

# High strength bolt assemblies

## Certification to AS/NZS 1252-1996.....Reject or Accept?



AUSTRALIAN STEEL INSTITUTE

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### Duty of care:

Australian standards provide the necessary guidelines to identify the quality of fasteners in AS/NZS 1252-1996. The quality assurance of high strength bolt assemblies and associated risk is distributed amongst the whole supply chain. Engineers must provide a tight specification and purchasers and inspectors alike must be proactive in checking and demanding quality documentation from the suppliers to maintain traceability and transparency in accordance with Australian Trade Practices. The ultimate responsibility and risk should be passed to the supplier/manufacturer where applicable and it is only a culture of vertical integration with respect to quality assurance checking that will shift this risk back to the source. Penalties are high for failure to provide an adequate duty of care.

### What suppliers must provide with bolt supply:

The majority of AS 1252 bolt assemblies are now imported. The quality systems of the manufacturer and supplier have to be relied upon to supply high strength bolt assemblies to Australian Standards and detection of any potential mechanical or manufacturing defects. Supplier's must verify and provide documentary evidence of conformance to the relevant Australian Standard and purchasers/installers and certifiers must demand this documentation.

### What should purchaser/specifier ask for? – A Test Report or Compliance/Test Certificate?

**Compliance/Test Certificate (Mandatory for QA and legal duty of care):** A compliance/test certificate not only tests the sample bolts to the relevant Australian Standard but also investigates the process by which the bolts were manufactured. This ensures that it is quality-traceable and the sample results can be applied to the whole batch of the bolts. Sample testing by a local NATA-accredited laboratory may be used to check a compliance/test certificate issued by an internationally accredited laboratory. Ideally a local NATA laboratory may issue a NATA accredited compliance certificate and take responsibility for following the necessary evaluation processes prescribed by the accreditation organisation. If this can be achieved the supplier could delegate the responsibility to the said NATA laboratory. The NATA signatory then accepts full liability and responsibility for the quality assured bolts.

In the current market with the majority of AS 1252 bolt assemblies imported there are two essential pieces of information to confirm product compliance. They are:

#### **A. Manufacturers test certificate:**

An accredited testing organisation in the country of manufacture must prepare a manufactures compliance/test certificate and issue this document to the supplier with the finished product. The supplier accepts responsibility that the production process is quality traceable and the batch shares the same statistical characteristics of the samples tested. This manufacturer compliance/test certificate is normally supplied at no additional charge and must be issued with each batch of product. The following information contains a GUIDE to the key Australian Standard specification requirements contained in this certificate.

#### **B. Compliance certificate - Independent testing and verification in Australia**

A local NATA-accredited laboratory then obtains, with this traceability assurance, all details for the batch of bolts from the supplier and/or the internationally accredited laboratory and independently tests and verifies the samples to the relevant Australian Standard. A statement of compliance issued either by the local NATA-accredited laboratory or by the local supplier assures that the product is verified and in full compliance with the relevant Australian Standard. This testing must be completed before the product is released for sale. The NATA signatory or the supplier, respectively, accepts full liability for any loss or damage caused by issuing a false compliance certificate therefore a lack of certain test results on the certificate should not cause a major concern. The supply of the complete local NATA (independent verification) test certificate may incur a cost which should be negotiated with the supplier at time of order if a copy is required.



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**RECOMMENDATION:** If the purchaser/specifier demands that the product supplied is supported by this information (covered in A & B above) the supplier takes the ultimate responsibility in terms of the compliance of the product to the prescribed industry standard and the purchaser/specifier has taken the required duty of care in the event of failure.

**Please be aware:** A test report cannot replace a compliance/test certificate as it will only provide specifications and test results pertaining to tested samples.

**Integrity of batch recording:** It is important for fabricators and riggers to ensure traceability of the product used in large steel projects. For best QA practice the order number and batch (or heat) number on the label of the carton should be recorded linking the product certification to a specified area on the job. Once the bolts are removed from the carton they are no longer traceable unless the information is recorded from the label and related to the project usage.

### WARNING: Market issues with AS/NZS 1252-1996

- M20 bolts: Are not readily available to AS/NZS 1252-1996 dimensions due to the ISO standards from which this code was modelled not being adopted internationally. M20 bolts are currently being supplied to AS 1252-1983 for dimensions and AS/NZS 1252-1996 for mechanical specifications.
- The hardness requirement for hot-dip galvanised washers was lowered in AS/NZS 1252-1996 to 26HRC. The specified hardness range for PC8.8 bolts to AS 4291.1 is 23-34HRC. It is therefore recommended that washers are made to 35-45HRC range (as required in AS 1252 for other than hot-dip galvanised) to avoid scouring of the washers.

