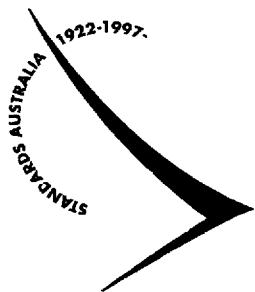


AS/NZS 1559:1997

Australian/New Zealand Standard®

Hot-dip galvanized steel bolts and
associated nuts and washers for
tower construction



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Australian Chamber of Commerce and Industry
Bureau of Steel Manufacturers of Australia
Electricity Supply Association of Australia
Federal Chamber of Automotive Industries
Metal Building Products Manufacturers Association
Metal Trades Industry Association of Australia
New Zealand Joinery Manufacturers Federation
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AS/NZS 1559:1997

Australian/New Zealand Standard[®]

**Hot-dip galvanized steel bolts and
associated nuts and washers for
tower construction**

*Originated in Australia as AS 1559—1986.
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STANDARDS AUSTRALIA
1 The Crescent,
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STANDARDS NEW ZEALAND
Level 10, Standards House,
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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee ME/29, Fasteners, to supersede AS 1559—1986, *Fasteners—Bolts, nuts and washers for tower construction*.

The objective of this Standard is to provide designers and manufacturers involved in tower construction with specifications for bolts, nuts and washers suitable for use in tower construction.

There are no ISO Standards for bolts for tower construction and IFI 541:1982, *Metric hex transmission tower bolts* has been used for guidance in the preparation of this Standard.

Bolts for tower construction have shorter thread lengths than specified in ISO 888:1976, *Bolts, screws and studs—Nominal lengths, and thread lengths for general purpose bolts* to ensure that in a connection the shear planes will occur through the unthreaded shank. Other features are in accordance with the following ISO Standards:

ISO

272 Fasteners—Hexagon products—Widths across flats

885 General purpose bolts and screws—Metric series—Radii under the head

4759 Tolerances for fasteners

4759.1 Part 1: Bolts, screws and nuts with thread diameters ≥ 1.6 and ≤ 150 mm and product grades A, B and C

The mechanical properties specified for tower bolts include appropriate shear strength and impact strength requirements suitable for the application.

The nuts specified for use with tower bolts are style 1 in accordance with AS/NZS 1112, *ISO metric hexagon nuts, including thin nuts, slotted nuts and castle nuts* and the washers are in accordance with ISO 887:1983, *Plain washers for metric bolts, screws and nuts—General plan* with a nominal thickness for all sizes.

This edition of the Standard does not include the requirements for weather-resistant steel bolts and some dimensions have been modified. An increased range of step bolts and mechanical properties for low temperature application have been included.

The optional diameter/length code marking has been replaced with an optional length marking.

The term 'informative' has been used in this Standard to define the application of the appendices. An 'informative' appendix is only for information and guidance.

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Australian/New Zealand Standard

Hot-dip galvanized steel bolts and associated nuts
and washers for tower construction

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE This Standard specifies the requirements for hot-dip galvanized bolts and step bolts with ISO metric coarse pitch series threads for normal and low temperature applications in tower construction, and associated nuts and washers. Bolt sizes are as follows:

- (a) Single-nut type bolts in diameters from 12 to 30 mm inclusive with lengths from 35 to 160 mm inclusive.
- (b) Double-nut type bolts in diameters from 12 to 30 mm inclusive with lengths from 50 to 125 mm inclusive.
- (c) Step bolts 16, 22 and 24 mm in diameter with lengths from 180 to 270 mm inclusive.

NOTE: The single-nut and double-nut bolts are known as 'tower bolts' and have a thread length/bolt length relationship to enable threads to be excluded from shear planes when assembled.

1.2 APPLICATION Bolts, nuts and washers shall comply with the requirements of Section 1 and with the following Sections as applicable:

- (a) Bolts Section 2.
- (b) Nuts Section 3.
- (c) Washers Section 4.

1.3 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS	
1214	Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series)
1275	Metric screw threads for fasteners
1544	Methods for impact tests on metals
1544.2	Charpy V-notch
1654	ISO system of limits and fits
1654.2	Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts
1650	Hot-dipped galvanized coatings on ferrous articles
AS/NZS	
1110	ISO metric precision hexagon bolts and screws
1112	ISO metric hexagon nuts, including thin nuts, slotted nuts and castle nuts
3678	Structural steel—Hot-rolled plates, floor-plates and slabs

4291	Mechanical properties of fasteners
4291.1	Part 1: Bolts, screws and studs
4291.2	Part 2: Nuts with specified proof load values—Coarse thread
SAA/SNZ	
HB 18	Guidelines for third-party certification and accreditation
HB 18.22	Guide 22: Information on manufacturer's declaration of conformity with standards or other technical specifications

1.4 DEFINITIONS For the purpose of this Standard, the definitions below apply.

1.4.1 Clamping length (l_c)—the total thickness of materials, excluding the washer, to be clamped, including any coating.

