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Vipac Engineers & Scientists

Aldeck Sales Pty Ltd

Test Report - Temporary Underslung Handrail

30B-15-0096-TRP-391792-0

18 Dec 2015

Report Title: Test Report - Temporary Underslung Handrail **Job Title: Handrail Testing**	
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REVISION HISTORY

Revision No:	Date Issued	Reason / Comments
0	18 Dec 2015	Initial Issue
1		
2		

DISTRIBUTION

Copy No: 2	Location	Comments
1	Project Folder	
2	Client (PDF Format)	Uncontrolled Copy

EXECUTIVE SUMMARY

Vipac Engineers & Scientists (Vipac) has been commissioned by Aldeck Sales Pty Ltd (the client) to undertake performance testing on their temporary underslung perimeter handrail system.

Testing was carried out in accordance with Section 4.1 of AS/NZS 4994.1:2009 *Temporary edge protection Part 1: General requirements*. Testing was carried out at the client's Thomastown facility during December 2015.

The components of the system that were tested comply with the requirements outlined in Section 4.1 of AS/NZS 4994.1:2009 and are suitable for use on roofs with a slope up to 15° from the horizontal.

Details of the testing are presented in the pages of this report.

TABLE OF CONTENTS

1 INTRODUCTION

Vipac Engineers & Scientists (Vipac) has been commissioned by Aldeck Sales Pty Ltd (the client) to perform to undertake performance testing on their temporary underslung perimeter handrail system. The aim of the testing is to determine the system's compliance with Section 4.1 of AS/NZS 4994.1:2009 *Temporary edge protection Part 1: General requirements*. The system tested is as described in Section 2 of this report; additional photos of the system are in Appendix A of this report. The test specification is as presented in Section 3.

2 SYSTEM UNDER TEST

Parameter	Details
Test sample:	Temporary underslung perimeter handrail system.
Manufacturer:	Aldeck
Comments / Remarks:	Post spacing – 3m Components tested: 1. Post with 380 mm steel base 2. Post with 660 mm steel base 3. Top rail 4. Top rail inline joiner See Appendix B and C for material information

Figure 1: Post with 380mm steel base

Figure 2: Post with 660mm steel base

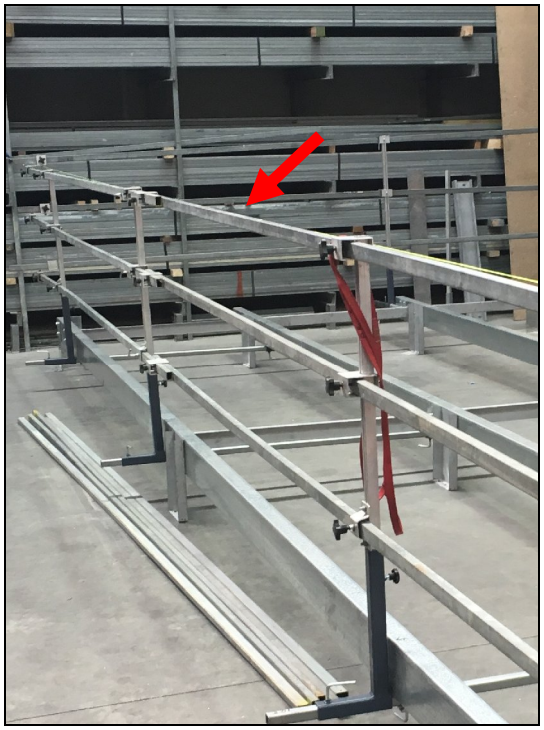


Figure 3: Top rail

Figure 4: Top rail inline joiner

3 TEST SPECIFICATION

The sample under test was tested in accordance with Section 4.1 of AS/NZS 4994.1:2009 *Temporary edge protection Part 1: General requirements*. Table 2 shows a summary of the testing requirements for the system. The client has specified the system only to be installed on roofs with a slope up to 15° from the horizontal therefore no dynamic testing is required.

