

Australian/New Zealand Standard™

High-strength steel fastener assemblies for structural engineering—Bolts, nuts and washers

Part 1: Technical requirements



AS/NZS 1252.1:2016

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Australian/New Zealand Standard™

High-strength steel fastener assemblies for structural engineering—Bolts, nuts and washers

Part 1: Technical requirements

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Previous edition jointly revised and designated AS/NZS 1252:1996.
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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee ME-029, Fasteners, to supersede AS/NZS 1252:1996, *High-strength steel bolts with associated nuts and washers for structural engineering*.

This Standard incorporates Amendment No. 1 (November 2018). The changes required by the Amendment are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

The objective of this Standard is to provide manufacturers of high-strength steel bolt assemblies with requirements and tests to ensure that such assemblies are suitable for bolted connections in steelwork construction, consistent with the steel design Standards AS 4100 and NZS 3404.

The major technical changes incorporated in this edition relate to updated testing and conformity requirements and the inclusion of a specific nominated European fastener Standard as a 'deemed to satisfy' alternative product and an additional assembly type. These aspects are designed to improve procurement outcomes in the Australian marketplace.

The specific changes in this edition include the following:

- (a) Updating and expansion of definitions to align, where relevant, with ISO definitions.
- (b) Revision of dimensions to align with ISO requirements.
- (c) Nomination of bolt assemblies to EN 14399-3 Type HR property class 8.8 as an alternative assembly type.
- (d) Nomination of bolt assemblies to EN 14399-3 Type HR property class 10.9 as an additional assembly type.

NOTE: This is designed to facilitate the use of property class 0.9 preloaded bolt assemblies if written into a future revision of AS 4100 or NZS 3404.

- (e) Revision of certain dimensions (in particular the across flat dimensions) of the M20 bolt and nut.

NOTE: The 1996 revision of AS 1252—1983 introduced changes to the M20 head and nut dimensions based on ISO dimensions that were not readily accepted by industry. This current revision has reinstated the dimensions from the 1983 edition, which is commonly available and consistent with the specific EN 14399-3 alternative assembly type nominated in this Standard [see Item (d)].

- (f) Addition of the k-class definition and testing requirements, which defines the torque-tension relationship during tightening of the bolt assemblies.

NOTE: This is designed to facilitate use of torque as a tightening method if written into a future revision of AS 4100 or NZS 3404.

- (g) New Section 5 specifically defining the performance requirements of the bolt assembly. This is supported with an updated normative appendix, Appendix D, which sets out bolt assembly tests.
- (h) New Section 6 on identification, certification and testing.
- (i) Inclusion of the M12 product.
- (j) New informative Appendix A, describing the differences between the European 'HR' and 'HV' bolt types.
- (k) New Appendix B on product conformity.
- (l) New informative Appendix C on purchasing guidelines.

Previous editions of this Standard were based on and, except for the marking requirements for the nuts and bolts, technically equivalent to the following withdrawn ISO Standards for the relevant property class:

ISO

- 4775:1984 Hexagon nuts for high-strength structural bolting with large width across flats—Product grade B—Property classes 8 and 10
- 7411:1984 Hexagon bolts for high-strength structural bolting with large width across flats (thread lengths according to ISO 888)—Product grade C—Property classes 8.8 and 10.9
- 7415:1984 Plain washers for high-strength structural bolting, hardened and tempered

Statements expressed in mandatory terms in notes to figures and tables are deemed to be requirements of this Standard.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

This revision is compatible with AS 4100—1998 incorporating Amendment No. 1 (2012).

NOTE: It is the intent of the committee to replace this Standard with the EN 14399 series, subject to Standards Australia review processes. This may require further amendment of AS 4100.

