

Practice Note on the Sourcing of Compliant High Strength Structural Bolts

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Introduction

The New Zealand *Steel Structures Standard* states that high strength structural bolts shall be supplied to AS/NZS 1252. This standard was republished on 23rd December 2016 after undergoing a major revision. The main technical changes incorporated in the new edition relate to updated testing and conformity requirements, the inclusion of the nominated European standard EN 14399-3 property class 8.8 HR bolt as a “Deemed to satisfy” alternative and an additional European EN 14399-3 high tensile property class 10.9 HR.

A significant change to AS/NZS 1252 has been the creation of Part 2, “Verification testing for bolt assemblies”. This represents a restricted form of third-party conformity assessment to provide confidence in products manufactured to AS/NZS 1252.1. Implementation of the AS/NZS 1252.2 verification test requirements has been problematic due a lack of test equipment in Australasia to undertake all the prescribed test procedures, and concern that the test requirements are excessive for routine batch testing of product from regular suppliers. Consequently, the requirements of AS/NZS 1252.2:2016 have not been fully implemented, either in New Zealand or Australia.

This practice note sets out the recommended practice for sourcing compliant high strength structural bolts for the New Zealand construction industry.

Recommended Sourcing Practice for AS/NZS 1252 Bolt Assemblies (Current)

It is currently recommended that project specific verification testing is undertaken when greater confidence is required of the quality of AS/NZS 1252 bolt assemblies. Suggested verification test regimes are presented in the following section.

Recommended Verification Test Requirements for AS/NZS 1252 Bolt Assemblies

Two recommended verification sampling and test plans are presented in Appendix A. These test plans focus on the key mechanical properties of the components of a bolt assembly: bolt, washer and nut. Sampling and test plan 2 has an additional galvanizing coating test requirement which is a relatively expensive test procedure to implement. Therefore, sampling and test plan 2 is only recommended for projects where the surface specific corrosion category is C3 or greater, as defined by TS 3404 (SNZ, 2018), and when routine inspection and maintenance of the steelwork is impossible.

The assembly test, prescribed in Appendix D of AS/NZS 1252.1:2016, is intended to demonstrate that the tightened bolt assembly can meet the minimum tension requirement of the standard (Key, 2019). The fastener manufacturer is required to undertake assembly testing as part of the AS/NZS 1252:2016 product conformity requirements. The rationale for not including the assembly test in the recommended verification test requirements in appendix A, is a lack of equipment to undertake this test commercially in New Zealand.

The Australian Steel Institute has developed recommended verification test requirements for high strength fasteners based on the assembly test. These requirements are presented in Appendix I of Technical Note TN 001 (Key 2019). It is recommended that this verification test regime is recognised as an acceptable alternative

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to that presented in Appendix A of this Steel Advisor article. The reason for accepting Australian practice is to avoid retesting product sourced through Australian supply chains already subject to fit for purpose verification testing. Product tested to the requirements of TN 001 must be traceable to the inspection documentation (test report and supplier declaration of conformity) prepared by the importer and the material test certificate supplied by the manufacturer.

Implementing Recommended Bolt Assembly Sourcing Practice

Exemplar specification clauses for implementing the high strength bolt assembly sourcing practice recommended in this Steel Advisor article are found in SCNZ Report 112:2018, "New Zealand Structural Steelwork Specification in Compliance with AS/NZS 5131" (SCNZ, 2018).

Recommended Sourcing Practice for AS/NZS 1252 Bolt Assemblies (Future)

In 2021, SCNZ will launch the Bolt Importer Charter scheme, an industry quality assurance programme to promote good practice in the sourcing of high strength bolt assemblies and stud bolts. Chartered bolt importers are required to have procedures for undertaking due diligence of new suppliers and for monitoring the quality of product from regular suppliers. Minimum new and regular supplier verification test requirements are also specified in the scheme implementation rules. For more details about the Bolt Importer Charter scheme, refer to SCNZ Fact Sheet 12 (SCNZ, 2020) available from the SCNZ website (www.scnz.org). Once the scheme has been launched, sourcing product through a Chartered Bolt Importer will be recommended best practice, with project specific verification testing to the requirements of this Steel Advisor article reserved for product sourced through non-chartered bolt importers.

References

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Appendix A

Verification testing for bolt assemblies to the mechanical and coating requirements of AS/NZS 1252:2016

1.0 Scope

This section specifies the requirements for the verification testing that is used to provide confidence in the product's conformity with the mechanical and coating (Sampling and test plan two only) requirements of AS/NZS 1252:2016.

2.0 Prerequisites for the verification testing program

An original or a copy of the inspection documents provided by the manufacturer or its approved representative, without any alteration, shall be provided. This documentation shall be accompanied by suitable means of identification of the product, in order to ensure the traceability between the manufacturing lot and the corresponding test certificate.

