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Vipac Engineers & Scientists

Aldeck Group Pty Ltd

Test Report - Temporary Handrail Posts

30B-15-0096-TRP-393171-0

15 Mar 2016

Report Title: Test Report - Temporary Handrail Posts Job Title: Temporary Handrail Post Testing	
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EXECUTIVE SUMMARY

Vipac Engineers & Scientists (Vipac) has been commissioned by Aldeck Group Pty Ltd (the client) to undertake compliance testing on components of their temporary 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 5th February 2016.

The components were tested individually (not as a system) and were found to 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 and including 15° from the horizontal.

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

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1 INTRODUCTION

Vipac Engineers & Scientists (Vipac) has been commissioned by Aldeck Group Pty Ltd (the client) to perform to undertake performance testing on components of their temporary 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 samples tested are as described in Section 2 of this report; additional material information can be found in Appendix A and Appendix B of this report. The test specification is as presented in Section 3.

2 SAMPLES UNDER TEST

Parameter	Details
Test sample 1:	Offset bracket (Z design) with C-purlin clamp, 660mm steel base and aluminium post
Manufacturer:	Aldeck (the client)
Comments / Remarks:	Tested individually/not in a system

Figure 1: Offset bracket (Z design) with C-purlin clamp, 660mm steel base and aluminium post

Figure 2: Offset bracket (Z design) with C-purlin clamp

Parameter	Details
Test sample 2:	Gable end clamp with 660mm steel base and aluminium post
Manufacturer:	Aldeck (the client)
Comments / Remarks:	Tested individually/not in a system

Figure 3: Gable end clamp with 660mm steel base and aluminium post

Figure 4: Gable end clamp

Parameter	Details
Test sample 3:	Beam clamp with 660mm steel base, 600mm extension bar and aluminium post
Manufacturer:	Aldeck (the client)
Comments / Remarks:	Tested individually/not in a system

Figure 5: Beam clamp with 660mm steel base, 600mm extension bar and aluminium post

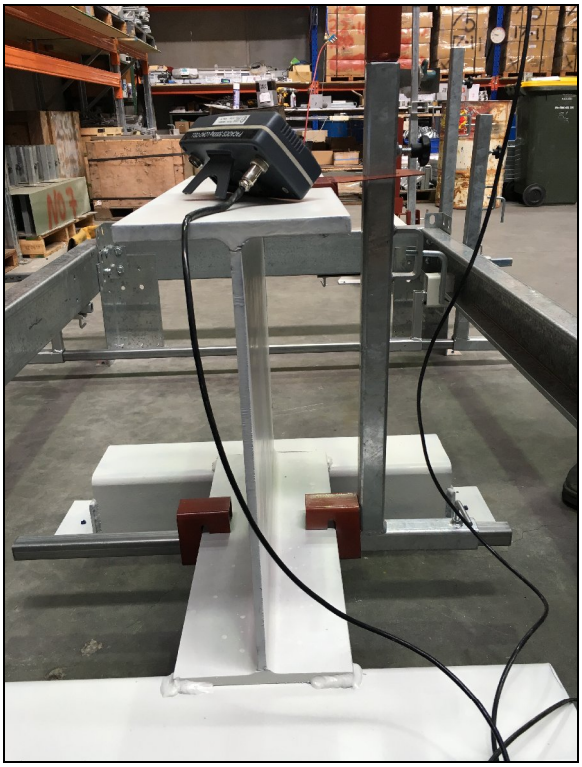


Figure 6: Beam clamp

Parameter	Details
Test sample 4:	Offset bracket (C design) with C-purlin clamp, 660mm steel base and aluminium post
Manufacturer:	Aldeck (the client)
Comments / Remarks:	Tested individually/not in a system

Figure 7: Offset bracket (C design) with C-purlin clamp, 660mm steel base and aluminium post

Figure 8: Offset bracket (C design) with C-purlin clamp

Parameter	Details
Test sample 5:	PFC beam clamp with 660mm steel base and aluminium post
Manufacturer:	Aldeck (the client)
Comments / Remarks:	Tested individually/not in a system