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STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard**High-strength steel fastener assemblies for structural engineering—
Bolts, nuts and washers****Part 1: Technical requirements**

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies the dimensional, material and marking requirements for steel bolt assemblies comprising steel bolts of property class 8.8, steel nuts of property class 8 with ISO metric coarse pitch series threads, in diameters from 12 mm to 36 mm, and associated hardened and tempered steel washers intended for use in steel structures. This Standard also specifies an additional bolt assembly type of property class 10.9 to EN 14399.3.

The bolt assemblies are intended to be fully tensioned but may also be used in a snug tight condition or where designed to be partially tensioned. This Standard also sets out tests to verify the suitability of high-strength bolt, nut and washer assemblies for tensioning (preloading) for bolted connections in steelwork construction.

This Standard is intended to apply to the manufacture of high-strength steel bolt assemblies.

NOTE: AS/NZS 1252.2 provides requirements for verification testing.

1.2 APPLICATION

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

- (a) Bolts..... Section 2.
- (b) Nuts..... Section 3.
- (c) Washers..... Section 4.
- (d) Assemblies Section 5.
- (e) Identification, certification and testing..... Section 6.

1.3 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS	
1275	Metric screw threads for fasteners
1815	Metallic materials—Rockwell hardness test
1815.1	Method 1: Test method (scales A, B, C, D, E, F, G, H, K, N, T)
1817	Metallic materials—Vickers hardness test
1817.1	Method 1: Test method (ISO 6507-1:1997, MOD)
1897	Fasteners—Electroplated coatings
2193	Calibration and classification of force-measuring systems

AS	
4100	Steel structures
4291	Mechanical properties of fasteners made of carbon steel and alloy steel
4291.1	Part 1: Bolts, screws and studs
AS/NZS	
1214	Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series) (ISO 10684:2004, MOD)
4291	Mechanical properties of fasteners made of carbon steel and alloy steel
4291.2	Part 2: Nuts with specified property classes—Coarse thread and fine pitch thread
4680	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
NZS	
3404	Steel structures standard
ISO	
4042	Fasteners—Electroplated coatings
6157	Fasteners—Surface discontinuities
6157-1	Part 1: Bolts, screws and studs for general requirements
6157-2	Part 2: Nuts
16228	Fasteners—Inspection documents
ISO/CD	
17607	Steel structures
EN	
14399	High-strength structural bolting assemblies for preloading (series)
14399-1	Part 1: General requirements
14399-2	Part 2: Suitability for preloading
14399-3	Part 3: System HR—Hexagon bolt and nut assemblies
14399-4	Part 4: System HV—Hexagon bolt and nut assemblies
14399-5	Part 5: Plain washers
14399-6	Part 6: Plain chamfered washers

1.4 DEFINITIONS

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

1.4.1 Assembly

The assembly of the matching high-strength bolt, nut and washer supplied together as a set.

1.4.2 Assembly lot or assembly batch

Assemblies supplied together as a set, comprising bolts from a single manufacturing lot, nuts from a single manufacturing lot and washers from a single manufacturing lot.

1.4.3 Concentricity tolerance

Of a bolt, the allowable deviation of the shank with respect to the pitch diameter of the screw thread.

1.4.4 Distributor

Any business entity that provides a point/source of supply of a product to the market.

1.4.5 Factory production control (FPC)

Comprises operational techniques and all measures necessary to regulate and maintain the conformity of the product to the requirements of this Standard.

1.4.6 Full tensioning

A method of installing and tensioning a bolt to a minimum level of tension, as defined in AS 4100 or NZS 3404, as appropriate.

1.4.7 Grip length

Of a bolt, the thickness of materials which can be clamped.

1.4.8 Heat

A product of a ladle of steel melted in one vessel and processed under the same conditions.

1.4.9 HR bolting system

A technical solution that provides ductility in direct tension through ensuring the failure mode involves tension failure in the bolt shank, which is consistent with the performance expectations of bolts to this Standard.

NOTE: Refer to EN 14399-3 for more detail.

1.4.10 HV bolting system

A technical solution that provides ductility in direct tension through deformation of the threads.

