

Supply of Bolts, Nuts and Washers

(ATS 5420-20, Ed 1.0 MOD)

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Preface

This document is the first issue as TS 00033:1.0, it supersedes TS 01748.1 *Steel Fasteners – QA* and TS 01748.2 *Steel Fasteners – DC*. This document adopts and modifies Austroads Technical Specification ATS 5420-20.

It sets out the requirements for the supply of bolts, nuts, screws, washers, studbolts, and threaded rods for steelwork. It also includes requirements for the supply of stainless steel fasteners.

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1. Scope

- 1.1 This specification sets out the requirements for the supply of bolts, nuts, screws, washers, studbolts and threaded rods for steelwork. It also includes requirements for the supply of stainless steel fasteners.
- 1.2 This Specification details the default properties of the fasteners. Additional requirements may be specified elsewhere on the drawings or other contract documents.
- 1.3 This specification includes requirements for the supply of weather resistant steel fasteners.
- 1.4 All the Annexures are mandatory.
- 1.5 All fasteners and associated components under this specification must have coarse pitch thread.
- 1.6 Project specific details of work are shown in Annexure C.

2. Definitions

- 2.1 The following definitions apply to this Specification:

Fasteners:	Steel items used to secure or join together individual items of steelwork, e.g. bolts, studbolts, threaded rods, holding down bolts, screws, nuts and washers.
High strength Fasteners:	Bolts, studbolts, threaded rods, and screws of property class 8.8 or higher, and nuts of property class 8 or higher, made from heat treated carbon steel.
Manufacturing Lot:	Fasteners of the same designation, including product grade, property class and size (one thread diameter and one length), manufactured from wire, rod or flat product from the same heat, processed through the same or similar steps at the same time or over a continuous time period from a process with factory production control, including the same heat treatment and/or coating process, if any.
Purchase lot size:	The number of fastener items to be purchased from a single Manufacturing Lot. This size is used to determine the frequency of testing in Annexure B.
Lot identification number:	Unique number assigned by the manufacturer to a Manufacturing Lot, allowing full traceability from the finished product item back through all previous manufacturing operations to a given heat number or cast number of the raw material of manufacture.
Low strength Fasteners:	Bolts, studbolts, threaded rods and screws of property class 4.6 or 4.8, and nuts with property class 5, made from carbon steel not subjected to heat treatment during manufacturing.
Manufacturer:	Entity providing the total, substantive or final production/assembly process of fasteners.
Mild steel washers:	Washers not subjected to heat treatment during manufacturing.

Fasteners:	Steel items used to secure or join together individual items of steelwork, e.g. bolts, studbolts, threaded rods, holding down bolts, screws, nuts and washers.
Product grade:	The precision of manufacture of the fastener, based on the applicable dimensional tolerances. Grade A is the most precise and grade C is the least precise.
Property class:	Numeric code, stamped on the fastener to indicate its mechanical properties. Bolts, screws and studbolts have a two-digit number with a decimal point in between, the first digit being 0.01 times the nominal tensile strength in MPa and the second digit being 10 times the ratio of the lower yield strength (or stress at 0.2% permanent set) to the nominal tensile strength in MPa. Nuts have a single digit number representing 0.01 times the proof load stress in MPa, except for thin nuts which have a zero in front of the single digit.
Threaded rods:	Rods that are threaded along their entire length, and used in conjunction with nuts.
High strength structural bolt assembly:	Assembly of bolts, nuts and washers conforming to AS/NZS 1252, commonly used in structural engineering applications.
Studbolts:	Short rods which are either threaded at both ends or along their entire length, and used in conjunction with nuts.
Supplier:	Australian business entity, which can be a local representative of an overseas manufacturer, wholesaler, importer or contractor, and is responsible for ensuring conformity of the supplied fasteners to this Specification.
Trace lot number:	Unique alphanumeric code assigned by a fastener manufacturer or distributor, to a consignment of fasteners which identifies the original Manufacturing Lot number in an unequivocal manner.
You:	Contractor or Supplier