4 TEST APARATUS

Instrument	Manufacturer	Model	Serial Number	Vipac Asset No.
5 Tonne Load Cell	Millennium Mechatronics	MT501	P2A086501	33662
0.05 – 200m Distance Laser	Leica	Disto D5	N/A	33606
8m Tape Measure	Stanley	8m	N/A	33020

Table 1: Equipment used during testing

SUMMARY OF TESTING REQUIREMENTS

Load component	Direction of load application			Purpose of test	Test location in plane (see Figure 4.1)
	Down	Horizontal IN	Horizontal OUT		
Post	NR	S	S or D	Post strength and connection to support	1
Top rail	S	S	S or D	Strength of rail, joiner, connection to post and deflection	2 and 4
Midrail, only where section/material properties are different to top rail	S	S	S or D	Strength of rail, connection to post and deflection	2
Bottom rail	NR	NR	S or D	Strength of rail, connection to post and deflection	2
Top rail with inline joiner	S	S	S or D	Strength of rail, joiner, connection to post and deflection	3
Toeboard	NR	NR	S or D	Strength, connection to post and deflection	2
Structural infill panel	S	S	S or D	Strength of rail, connection to post and deflection	2 (see Note)
Non-structural infill panel	NR	NR	S Types 1, 2 D Type 3	Strength—Deflection not a criteria	2 (see Note)

LEGEND:
Down = test load applied vertically downward at point of application
Horizontal IN = test load applied horizontally inward towards the roof
Horizontal OUT = test load applied horizontally outward away from the roof
S = static testing as specified in the relevant Appendix
D = dynamic testing as specified in the relevant Appendix
NR = test not required

Table 2: Summary of testing requirements for the system[1]

[1] Table taken from AS/NZS 4994.1:2009 (Table 4.1)

5 TEST METHOD

The system was installed on a custom test rig built by the client at their Thomastown facility. The client has advised that materials of the same characteristics as the intended supporting structure were used to build the test rig as to simulate the manner of installation. Figure 5 to Figure 8 shows the test rig. The system was tested in accordance with the test specification outlined in Section 3. During testing, the static load was applied to the system using a lifting and ratchet straps. The load cell was installed inline with these straps to ensure the correct load was applied. Figure 9 illustrates the static load application setup. Deflection of the post was measured at the position of the top rail and the deflection of the rails was measured at the top surface of the rail.