NOTE: Refer to EN 14399-4 for more detail.

1.4.11 Inspection documents (for fasteners)

Fastener declaration of compliance F2.1, or test reports F2.2, F3.1 and F3.2, in accordance with ISO 16228.

1.4.12 k-class

The designation of a bolt assembly, which relates the torque applied to the nut to the tension developed in the bolt.

NOTES:

- 1 The k-class and designations of K0, K1 and K2 are defined in EN 14399-1.
- 2 A K0 designation indicates bolt assemblies that do not have a defined torque-tension relationship. These bolt assemblies cannot be tensioned by torque controlled methods but may be tensioned by the part turn method or direct tension indicator (DTI) method detailed in AS 4100 and NZS 3404.

1.4.13 Manufacturer (fastener)

The business entity providing the total, substantive or final production/assembly process of the bolt assembly.

1.4.14 Manufacturing lot or manufacturing batch

Quantity of fasteners of a single designation, including product grade, property class and size (one thread diameter and one length), manufactured from bar, wire, rod or flat product from a single cast, processed through the same or similar steps at the same time or over a continuous time period from a process with FPC, including the same heat treatment and/or coating process, if any.

1.4.15 Manufacturing lot number

Unique alphanumeric code assigned by the fastener manufacturer to a manufacturing lot enabling its traceability throughout the entire production operation, including incoming materials control and all processes defined in the FPC.

1.4.16 May

Indicates the existence of an option.

1.4.17 Nominal length (ℓ)

Of a bolt, the distance from the bearing surface of the head to the extreme end.

1.4.18 Partial tensioning

A defined degree of tensioning of the bolt assembly that is intermediate between snug tight and full tensioning.

1.4.19 Preloading

Terminology used to indicate bolt assemblies that are capable of being fully tensioned (preloaded) to the requirements of the relevant EN Standards.

NOTE: Preloading is referenced in the EN 14399 series.

1.4.20 Purchaser

Organization or person who buys fasteners, but is not necessarily the user.

1.4.21 Shall

Indicates that a statement is mandatory.

1.4.22 Should

Indicates a recommendation.

1.4.23 Supplier

Organization that provides fasteners.

NOTE: The supplier may be the manufacturer, an importer or a distributor.

1.4.24 Symmetry tolerance

1.4.24.1 *Of a bolt*

The allowable deviation of the across-flats dimension with respect to the shank or the pitch diameter of the screw thread.

1.4.24.2 *Of a nut*

The allowable deviation of the across-flats dimension with respect to the pitch diameter of the screw thread.

1.4.25 Thread length (b)

Of a bolt, 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 6g GO screw ring gauge, screwed as far as practical onto the bolt by hand.

1.4.26 Thread run out

1.4.26.1 *Bolts with cut threads*

The distance from the last witness of thread to the nearest face of a 6g GO screw ring gauge, screwed on as far as practicable by hand.

1.4.26.2 *Bolts with rolled threads*

The distance from the top of the extrusion angle to the nearest face of a 6g GO screw ring gauge, screwed on as far as practicable by hand.

1.4.27 Trace lot number

Unique alphanumeric code assigned by a fastener manufacturer or distributor, which identifies the original manufacturing lot number in an unequivocal manner.

1.4.28 Transition diameter (d_a)

The diameter of a circle formed at the transition between the fillet radius and the bearing surface of the head.

1.4.29 Type testing

Testing performed to prove that the product is capable of conforming to the requirements of this Standard.

1.4.30 Unthreaded shank length (ℓ_s)

Of a bolt, the distance from the bearing surface of the bolt head to the nearest face of a 6g GO screw ring gauge, screwed as far as practical onto the bolt by hand.

1.5 ALTERNATIVE ASSEMBLY TYPE

High-strength structural bolt assemblies for preloading that are manufactured in accordance with EN 14399-3, System HR, property class 8.8 are the only alternative assembly type that is deemed to satisfy the requirements of this Standard, and may be used where reference is made to fasteners conforming to this Standard.

