1 The bolts shall be packed complete with their nuts screwed for few threads when bolts and nuts are ordered together. The bolts and nuts shall be packed in double bags conforming to IS 2875-1993 “Jute Corn Sacks” and of suitable size. No bag shall contain more than 50 Kg or more than one kind of bolts and nuts.