Figure 5: Test rig

Figure 6: System installed on test rig

Figure 7: Corner support of test rig

Figure 8: Mid support of test rig

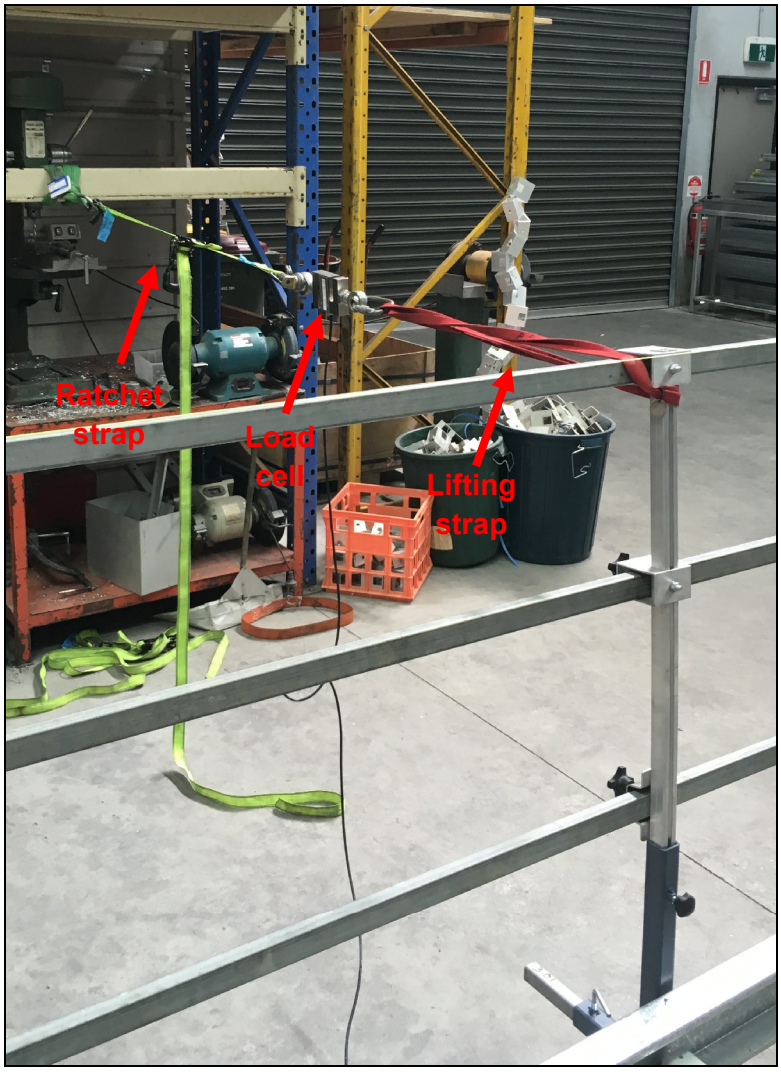


Figure 9: Static load testing setup

6 TEST RESULTS

6.1 POST WITH 380 MM STEEL BASE

Static Inward

Test Standard: AS/NZS 4994.1:2009 Appendix A

Applied Load: Proof = 637.7 N

Net Deflection: 99 mm

Result: Pass – deflection less than 101 mm

Static Outward

Test Standard: AS/NZS 4994.1:2009 Appendix A

Applied Load: Proof = 627.8 N, Maximum = 1226.3 N

Net Deflection: 87 mm

Result: Pass – deflection less than 101 mm, no ultimate failure

Figure 10: Post with 380 mm steel base under maximum static load

6.2 POST WITH 660 MM STEEL BASE

Static Inward

Test Standard: AS/NZS 4994.1:2009 Appendix A

Applied Load: Proof = 608.2 N

Net Deflection: 83 mm

Result: Pass – deflection less than 101 mm

Static Outward

Test Standard: AS/NZS 4994.1:2009 Appendix A

Applied Load: Proof = 608.2 N, Maximum = 1216.4 N

Net Deflection: 71 mm

Result: Pass – deflection less than 101 mm, no ultimate failure

Figure 11: Post with 660 mm steel base under maximum static load

6.3 TOP RAIL

Static Downward

Test Standard: AS/NZS 4994.1:2009 Appendix B

Applied Load: Proof = 608.2 N

Net Deflection: 30 mm

Result: Pass – deflection less than 101 mm

Static Inward

Test Standard: AS/NZS 4994.1:2009 Appendix B

Applied Load: Proof = 608.2 N

Net Deflection: 54 mm

Result: Pass – deflection less than 101 mm

Static Outward

Test Standard: AS/NZS 4994.1:2009 Appendix B