NOTE: High-strength bolt assemblies to 'System HR' provide ductility in direct tension through ensuring the failure mode involves tension failure in the bolt shank, which is consistent with the performance expectations of bolts that are manufactured in accordance with this Standard. The alternative, 'System HV', defined in EN 14399-4, provides ductility in direct tension through failure by thread stripping, a failure mode that may not provide obvious indication that the assembly has failed. Refer to Appendix A for further information.

1.6 ADDITIONAL ASSEMBLY TYPE

High-strength structural bolt assemblies for preloading that are manufactured in accordance with EN 14399-3, System HR, property class 10.9 are the only additional assembly type that is deemed to satisfy the requirements of this Standard, and may be used where reference is made to property class 10.9 fasteners conforming to this Standard.

1.7 MARKING

1.7.1 Bolts

Except where applicable under Clause 1.7.4 or Clause 1.7.5, high-strength steel bolts shall be marked with the following information:

- The property class symbol with or without the separating point embossed or indented on top of the head or indented or rolled into one of the hexagon flats.
- Three radial lines approximately 120 degrees apart embossed or indented on top of the head.
- The trade (identification) mark of the manufacturer embossed or indented on top of the head.

See Figure 1.1(a).

1.7.2 Nuts

Except where applicable under Clause 1.7.4 or Clause 1.7.5, high-strength steel nuts shall be marked with the following information:

- The property class symbol indented or rolled into a hexagon flat or the bearing surface, or embossed or indented on the external chamfer.

- (b) Three circumferential arcs approximately 120 degrees apart embossed or indented on the non-bearing face, or for double-chamfered nuts, indented on one or both bearing faces. See Figure 1.1(b).
- (c) The trade (identification) mark of the manufacturer embossed or indented on an external chamfer or indented on the non-bearing face.

1.7.3 Washers

Except where applicable under Clause 1.7.4 or Clause 1.7.5, flat round washers for use with high-strength steel bolts and nuts for structural engineering shall be identified by the provision of three nibs as shown in Figure 1.1(c).

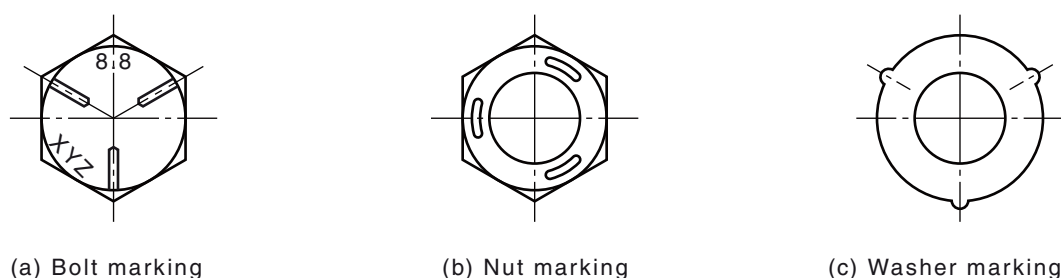
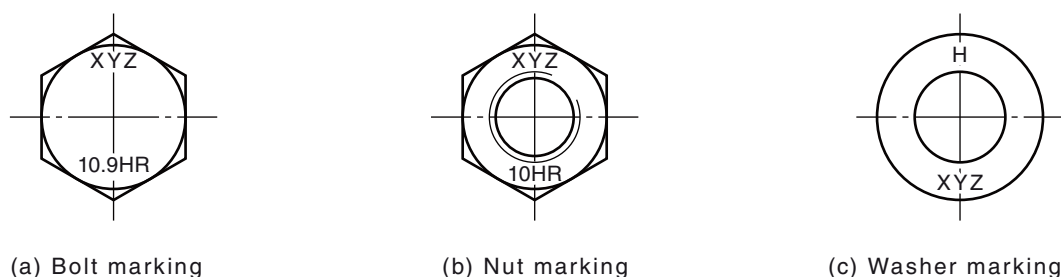


FIGURE 1.1 IDENTIFICATION MARKING

1.7.4 Alternative bolt assembly type

For the alternative bolt assembly type, as defined in Clause 1.5, the bolt, nut and washer shall be identified as shown in Figure 1.2.



