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भारतीय मानक मसौदा

उच्च शक्ति संरचनात्मक बोल्ट और नट के लिए

कठोर और टेम्पर्ड वाशर — विशिष्टि

(IS 6649 का दूसरा पुनरीक्षण)

Draft Indian Standard

**Hardened and Tempered Washers for
High Strength Structural Bolts and Nuts — Specification**

(Second Revision of IS 6649)

ICS 21.060.20

General Engineering and Fasteners
Standards Sectional Committee, PGD 37

Last date for receipt of comment is
3 August 2024

FOREWORD

(Formal Clauses will be added later)

This standard was first published in 1972 and was subsequently revised in 1985. This second revision has been brought out to keep pace with the latest technological developments and international practices. In this revision following changes have been made:

- a) Size M12 has been added, and
- b) References have been updated.

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 or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*).' The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Draft Indian Standard

**Hardened and Tempered Washers for
High Strength Structural Bolts and Nuts — Specification**
(Second Revision)

1 SCOPE

This standard covers the requirements for through hardened and tempered steel washers intended for assembly with large series hexagon, high strength structural bolts and nuts in the size range M12 to M36.

2 REFERENCES

The listed below 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 the standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below:

<i>IS</i>	<i>Title</i>
IS 1367 (Part 13) : 2020/ ISO 10684 : 2004	Technical supply conditions for threaded steel fasteners: Part 13 Hot dip galvanized coatings on threaded fasteners (<i>third revision</i>)
IS 1367 (Part 17) : 2023/ ISO 3269 : 2019	Technical supply conditions for threaded steel fasteners: Part 17 Inspections, sampling and acceptance procedure (<i>fifth revision</i>)
IS 1570 (Part 2) : 1979	Schedules for wrought steels: Part 2 Carbon steels (Unalloyed steels)
IS 1586 (Part 1) : 2018	Metallic materials — Rockwell hardness test: Part 1 Test method (<i>fifth revision</i>)
Doc No. PGD 37 (22675)	High strength structural bolts — Specification (<i>third revision</i>)
IS 6623 : 2024	High strength structural nuts — Specification (<i>second revision</i>)
IS 15274 : 2021/ ISO 4759-3 : 2016	Tolerances for fasteners — Washers for bolts, screws and nuts — Product grades A, C and F (<i>first revision</i>)

3 TYPES

The washers conforming to this standard shall be of the types as given in the table below:

<i>Type</i>	<i>Description</i>
Type A	Plain hole circular washers
Type B	Square taper washers for use with channels (6° taper)
Type C	Square taper washers for use with I-beams (8° taper)

4 DIMENSIONS AND TOLERANCES

The dimensions of the plain hole circular washers shall be as given in Fig.1 and Table 1 and those for square taper washers shall be as given in Fig. 2 and Table 2.