1.4.2 Concentricity tolerance—the allowable deviation of the shank with respect to the pitch diameter of the screw thread (see Figure 2.2).

1.4.3 Grip length (l_g)—the distance from the bearing surface of the bolt head to the nearest face of a 8g GO screw ring gauge, screwed on as far as practicable by hand before coating.

1.4.4 Length (l)—of a bolt, is the distance from the bearing surface of the head to the extreme end.

1.4.5 May—indicates the existence of an option.

1.4.6 Shall—indicates that a statement is mandatory.

1.4.7 Should—indicates a recommendation.

1.4.8 Step bolt—a type of tower bolt which, when fitted, is used to gain access to the structure.

1.4.9 Symmetry tolerance—the allowable deviation of the across-flats dimension with respect to the shank or the pitch diameter of the screw thread.

1.4.10 Thread length (b)—the difference between the nominal length of the bolt and the distance between the bearing surface of the head and the nearest face of a 8g GO screw ring gauge, screwed on as far as practicable to the bolt by hand before coating.

1.4.11 Tower bolt, double-nut type—a special variety of tower bolt using a second nut for locking purposes.

1.4.12 Tower bolt, single-nut type—a hexagon-headed fastener, with a specific relationship of the threaded length to the overall length.

1.4.13 Transition diameter (d_a)—the diameter of the circle formed at the transition between the fillet radius and the bearing surface of the head.

1.4.14 Unthreaded shank length (l_s)—the distance from the bearing surface of the bolt head to the last scratch of thread, or top of the extrusion angle, whichever is closer to the head.

1.5 MARKING (see Figure 1.1)

1.5.1 Bolts Tower bolts shall be marked with the following information:

- (a) The following letters embossed or indented on top of the head or rolled into one of the hexagon flats:
 - (i) Bolts for normal temperature application T.
 - (ii) Bolts for low temperature application TL.
- (b) The trade (identification) mark of the manufacturer embossed or indented on top of the head.

Tower bolts may be marked with the nominal bolt length in millimetres.

1.5.2 Nuts Nuts for use with tower bolts shall be marked in accordance with AS/NZS 1112.

1.5.3 Washers There are no marking requirements for hot-dip galvanized washers for use with tower bolts.

NOTES:

- 1 Manufacturers making a statement of compliance with this Australian/New Zealand Standard on a product, packaging, or promotional material related to that product are advised to ensure that such compliance is capable of being verified.
- 2 Guidance on the manufacturer's declaration of conformity with this Standard is given in SAA HB 18.22/SANZ HB18.22.