2.2 The following abbreviations apply to this Specification:

AISI	American Iron and Steel Institute
ASTM	ASTM International / American Society for Testing of Materials
ASSDA	Australian Stainless Steel Development Association
HDG	Hot-dip galvanizing
HRC	Rockwell Hardness measured on the C scale
HV	Vickers Hardness
JAS-ANZ	Joint Accreditation System for Australia and New Zealand
NATA	National Association of Testing Authorities, Australia
PC	Property class
TB	Bearing-type tensioned bolt conforming to AS 5100.6
TF	Friction-type tensioned bolt conforming to AS 5100.6

3. Referenced documents

3.1 The following documents are referenced in this Specification:

TfNSW

TfNSW Q	Quality Management System
TfNSW B201	Steelwork for Bridges

Austroads

ATS 5310	Steel Fabrication
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Australian Standards

AS 1110	ISO metric hexagon bolts and screws - Product grades A and B
AS 1110.1	Bolts
AS 1110.2	Screws
AS 1111	ISO metric hexagon bolts and screws - Product grade C
AS 1111.1	Bolts
AS 1111.2	Screws
AS 1112	ISO metric hexagon nuts
AS 1112.1	Style 1 - Product grades A and B
AS 1112.2	Style 2 - Product grades A and B
AS 1112.3	Product grade C
AS 1112.4	Chamfered thin nuts - Product grades A and B
AS 1214	Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series)
AS 1237	Plain washers for metric bolts, screws and nuts for general purposes
AS 1237.1	General plan
AS 1237.2	Tolerances
AS/NZS 1252.1	High-strength steel fastener assemblies for structural engineering - Bolts, nuts and washers - Technical requirements
AS 1275	Metric screw threads for fasteners
AS/NZS 1390	Cup head bolts with ISO metric coarse threads
AS 1420	ISO metric hexagon socket head cap screws
AS 1443	Carbon and carbon-manganese steel - Cold finished bars
AS 1789	Electroplated zinc (electro-galvanized) coatings on ferrous articles (batch process)
AS 1815	Metallic materials - Rockwell hardness test
AS 1817	Metallic materials - Vickers hardness test
AS/NZS 2465	Unified hexagon bolts, screws and nuts (UNC and UNF threads)

AS 2528	Bolts, studbolts and nuts for flanges and other high and low temperature applications
AS 3566	Self-drilling screws for building and construction industry
AS 3566.1	General requirements and mechanical properties
AS 3566.2	Corrosion resistance requirements
AS 4291	Mechanical properties of fasteners made of carbon steel and alloy steel
AS 4291.1	Bolts, screws and studs
AS/NZS 4291.2	Nuts with specified proof load - Coarse thread
AS/NZS 5100.6	Bridge design - Steel and composite construction
AS/NZS ISO 9001	Quality management systems – Requirements

ISO Standards

ISO 898	Mechanical properties of fasteners made of carbon steel and alloy steel
ISO 898-1	Bolts, screws and studs with specified property classes - Coarse thread and fine pitch thread
ISO 898-2	Nuts with specified proof load values - Coarse thread
ISO 965	ISO general-purpose metric screw threads
ISO 3506	Mechanical properties of corrosion-resistant stainless steel fasteners
ISO 3506-1	Bolts, screws and studs
ISO 3506-2	Nuts
ISO 4014	Hexagon head bolts - Product grades A and B
ISO 4017	Hexagon head screws - Product grades A and B
ISO 4032	Hexagon nuts, Style 1 - Product grades A and B
ISO 4762	Hexagon socket head cap screws
ISO 7089	Plain washers - Normal series - Product grade A
ISO 7090	Plain washers, chamfered - Normal series - Product grade A
ISO 10642	Hexagon socket countersunk head screws

ASTM International

ASTM A193M	Standard specification for alloy-steel and stainless steel bolting for high temperature or high pressure service and other special purpose applications
ASTM A194M	Standard specification for carbon steel, alloy steel, and stainless steel nuts for bolts for high pressure or high temperature service, or both
ASTM B695	Standard specification for coatings of zinc mechanically deposited on iron and steel
ASTM F3125M	Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength

European Standards

BS 4168	Hexagon socket screws and wrench keys
DIN 125A	Product grade A washers
DIN 912	Socket head cap screws
DIN 931	Hexagon head bolts with shank
EN 14399	High-strength structural bolting assemblies for preloading
EN 14399-2	Suitability test for preloading
EN 14399-3	System HR - Hexagon bolt and nut assemblies
EN 14399-5	Plain washers
EN 14399-6	Plain chamfered washers
EN 14399-10	System HRC – Bolt and nut assemblies with calibrated preload.

