

**Technical Note 60**

# **Materials Test Certificates Acceptance**

**November 2015**

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## 1 Introduction

The purpose of this technical note is to help explain the requirements for the supply of material test certificates to the requirements of MRTS78 *Fabrication of Structural Steelwork*.

## 2 Specification requirements

Clause 7 of MRTS78 states the following:

### **Steel Plate and Sections**

Steel shall comply with the requirements of the following standards:

- rolled plate AS 1594
- hollow sections AS/NZS 1163 Grade L0
- hot-rolled steel plates AS 3678 and
- hot-rolled steel sections AS 3679.1.

For each shipment of steel to be used in the fabrication of:

- a) bridge girders, bridge traffic barrier, safety barrier and pedestrian balustrade
- b) other load bearing structures with a design life of 100 years or more, and
- c) other steelwork structures.

The Contractor shall supply to the Administrator prior to the commencement of fabrication copies of the steel manufacturer's test sheets, showing the chemical properties and results of tensile and elongation tests and Charpy V-notch impact tests. The Charpy V-notch impact tests results are to be supplied for material where "L0" is specified.

If test sheets are not available, then the Administrator shall select samples, for testing of tensile strength and elongation, cold and temper bend tests, chemical analysis and Charpy V-notch impact test in accordance with the appropriate Australian Standard at no expense to the Principal.

**Witness Point** Minimum testing requirements are two percent of each size and grade of product with a minimum sample size of one for each size and grade of the steel.

Steel fabrication shall not commence until the Administrator has reviewed and approved the material test certificates. **Hold Point 2**

Material supplied in accordance with AS/NZS 1163, where the Silicon content is greater than 0.24% will not be accepted when steelwork is to be hot dip galvanised in accordance with AS/NZS 4680.

## 3 Explanation of material test certificates

As outlined in the Transport and Main Roads (TMR) specification there is a requirement for the materials used for steel fabrication to conform to the requirements of the relevant Australian Standard. This section will detail the information that shall be contained on the material test certificate. We have attached a number of conforming material test certificates.

### **3.1 Traceability**

The material test certificate shall supply a unique number which can be used to trace back to the material provided. Generally this will be the material heat number, production number or the coil number.

### **3.2 Chemical composition**

The material test certificate shall specify chemical elements as outlined in the Australian Standard. The chemical composition values are used to determine the Carbon Equivalence (CE), there must be sufficient information to calculate the CE value. The CE is required from a weldability view point.

### **3.3 Mechanical properties**

The material test certificate shall outline the yield strength, tensile strength and elongation.

When pipe section material is supplied, generally the material is supplied to both the API 5L and AS/NZS 1163 standards. For a material test certificate to comply with the AS/NZS 1163 requirements the material yield, tensile and elongation test results shall be tested in the longitudinal direction.

Material tested to the API standard is tested in the circumferential, which is not equivalent to testing the material in the longitudinal direction. TMR requires the material test certificate to specify that the materials yield, tensile and elongation was tested in the longitudinal direction.

### **3.4 Charpy V Notch impact testing**

When a material is specified with "L0", then the material test certificate shall contain a Charpy V Notch impact test value for the particular heat number being supplied. This requirement mainly applies to steel hollow sections manufactured to AS/NZS 1163. This process involves testing the impact properties of the steel supplied at 0°C.

In AS/NZS 1163 there is a requirement for the material with an overall thickness greater than 6 mm thick to be impact tested. All material with overall thickness less than 6mm thick does not need to be supplied with an impact test result. However the test certificate must comply with the requirements of Clause 13.2.2 of AS/NZS 1163.

### **3.5 Silicon content for galvanising**

In AS/NZS 1163, there is a statement where product is to be hot dip galvanised, the Principal shall approve the use of the product for galvanising.

As the majority of structural steelwork supplied for Transport and Main Roads projects are hot dip galvanised, TMR will not accept hollow section material which has a silicon content greater than 0.24%.

### **3.6 Compliance of mechanical properties based on statistical sampling**

AS/NZS 1163 permits the compliance of mechanical properties by statistical sampling. However the TMR specification requires the mechanical testing to be supplied for each heat number (batch testing). Therefore, if a manufacturer wishes to adopt a reduced level of testing then the supplier will need to comply with the following requirements.

- submit all testing data for each testing thickness from the previous 12 months. A minimum of 50 test result shall be supplied for each testing thickness
- Transport and Main Roads will use the test data to carry out a statistical analysis to determine the confidence level that the material is unlikely to be less than the minimum Charpy V Notch impact test result outlined in AS/NZS 1163
- the statistical analysis will be used to determine if a reduced level of testing can be adopted.

If the statistical data is satisfactory, the Deputy Chief Engineer (Structures) will issue a letter advising that a reduced level of testing can be adopted. The following testing will need to be undertaken to maintain a reduced level of testing.

