IS 6623 (2004): High Strength Structural Nuts [PGD 31: Bolts, Nuts and Fasteners Accessories]

BLANK PAGE

भारतीय मानक

उच्च सामर्थ्य वाली संरचना ढिबरियाँ — विशिष्टि

(दूसरा पुनरीक्षण)

Indian Standard

HIGH STRENGTH STRUCTURAL NUTS — SPECIFICATION

(Second Revision)

ICS 21.060.20

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

August 2004

Price Group 3

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Bolts, Nuts and Fasteners Accessories Sectional Committee had been approved by the Basic and Production Engineering Division Council.

This standard was first published in 1972 and revised in 1985. This second revision has been taken up to incorporate the development taken place in the field and also updated editorially and technically.

The nuts covered in this standard are suitable to be used along with high strength structural bolts as per IS 3757:1985 'Specification for high strength structural bolts (*second revision*)' for both friction-type and bearing-type of structural steel connections.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

HIGH STRENGTH STRUCTURAL NUTS — SPECIFICATION

(Second Revision)

1 SCOPE

This standard covers the requirements of large series hexagon, high strength structural steel nuts of property classes 8 and 10 in the size range of M 12 to M 36 suitable for use in both friction-type and bearing-type of structural steel connections. Nuts to this standard when matched with the appropriate bolts have been designed to provide an assembly with a high level of assurance against failure by thread stripping on over tightening.

NOTE — Attention is drawn to the importance of ensuring that the nuts are correctly used, if satisfactory results are to be obtained.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
1367	Technical supply conditions for threaded steel fasteners:
(Part 1) : 2002	General requirements of bolts, screws, studs and nuts (*third revision*)
(Part 2) : 2002	Tolerance for fasteners — Bolts, screws, studs and nuts — Product grades A, B and C (*third revision*)
(Part 6) : 1994	Mechanical properties and test methods for nuts with specified proof loads (*third revision*)
(Part 10) : 2002	Surface discontinuities of nuts (*third revision*)
(Part 13) : 1983	Hot-dip galvanized coatings on threaded fasteners (*second revision*)
(Part 17) : 1996	Inspection, sampling and acceptance procedure (*third revision*)
(Part 18) : 1996	Packaging (*third revision*)
3757 : 1985	Specification for high strength structural bolts (*second revision*)
4218	ISO General purpose metric screw threads:
(Part 1) : 2001	Basic profile (*second revision*)
(Part 2) : 2001	General plan (*second revision*)
(Part 3) : 1999	Basic dimensions (*second revision*)
(Part 4) : 2001	Selected sizes for screws, bolts and nuts (*second revision*)
6649 : 1985	Specification for hardened and tempered washers for high strength structural bolts and nuts (*first revision*)
14962	ISO general purposes metric screw threads — Tolerances:
(Part 1) : 2001	Principle and basic data
(Part 2) : 2001	Limits of sizes for general purpose external and internal screw threads — Medium quality
(Part 3) : 2001	Deviations for constructional screw threads
(Part 4) : 2001	Limits of sizes for hot-dip galvanized external screw threads to mate with internal screw threads tapped with tolerance position H or G after galvanizing
(Part 5) : 2001	Limits of sizes for internal screw threads to mate with hot-dip galvanized external screw threads with maximum size of tolerance position h before galvanizing

3 PRODUCT GRADE

Unless otherwise specified the nuts shall be of product grade B as specified in IS 1367(Part 2).

4 DIMENSIONS

4.1 The dimensions of nuts shall be as given in Table 1 when read with Fig. 1.

4.2 The threads of the nuts shall be in accordance with IS 4218 [Parts (1, 2, 3 and 4)]. The tolerances on the threads shall conform to tolerance 6H of IS 14962 [Parts (1, 2, and 3)] and in case of hot-dip galvanized nuts the tolerance shall be in accordance with IS 14962 [(Parts 4 and 5)].

5 MECHANICAL PROPERTIES

5.1 The nuts shall be of property class 8 or 10 as specified in IS 1367(Part 6) except that all nuts shall be hardened and then tempered at a temperature of at least 425 °C. The proof load and hardness values shall be as given in Table 2.

