

Mechanical Testing

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 - Reinforcing Products
 - Scaffolding
 - Structures
 - Tensile

IN CONFIDENCE TO THE CLIENT

REPORT NO: 20-0285

TESTING COMPONENTS OF A STEEL STUD FRAME SYSTEM

CLIENT: **KEWARM PTY LTD**
 F2/272-284 FRANKSTON-DANDENONG ROAD
 DANDENONG SOUTH VIC 3175

DATE OF TEST: MARCH 27TH TO APRIL 02ND 2020

DATE OF REPORT: APRIL 17TH 2020

TEST SYNOPSIS:

A consignment of KEWARM PTY LTD steel stud framing system members was delivered to the MTS laboratory for testing. The delivered samples comprised variant profiles of WPG Wall Stud, Wall Track and Deflection Head Track (DHT) members (see Fig 1).

At the request of the client, MTS was to measure the cross-sectional geometry of each variant member. Additionally, the material tensile properties, chemical composition, and zinc coating mass of the steel sections were to be determined.

SAMPLE DETAILS:

Upon arrival at the laboratory, the steel members were examined and the following identification details and nominal dimensions were recorded.

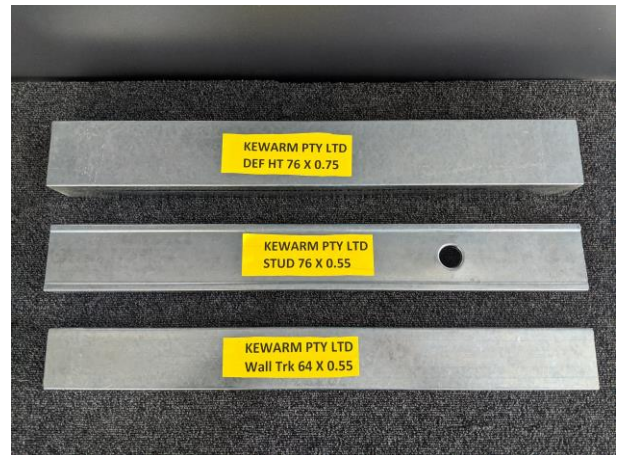


FIG. 1
STUD FRAME SYSTEM
STEEL MEMBERS

Wall Stud Framing Member Profiles

STUD 51 × 0.55:	<i>51×35×0.55 mm BMT zinc coated steel section</i>
STUD 64 × 0.55:	<i>64×35×0.55 mm BMT zinc coated steel section</i>
STUD 76 × 0.55:	<i>76×35×0.55 mm BMT zinc coated steel section</i>
STUD 92 × 0.55:	<i>92×35×0.55 mm BMT zinc coated steel section</i>
STUD 64 × 0.75:	<i>64×36×0.75 mm BMT zinc coated steel section</i>
STUD 76 × 0.75:	<i>76×36×0.75 mm BMT zinc coated steel section</i>
STUD 92 × 0.75:	<i>92×36×0.75 mm BMT zinc coated steel section</i>
STUD 64 × 1.15:	<i>64×36×1.15 mm BMT zinc coated steel section</i>
STUD 76 × 1.15:	<i>76×36×1.15 mm BMT zinc coated steel section</i>
STUD 92 × 1.15:	<i>92×36×1.15 mm BMT zinc coated steel section</i>

Wall Track Framing Member Profiles

Wall Trk 51 × 0.55: 51×28×0.55 mm BMT zinc coated steel section

Wall Trk 64 × 0.55: 64×28×0.55 mm BMT zinc coated steel section

Wall Trk 76 × 0.55: 76×28×0.55 mm BMT zinc coated steel section

Wall Trk 92 × 0.55: 92×28×0.55 mm BMT zinc coated steel section

Wall Trk 64 × 0.75: 64×29×0.75 mm BMT zinc coated steel section

Wall Trk 76 × 0.75: 76×29×0.75 mm BMT zinc coated steel section

Wall Trk 92 × 0.75: 92×29×0.75 mm BMT zinc coated steel section

Wall Trk 64 × 1.15: 64×29×1.15 mm BMT zinc coated steel section

Wall Trk 76 × 1.15: 76×29×1.15 mm BMT zinc coated steel section

Wall Trk 92 × 1.15: 92×29×1.15 mm BMT zinc coated steel section

Deflection Head Track (DHT) Framing Member Profiles

DEF HT 64 × 0.55: 64×48×0.55 mm BMT zinc coated steel section

DEF HT 76 × 0.55: 76×48×0.55 mm BMT zinc coated steel section

DEF HT 92 × 0.55: 92×48×0.55 mm BMT zinc coated steel section

DEF HT 64 × 0.75: 64×48×0.75 mm BMT zinc coated steel section

DEF HT 76 × 0.75: 76×48×0.75 mm BMT zinc coated steel section

DEF HT 92 × 0.75: 92×48×0.75 mm BMT zinc coated steel section

DEF HT 92 × 1.15: 92×48×1.15 mm BMT zinc coated steel section

TEST PROCEDURES:

Section Geometry Tests

In preparation for testing, the ends of each of the twenty-seven (27) variant steel sections were cut and finished to provide a suitable cross-section for geometry measurements. The cross-section geometrical properties of each specimen were determined using a calibrated digital caliper.

The base metal thickness of each wall frame component was measured using a calibrated micrometer on a section of the steel member that had been stripped of zinc coating.

Tensile Testing

Tensile test specimens were procured from the 64 × 0.55 mm, 76 × 0.75 mm, and 92 × 1.15 mm variants of each of the three (3) framing member types.

The test samples were prepared and tested in accordance with the principles of AS 1391 – 2007 (R2017), METALLIC MATERIALS-TENSILE TESTING AT AMBIENT TEMPERATURE.

Chemical Composition Analysis

Specimens obtained from the ‘STUD 76 × 0.75’, ‘Wall Trk 64 × 0.55’, and ‘DEF HT 92 × 1.15’ members were submitted to the NATA accredited laboratory, SPECTROMETER SERVICES PTY LTD, for spectrographic analysis of the substrate material.

Coating Mass Testing

Coating mass testing was conducted in accordance with the general provisions outlined by AS 2331.2.1 – 2001; METHOD A – STRIP AND WEIGH (DISSOLUTION OF COATING).

Samples were prepared from the 64×0.55 mm, 76×0.75 mm, and 92×1.15 mm variants of each of the three (3) framing member types. The mass and surface area of each sample were recorded prior to removal of the zinc coating using a stripping reagent. Each steel coupon was subsequently reweighed to facilitate calculation of the zinc coating mass for the wall frame system members.

TEST RESULTS:

Section Geometry Tests

The nominal cross-section geometry and locations of measured dimensions for each Wall Stud, Wall Track, and DHT profile are presented in Appendix A.

The tabulated measured dimensions are additionally provided in Appendix A.

Tensile Testing

Reports for the tensile tests conducted on the wall frame members are presented in Appendix B.

The tensile properties of the specimens are summarised below. The 0.2% Yield Strength is provided and all Post-Fracture Elongations were calculated on a non-proportional gauge length of 50 mm.

STUD 64×0.55 :

- Ultimate Tensile Strength: **398 MPa**
- Yield Strength: **331 MPa**
- Post Fracture Elongation: **32 %**

STUD 76×0.75 :

- Ultimate Tensile Strength: **385 MPa**
- Yield Strength: **328 MPa**
- Post Fracture Elongation: **35 %**

STUD 92×1.15 :

- Ultimate Tensile Strength: **380 MPa**
- Yield Strength: **329 MPa**
- Post Fracture Elongation: **37 %**

Wall Trk 64×0.55 :

- Ultimate Tensile Strength: **392 MPa**
- Yield Strength: **332 MPa**
- Post Fracture Elongation: **29 %**

Wall Trk 76 × 0.75:

- Ultimate Tensile Strength: **390 MPa**
- Yield Strength: **338 MPa**
- Post Fracture Elongation: **31 %**

Wall Trk 92 × 1.15:

- Ultimate Tensile Strength: **378 MPa**
- Yield Strength: **332 MPa**
- Post Fracture Elongation: **37 %**

DEF HT 64 × 0.55:

- Ultimate Tensile Strength: **396 MPa**
- Yield Strength: **331 MPa**
- Post Fracture Elongation: **30 %**

DEF HT 76 × 0.75:

- Ultimate Tensile Strength: **393 MPa**
- Yield Strength: **335 MPa**
- Post Fracture Elongation: **31 %**

DEF HT 92 × 1.15:

- Ultimate Tensile Strength: **381 MPa**
- Yield Strength: **330 MPa**
- Post Fracture Elongation: **37 %**

Chemical Composition Analysis

The chemical compositions of the tested members are presented in Table 1. Chemical analysis confirms that the composition of each tested steel section is compliant with the specifications required by AS 1397 – 2011 TABLE 2.1 “REQUIREMENTS FOR CHEMICAL COMPOSITION” for the steel grade designations G550, G500, G450, G350, G300, G250, G1, G2 and G3.