As products are usually manufactured on a particular machine using different feedstock. Therefore, one sample from each machine will need to be selected at random every two months.

The material test certificate shall state the Charpy V Notch Impact test result as an "Indicative Test Result TMR Approved". The test report shall state the heat number, material section used for testing and the date tested which apply to the particular Charpy V Notch impact test result.

If a sample is below the minimum requirements, then the approval for reduced level of testing will be withdrawn and the supplier will need to supply Charpy V Notch impact test results for every heat number (batch testing).

#### 4 References

MRTS78	<i>Fabrication of Structural Steelwork (09/13)</i>
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Appendix A – Conforming Material Test Certificates

Figure 1 – Conforming Square Hollow Section material test certificate to AS/NZS 1163



Certificate No: 1110061  
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Date Printed: 19/10/2011

**SUPPLIER:** OneSteel Australian Tube Mills Pty Ltd  
146 Ingram Road,  
Acacia Ridge, QLD 4109  
ABN 21 123 666 679

**PRODUCT DESCRIPTION**

**PRODUCT:** 150X150X9.0 LITEOIL 12.0M AS/NZS 1163-C350L0/C450L0  
**SPECIFICATION:** AS/NZS 1163-C350L0/C450L0  
**MATERIAL:** ERW Steel Tube **STEELMAKING:** Basic Oxygen, Fully Killed, Continuous Cast, Fine Grained  
**STEEL FEED:** Coil from Hot Strip Mill

**CHEMICAL ANALYSIS**

Test No	Heat No	Test Lab	Analysis Category	Percentage of Elements by Mass									
				C	P	Mn	Si	S	Ni	Cr	Mo	Cu	
1054/16469	20636	9999	L	.150	.015	1.28	.010	.004	.010	.020	<.010	.020	
1054/16469	20641	9999	L	.160	.012	1.30	.010	.007	.010	.020	<.010	.010	
1054/16469	20848	9999	L	.150	.014	1.28	.010	.003	.010	.020	<.010	.020	
SPEC LIMITS				L/P	0.20	0.03	1.60	0.45	0.03	0.15	0.30	0.10	0.25

Test No	Heat No	Test Lab	Analysis Category	Percentage of Elements by Mass								
				Al-t	Al-s	Ti	Nb	V	CE	CF2	CF3	
1054/16469	20636	9999	L	NA	.035	<.001	.018	.002	0.37	0.02	0.0475	
1054/16469	20641	9999	L	NA	.043	<.001	.020	.002	0.38	0.022	0.04	
1054/16469	20848	9999	L	NA	.039	<.001	.016	<.001	0.37	0.016	0.045	
SPEC LIMITS				L/P	0.10	0.10	0.04	0.15	0.10	0.43	0.15	0.09

**NOTES:**  
(1) The Test No. represents the test report reference for this analysis.  
(2) For details on Test Lab – see Overall Notes below.  
(3) L/P: L=Ladle or Cast analysis; P=Product analysis.  
(4) Spec Limits represent maximum values. For Al-t=Total, -s=Soluble.  
(5) CE = C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15; CF2 = Nb+V+Ti; CF3 = Si+2.5P  
(6) Analysis results are taken from supplier laboratory accredited Test Certificates and are not rounded.

**MECHANICAL PROPERTIES**

**Tensile Test**

Test No	Heat No.	Test Lab	Test Cat.	Test Type	Yield Strength R <sub>0.5</sub> (MPa)	Tensile Strength R <sub>m</sub> (MPa)	Elong (%)	Gauge Length Method	Comments	
1054/16469	20636	9999	B	LSA	507	588	21	1		
1054/16469	20641	9999	B	LSA	518	599	20	1		
1054/16469	20848	9999	B	LSA	506	585	23	1		
SPECIFICATION b/t >15 & ≤30					LSA	450	500	14	--	Minimum values

**NOTES:**  
(1) The Test No. represents the test report reference for this analysis.  
(2) For details on Test Lab – see Overall Notes below.  
(3) TEST CATEGORY (Cat.): B = Batch, S = Statistical Sampling; NA = Type Testing  
For Test Category S, demonstration of process verification for product conformity (App. B2.3 of AS/NZS 1163) can be supplied upon request for the relevant product listed.  
For Test Category NA, demonstration of type testing for product manufactured prior or during transition to the AS/NZS 1163-2009.  
(4) TEST TYPE: LSA=Longitudinal strip specimen tested in the artificially aged condition; LFA=Longitudinal full section tested in the artificially aged condition  
(5) GAUGE LENGTH METHOD: 1 = 5.65 x SQRT(S<sub>0</sub>); 2 = 50 mm converted to 5.65 x SQRT(S<sub>0</sub>); 3 = 2 inches  
(6) All properties determined by OneSteel Australian Tube Mills (NATA Accreditation 724) on samples supplied by production personnel and tested in accordance with Australian Standard AS 1391 using OneSteel ATM method NPM-LAB-PRG-08-007.