Applied Load: Proof = 627.8 N

Net Deflection: 51 mm

Result: Pass – deflection less than 101 mm

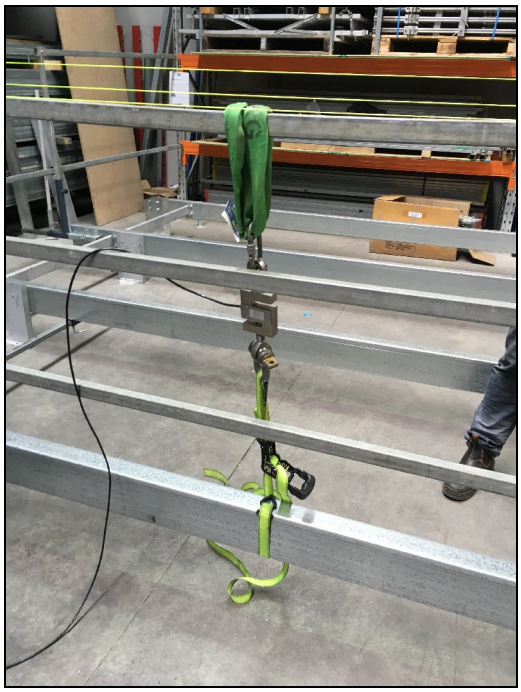


Figure 12: Top rail under load in static downwards test

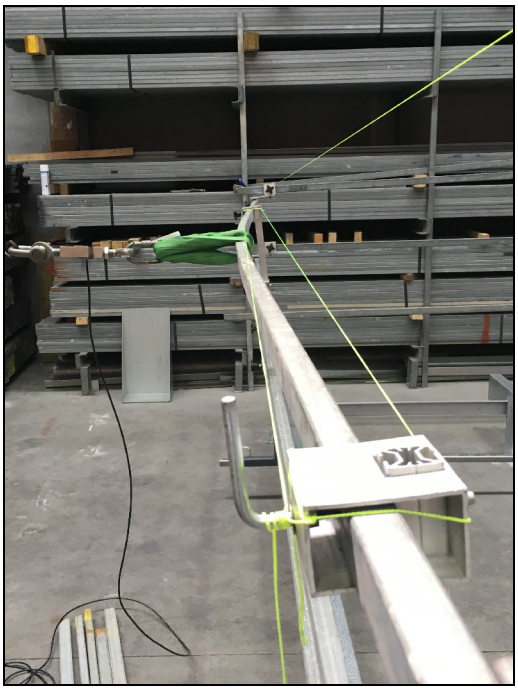


Figure 13: Top rail under load in static outwards test

6.4 TOP RAIL INLINE JOINER

Static Downward

Test Standard: AS/NZS 4994.1:2009 Appendix B

Applied Load: Proof = 657.3 N

Net Deflection: 28 mm

Result: Pass – deflection less than 101 mm

Static Inward

Test Standard: AS/NZS 4994.1:2009 Appendix B

Applied Load: Proof = 647.5 N

Net Deflection: 31 mm

Result: Pass – deflection less than 101 mm

Static Outward

Test Standard: AS/NZS 4994.1:2009 Appendix B

Applied Load: Proof = 618.0 N

Net Deflection: 23 mm

Result: Pass – deflection less than 101 mm

Figure 14: Joiner under load in static downwards test

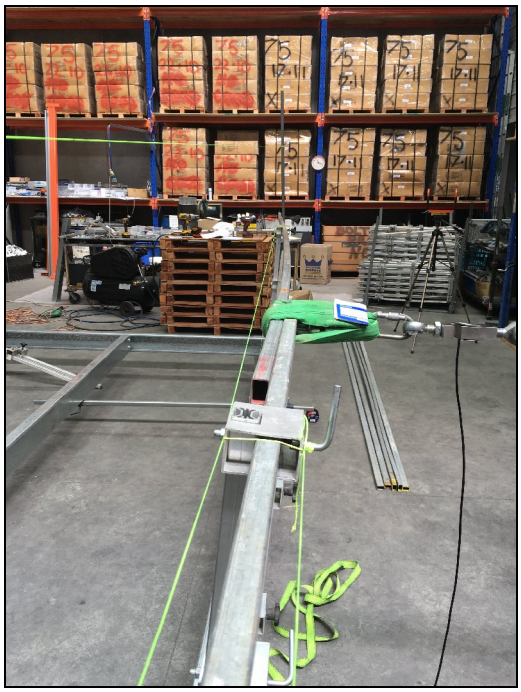


Figure 15: Joiner under load in static outwards test

7 CONCLUSION

Vipac carried out testing on a temporary underslung perimeter handrail system in accordance with Section 4.1 of AS/NZS 4994.1:2009 *Temporary edge protection Part 1: General requirements* as directed by Aldeck Sales Pty Ltd. Table 3 summarises the components tested and the results of each test. The results from all components tested indicate the temporary underslung perimeter handrail system complies with the requirements outlined in Section 4.1 of AS/NZS 4994.1:2009 for use on roofs with a slope up to 15° from the horizontal.