NOTE: The identification marking shown in Figure 1.2 is consistent with that required in EN 14399-3.

FIGURE 1.2 IDENTIFICATION MARKING FOR ALTERNATIVE ASSEMBLY TYPE

1.7.5 Additional bolt assembly type

For the additional bolt assembly type, as defined in Clause 1.6, the bolt, nut and washer shall be identified as shown in Figure 1.3.

1.8 DESIGNATION

1.8.1 Bolts

Except where applicable under Clause 1.8.4, the designation of high-strength steel bolts for structural engineering shall include the following:

- (a) General product description.
- (b) Reference to this Standard, i.e. AS/NZS 1252.1.

- (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) The property class symbol.
- (f) The coating, where applicable in accordance with the appropriate Standard.
- (g) Any other features.

Example:

Hot-dip galvanized high-strength steel bolts, 20 mm diameter and 100 mm long, are designated as follows:

High-strength steel bolts for structural engineering to AS/NZS 1252.1—M20 × 100—8.8 (hot-dip galvanized to AS/NZS 1214).

1.8.2 Nuts

Except where applicable under Clause 1.8.4, the designation of high-strength steel nuts for structural engineering shall include the following:

- (a) General product description.
- (b) Reference to this Standard, i.e. AS/NZS 1252.1.
- (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 property class symbol.
- (e) The coating, where applicable, in accordance with the appropriate Standard.
- (f) Any other features.

Example:

Uncoated high-strength steel nuts with 20 mm threads are designated as follows:

High-strength steel nuts for structural engineering to AS/NZS 1252.1—M20—8.

1.8.3 Washers

Except where applicable under Clause 1.8.4, the designation of hardened and tempered washers for structural bolting shall include the following:

- (a) General product description.
- (b) Reference to this Standard, i.e. AS/NZS 1252.1.
- (c) The nominal size (nominal bolt diameter), in millimetres.
- (d) The coating, where applicable, in accordance with the appropriate Standard.
- (e) Any other features.

Example:

20 mm hot-dip galvanized hardened and tempered steel washers for structural engineering are designated as follows:

Steel washers for structural bolting to AS/NZS 1252.1—20 (hot-dip galvanized to AS/NZS 4680).

NOTE: Bolts, nuts and washers should be supplied as assemblies.

1.8.4 Alternative bolt assembly type and additional bolt assembly type

For the alternative bolt assembly type, as defined in Clause 1.5, and the additional bolt assembly type, as defined in Clause 1.6, the designation of the bolt, nut and washer shall be as required in the applicable product Standard.

NOTE: This should be as follows:

- (a) For bolts:
 - (i) General product description.
 - (ii) Reference to the relevant Standard, i.e. EN 14399-3.
 - (iii) The letter 'M' indicating that the product has a metric coarse pitch series thread followed by the nominal size (thread diameter), in millimetres.
 - (iv) The nominal length, in millimetres.
 - (v) The property class symbol and HR designation.
 - (vi) The surface finish, where applicable, in accordance with the appropriate Standard.
 - (vii) Any other features.
- (b) For nuts:
 - (i) General product description.
 - (ii) Reference to the relevant Standard, i.e. EN 14399-3.
 - (iii) The letter 'M' indicating that the product has a metric coarse pitch series thread followed by the nominal size (thread diameter), in millimetres.
 - (iv) The property class symbol and HR designation.
 - (v) The surface finish, where applicable, in accordance with the appropriate Standard.
 - (vi) Any other features.
- (c) For washers:
 - (i) General product description.
 - (ii) Reference to the relevant Standard, i.e. EN 14399-5.
 - (iii) The nominal size (thread diameter), in millimetres.
 - (iv) The surface finish, where applicable, in accordance with the appropriate Standard.
 - (v) Any other features.