**Impact Test**

Test No	Heat No.	Test Lab	Report No.	Test Cat.	Test Type	Specimen Size	Test Temp	Absorbed Energy Joules			Average Joules
1054/16469	20636	9999	1054/16469	B	LSA	10X7.5	0°C	169	176	185	177
1054/16469	20641	9999	1054/16469	B	LSA	10X7.5	0°C	115	127	114	119
1054/16469	20848	9999	1054/16469	B	LSA	10X7.5	0°C	168	168	167	168
SPECIFICATION					LSA	10x7.5	0°C	Min 13	Min 13	Min 13	Ave 3 tests 18

**NOTES:**  
(1) The Test No. represents the test report reference for this analysis.  
(2) For details on Test Lab – see Overall Notes below.  
(3) TEST CATEGORY (Cat.): B = Batch, S = Statistical Sampling; NA = Type Testing  
For Test Category S, demonstration of process verification for product conformity (App. B2.3 of AS/NZS 1163) can be supplied upon request for the relevant product listed.

**Figure 2 – Conforming Square Hollow Section material test certificate to AS/NZS 1163**



Certificate No: 1110061  
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For Test Category NA, demonstration of type testing in accordance with the requirements of AS 1163 - 1991, Clause B2 'Statistical Sampling' as described in PQS 100, Clause 5.3.2.  
 (4) TEST TYPE : LSA=Longitudinal strip specimen tested in the artificially aged condition.  
 (5) All properties determined by the listed Test Laboratories on samples supplied by OneSteel Australian Tube Mills production personnel and tested in accordance with Australian Standard AS 1544.2.

**OVERALL NOTES:**

- (1) TEST LAB : Analyses may be performed by the following laboratories:  
 632 = BlueScope Steel, Port Kembla Works (NATA accreditation no. 632)  
 17051 = Australian Tube Mills, Acacia Ridge (NATA accreditation no. 17051)  
 218 = Australian Laboratory Services (ALS), North Melbourne, VIC (NATA accreditation no. 218 site no. 14308)  
 9999 = Analysis supplied by steel supplier.
- (2) For analyses not performed by OneSteel Australian Tube Mills the Test No. and Report No. represents the test report reference number for this analysis.
- (3) Unless noted otherwise, the above Test Laboratories have been third-party certified by signatories to ILAC-MRA ([www.ilac.org](http://www.ilac.org)).

**ITEMS COVERED BY THIS CERTIFICATE**

ITEM	UNITS	Heat No.	Pack Date	Pack Numbers
55325	1	20636 20641 20848	NA	9811038311

NOTES:  
 The results fall within the distribution of properties for this product and are not actual values of the pack length.

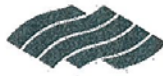
I certify that the above information is in accordance with the records of the company and conforms to the specification(s) stated.

Name: Chris Riggs  
 Signatory for Australian Tube Mills

Signature: *Chris Riggs*

Figure 3 – Conforming Plate material test certificate to AS/NZS 3678

**TEST CERTIFICATE**



**BLUESCOPE  
STEEL**

Page 1 of 1  
Certificate No. : T53618  
Transmission Date: 07/10/08

W10748323

Customer: <b>BLUESCOPE DISTRIBUTION ELECTRONIC TRADING HAMILTON CENTRAL Q L D 4007</b>	Supplier: <b>BLUESCOPE STEEL (AIS) PTY LTD PORT KEMBLA, N.S.W., AUSTRALIA, A.B.N. 19 000 019 625</b>
Cust Order No: 4201367464	Sales Order No: B8930 Printed At: Supplier MWS on: 02/12/2008

STEELMAKING: Basic Oxygen - Slab Cast  
SPECIFICATION: AS/NZS 3678-250  
PRODUCT: XLERPLATE

INSPECTION: Supplier  
CERTIFICATION: Supplier

**CHEMICAL ANALYSIS**

Percentage of element by mass (L=Cast, P=Product, -S=Soluble, -T=Total, CF=Chemical Formula, n=Min, x=Max)

Item No	Heat / Unit No	NATA Lab	L/P	C	P	Mn	Si	S	Ni	Cr	Mo	Cu	Al-T
5175	7114969	0632	L	.150	.016	.65	.14	.010	.018	.017	.002	.012	.032

Item No	Heat / Unit No	NATA Lab	L/P	Ti	Nb	V	CF1	CF2	CF3
5175	7114969	0632	L	.002	.001	.003	.26	.05	.00