Specimen ID.	Fe (%)	C (%)	Mn (%)	Si (%)	S (%)	P (%)	Ni (%)	Cr (%)	Mo (%)	Cu (%)	V (%)	Nb (%)	Ti (%)	Al (%)	B (%)
STUD 76 × 0.75	Bal	0.02	0.19	0.03	0.01	0.02	<0.01	0.02	<0.01	0.02	<0.01	<0.01	<0.01	0.036	<0.0005
Wall Trk 64 × 0.55	Bal	0.04	0.19	0.02	0.01	0.02	<0.01	0.02	<0.01	0.02	<0.01	<0.01	<0.01	0.028	<0.0005
DEF HT 92 × 1.15	Bal	0.04	0.19	<0.02	0.01	0.01	<0.01	0.02	<0.01	0.02	<0.01	<0.01	<0.01	0.028	<0.0005

**TABLE 1
CHEMICAL COMPOSITION RESULTS**

Coating Mass Testing

The zinc coating masses of the tested sections are provided in Table 2.

Specimen I.D.	One Side Surface Area (mm²)	Total Surface Area (mm²)	Total Coating Mass (g)	Zinc Coating Per Surface Area (g/m²)	Zinc Coating Per Sheet Area (g/m²)
STUD 64 × 0.55	4167	8335	1.203	144	290
STUD 76 × 0.75	4532	9064	1.372	151	305
STUD 92 × 1.15	4705	9411	1.429	152	305
Wall Trk 64 × 0.55	4614	9228	1.369	148	295
Wall Trk 76 × 0.75	4749	9497	1.381	145	290
Wall Trk 92 × 1.15	4708	9417	1.395	148	295
DEF HT 64 × 0.55	4675	9350	1.309	140	280
DEF HT 76 × 0.75	4800	9599	1.531	159	320
DEF HT 92 × 1.15	4667	9334	1.325	142	285

Note: In accordance with the requirements of AS 1397-2011, the values of coating mass per sheet area are rounded to the nearest 5g/m².

**TABLE 2
COATING MASS TEST RESULTS**

Notes:

- Melbourne Testing Services (MTS) Pty Ltd shall not be liable for loss, cost, damages or expenses incurred by the client or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Melbourne Testing Services Pty Ltd be liable for consequential damages including, but not limited to, lost profit, damages for failure to meet deadlines and lost production arising from this report.
- This document shall not be reproduced except in full and relates only to the items tested.
- It remains the responsibility of the client to ensure that the samples tested are representative of the entire product batch.
- MTS shall take no responsibility for the procurement and authenticity of the test product as described herein.
- This report is specific to the test items in their state at the time of testing. It should not be taken as a statement that all products in all states of repair, would also perform in the same manner.
- MTS shall take no responsibility for the interpretation or misinterpretation of the procedures or calculation methods as provided herein or for the appropriateness or validity of the test procedures for the test items described and reported herein.



GAVIN VAN DEVENTER
PRINCIPAL ENGINEER



ALEXANDER CORTES
TEST ENGINEER

APPENDIX A:

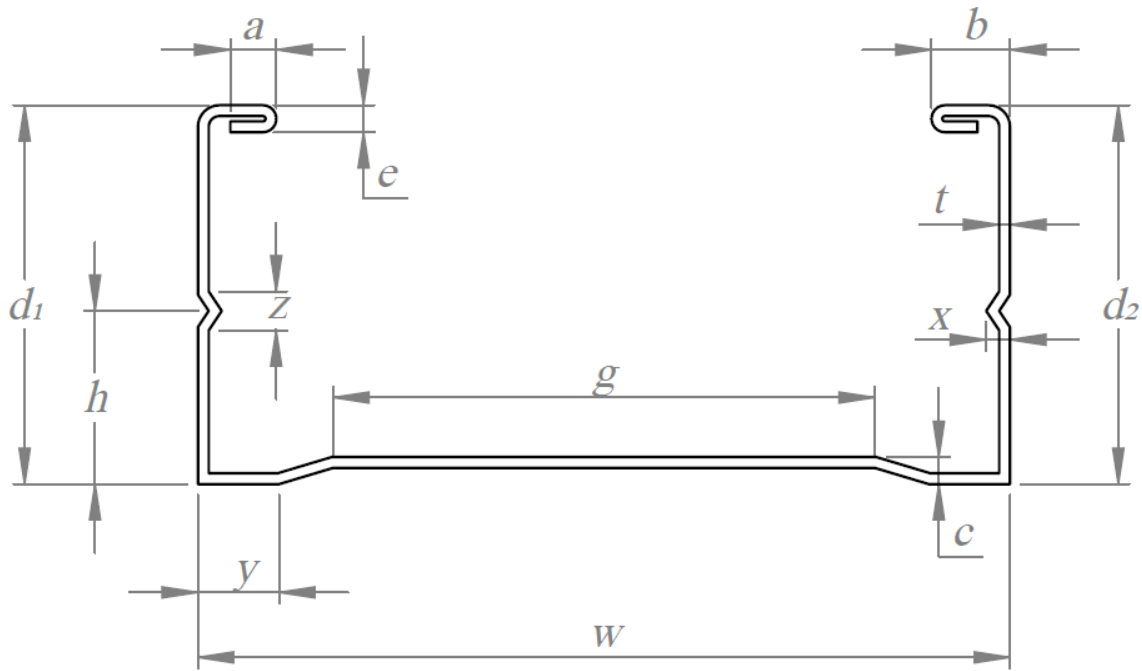


FIG. A1
WALL STUD 0.55 MM BMT
NOMINAL CROSS SECTION GEOMETRY

Specimen I.D.	w (mm)	d_1 (mm)	d_2 (mm)	h (mm)	t (mm)	a (mm)	b (mm)	c (mm)	e (mm)	g (mm)	x (mm)	y (mm)	z (mm)
STUD 51 × 0.55	50.6	32.7	35.6	16.7	0.501	2.6	6.9	1.5	1.4	32.4	1.1	7.5	3.5
STUD 64 × 0.55	62.8	33.2	35.5	16.8	0.504	3.7	6.5	1.6	1.5	45.0	1.1	7.2	4.0
STUD 76 × 0.55	75.5	32.9	35.5	16.7	0.499	2.8	7.0	1.7	1.5	58.5	1.1	7.3	3.9
STUD 92 × 0.55	91.8	32.8	36.0	16.7	0.510	3.1	6.3	1.5	1.4	73.5	1.1	7.4	5.1

TABLE A1
WALL STUD 0.55 MM BMT CROSS-SECTION DIMENSIONS

APPENDIX A (CONT.):