Figure 9: PFC beam clamp with 660mm steel base and aluminium post

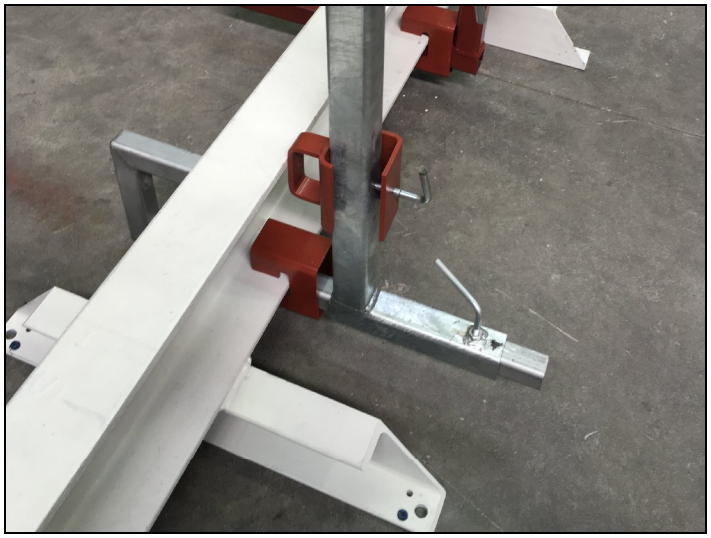


Figure 10: PFC beam clamp

Parameter	Details
Test sample 6:	Beam clamp with 660mm steel base and aluminium post
Manufacturer:	Aldeck (the client)
Comments / Remarks:	Tested individually/not in a system

Figure 11: Beam clamp with 660mm steel base and aluminium post

Figure 12: Beam clamp

Parameter	Details
Test sample 7:	Timber beam clamps with 660mm steel base and aluminium post
Manufacturer:	Aldeck (the client)
Comments / Remarks:	Tested individually/not in a system. Timber beam clamps spaced 620mm apart. Tri-Fixx type 17 screws (12 x 40mm) were used to mount the clamps (see Figure 17).

Figure 13: Timber beam clamps with 660mm steel base and aluminium post

Figure 14: Timber beam clamp

Parameter	Details
Test sample 8:	Timber beam clamp with offset bracket (C design), 660mm steel base and aluminium post
Manufacturer:	Aldeck (the client)
Comments / Remarks:	Tested individually/not in a system. Timber beam clamps spaced 620mm apart. Tri-Fixx type 17 screws (12 x 40mm) were used to mount the clamps (see Figure 17).

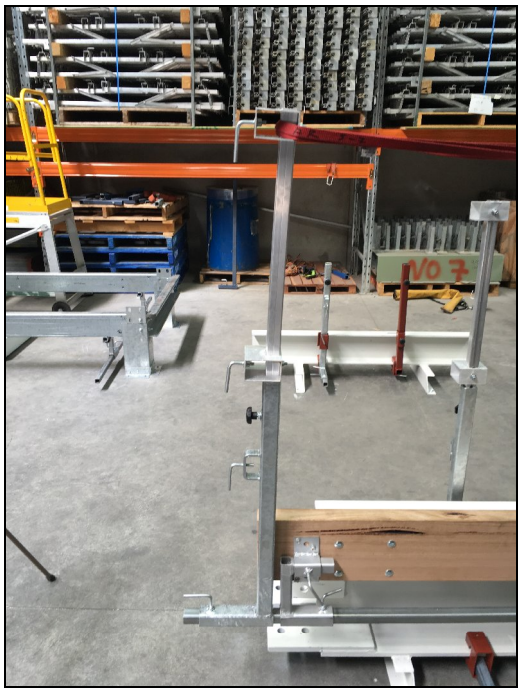


Figure 15: Timber beam clamp with offset bracket (C design), 660mm steel base and aluminium post

Figure 16: Timber beam clamp with offset bracket (C design)