Example:

Designation of a bolt/nut assembly and washer for high-strength structural bolting for preloading, system HR, consisting of a hexagon head bolt with thread M16, nominal length of 80 mm and property class 8.8; a hexagon nut with thread M16 and property class 8; and a hardened and tempered plain washer for preloading of nominal size to suit M16 bolt, uncoated:

Bolt/nut assembly EN 14399-3—M16 × 80—8.8/8-HR

Washer EN 14399-5—16

1.9 PRODUCT REQUIREMENTS

1.9.1 General

Means for demonstrating compliance with this Standard are specified in Appendix B.

NOTE: Appendix B does not apply to the alternative assembly type or the additional assembly type. Bolts supplied as the alternative assembly type (Clause 1.5) or the additional bolt assembly type (Clause 1.6) have separate product conformity requirements.

1.9.2 Dimensions, tolerances, materials and mechanical properties

Bolts, nuts and washers manufactured to this Standard shall conform to the requirements in Sections 2, 3 and 4 of this Standard, respectively.

Components of alternative bolt assemblies, as defined in Clause 1.5, shall conform to the requirements of the applicable product Standard cited in Clause 1.5. Components of additional bolt assemblies, as defined in Clause 1.6, shall conform to the requirements of the applicable product Standard cited in Clause 1.6.

1.9.3 Galvanized nut threading process

Hot-dip galvanized nuts shall be galvanized before they are threaded. Nuts shall not be re-threaded.

1.9.4 Finish and coating

Finish and coating shall be as specified in the relevant part of this Standard.

Coatings of all components of an assembly shall be compatible and shall have similar corrosion resistance.

Hot-dip galvanizing of each component shall be under the control of the manufacturer of the assemblies.

1.9.5 Functional characteristics of the assembly

The performance of the structural bolt assembly shall conform to the requirements given in Section 5 of this Standard.

Alternative bolt assemblies, as defined in Clause 1.5, shall conform to the requirements of the applicable product Standard cited in Clause 1.5. Additional bolt assemblies, as defined in Clause 1.6, shall conform to the requirements of the applicable product Standard cited in Clause 1.6.

1.9.6 Delivery conditions

Bolt assemblies shall be supplied to the purchaser either in the original unopened single sealed container or alternatively in the separate sealed containers of the manufacturer of the assemblies, with identification in accordance with Section 6.

High-strength bolts, nuts and washers shall be supplied as a complete assembly from the one manufacturer.

Different bolt assembly types shall not be supplied mixed in the same box.

Components from different fastener assembly types shall not be interchanged or mixed.

SECTION 2 HIGH - STRENGTH STEEL BOLTS

2.1 SCOPE OF SECTION

The requirements of this Section apply to bolts manufactured in accordance with this Standard. For alternative bolt assemblies, the requirements of the applicable product Standard cited in Clause 1.5 apply. For additional bolt assemblies, the requirements of the applicable product Standard cited in Clause 1.6 apply.

2.2 METHOD OF MANUFACTURE

High-strength steel bolts shall be—

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

2.3 SHAPE, DIMENSIONS AND FINISH

2.3.1 Head

The heads of high-strength steel bolts shall be in accordance with Figure 2.1 and Table 2.1. The dimensions given in Table 2.1 apply before hot-dip galvanizing.

2.3.2 Length

The length of high-strength steel bolts shall be as given in Table 2.2.

2.3.3 Ends

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

2.3.4 Screw threads

2.3.4.1 General

The form of thread, diameters and associated pitches of high-strength steel bolts shall be the ISO coarse pitch series in accordance with AS 1275.

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

2.3.4.2 Tolerances

The screw threads shall be made to tolerance class 6g in accordance with AS 1275.