Copying of the original document is permitted, provided that

- a) Traceability of product is maintained
- b) The original document is available on request.

The supplier shall review the inspection or test certification for the bolt batch purchased. Checks shall include:

- a) The lot or batch identification number is consistent with that indicated on the packaging for the bolts purchased
- b) All tests are passed
- c) The testing is within the scope of the laboratory accreditation and their accreditation is still valid.

3.0 Definition of 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 factory production control, including the same heat treatment and/or coating process, if any.

4.0 Minimum sampling and testing plans for verification testing

The minimum sampling and test plans for verification testing are presented in table 1.

Table1: Sampling and test plans¹ for verification testing

Mechanical Characteristics	Sampling and Test Plan 1		Sampling and Test Plan 2	
	Sample Size	Acceptance no. (Ac)	Sample Size	Acceptance no. (Ac)
Bolts:				
Ultimate tensile strength	1	0	1	0
Proof load test	1	0	1	0
Surface integrity – non-destructive	Not required	-	Not required	-
Surface integrity - destructive	Not required	-	Not required	-
Chemical composition	Not required	-	Not required	-
Metallurgical characteristics	Not required	-	Not required	-
Coating	Not required	-	1	0
Nuts:				
Proof load test	1	0	1	0
Hardness	1	0	1	0
Washers:				
Hardness	1	0	1	0

1 Sampling and test plan 1 is appropriate for most constructional steelwork projects. Refer to the Recommended Verification Test Requirements for AS/NZS 1252 Bolt Assemblies section for a suggested criterion for selecting sampling and test plan 2.

5.0 Traceability of components

The identification number of the manufacturing lots, including the number of units, of the assembly lot to which the verification testing applies, shall be identified both on the test report and on all packaging for the entire assembly lot for the purpose of traceability of components.

6.0 Sampling, testing and assessment

Sampling, testing and assessment shall be undertaken in the following steps:

- (a) Select samples at random from the assembly lot
- (b) For each characteristic listed in either table 1 or 2, carry out the inspection or test on the number of samples required.
- (c) Record the number of nonconforming characteristics and accept the assembly lot if this number is less than or equal to the acceptance number (Ac).
- (d) For any characteristic, if the number of nonconforming test results is greater than the acceptance number (Ac), then reject the assembly lot.

7.0 Re-testing in case of non-conforming product

Where a test indicates that an assembly lot is nonconforming, a sample of additional items, of the sample size specified in Table 2, for the number of non-conformances, shall be taken from the assembly lot and tested for the particular nonconforming parameter(s).

If the additional test result demonstrate conformance, then the assembly lot shall be deemed to comply, and all of the additional results included in the records.

If any of the additional test results demonstrate nonconformance, then the assembly lot shall be rejected as nonconforming and the supplier shall take steps to ensure the manufacturer is informed and the nonconforming assembly lot is not put into the market. The supplier shall have written procedures specifying the processing of nonconforming product.

Table 2: Minimum sampling and testing plan for verification testing - re-testing after initial tests indicate lot is non-conforming

Initial test sample size = 1	
Sample size	Acceptance No. (Ac)
1 (initial sample)	0
10	1
25	2
Lot to be rejected	3

8.0 Testing laboratory

Testing must be performed at an IANZ or NATA accredited test facility in New Zealand or Australia respectively. Alternatively, if a reliable sample collection process is utilised, product may be tested at an accredited international test facility. A reliable sample collection process is defined as one that meets the following requirements:

1. Samples are collected from the manufacturer and delivered to an accredited test facility by a reliable second (employee of the bolt importer) or third party (independent of bolt importer and manufacturer).
2. The test sample is traceable to a manufacturing lot and inspection documentation

9.0 Verification test report

The following minimum information shall be included on all supplied test reports:

- a) Date of testing

- b) Printed name, position and signature of the person authorizing the report, with date of issue
- c) Identification number of the manufacturing lot sufficient to allow traceability
- d) Number of items tested
- e) Designation of bolts, nuts and washers
- f) Coating or surface finish
- g) Test results in accordance with AS/NZS 1252:2016 and this specification

10.0 Supplier Declaration of Conformity

A Supplier's declaration of conformity (SDoC) shall be provided. The issued SDoC shall include the following:

- a) Statement from the supplier that the bolt assembly type(s) covered by the SDoC complies with the mechanical requirements of AS/NZS 1252:2016 and coating requirements of AS/NZS 1252:2016 (Sampling and test plan 2 only) and this specification.
- b) Test report numbers for the verification testing carried out under the responsibility of the supplier