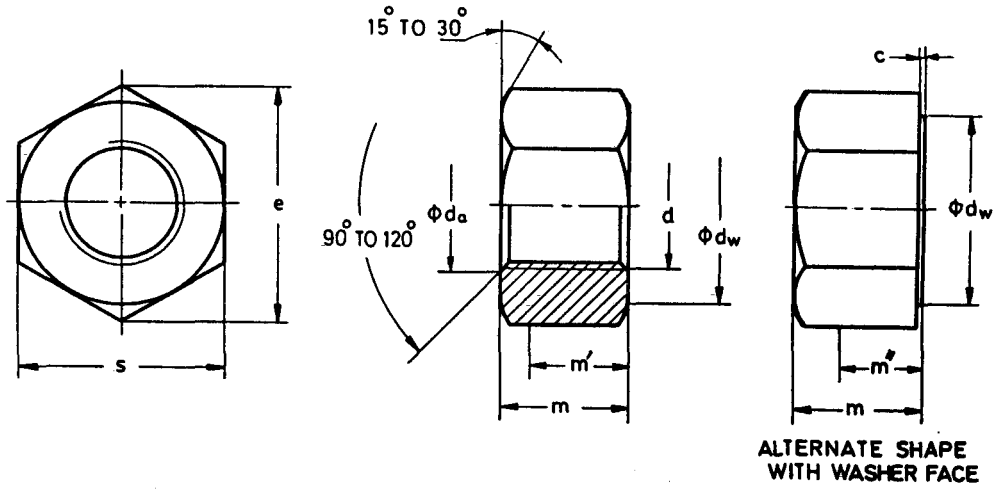

FIG. 1 DIMENSIONS FOR HIGH STRENGTH STRUCTURAL NUTS

Table 1 Dimensions for High Strength Structural Nuts

(*Clause* 4.1)

All dimensions in millimetres.

Sl No.	Thread Size, d		M 12	M 16	M 20	(M 22)	M 24	(M 27)	M 30	M 36
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
i)	P[1]		1.75	2	2.5	2.5	3	3	3.5	4
ii)	d_a	*Max*	13.0	17.3	21.6	23.8	25.9	29.2	32.4	38.9
		Min	12.0	16.0	20.0	22.0	24.0	27.0	30.0	36.0
iii)	d_w	*Max*	[2]	[2]	[2]	[2]	[2]	[2]	[2]	[2]
		Min	19.2	24.9	31.4	33.3	38.0	42.8	46.5	55.9
iv)	e	*Min*	22.78	29.56	37.29	39.55	45.20	50.85	55.37	66.44
v)	m	*Max*	12.3	17.1	20.7	23.6	24.2	27.6	30.7	36.6
		Min	11.9	16.4	19.4	22.3	22.9	26.3	29.1	35.0
vi)	m'	*Min*	9.5	13.1	15.5	17.8	18.3	21.0	23.3	28.0
vii)	m''	*Min*	8.3	11.5	13.6	15.6	16.0	18.4	20.4	24.5
viii)	c	*Max*	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
		Min	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
ix)	s	*Max*	21.00	27.00	34.0	35.0	41.0	46.0	50.0	60.0
		Min	20.16	26.16	33.0	34.0	40.0	45.0	49.0	58.8

NOTES

1 Sizes shown in brackets are of second preference.

2 For hot-dip galvanized nuts, the above dimensions apply before galvanizing.

[1] Pitch of thread.

[2] d_w, *Max* = s, actual.

5.1.1 For proof load testing of nuts, the speed of testing as determined with a free running cross head shall not exceed 25 mm/min.

6 FINISH

6.1 Unless otherwise specified, the nuts shall be supplied in the dull black heat-treated condition with a residual coating of light oil.

6.2 Where the nuts of property class 10, are required to be hot-dip galvanized, they shall be galvanized in accordance with the requirements of IS 1367 (Part 13).

6.2.1 For fasteners with hot-dip galvanized coatings, the nuts of the mating bolts shall be provided with a suitable lubricant coating, which shall be clean, and dry to the touch to ensure the seizure shall not take place in assembly. The hot-dip galvanized nuts shall be subjected to the anti-seizing test as specified in Annex A.

7 GENERAL REQUIREMENTS

7.1 In regard to permissible surface discontinuities, the nuts shall conform to IS 1367 (Part 10).

7.2 In regard to the requirements not covered in this standard, the nut shall conform to the general requirements given in IS 1367 (Part 1).

7.3 The high strength structural bolts to be used with these nuts shall conform to the requirements of IS 3757.

7.4 The bolts shall have the property class and finish as given below for each type of nut as follows:

Sl No.	*Property Class and Finish Nuts*	*Property Class and Finish Bolts*
i)	8 S or 10 S, Dull black	8.8 S, Dull black
ii)	10 S, Hot-dip galvanized	8.8 S, Hot-dip galvanized
iii)	10 S, Dull black	10.9 S, Dull black

7.5 The hardened and tempered washers to be used with these nuts shall conform to the requirements of IS 6649.

8 DESIGNATION

The high strength structural nuts shall be designated by name, size, and property class identification symbol 8 S or 10 S (the suffix letter S denotes a high strength structural nut with a large series hexagon) and number of this Indian Standard. In case of hot-dip galvanized nuts the word 'galvanized' shall also be added to the designation.

Example

A high strength structural nut of size M 24, property class 8 and galvanized shall be designated as:

High Strength Structural Nut – M 24 IS 6623 – 8 S Galvanized

9 SAMPLING INSPECTION AND ACCEPTANCE CRITERIA

The sampling, inspection and acceptance criteria of nuts shall be in accordance with IS 1367 (Part 17).

10 MARKING

10.1 The high strength structural nuts shall be marked with the following as shown in Fig. 2:

a) Manufacturer's identification symbol; and

b) Property class 8 S or 10 S.