Where bolts are to be hot-dip galvanized, the 6g tolerance class applies before hot-dip galvanizing.

2.3.5 Thread length (b)

The nominal thread lengths for high-strength steel bolts shall be as given in Table 2.3.

The tolerances on the thread length shall be such that the grip lengths (ℓ_g) and unthreaded shank lengths (ℓ_s) given in Table 2.2 are maintained.

The grip length (ℓ_g) shall be determined as the distance between the bearing surface of the head and the nearest face of a 6g GO screw ring gauge, screwed as far as practicable onto the bolt by hand. This dimension applies before hot-dip galvanizing.

2.3.6 Squareness, concentricity and symmetry

2.3.6.1 Squareness of bearing face

When determined as shown in Figure 2.2(a), the bearing face of the head shall be square, within the values given in Table 2.1, to the shank. The values are based on an angle of two degrees.

2.3.6.2 Concentricity of shank to screw thread

When determined as shown in Figure 2.2(b), the shank for a distance of 1.5 diameters from the nearest face of a 6g GO screw ring gauge, screwed as far as practicable onto the thread by hand, shall be concentric, within the values given in Table 2.1, to the pitch diameter of the screw thread.

2.3.6.3 Symmetry of head to shank

When determined as shown in Figure 2.2(c), the head shall be symmetrical, within the values given in Table 2.1, to the shank.

2.3.7 Chamfering and washer facing

High-strength steel bolts shall have heads with a chamfer of 15 to 30 degrees on their upper faces. The diameter of the circle formed by this chamfer shall be not less than 90 percent of the minimum width across-flats of the bolts.

Bolts shall have a washer face on the underside of the head (see Figure 2.1). The diameter and depth of washer faces shall be as given in Table 2.1.

2.3.8 Shank

2.3.8.1 Diameter

The diameter (d_s) of the shank of high-strength steel bolts shall be as given in Table 2.1.

2.3.8.2 Straightness

High-strength steel bolts shall be straight within the tolerance shown in in Figure 2.3.

2.3.9 Underhead fillet

The fillet junction of the head and shank shall be a smooth concave curve lying within an envelope defined by the minimum radius under the head (r) and a maximum profile defined by a tangent to a radius equal to the minimum value of r , blending to the maximum transition diameter on the underside of the head and the fillet length (ℓ_f) on the shank, as shown in Figure 2.1. The minimum values of r and the maximum values of ℓ_f are given in Table 2.1.

2.3.10 Finish

2.3.10.1 General

High-strength steel bolts shall be cleanly finished, sound, and free from defects detrimental to their end use. The surface discontinuities on high-strength steel bolts shall be not greater than the limits given in ISO 6157-1.

2.3.10.2 Surface roughness

All surfaces of high-strength steel bolts, except screw threads, may be in the as-forged or machined condition. Screw threads shall be machined or have a surface quality equivalent to machining.

2.3.10.3 Surface finish and coating

High-strength steel bolts may be supplied with either decorative or corrosion-resistant coatings. Coatings of all components of an assembly shall be compatible and shall have similar corrosion resistance.

High-strength hot-dip galvanized steel bolts shall be supplied in accordance with AS/NZS 1214 unless otherwise specified.

NOTE: AS/NZS 1214 provides additional requirements for cleaning and pickling to avoid hydrogen embrittlement of property class 10.9 bolts.

Electroplated high-strength steel bolts shall be supplied in accordance with either AS 1897 or ISO 4042 unless otherwise specified. Electroplated high-strength steel bolts shall not be coated in cadmium or cadmium alloy.

Uncoated bolts shall be in the dull black as-heat-treated condition.

NOTE: Where the purchaser requires bolts with coatings other than as specified above, the relevant coating specification should be specified on the enquiry or order.

2.4 MATERIALS AND MECHANICAL PROPERTIES

The materials and mechanical properties of high-strength steel bolts shall be as given in AS 4291.1 for property class 8.8.