Australian Stainless Steel Development Association

Australian Stainless Issue 40	Chlorine and Chloride: Same element, very different effect
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4. Quality System Requirements

- 4.1 Fasteners must be manufactured and supplied by organisations that have quality management systems which are certified to AS/NZS ISO 9001 by an organisation which is accredited by JAS-ANZ or an International Accreditation Association member.
- 4.2 At least 6 weeks prior to the commencement of supply of fasteners, the following information for each type of fastener which is proposed to be used in the Works must be submitted to the Principal:
- name and address of proposed supplier(s);
 - evidence of conformity to the requirements of Clause 4.1;
 - product designation, description and proposed Purchase Lot size;
 - list of required tests in accordance with Clause 9;
 - number of specimens to be tested in accordance with Annexure B;
 - initial evidence of conformity to the traceability requirements in Clause 10; and
 - sample test certificates of similar type(s) of fasteners, showing conformity with this Specification.
- 4.3 Documents submitted on previous projects may be accepted as evidence for Items (f) and (g). The documents must clearly show the lot identification number of the fastener on the test certificates.

HOLD POINT 1	
Process Held	Commencement of supply of fasteners.
Submission Details	The Required Information in Clauses 4.1 and 4.2 must be provided at least 6 weeks prior to the delivery of the fasteners to the Site.

- 4.4 The Principal may conduct audits and inspections of the supplier's procedures and processes during the course of the Contract.

5. High Strength Structural Bolt Assemblies

Assemblies Conforming to AS/NZS 1252

- 5.1 Assemblies comprising bolts PC 8.8 (sizes M12 to M36), nuts PC 8 (sizes M12 to M36) and hardened washers conforming to AS/NZS 1252 are acceptable as high strength fastener assembly types under this Specification.

Alternative Assembly Type (to EN 14399-3)

- 5.2 In accordance with AS/NZS 1252.1 Clause 1.5 "Alternative Assembly Type", only assemblies comprising bolts PC 8.8, nuts PC 8 and hardened washers manufactured in accordance with EN 14399-3, System HR, are acceptable under this Specification.

Additional Assembly Type (to EN 14399-3)

- 5.3 In accordance with AS/NZS 1252.1 Clause 1.6 "Additional Assembly Type", only assemblies comprising high strength bolts PC 10.9, high strength nuts PC 10 and associated hardened washers manufactured in accordance with EN14399-3, System HR, are acceptable under this Specification where shown on the drawings.

Weather Resistant Steel Fasteners

- 5.4 Bolt assemblies (all strengths and types) for use with weather resistant steel must be Type 3 Grade A325M conforming to ASTM F3125M rather than high strength structural bolt assemblies to AS/NZS 1252. Rotational Capacity Test in accordance with ASTM F3125M Supplementary requirement S4 and Annexure A2 must be performed.

6. Other Fasteners

- 6.1 This Clause sets out the requirements for carbon steel fasteners, other than high strength structural fasteners specified in Clause 5.
- 6.2 Unless stated otherwise, all references to fasteners are to ISO metric fasteners.

Bolts and Nuts

6.3 The dimensions and associated tolerances (“product grade”), and material properties (“property class”), of bolts and nuts must conform to the standards stated in Table 6.3.

Table 6.3: Manufacturing and material standards for ISO metric bolts and nuts

Strength	Common name	Product grade	Manufacturing standard	Property class	Material standard
High	ISO metric hexagon head bolts PC 8.8	A or B	AS 1110.1	8.8	AS 4291.1
	ISO metric hexagon head bolts PC 10.9	A or B	AS 1110.1	10.9	AS 4291.1
	ISO metric hexagon nuts PC 8	A or B	AS 1112.1	8	AS/NZS 4291.2
	ISO metric hexagon nuts PC 10	A or B	AS 1112.1	10	AS/NZS 4291.2
	ISO metric cup head bolts PC 8.8 ⁽¹⁾	–	AS/NZS 1390 (for dimensions only)	8.8	AS/NZS 4291.1
Low	ISO metric hexagon head bolts PC 4.6	C	AS 1111.1	4.6	AS 4291.1
	ISO metric hexagon nuts PC 5	C	AS 1112.3	5	AS/NZS 4291.2
	ISO metric cup head bolts PC 4.6	–	AS/NZS 1390	4.6	AS/NZS 4291.1
	ISO metric thin hexagon nuts PC 04 or PC 05 ⁽²⁾	A or B	AS 1112.4	05	AS/NZS 4291.2