### CHECKLIST for Compliance/Test Certificate documentation:

This technical note details what you must look for when accepting or rejecting the documentation and bolt assemblies provided by the supplier.

- The correct test certificate should contain all the information listed below
- The correct compliance certificate **must** contain at least the information in **bold**:

Item	Yes	No
<b>Identification and address of the supplier</b>		
<b>Identification and address of the test laboratory and accreditation seals of the test laboratory</b>		
<b>Date of issue, page number on each page</b>		
<b>Test certificate number</b>		
<b>Batch or heat identification number</b>		
<b>Product identification</b>		
<b>Customer purchase order number to match the batch or heat number</b>		
<b>Any other system reference numbers.</b> These make sure that the product is fully traceable from the customer purchase order to the original steel used for the production of the products.		
Test, test specification, measured values in comparison to specification: <i>Typical for the bolt:</i> Tensile test/surface hardness test, raw material specification, reference number and the heat number with chemical analysis or any traceable pointer to this information <i>Typical for the nut:</i> Proof load/hardness test, reference number, any other associated test certificate number, raw material specification, its reference number and the heat number with chemical analysis or any traceable pointer to this information <i>Typical for the washer:</i> Hardness test, reference number, any other associated test certificate number, raw material specification, reference number and the heat number with chemical analysis or any traceable pointer to this information		
<b>Statement of compliance referring to a definite relevant Australian Standard</b>		
<b>Signature of authenticity</b>		
Any further information or tests that may be requested or as agreed with the supplier but may incur extra cost. Such extras may include items like: A normative or more rigorous project specific sampling and testing regime than those in Appendix A of AS/NZS 1252-1996 which is currently informative.		

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### GUIDE to the key Australian Standard specification requirements in checking Compliance/Test Certificate documentation

Chemical composition limits						
Assembly item	C%		Mn%	P%	S%	B%
	Min	Max	Min	Max	Max	Max
PC8.8 Bolt <sup>1</sup> (Carbon steel with additives (e.g. B, Mn or Cr) quenched & tempered)	0.15	0.40	-	0.035	0.035	0.003
PC8.8 Bolt <sup>1</sup> (Carbon steel quenched & tempered)	0.25	0.55	-	0.035	0.035	0.003
PC8 Nut <sup>3</sup>	-	0.58	0.25	0.060	0.150	-
Washer	-	-	-	-	-	-

Mechanical properties of bolts for d ≥ 16mm (≥ M16)				
Assembly item	Min tensile strength N/mm <sup>2</sup> or MPa	Min stress at 0.2% non-proportional elongation (Yield) N/mm <sup>2</sup> or MPa	Min percentage elongation after fracture %	Min strength under wedge loading N/mm <sup>2</sup> or MPa
PC8.8 Bolt <sup>2</sup>	830	660	12	830

Rockwell hardness HRC		
Assembly item	d ≥ 16mm	
	Min	Max
PC8.8 Bolt <sup>1</sup>	23	34
PC8 Nut <sup>4</sup> (Galv.)	24	36
Washer <sup>5</sup> (Galv.)	26 (35 recommended)	45
Washer <sup>5</sup> (No Galv.)	35	45

#### Specification references to the relevant Australian Standards:

- 1 AS 4291.1-2000 Mechanical properties of fasteners made of carbon steel and alloy steel Part 1: Bolts, screws and studs, Table 2 – Steels
- 2 AS 4291.1-2000 Table 3- Mechanical and physical properties of bolts, screws and studs
- 3 AS/NZS 4291.2:1995 Mechanical properties of fasteners Part 2: Nuts with specified proof load values – Coarse thread, Table 4 – Limits of chemical composition
- 4 AS/NZS 1252-1996 High strength steel bolts with associated nuts and washers for structural engineering, Table 3.1 – Mechanical properties of high-strength steel nuts
- 5 AS/NZS 1252-1996 Section 4.3 Hardness – (of flat round washers).