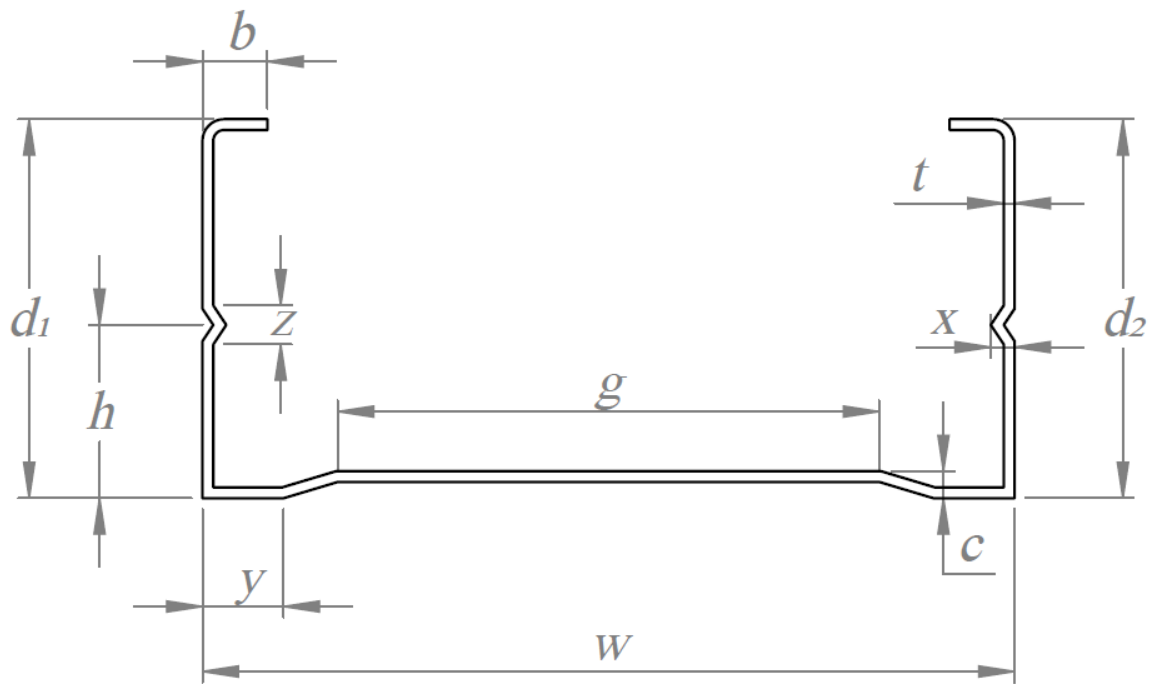


FIG. A2
WALL STUD 0.75 & 1.15 MM BMT
NOMINAL CROSS-SECTION GEOMETRY

Specimen I.D.	w (mm)	d_1 (mm)	d_2 (mm)	h (mm)	t (mm)	b (mm)	c (mm)	g (mm)	x (mm)	y (mm)	z (mm)
STUD 64 × 0.75	63.1	34.1	36.8	16.8	0.698	7.3	1.8	43.9	1.2	7.5	3.8
STUD 76 × 0.75	75.4	34.4	36.8	17.0	0.713	7.3	2.5	56.5	1.2	7.8	3.5
STUD 92 × 0.75	91.4	34.1	36.0	16.8	0.709	8.1	2.0	72.8	1.3	8.8	3.6
STUD 64 × 1.15	63.3	34.3	36.5	16.9	1.112	7.0	1.9	44.5	1.6	7.6	3.1
STUD 76 × 1.15	76.3	33.0	36.2	16.2	1.120	7.0	2.4	56.8	1.6	8.1	3.1
STUD 92 × 1.15	91.8	34.1	36.4	17.3	1.113	5.7	2.3	72.5	1.6	7.4	3.1

TABLE A2
WALL STUD 0.75 & 1.15 MM BMT CROSS-SECTION DIMENSIONS

APPENDIX A (CONT.):