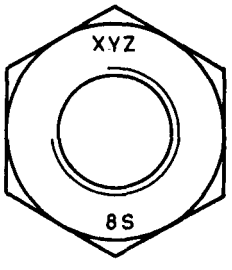

FIG. 2 MARKING ON THE NUTS

10.1.1 The marking shall be indented on either the top or bottom face of double-chamfered nuts and shall be either indented or embossed on non-bearing face of washer faced nuts.

10.2 BIS Certification Marking

The product may also be marked with the Standard Mark. Wherever it is not possible to put the Standard Mark on the product, it may be marked on the packaging.

10.2.1 The use of Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to the manufacturers or producers may be obtained from the Bureau of Indian Standards.

11 PACKAGING

The packaging of high strength structural nuts shall be done in accordance with IS 1367 (Part 18).

Table 2 Proof Loads and Hardness Values of High Strength Structural Nuts

(*Clause* 5.1)

Sl No.	Thread Size, d	Nominal Stress Area of Standard Test Mandrel A_s, mm²	Property Class						
			8 S			10 S			
			Finish						
			Plain			Plain	Hot-Dip Galvanized	Plain and Hot-Dip Galvanized	
			Proof load (N) ($A_s \times S_p$)	Hardness		Proof load (N) ($A_s \times S_p$)		Hardness	
				Rockwell HR	Vickers HV			Rockwell HR	Vickers HV
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
i)	M 12	84.3	90 600			105 000	98 200		
ii)	M 16	157	168 900			195 500	182 900		
iii)	M 20	245	263 400	B 89	188	305 000	285 400	C 26	272
iv)	(M 22)	303	325 700	to	to	377 200	353 000	to	to
v)	M 24	353	379 500	C 38	372	439 500	411 200	C 38	372
vi)	(M 27)	459	493 400			571 500	534 700		
vii)	M 30	561	603 100			698 400	653 600		
viii)	M 36	817	878 300			1 017 200	951 800		

NOTES

1 Based on the following proof load stress (S_p) :

a) for nuts of property class 8 S, plain : 1 075 N/mm²,

b) for nuts of property class 10 S, plain : 1 245 N/mm², and

c) for nuts of property class 10 S, hot-dip galvanized : 1 165 N/mm².

2 Sizes shown within the brackets are non-preferred.

ANNEX A

(*Clause* 6.2.1)

ANTI-SEIZING TEST FOR HOT-DIP GALVANIZED FASTENERS

A-1 Where bolts and mating nuts and washers with hot-dip galvanized coating are specified, these shall be subject to the following anti-seizing test for testing the effectiveness of the lubricant coating applied to the hot-dip galvanized bolts or nuts.

A-1.1 The test shall be carried out on bolts, nuts, and washers in the condition as supplied by the manufacturer and shall be in accordance with and include a lubricant coating as required by **6.2**. There shall be no other lubricant applied for the purpose of this test. If the test is performed by the user, it shall be carried out immediately after receipt of the bolts nuts and washers from the manufacturer.

A-1.2 The bolt with nut and washer selected for testing shall be placed with the washer directly under the nut in a steel joint with total thickness so that 3 to 5 full threads of the bolt are located between the bearing surfaces of the bolt head and nut. The diameter of the holes in the assembly shall have the same nominal diameter as the hole in washer.

A-1.3 The nut shall be initially tightened to produce a load in the bolt not less than 10 percent the specified proof load. After this initial tightening, the bolt and nut position shall be marked provide the starting point for the rotational movement to be measured. During nut rotation the bolt head shall be restrained from turning, and the final tensioning shall be completed without stopping the motion of the nut. The nut shall be rotated in accordance with the requirements of Table 3 from the initial tightening position without fracture of the bolt, stripping of the bolt or nut thread.

Table 3 Nut Rotation Requirements

(*Clause* A-1.3)

Sl No.	Bolt Length (Nominal)	Nut Rotation
	mm	*Min*
(1)	(2)	(3)
i)	$l \leq 2d$	180°
ii)	$2d < l \leq 3d$	240°
iii)	$3d < l \leq 4d$	300°
iv)	$4d < l \leq 8d$	360°
v)	$l > 8d$	420°

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

This Indian Standard has been developed from Doc: No. **BP 33 (0184).**

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402 *website* : www.bis.org.in

Regional Offices:		Telephones
Central	: Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002	2323 7617, 2323 3841
Eastern	: 1/14 C.I.T. Scheme VII M, V.I.P. Road, Kankurgachi, KOLKATA 700054	2337 8499, 2337 8561, 2337 8626, 2337 9120
Northern	: SCO 335-336, Sector 34-A, CHANDIGARH 160022	260 3843, 260 9285
Southern	: C.I.T. Campus, IV Cross Road, CHENNAI 600113	2254 1216, 2254 1442, 2254 2519, 2254 2315
Western	: Manakalaya, E9 MIDC, Marol, Andheri (East), MUMBAI 400093	2832 9295, 2832 7858, 2832 7891, 2832 7892

Branches : AHMEDABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. NAGPUR. NALAGARH. PATNA. PUNE. RAJKOT. THIRUVANANTHAPURAM. VISAKHAPATNAM.

Printed at Simco Printing Press, Delhi