CF1=C+ (MN/6) + ((CR+MO+V)/5) + ((CU+NI)/15) CF2=NI + CR + CU + MO CF3=NB + V

**MECHANICAL TESTING**

**Tensile AS1391**

Item No	Heat No	Tested Unit	NATA Lab	Cat	Loc	THICK mm	ReH MPa	Rm MPa	Lo	ELONGN %
5175	7114969	NR043	0631	B	TQF	8.00	385	470	A	34
5175	7114969	NS123	0631	B	TQF	8.00	385	470	A	30

**ITEMS COVERED BY THIS CERTIFICATE**

Item No	Heat No	Ordered Dimensions (mm)	No of Units	Mass (Tonnes)	Unit Identities
5175	7114969	3200.0X8.00X12000	4	9.648	NS125A1 NS125B1 NS127A1 NS127B1

**COMMENTS**

This test certificate is issued subject to the Uncertainty of Results statement set out on BlueScope Steel's Website [www.bluescopesteelconnect.com](http://www.bluescopesteelconnect.com). In order to rely upon this certificate, you must read the Uncertainty of Results statement. SAMPLING AND CHEMICAL ANALYSIS ARE PERFORMED IN ACCORDANCE WITH BLUESCOPE STEEL PROCEDURE DH-LABS-QS-00 S05.07C. MECHANICAL TESTING HAS BEEN PERFORMED ON SAMPLES SUPPLIED BY THE RELEVANT PRODUCTION DEPARTMENTS. HEAT TREATMENT - PRODUCT AS ROLLED.


**MECHANICAL COMMENTS**

TEST PIECE LOCATION (LOC) TQF=Transverse Quarter Front End  
TEST CATEGORY (CAT) B=Batch  
GAUGE LENGTH (Lo) A=5.65 \* square root of the original cross-sectional area of the test piece.

	This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025.	I certify that the original records of the company show that the item(s) referred to on this certificate conform to the specification as stated.  C.ZAMUNER - APPROVED SIGNATORY Mechanical LAB 0631 A.RYAN - APPROVED SIGNATORY Chemical LAB 0632
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Figure 4 – Conforming Rolled Section material test certificate to AS/NZS 3679.1



**TEST CERTIFICATE**

Page 1 of 1  
Certificate No.: W788023  
Transmission Date: 30/05/11

<b>Customer:</b> SOUTHERN QUEENSLAND STEEL PTY LTD 77-97 COULSON STREET WACOL Q L D 4076  <b>Ship To:</b>	<b>Supplier:</b> OneSteel Manufacturing Pty Limited Whyalla, SA - 5600, Australia A.B.N. 42 004 651 325  <b>Sales Order No:</b> B1111 <b>Printed on:</b> 31/05/2011
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**STEELMAKING:** Basic Oxygen - Slab Cast  
**SPECIFICATION:** AS/NZS3679.1-300  
**PRODUCT:** 150UC30

**INSPECTION:** Supplier  
**CERTIFICATION:** Supplier

**ITEMS COVERED BY THIS TEST CERTIFICATE**

Item No	Heat No	Customer Order	Length
0882	516330	B28736	18.000
0924	516337	B28760	12.000

**CHEMICAL ANALYSIS**  
Percentage of element by mass (L=Cast, P=Product, -S=Soluble, -T=Total, CF=Chemical Formula, n=Min, x=Max)

Item No	Heat / Unit No	NATA Lab	L/P	C	P	Mn	Si	S	Ni	Cr	Mo	Cu	Sn	Al
0882	516330	0834	L	.159	.013	1.42	.190	.008	.009	.025	.001	.028	.005	.002
0924	516337	0834	L	.161	.021	1.43	.190	.014	.009	.021	.001	.024	.002	.001

Item No	Heat / Unit No	NATA Lab	L/P	Nb	Ti	B	V	N	Ca	Zr	CF1
0882	516330	0834	L	.001	.001	.0004	.001	.0070	.0002	.001	.40
0924	516337	0834	L	.001	.001	.0003	.001	.0050	.0001	.002	.40

CF1=C+Mn/6 + (Cr+Mo+V)/5 + (Ni+Cu)/15

**MECHANICAL TESTING**

**Tensile**

Item No	Heat No	Tested Unit	NATA Lab	Test Report	ReH MPa	Rm MPa	ELONGN %
0882	516330	516330	0794	51376	345	480	41
0882	516330	516330	0794	51376	345	480	39
0924	516337	516337	0794	51376	340	490	36
0924	516337	516337	0794	51376	345	480	38

Yield Strength - determined in accordance with requirements of nominated product standard

**COMMENTS**  
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I certify the conformance of the material to the requirements and that the information on this certificate is in accordance with the records of the company. M. Bubicich - OneSteel Whyalla
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