1. AS/NZS 1390 covers cup head bolts to PC 4.6 only; however, the bolts can be manufactured to a higher property class (i.e. PC 8.8) as specified on the drawings for some applications.

2. Low strength thin nuts PC 04 or PC 05 are typically used as lock nuts with high or low tensile fasteners.

6.4 For ISO metric bolts or other threaded components of a particular property class, use only steel nuts of the corresponding property class shown in Table 6.4.

Table 6.4: Corresponding property class of ISO metric nuts to bolts

Component	Property class				
	4.6	4.8	5.6	8.8	10.9
Bolts, U-bolts, threaded rods, etc	4.6	4.8	5.6	8.8	10.9
Nuts	5	5	5	8	10

Screws

6.5 The dimensions and associated tolerances, and material properties, of steel screws must conform to the standards stated in Table 6.5.

Table 6.5: Manufacturing and material standards for ISO metric screws

Strength	Common name	Product grade	Manufacturing standard	Property class	Material standard
High	ISO metric hexagon head screws PC 8.8	A or B	AS 1110.2	8.8	AS 4291.1
	ISO metric hexagon head screws PC 10.9 ⁽¹⁾	A or B	AS 1110.2	10.9	AS 4291.1
	ISO metric hexagon socket head cap screws PC 10.9	A	AS 1420 or DIN 912	10.9	AS 4291.1
	ISO metric countersunk socket head screws PC 10.9	–	ISO 10642 or BS 4168	10.9	AS 4291.1 or ISO 898-1
	ISO metric hexagon socket head cap screws PC 12.9	A	AS 1420 or DIN 912	12.9	AS 4291.1
	ISO metric countersunk socket head screws PC 12.9 ⁽¹⁾	–	ISO 10642 or BS 4168	12.9	AS 4291.1 or ISO 898-1
Low	ISO metric hexagon head screws PC 4.6	C	AS 1111.2	4.6	AS 4291.1

1. Item may not be readily available in the Australian market.

6.6 Self-drilling steel screws for fixing to steel must conform to AS 3566, with Class 4 protective coating.

Fasteners in Imperial Units

6.7 Fasteners in imperial units comprising hexagon bolts, screws and nuts must conform to relevant standards, e.g. AS/NZS 2465.

Washers

6.8 Unless shown otherwise on the drawings, all washers must be flat, round and normal size.

6.9 Hardened steel washers for use with fasteners PC 8.8 or higher must conform to AS/NZS 1252.1. Washers conforming to EN 14399-5 or EN14399-6 are acceptable.

6.10 Steel washers for use with bolts PC 4.6, PC 4.8 or PC 5.6 must conform to AS 1237.1 and AS 1237.2.

6.11 Oversize and square washers must be manufactured to the dimensions and material properties specified on the drawings.

Studbolts

- 6.12 ISO metric high strength steel studbolts must be PC 8.8 to AS 2528 or ASTM A193M. Associated nuts must be PC 8 to AS 2528 or ASTM A194M.
- 6.13 ISO metric low strength steel studbolts must be PC 4.6 to AS 2528. Associated nuts must be PC 5 to AS 2528.
- 6.14 High strength steel studbolts in Imperial units must be Grade B7 to AS 2528 or ASTM A193M. Associated nuts must be Grade 2H to AS 2528 or ASTM A194M.
- 6.15 Low strength steel studbolts in Imperial units must be Grade B8 to AS 2528. Associated nuts must be Grade 8 to AS 2528.