Component	Test	Result
Post with 380mm steel base	Static Inward	Pass
	Static Outward (Proof Load)	Pass
	Static Outward (Maximum Load)	Pass
Post with 660mm steel base	Static Inward	Pass
	Static Outward (Proof Load)	Pass
	Static Outward (Maximum Load)	Pass
Top rail	Static Downward	Pass
	Static Inward	Pass
	Static Outward	Pass
Top rail inline joiner	Static Downward	Pass
	Static Inward	Pass
	Static Outward	Pass

Table 3: Summary of results

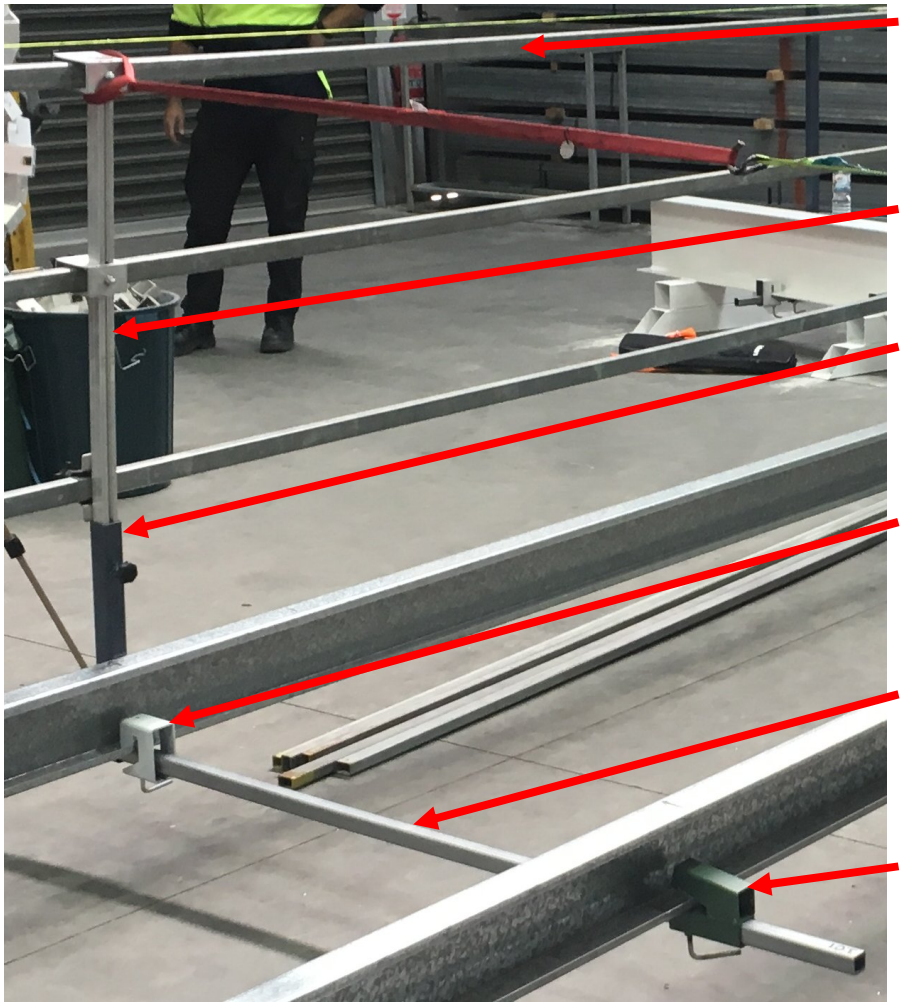
APPENDIX A – SYSTEM PHOTOS

Post with 380 mm steel base

Post with 660 mm steel base

Post support structure

APPENDIX B – MATERIAL INFORMATION



Top rail:

38x25x2mm galvanised steel square tube

Extruded aluminium post:
See Appendix C for drawing

Steel bases:
40x40x4mm mild steel square tube

C-purlin hook:
100x50x4mm mild steel square tube

Connecting tube:
30x30x3mm galvanised steel square tube

C-purlin hook:
40x40x4mm mild steel square tube

APPENDIX C – ALUMINIUM POST DRAWING