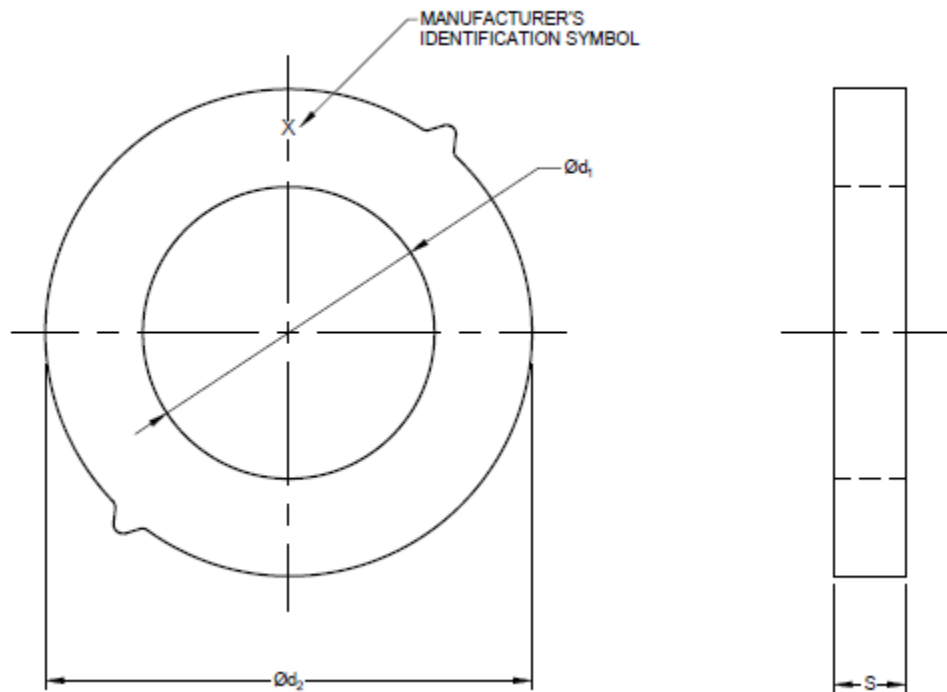


FIG.1 PLAIN HOLE CIRCULAR WASHERS (TYPE A)

Table 1 Dimensions for Plain Hole Circular Washers (Type A)
(Clause 4)

All dimensions are in millimetres.

Sl No.	Nominal size (Thread size d of associated bolt)	M12	M16	M20	(M22) ¹⁾	M24	(M27) ¹⁾	M30	M36	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
i)	d_1	Min	14	18	22	24	26	30	33	39
		Max	14.43	18.43	22.52	24.52	26.52	30.52	33.62	39.62
ii)	d_2	Min	25.70	32.4	40.4	42.4	48.4	54.1	58.1	70.1
		Max	27	34	42	44	60	66	60	72

iii)	<i>s</i>	<i>Min</i>	3.1	3.1	3.1	3.4	3.4	3.4	3.4	3.4
		<i>Max</i>	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6

¹⁾ Non-preferred sizes.

NOTE — For hot-dip galvanized washers, the above dimensions apply before galvanizing.

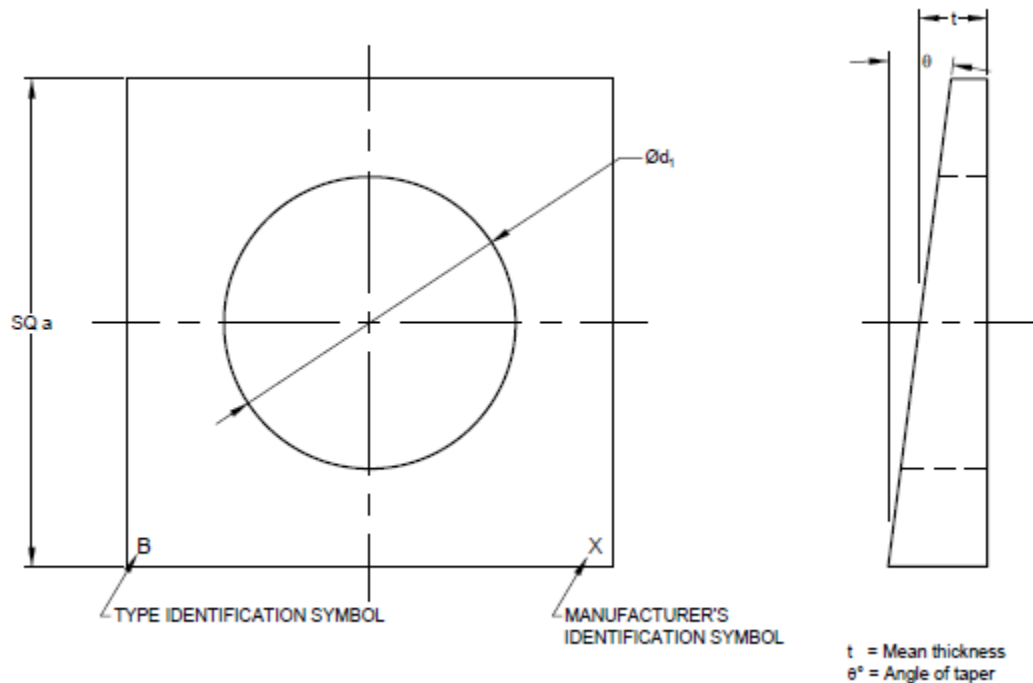


FIG.2 SQUARE TAPER WASHERS (TYPE B AND C)

Table 2 Dimensions for Square Taper Washers (Type B and C)
(Clause 4)

All dimensions are in millimetres.