**Note:** Please refer to the relevant Australian Standards for all detailed provisions of Property Class 8.8 bolts and Property Class 8 Nuts and associated washers to AS/NZS 1252-1996. AS4291.1 is referred to by AS/NZS1252-1996 for mechanical properties. AS4291.1 Table 3 specifies d ≤ 16 as the transition point of Minimum tensile strength from 800 to 830MPa for all standard fasteners (eg AS 1111, AS 1110) except for “structural bolting” where the limit is d ≤ M12. Although the footnote c of Table 3 uses the wording “structural bolting” it does not reference to AS/NZS 1252-1996. Going with the intent of this standard however structural bolting to AS/NZS 1252-1996 all sizes (includes only d ≥ M16) will have the same minimum tensile strength requirement of 830MPa. M12 reference is not applicable to AS1252 as this is not a specified size within this standard.

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**SAMPLE TEST CERTIFICATE:****Courtesy of Ajax Engineered Fasteners to AS 1252-1983.**

**Note:** Some test certificates may provide the mechanical properties in kN instead of N/mm<sup>2</sup>. ASI has included this sample certificate as AJAX was the manufacturer/supplier quality benchmark in Australia for many decades pulling out in 2001. The format and information received from manufacturers and their suppliers is often poor with varying units of measure, inconsistent layouts and code references. The importer/supplier industry must all provide clear compliance/test certificate documentation and values tested against AS/NZS 1252-1996 specifications. This is necessary to assure the industry that bolt suppliers stand by their product and it is suitable for the structural application specified.



Ajax Engineered Fasteners  
A Division of Global Engineered Fasteners Pty. Ltd.  
A.B.N. 55 091 040 989  
76 - 88 Mills Road, Braeside  
P.O. Box 145, Braeside 3195  
Telephone: (03) 9586 6666  
Account Fax: (03) 9586 6640

**LABORATORY TEST CERTIFICATE**

DATE: 13/08/04  
PAGE: 1

CERTIFICATE #  
18707

CUSTOMER: 230100 HOBSONS ENGINEERING  
SHIPMENT:  
CUST ORD NO: 9156WPI OUR RMS NO: 473041/001

BOLT : 442380 KBHSTGCM200050A		M 20 X 50		QARN: 29195701		
<b>Test</b>	<b>Specifications</b>			<b>Test Results</b>		
	Min	Max	Units	Min	Max	Units
<b>Tensile</b>	203.000		kN	236.400	239.800	kN
<b>Hardness</b>	23.000	34.000	HRC	29.000	30.000	HRC
<p>Raw Mat: 8290763 WIRE SPEC 29 .763/.765 (5140) Heat#: 539260</p> <p>% C .40 % Si .21 % Mn .81 % P .020 % S .009 % Cu .009 % Ni .009</p> <p>% Cr .80 % Mo .002 % Al .017</p> <p>Chemical Analysis Reported from Steel Suppliers Certification</p>						
<b>NUT</b>	435465 GAL STRUCT NUT LPM 20			Q.A.#: W291431/07		
<b>Test</b>	<b>Specifications</b>			<b>Test Results</b>		
	Min	Max	Units	Min	Max	Units
<b>Hardness</b>	24.000	36.000	HRC	26.000	27.000	HRC
<p>Raw Mat: 2269260 BAR SPEC 26 26.0 MM (1137) Heat#: 533060</p> <p>% C .35 % Si .17 % Mn 1.55 % P .021 % S .112 % Cu .009 % Ni .005</p> <p>% Cr .016 % Mo .002 % Al .001 % B .0003</p> <p>Chemical Analysis Reported from Steel Suppliers Certification</p>						
<b>WASHER</b>	207047 STR WASH GAL LPS M20			Q.A.#: R115046/2/298295		
<b>Test</b>	<b>Specifications</b>			<b>Test Results</b>		
	Min	Max	Units	Min	Max	Units
<b>Hardness</b>	26.000	45.000	HRC	35.000	36.000	HRC

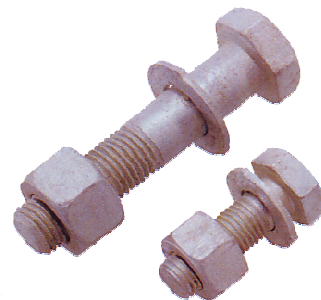
This Product Conforms to AS 1252: 1983



This TEST CERTIFICATE should not be reproduced  
by any means except in Full.

COUNTRY OF ORIGIN AUSTRALIA

Quality Manager  
Signed for and on behalf of  
AJAX ENGINEERED FASTENERS



**Further information:** Refer ASI Steel Construction Journal Volume 39 Number 2 – December 2005

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