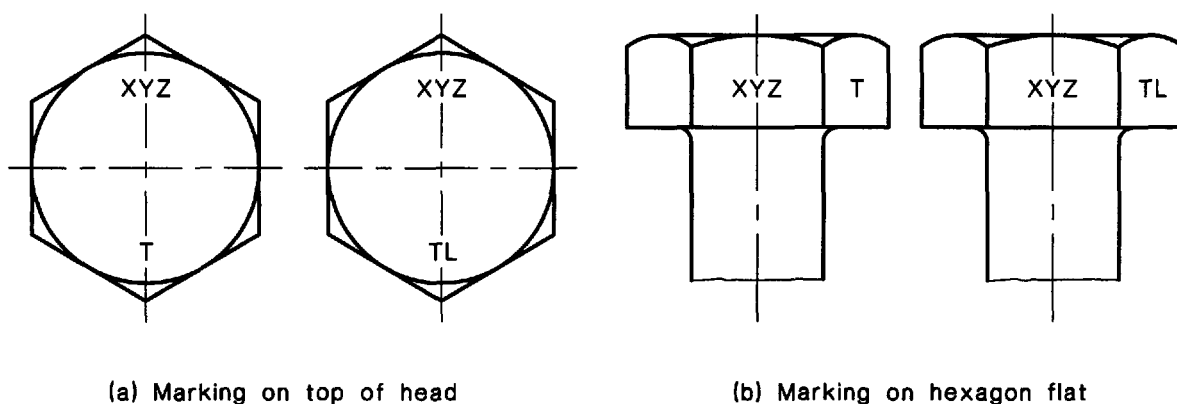


FIGURE 1.1 IDENTIFICATION MARKING OF TOWER BOLTS

1.6 DESIGNATION

1.6.1 Bolts The designation of tower bolts shall be composed of the following:

- (a) General product description.
- (b) The number of this Australian/New Zealand Standard, i.e. AS/NZS 1559.
- (c) The letter 'M' indicating that the product has a metric coarse pitch series thread followed by the nominal size (thread diameter), in millimetres.
- (d) The nominal length, in millimetres.
- (e) Any other features.

Examples

- (i) Single nut tower bolts 20 mm diameter and 50 mm long are designated as follows:
Hot-dip galvanized steel single nut tower bolts to AS/NZS 1559—M20 × 50.
- (ii) Double nut tower bolts 24 mm diameter and 90 mm long are designated as follows:
Hot-dip galvanized steel double nut tower bolts to AS/NZS 1559—M24 × 90.
- (iii) Step bolts 16 mm diameter and 180 mm length are designated as follows:
Hot-dip galvanized steel step bolts to AS/NZS 1559—M16 × 180.

1.6.2 Nuts Nuts for use with bolts for tower construction shall be designated in accordance with AS/NZS 1112.

Example

Hot-dip galvanized Style 1 metric nuts 20 mm diameter manufactured to property class 5 are designated as follows:

Style 1 nuts to AS/NZS 1112—M20—Class 5 (hot-dip galvanized to AS 1214).

1.6.3 Washers The designation of washers for use with nuts and bolts for tower construction shall be composed of the following:

- (a) General product description.
- (b) The number of this Australian/New Zealand Standard, i.e. AS/NZS 1559.
- (c) The nominal size (nominal bolt diameter), in millimetres.

Example

Washers for use with 20 mm tower bolts are designated as follows:

Hot-dip galvanized steel washers to AS/NZS 1559—20.

SECTION 2 BOLTS

2.1 METHOD OF MANUFACTURE Tower bolts and step bolts shall be produced by—

- (a) hot or cold forging with or without secondary machining; or
- (b) machining from bar stock.

2.2 SHAPE, DIMENSIONS AND FINISH

2.2.1 Heads

2.2.1.1 General The heads of tower and step bolts shall be in accordance with Figure 2.1. The dimensions for tower bolt heads shall be as given in Table 2.1 and the dimensions given for M16, M22 and M24 tower bolts are applicable to step bolts.

The dimensions given in Table 2.1 shall apply before hot-dip galvanizing.

2.2.1.2 Chamfer The upper face of the head shall have a chamfer of 15 to 30 degrees. The diameter of the circle formed by this chamfer shall be not less than 90 percent of the minimum width across-flats of the head.

2.2.1.3 Washer face The underside of the head shall have either a washer face or a full bearing face (see Figure 2.1). The diameter and depth of the washer face shall be as given in Table 2.1.

2.2.2 Length The lengths of tower bolts shall be as given in Table 2.2 for single-nut bolts, Table 2.3 for double-nut bolts and Table 2.4 for step bolts.

NOTE: Clamping lengths for tower bolts are given in Appendix A.

2.2.3 Ends The ends of tower bolts shall be finished with a 45-degree chamfer to a depth slightly exceeding the depth of thread (see Figure 2.1).

2.2.4 Screw threads

2.2.4.1 General The form of thread, diameters and associated pitches of tower bolts shall be the ISO coarse pitch series in accordance with AS 1275.

Screw threads shall be formed by thread rolling or thread cutting.

2.2.4.2 Tolerances The screw threads shall be made to tolerance class 8g in accordance with AS 1275.

The 8g tolerance class shall apply before hot-dip galvanizing.

2.2.5 Thread length The nominal thread lengths (b) for tower bolts shall be as determined from the following equations:

- (a) For single-nut bolts, as follows:
 - (i) For M12, M16 and M22 bolts $b = d + 9$
 - (ii) For M20 bolts $b = d + 8$
 - (iii) For M24 bolts $b = d + 7$
 - (iv) For M30 bolts $b = d + 6$
- (b) For double-nut bolts, as follows:
 - (i) For M12 bolts $b = 1.8d + 9$
 - (ii) for M16 and M20 bolts $b = 1.8d + 10$
 - (iii) For M22 bolts $b = 1.8d + 13$