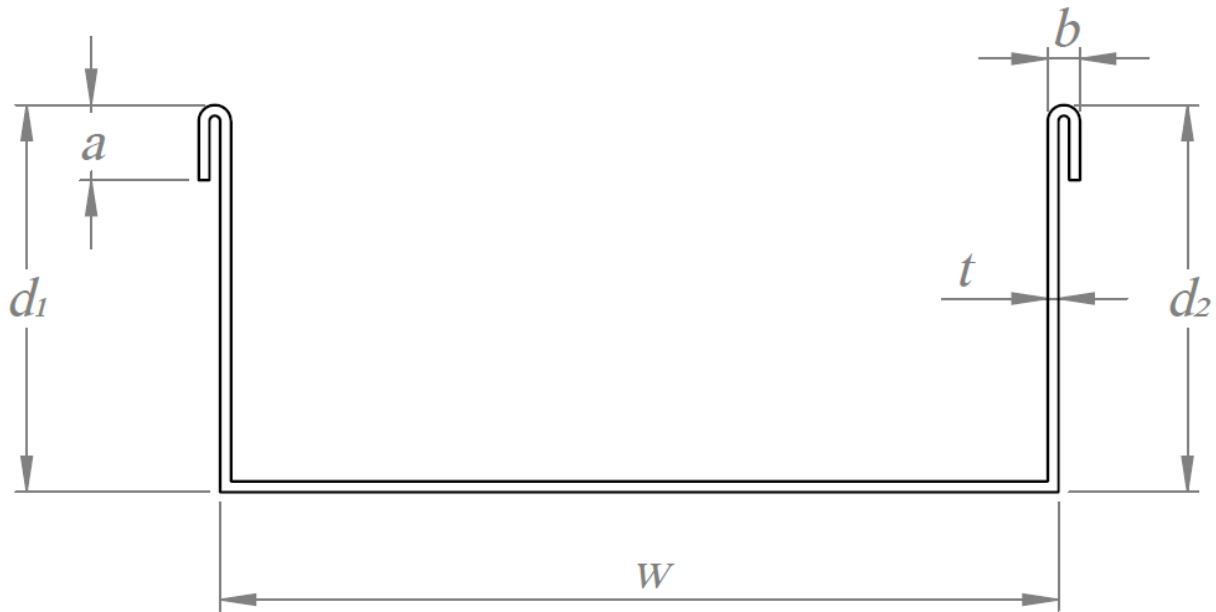


FIG. A3
WALL TRACK 0.55 MM BMT
NOMINAL CROSS-SECTION GEOMETRY

Specimen I.D.	w (mm)	d_1 (mm)	d_2 (mm)	t (mm)	a (mm)	b (mm)
Wall Trk 51 × 0.55	52.2	27.9	28.7	0.499	3.6	1.3
Wall Trk 64 × 0.55	65.0	28.2	28.7	0.509	3.6	1.2
Wall Trk 76 × 0.55	77.4	27.3	28.7	0.503	3.6	1.5
Wall Trk 92 × 0.55	92.8	28.2	28.7	0.502	3.8	1.6

TABLE A3
WALL TRACK 0.55 MM BMT CROSS -SECTION DIMENSIONS

APPENDIX A (CONT.):

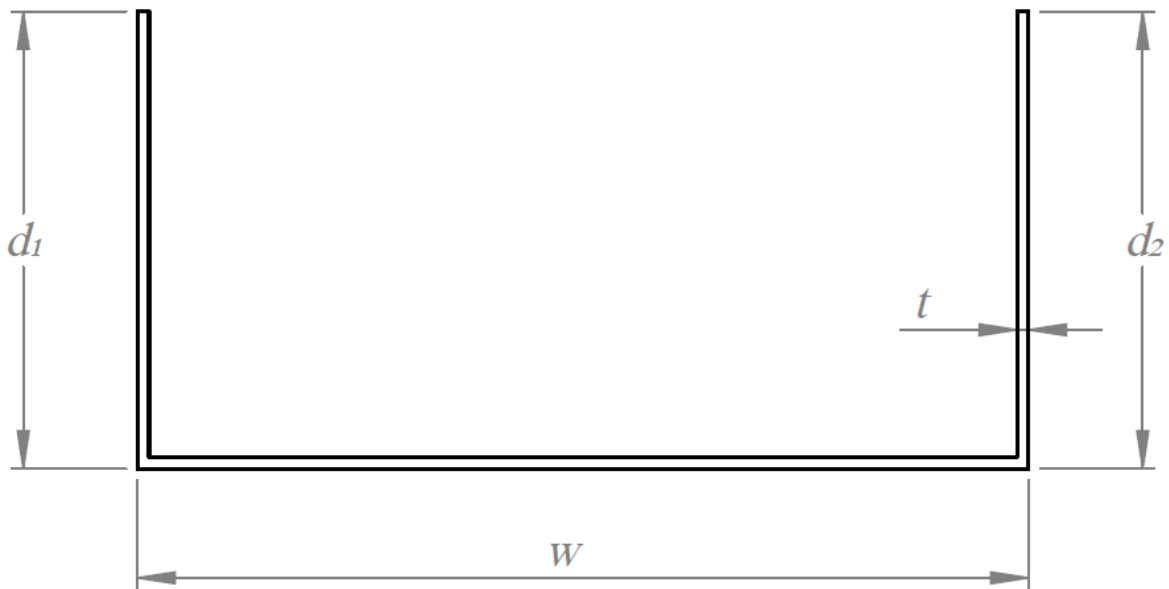


FIG. A4
WALL TRACK 0.75 & 1.15 MM BMT & DEFLECTION HEAD TRACK
NOMINAL CROSS-SECTION GEOMETRY

Specimen I.D.	w (mm)	d₁ (mm)	d₂ (mm)	t (mm)
Wall Trk 64 × 0.75	65.1	28.8	29.0	0.702
Wall Trk 76 × 0.75	77.6	28.6	28.9	0.708
Wall Trk 92 × 0.75	93.2	29.0	29.2	0.697
Wall Trk 64 × 1.15	66.8	27.6	28.2	1.120
Wall Trk 76 × 1.15	77.8	28.9	29.6	1.111
Wall Trk 92 × 1.15	94.1	28.4	29.7	1.120