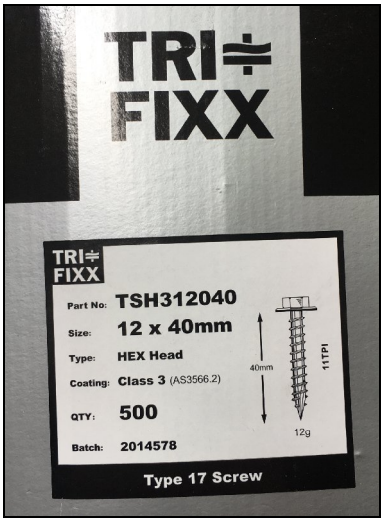


Figure 17: Tri-Fixx type 17 screws

Parameter	Details
Test sample 9:	Beam clamp with long tail 660mm steel base and aluminium post
Manufacturer:	Aldeck (the client)
Comments / Remarks:	Tested individually/not in a system. Length of tail – 450mm.

Figure 18: Beam clamp with long tail 660mm steel base and aluminium post

Figure 19: Beam clamp

3 TEST SPECIFICATION

The samples were tested in accordance with Section 4.1 and Appendix A 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 samples are to be installed only on roofs with a slope up to and including 15° from the horizontal therefore no dynamic testing was required (as per AS/NZS 4994:2009).

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

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 test samples were installed as per client specifications on custom test rigs 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 rigs as to simulate the manner of installation. Figure 20 to Figure 22 shows the test rigs.

The samples were tested in accordance with the test specification outlined in Section 3. During testing, the static load was applied each sample using lifting and ratchet straps. The load cell was installed inline with these straps to ensure the correct load was applied. Figure 23 illustrates the static load application setup. Deflection of the post was measured at the position of the top rail.