Threaded Rods, Holding Down Bolts and Other Non-standard Fasteners

- 6.16 The pitch and dimensional tolerances of threaded rods and associated nuts must conform to AS 1275 or ISO 965. Their material property class must conform to AS 4291.1 and AS/NZS 4291.2, or ISO 898-1 and ISO 898-2, as specified on the drawings.
- 6.17 U-bolts, L-bolts and other non-standard fasteners must conform to the dimensions, material properties and protective treatment shown on the drawings.
- 6.18 Low strength fasteners (e.g. bolts and rods PC 4.6 and nuts PC 4) may be welded. Welding must conform to ATS 5310 (TfNSW specification B201 must apply until ATS 5310 is harmonised). Such fasteners must not be manufactured from free-cutting steel as specified in AS 1443.

Locking Devices

- 6.19 Locking devices must be a type approved by the Principal.

7. Stainless Steel Fasteners

Composition

- 7.1 [Deleted]
- 7.2 High strength stainless steel fasteners must have a minimum ultimate tensile strength of 800 MPa.
- 7.3 The dimensions and associated tolerances of stainless steel fasteners must conform to the standards stated in Table 7.3.

Table 7.3: Manufacturing requirements for stainless steel fasteners

Fastener	Manufacturing standard
ISO metric hexagon head bolts	ISO 4014 or AS 1110.1 or DIN 931
ISO metric hexagon head screws	ISO 4017 or AS 1110.2
ISO metric hexagon socket head cap screws	ISO 4762 or AS 1420
ISO metric hexagon nuts	ISO 4032 or AS 1112.1
Washers	ISO 7089 or ISO 7090 for chamfered washers or DIN 125A (withdrawn)
ISO metric threaded rods	ISO 965 or AS 1275

- 7.4 Where austenitic stainless steel fasteners are specified, only A4, A5, or A8 grades of appropriate strength in accordance with ISO 3506 must be used.
- 7.5 A4 or A5 grade fasteners must not be exposed to chloride content exceeding 1000 ppm*.
- 7.6 Where duplex stainless steel fasteners are specified either D6 or D8 grade of appropriate strength in accordance with ISO 3506 must be used.
- 7.7 D6 grade fasteners must not be exposed to chloride content exceeding 3000 ppm*.

*Note: See ASSDA publication mentioned in Clause 3

8. Protective Treatment for Fasteners

- 8.1 The protective treatment of fasteners must conform to Table 8.1.

Table 8.1: Protective treatment of fasteners

Fastener type	Clause reference	Protective treatment
High strength structural bolts PC 8.8, and associated nuts and washers	5.1, 5.2	Hot-dip galvanizing (HDG) ⁽¹⁾
Low strength hexagon head bolts and screws PC 4.6, and associated nuts and washers	6.3	
Threaded rods PC 4.6 or PC 8.8, and associated nuts and washers	6.3, 6.16	
Holding down bolts and associated nuts and washers	6.16, 6.3	
Cup head bolts	6.3	
High strength structural bolts PC 10.9, and associated nuts and washers	5.3	Mechanical plating with zinc ⁽²⁾ , or HDG ⁽¹⁾

Fastener type	Clause reference	Protective treatment
High strength hexagon head bolts and screws PC 8.8 or PC 10.9 product grade A or B, and associated nuts and washers	6.3	PC 8.8: Mechanical plating with zinc ⁽²⁾ , or electroplating with zinc ⁽³⁾ , PC 10.9: Mechanical plating with zinc ⁽²⁾
High strength hexagon socket head cap screws PC 10.9 or PC 12.9	6.5	Residual coating of light oil
High strength countersunk socket head screws PC 10.9 or PC 12.9	6.5	
Self-drilling screws	6.5	Class 4 to AS 3566.2 (withdrawn)
Stainless steel fasteners	7	No additional protective treatment
Weathering steel fasteners	5.4	No additional protective treatment
Locking devices	6.19	As approved by the Principal

1. HDG must be in accordance with AS/NZS 1214 or equivalent.
2. Mechanical plating with zinc must be in accordance with ASTM B695-04 or equivalent.
3. Electroplating with zinc must be in accordance with AS 1897 or equivalent.
4. [Deleted]

Thermal Diffusion Galvanising

- 8.2 If specified in the Contract documents, thermal diffusion galvanising (TDG) instead of HDG or zinc plating must be used. The specified TDG layer thickness must be achieved for the bolt assembly product grades and the thread dimension tolerances.
- 8.3 A trial assembly of fastener components with the specified coatings, to verify that the components will fit properly, must be carried out.
- 8.4 During the trial assembly, the nuts must be able to run up and down the threaded length of the bolt using only force applied by fingers.