TABLE A4
WALL TRACK 0.75 & 1.15 MM BMT CROSS -SECTION DIMENSIONS

Specimen I.D.	w (mm)	d₁ (mm)	d₂ (mm)	t (mm)
DEF HT 64 × 0.55	64.8	47.7	48.0	0.502
DEF HT 76 × 0.55	76.6	49.1	49.9	0.502
DEF HT 92 × 0.55	93.2	47.6	47.8	0.501
DEF HT 64 × 0.75	65.2	47.6	48.2	0.702
DEF HT 76 × 0.75	77.8	47.6	48.0	0.704
DEF HT 92 × 0.75	93.7	47.3	48.1	0.701
DEF HT 92 × 1.15	94.1	47.0	49.6	1.104

TABLE A5
DEFLECTION HEAD TRACK CROSS -SECTION DIMENSIONS

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Tensile Test Report

Report No: 20-0285-A
Report Date: 6-Apr-20
Specimen Description: Flat Tensile Specimens - Wall Studs

TEST DETAILS

Test Date:	30/03/2020	1	2	3
Specimen I.D:		STUD	STUD	STUD
		64 × 0.55	76 × 0.75	92 × 1.15
Extensometer Gauge Length: L_e (mm)		50	50	50

SPECIMEN DETAILS

Thickness: a (mm)	0.50	0.71	1.11
Width: b (mm)	12.58	12.60	12.57
Area: S_o (mm ²)	6.29	8.95	13.95
Gauge Length: L_o (mm)	50	50	50
Parallel Length: L_c (mm)	75	75	75

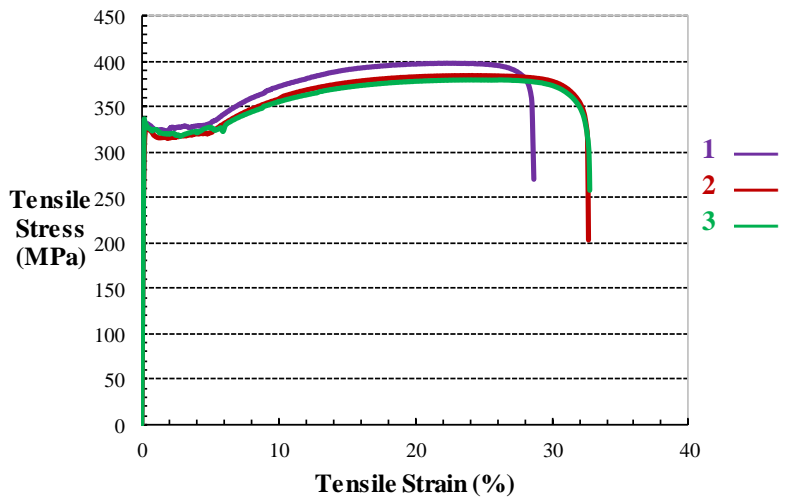
TENSILE PROPERTIES

Tensile Strength: R_m (MPa)	398	385	380
Proof Strength: $R_{p0.2}$ (MPa)	331	328	329
Upper Yield Stress: R_{eH} (MPa)	331	328	337
Lower Yield Stress: R_{eL} (MPa)	324	315	317
Post Fracture Elongation: A_{50mm} (%)	32	35	37

Test Comments:

Tested in accordance with AS 1391-2007(R2017).

Area (S_o) computed on base metal thickness (BMT).



GAVIN VAN DEVENIER
Authorised Signatory



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Tensile Test Report

Report No: 20-0285-B
Report Date: 6-Apr-20
Specimen Description: Flat Tensile Specimens - Wall Tracks

TEST DETAILS

Test Date:	30/03/2020	1	2	3
Specimen I.D:		Wall Trk	Wall Trk	Wall Trk
		64 × 0.55	76 × 0.75	92 × 1.15
Extensometer Gauge Length: L_e (mm)		50	50	50

SPECIMEN DETAILS

Thickness: a (mm)	0.51	0.71	1.12
Width: b (mm)	12.59	12.59	12.59
Area: S_o (mm ²)	6.42	8.94	14.10
Gauge Length: L_o (mm)	50	50	50
Parallel Length: L_c (mm)	75	75	75