Figure 20: I-beam and timber beam test rig

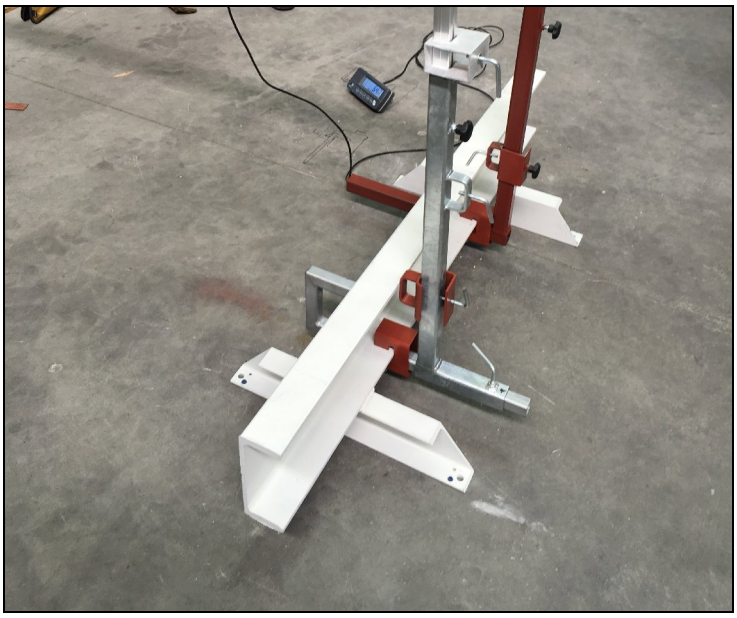


Figure 21: PFC beam test rig

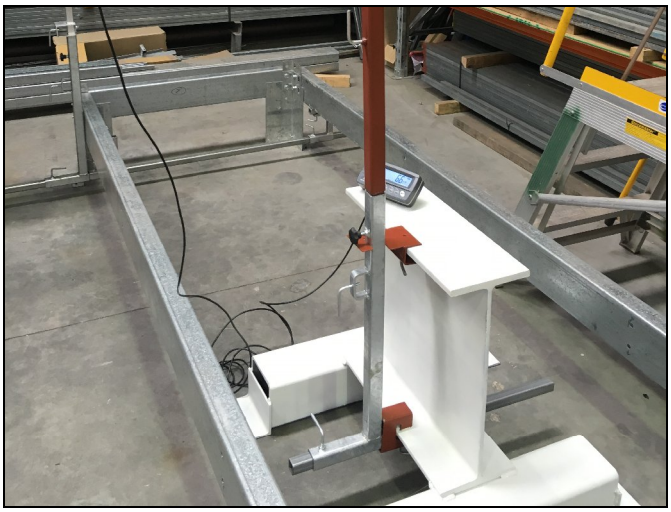


Figure 22: I-beam and C-purlin test rig

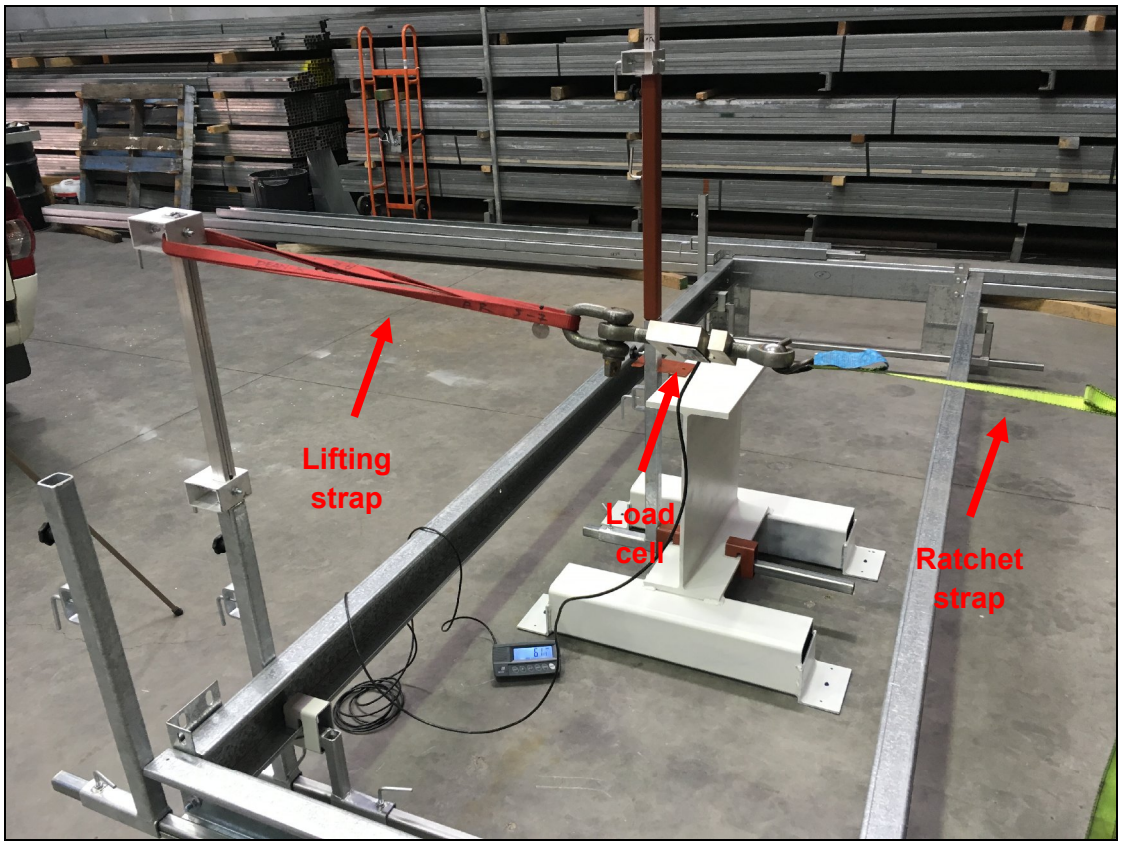


Figure 23: Static load testing setup

6 TEST RESULTS

Test Location: Aldeck Thomastown Factory

Test Date: 5/02/2016

Sample 1:	Offset bracket (Z design) with C-purlin clamp, 660mm steel base and aluminium post