9. Testing

General

- 9.1 The Contractor must ensure that the fasteners are tested in accordance with this Clause and provide evidence of that testing.

- 9.2 Testing of fasteners in Imperial units must conform to the relevant material and manufacturing standard(s), e.g. AS/NZS 2465.
- 9.3 Where less than 50 fasteners of one type are required in the Works and those fasteners are used in a low risk environment, the Contractor may request the Principal to approve a waiver of the specified testing requirements for those fasteners.
- 9.4 Tests must be carried out in laboratories accredited by NATA for the test, or in laboratories accredited for that test by an organisation with a Mutual Recognition Agreement with NATA.
- 9.5 The frequency of testing of fasteners in Imperial units must conform to Annexure B for the equivalent ISO metric fastener grade.
- 9.6 Testing must be carried out on finished fasteners which are representative of those supplied.

Mechanical Properties

- 9.7 Testing for mechanical properties must be carried out in accordance with Annexure B, which overrides the requirements of the manufacturing standards, including AS/NZS 1252.
- 9.8 Tensile tests instead of wedge tensile test must be carried out on bolts with nominal diameters larger than 39 mm.
- 9.9 The hardness tests may be carried out using either the Vickers or Rockwell scale. Test results that have been converted from one scale to the other must not be provided
- 9.10 The proof load test (refer Clauses 9.8 and 9.9) is a destructive test. Proof load tested specimens must not be used in works.
- 9.11 The minimum number of specimens to be tested from each Purchase Lot for each of the specified tests must be in accordance with Annexure B.

Chemical Composition

- 9.12 Chemical composition testing must be carried out in accordance with the applicable standard.
- 9.13 One chemical composition test must be carried out for each Purchase Lot.

Test Certificates

- 9.14 The Contractor must provide test certificates showing that fasteners tested conform to the requirements of this Specification.
- 9.15 The test certificate for each Purchase Lot must include the following:
- a. test certificate number and test date;
 - b. test description and applicable standard;
 - c. identification of test specimen and Purchase Lot;

- d. description of test specimen and stage of manufacture at the time of testing;
- e. protective treatment (if applicable) and lubrication condition
- f. test result and acceptance criteria;
- g. description of type and location of failure and the fracture surfaces, where applicable;
- h. chemical composition of Purchase Lot;
- i. name of and position of the person authorised the test report and dated signature; and
- j. laboratory accreditation details.

Testing by Principal

- 9.16 If requested by the Principal, the Contractor must supply additional fasteners from each Purchase Lot to enable the Principal to undertake testing of those fasteners.

Nonconforming Purchase Lots

- 9.17 Where any test fails to meet the acceptance criteria, the Purchase Lot from which the sample specimen was taken must be discarded and replaced with a new Purchase Lot.
- 9.18 The replacement Purchase Lot must not be replaced from the same Manufacturing Lot as the rejected Lot.

Additional Testing by the Contractor

- 9.19 Carry out additional testing where so specified in Annexure C.

10. Traceability

- 10.1 Each supplied fastener item must be traceable. Documentation and identification of fastener items and their packaging must enable traceability of each item.
- 10.2 The lot identification number (and trace lot number, if any) must be recorded for each item within each Purchase Lot to enable identification of the source of each item and each production process used for its manufacture.

11. Delivery and Storage

- 11.1 The following documentation must be provided prior to delivery:
- a. Documents specified in Clause 4.
 - b. Details of supplier(s), the relevant lot identification number and trace lot number if any, and the fastener description/designation.

- c. Test certificates for the Purchase Lot(s) in accordance with Clause 9.14.
- d. Supplier declaration of conformity (“SDoC”) of the Purchase Lot(s) to the standards specified in this Specification.