Sl No.	Nominal size (thread size <i>d</i> of associated bolt)		M12	M16	M20	(M22) ¹⁾	M24	(M27) ¹⁾	M30	M36
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
i)	<i>d</i> ₁	<i>Min</i>	14	18	22	24	26	30	33	39
		<i>Max</i>	14.43	18.43	22.52	24.52	26.52	30.52	33.62	39.62
ii)	<i>a</i>	<i>Min</i>	42	42	42	42	42	55	55	65
		<i>Max</i>	45	45	45	45	45	58	58	58
iii)	<i>t</i>	<i>Min</i>	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
		<i>Max</i>	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5

iv)	θ°	Type B	6	6	6	6	6	6	6	6
		Type C	8	8	8	8	8	8	8	8

¹⁾ Non-preferred size.

NOTE — For hot-dip galvanized washers, the above dimensions apply before galvanizing.

4.1 The washers shall be flat with a maximum deviation not exceeding 0.25 mm from the straight edge laid along a line passing through the center of the hole.

4.2 The hole of the washer shall be concentric with the outside dimensions within 0.50 mm.

4.3 When circular or square taper washers are required to be clipped to provide clearance, the clipped edge shall not be closer to the center of the washer than 0.9 of the bolt diameter. In case of square taper washers, these may be clipped along the thin edge parallel to the opposite edge.

5 TOLERANCES

Unless otherwise specified, washers shall conform to product grade C of IS 15274.

6 MATERIAL

The washers shall be made from 45C8 steel according to IS 1570 (Part 2) with the contents of sulphur and phosphorus not exceeding 0.06 percent in the check analysis.

7 HEAT TREATMENT

The washers shall be through hardened and tempered. Carburized washers are not suitable.

8 HARDNESS

The washers shall be subjected to a hardness test in accordance with IS 1586 (Part 1) and the hardness shall be between 35 to 45 HRC. The minimum hardness for hot-dip galvanized washers shall be 26 HRC.

9 FINISH

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

9.2 Where washers are required to be hot-dip galvanized, they shall conform to IS 1367 (Part 13).

NOTE — For hot-dip galvanized washers, to avoid hydrogen embrittlement cleaning shall be done by using inhibited acid, alkaline or mechanical process. Baking shall also be done.

10 ASSOCIATED BOLTS AND NUTS

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

10.2 The high strength structural nuts to be used with these washers shall conform to the requirements of IS 6623.

11 DESIGNATION

Hardened and tempered washers shall be designated by the word 'washer', nominal size, type and the number of this standard. In case of hot-dip galvanized washers the word 'galvanized' shall be added to the designation.

Examples:

1) A plain hole circular washer of nominal size M24 conforming to this standard and galvanized shall be designated as:

Washer M24 A IS 6649 galvanized.

2) A square taper washer of 6° taper for use with channels, of nominal size M24 conforming to this standard and galvanized shall be designated as:

Washer M24 B IS 6649 galvanized.

12 SAMPLING

Sampling and criteria of acceptance shall be in accordance with IS 1367 (Part 17).

13 MARKING

13.1 Type A plain hole circular washers shall be identified by the provision of two nibs and the manufacturer's identification symbol in indented character as shown in Fig. 1, the indented symbol being placed as near to the outer edge as possible.

13.2 Type B and C square taper washers shall be identified by the type identification symbol, B or C, and the manufacturer's identification symbol. All symbols shall be indented and placed as near as possible to the two corners of washer as shown in Fig. 2.

13.3 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed thereunder, and the product(s) may be marked with the standard mark.