Test: Static Inward

Test Standard: AS/NZS 4994.1:2009 Appendix A

Applied Load: Proof = 608.2 N

Net Deflection: 40 mm

Result: Pass – deflection less than 101 mm

Test: Static Outward

Test Standard: AS/NZS 4994.1:2009 Appendix A

Applied Load: Proof = 637.7 N, Maximum = 1206.6 N

Net Deflection: 87 mm

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

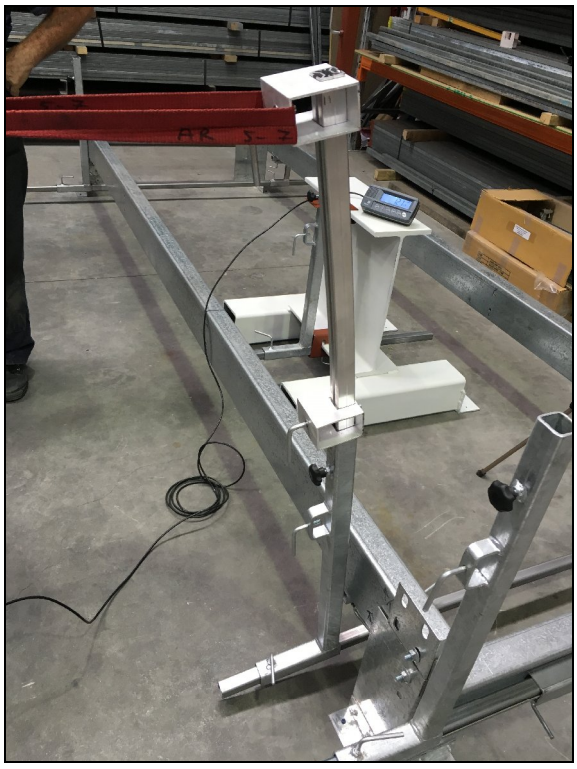


Figure 24: Sample 1 under maximum static load

Sample 2:	Gable end clamp with 660mm steel base and aluminium post

Test: Static Inward

Test Standard: AS/NZS 4994.1:2009 Appendix A

Applied Load: Proof = 608.2 N

Net Deflection: 58 mm

Result: Pass – deflection less than 101 mm

Test: Static Outward

Test Standard: AS/NZS 4994.1:2009 Appendix A

Applied Load: Proof = 667.1 N, Maximum = 1206.6 N

Net Deflection: 89 mm

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

Figure 25: Sample 2 under maximum static load

Sample 3:	Beam clamp with 660mm steel base, 600mm extension bar and aluminium post

Test: Static Inward

Test Standard: AS/NZS 4994.1:2009 Appendix A

Applied Load: Proof = 608.2 N

Net Deflection: 57 mm

Result: Pass – deflection less than 101 mm

Test: Static Outward

Test Standard: AS/NZS 4994.1:2009 Appendix A

Applied Load: Proof = 647.5 N, Maximum = 1236.1 N

Net Deflection: 74 mm

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

Figure 26: Sample 3 under maximum static load

Sample 4:	Offset bracket (C design) with C-purlin clamp, 660mm steel base and aluminium post