HOLD POINT 2	
Process Held	Delivery of each consignment of fasteners to Site
Submission Details	The documentation in Clause 11.1 must be provided at least 14 days prior to the delivery of the fasteners to the Site

- 11.2 Fasteners must be delivered as assemblies and components of assemblies must not be interchanged.
- 11.3 Fasteners of the same Purchase Lot must be delivered in the same container or in containers with identical labels for large quantities.
- 11.4 Fasteners must be stored in a waterproof container clear of the ground and protected from damage.

Annexure A Summary of Hold Points, Witness Points and Identified Records

A.1 The following is a summary of the Witness Points/Hold Points that apply to this Specification and the Identified Records that the Contractor must submit to the Principal.

Clause	Hold point	Witness point	Identified Records
4.3	Commencement of supply of fasteners		The documentation listed in Clause 4
11.1	Delivery of each consignment of fasteners to Site		Fastener delivery documentation listed in Clause 11.1
10			Fastener traceability documentation

A.2 Refer to specification TfNSW Q for definition of HOLD POINTS.

A.3 Identified Records are for the purpose of TfNSW Q Annexure Q/E.

Annexure B Testing of Mechanical Properties

- B.1 The Inspection and Test Plan must nominate the proposed frequency of testing to verify conformity of the item, which must not be less than the frequency specified in Table B.1
- B.2 Where a minimum frequency is not specified, nominate an appropriate frequency. Frequency of testing must conform to the requirements of TfNSW Q.
- B.3 You may propose to the Principal a reduced minimum frequency of testing. The proposal must be supported by a statistical analysis verifying consistent process capability and product characteristics.
- B.4 The Principal may vary or restore the specified minimum frequency of testing, either provisionally or permanently, at any time.

Required Tests

Table B.1: Mechanical testing requirements

Fastener type	Clause reference	Tensile strength Test method ⁽¹⁾	Test plan	Proof load Test method ⁽¹⁾	Test plan	Other tests Test method ⁽¹⁾	Test plan
High strength weathering steel structural bolts	5	Wedge test to ASTM F3125M / F606M	B	ASTM F3125M / F606M	B	Rotational capacity test ASTM F3125M-Supplementary Requirement S4+Annex A2	B
High strength structural bolts	5	Wedge test to AS/NZS 1252.1, Clause 6.6	B	AS/NZS 1252.1, Clause 6.6	B	Assembly test to AS/NZS 1252.1 and Hardness test to AS/NZS 1252.1, Clause 2.4	B
High strength structural nuts	5	NA		AS/NZS 1252.1, Clause 6.6	B	Hardness test to AS/NZS 1252.1, Clause 3.4	B
Structural washers (hardened)	5	NA		NA		Hardness test to AS/NZS 1252.1, Clause 6.6	C
High strength bolts	6	Wedge test to AS 4291.1, Clause 9.1	A	AS 4291.1, Clause 9.6	A	Hardness test to AS 4291.1, Clause 9.9	C

Fastener type	Clause reference	Tensile strength Test method ⁽¹⁾	Test plan	Proof load Test method ⁽¹⁾	Test plan	Other tests Test method ⁽¹⁾	Test plan
High strength nuts	6	NA		AS/NZS 4291.2, Clause 9.1	A	Hardness test to AS/NZS 4291.2, Clause 9.2	C
High strength screws other than socket head cap screws	6	Wedge test to AS 4291.1, Clause 9.1	A	AS 4291.1, Clause 9.6	A	Hardness test to AS 4291.1, Clause 9.9	C
High strength socket head cap screws	6	AS 4291.1, Clause 9.4	A	AS 4291.1, Clause 9.6	A	Hardness test to AS 4291.1, Clause 9.9	C
High strength studbolts or threaded rods	6	Wedge test to AS 2528, Clause 2.3.6.3	A	AS 2528, Clause 2.3.6.2	A	Hardness test to AS 2528, Clause 2.3.6.6	C
Hardened washers	6	NA		NA		Vickers hardness test to AS 1817 or Rockwell hardness test to AS 1815	B
Low strength bolts	6	AS 4291.1, Clause 9.2 (or wedge test to Clause 9.1)	B	AS 4291.1, Clause 9.6	B	NA	
Low strength screws	6	AS 4291.1, Clause 9.2 (or wedge test to Clause 9.1)	B	AS 4291.1, Clause 9.6	B	NA	
Low strength nuts	6	NA		AS/NZS 4291.2, Clause 9.1	B	NA	
Low strength studbolts or threaded rods	6	AS 4291.1, Clause 9.2	B	AS 2528, Clause 2.3.6.2	B	NA	
Mild steel washers	6	NA		NA		Hardness test to AS 1237.1	B
Stainless steel bolts	7	ISO 3506-1, Clause 7	B	ISO 3506-1, Clause 7	B	NA	
Stainless steel screws	7	ISO 3506-1, Clause 7	B	ISO 3506-1, Clause 7	B	NA	
Stainless steel nuts	7	NA		ISO 3506-1, Clause 7	B	NA	
Stainless steel studbolts or threaded rods	7	ISO 3506-1, Clause 7	B	ISO 3506-1, Clause 7	B	NA	