TENSILE PROPERTIES

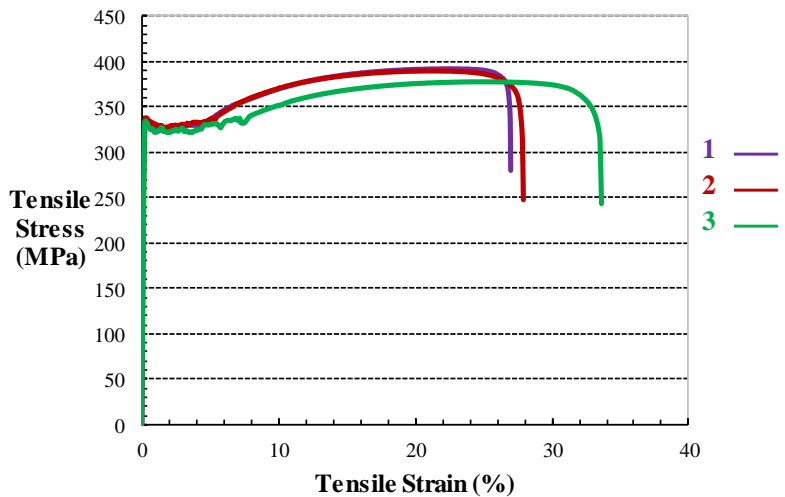
Tensile Strength: R_m (MPa)	392	390	378
Proof Strength: $R_{p0.2}$ (MPa)	332	338	332
Upper Yield Stress: R_{eH} (MPa)	332	338	334
Lower Yield Stress: R_{eL} (MPa)	324	327	322
Post Fracture Elongation: A_{50mm} (%)	29	31	37

Test Comments:

Tested in accordance with AS 1391-2007(R2017).

Area (S_o) computed on base metal thickness (BMT).

Specimen 1 - Fracture location was observed to be less than 1/3 of L_o to the outside gauge mark. Therefore, A_{50mm} may be invalid as per AS 1391 Clause 11.1.



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Tensile Test Report

Report No: 20-0285-C
Report Date: 6-Apr-20
Specimen Description: Flat Tensile Specimens - Deflection Head Tracks (DHT)

TEST DETAILS

Test Date:	30/03/2020	1	2	3
Specimen I.D:		DEF HT	DEF HT	DEF HT
		64 × 0.55	76 × 0.75	92 × 1.15
Extensometer Gauge Length:	L_e (mm)	50	50	50

SPECIMEN DETAILS

Thickness:	a (mm)	0.50	0.70	1.10
Width:	b (mm)	12.58	12.55	12.61
Area:	S_o (mm ²)	6.29	8.79	13.87
Gauge Length:	L_o (mm)	50	50	50
Parallel Length:	L_c (mm)	75	75	75

TENSILE PROPERTIES

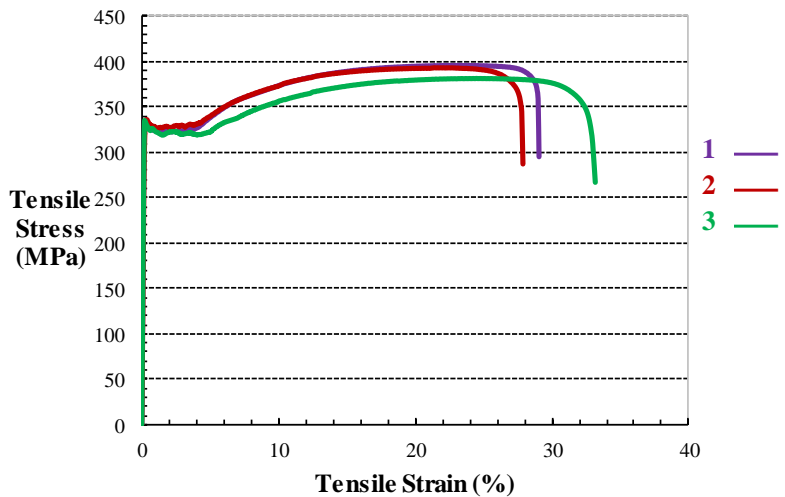
Tensile Strength:	R_m (MPa)	396	393	381
Proof Strength:	$R_{p0.2}$ (MPa)	331	335	330
Upper Yield Stress:	R_{eH} (MPa)	331	336	335
Lower Yield Stress:	R_{eL} (MPa)	322	326	319
Post Fracture Elongation:	A_{50mm} (%)	30	31	37

Test Comments:

Tested in accordance with AS 1391-2007(R2017).

Area (S_o) computed on base metal thickness (BMT).

Specimen 1 - Fracture location was observed to be less than 1/3 of L_o to the outside gauge mark. Therefore, A_{50mm} may be invalid as per AS 1391 Clause 11.1.



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