Fastener type	Clause reference	Tensile strength Test method ⁽¹⁾	Test plan	Proof load Test method ⁽¹⁾	Test plan	Other tests Test method ⁽¹⁾	Test plan
Stainless steel washers	7	NA		NA		Vickers hardness test to AS 1817 or Rockwell hardness test to AS 1815	B
Self-drilling screws	6	AS 3566.1, Clause 1.11		NA		NA	

NA = Not applicable

1. Refer to Table B2 for details of minimum testing frequency for the respective Test Plans

Test Frequency

The test frequency must be determined as follows:

1. Identify the type of tests required and the associated Test Plan from Table B1.
2. Determine minimum number of specimens for each test from Table B2 for the Purchase Lot size according to the specified Test Plan.

Table B.2: Testing frequency for test plans

Purchase Lot size ⁽¹⁾	Minimum number of specimens - Test Plan A	Minimum number of specimens - Test Plan B	Minimum number of specimens - Test Plan C
≤ 50	2	1	1
> 50 and ≤ 200	3	1	1
> 200 and ≤ 1,000	5	2	1
> 1,000 and ≤ 5,000	8	3	2
> 5,000 and ≤ 10,000	12	3	2
> 10,000	16	4	2

1. Refer to Clause 2 for “Purchase Lot size” definition.

Annexure C Project Specific Requirements

Refer to Clause 1.6

C.1 SUPPLY OF FASTENERS

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure C)

Complete Clause C.1 only where this specification is used in a contract for supply of steel fasteners directly to the Principal. If this is not the case, delete this section in its entirety and replace the heading title with "Not Used".

In Table C.1 below, fill in the required details for each fastener group. Examples of the minimum description when specifying fasteners are as follows:

High strength structural bolts to AS/NZS 1252 - M20 x 150 - PC 8.8;

Hexagon head bolts to AS 1110.1 - M20 x 150 - PC8.8 to AS 4291.1

(optional addition) thread tolerance class 6g to AS 1275.

Table C.1

Description	Details	Protective Treatment ⁽¹⁾	Quantity Required
Fastener details			
Other requirements ⁽²⁾			
Delivery location ⁽³⁾			

Notes

⁽¹⁾ Refer to Table 8.1.

⁽²⁾ State any other requirements (e.g. thread length of bolts).

⁽³⁾ Refer to attached map if provided.

C.2 WAIVER OF TESTING

Refer to Clause 9.3.

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure C)

List here any tests to be waived, where applicable.

C.3 ADDITIONAL TESTING AND ADDITIONAL SPECIMENS

C.3.1 Additional Testing

Refer to Clause 9.7.

Table C.2

Description of Additional Testing	Testing Frequency

C.3.2 Additional Specimens

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure C)

Insert in Table C.3 below the quantity of additional fasteners required for each fastener group. The default quantity is 5. Where different quantities are required for different fastener groups, show the quantity required against each fastener group.

Table C.3

Description	Quantity Required ⁽¹⁾
Additional fasteners as specimens for independent testing ⁽²⁾	5

Notes:

⁽¹⁾ For each fastener group, unless shown otherwise.

⁽²⁾ Refer Clause 9.17.

Amendment Record

Amendment no.	Clauses amended	Action	Date
-	New specification	New	June 2023

Key

Format	Change in format
Substitution	Old clause removed and replaced with new clause
New	Insertion of new clause
Removed	Old clauses removed