Test: Static Inward

Test Standard: AS/NZS 4994.1:2009 Appendix A

Applied Load: Proof = 627.8 N

Net Deflection: 50 mm

Result: Pass – deflection less than 101 mm

Test: Static Outward

Test Standard: AS/NZS 4994.1:2009 Appendix A

Applied Load: Proof = 608.2 N, Maximum = 1206.6 N

Net Deflection: 78 mm

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

Figure 27: Sample 4 under maximum static load

Sample 5:	PFC beam clamp with 660mm steel base and aluminium post

Test: Static Inward

Test Standard: AS/NZS 4994.1:2009 Appendix A

Applied Load: Proof = 627.8 N

Net Deflection: 43 mm

Result: Pass – deflection less than 101 mm

Test: Static Outward

Test Standard: AS/NZS 4994.1:2009 Appendix A

Applied Load: Proof = 618.0 N, Maximum = 1206.6 N

Net Deflection: 96 mm

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

Figure 28: Sample 5 under maximum static load

Sample 6:	Beam clamp with 660mm steel base and aluminium post

Test: Static Inward

Test Standard: AS/NZS 4994.1:2009 Appendix A

Applied Load: Proof = 627.8 N

Net Deflection: 63 mm

Result: Pass – deflection less than 101 mm

Test: Static Outward

Test Standard: AS/NZS 4994.1:2009 Appendix A

Applied Load: Proof = 608.2 N, Maximum = 1206.6 N

Net Deflection: 61 mm

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

Figure 29: Sample 6 under maximum static load

Sample 7:	Timber beam clamps with 660mm steel base and aluminium post

Test: Static Inward

Test Standard: AS/NZS 4994.1:2009 Appendix A

Applied Load: Proof = 608.2 N

Net Deflection: 80 mm

Result: Pass – deflection less than 101 mm

Test: Static Outward

Test Standard: AS/NZS 4994.1:2009 Appendix A

Applied Load: Proof = 637.7 N, Maximum = 1206.6 N

Net Deflection: 79 mm

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

Figure 30: Sample 7 under maximum static load

Sample 8:	Timber beam clamp with offset bracket (C design), 660mm steel base and aluminium post

Test: Static Inward

Test Standard: AS/NZS 4994.1:2009 Appendix A

Applied Load: Proof = 637.7 N

Net Deflection: 89 mm

Result: Pass – deflection less than 101 mm

Test: Static Outward

Test Standard: AS/NZS 4994.1:2009 Appendix A

Applied Load: Proof = 608.2 N, Maximum = 1206.6 N

Net Deflection: 69 mm

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

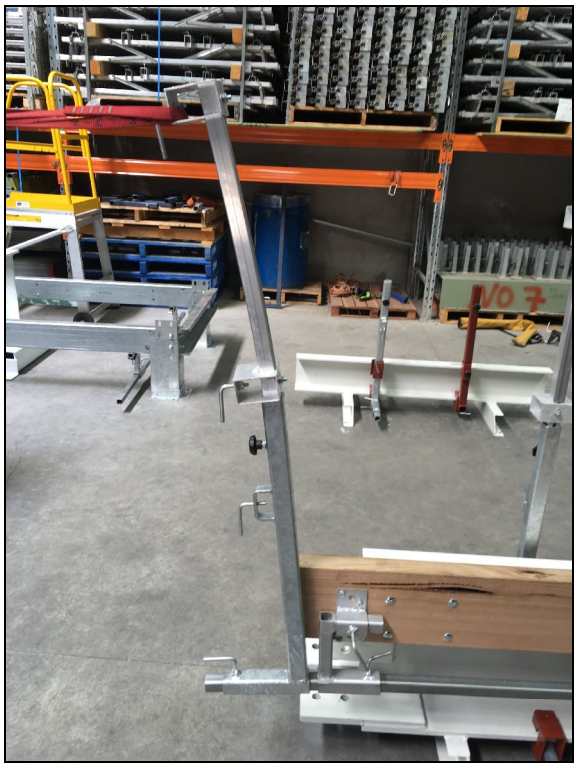


Figure 31: Sample 8 under maximum static load

Sample 9:	Beam clamp with long tail 660mm steel base and aluminium post

Test: Static Inward

Test Standard: AS/NZS 4994.1:2009 Appendix A

Applied Load: Proof = 618.0 N

Net Deflection: 41 mm

Result: Pass – deflection less than 101 mm

Test: Static Outward

Test Standard: AS/NZS 4994.1:2009 Appendix A

Applied Load: Proof = 618.0 N, Maximum = 1216.4 N

Net Deflection: 79 mm

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

Figure 32: Sample 9 under maximum static load

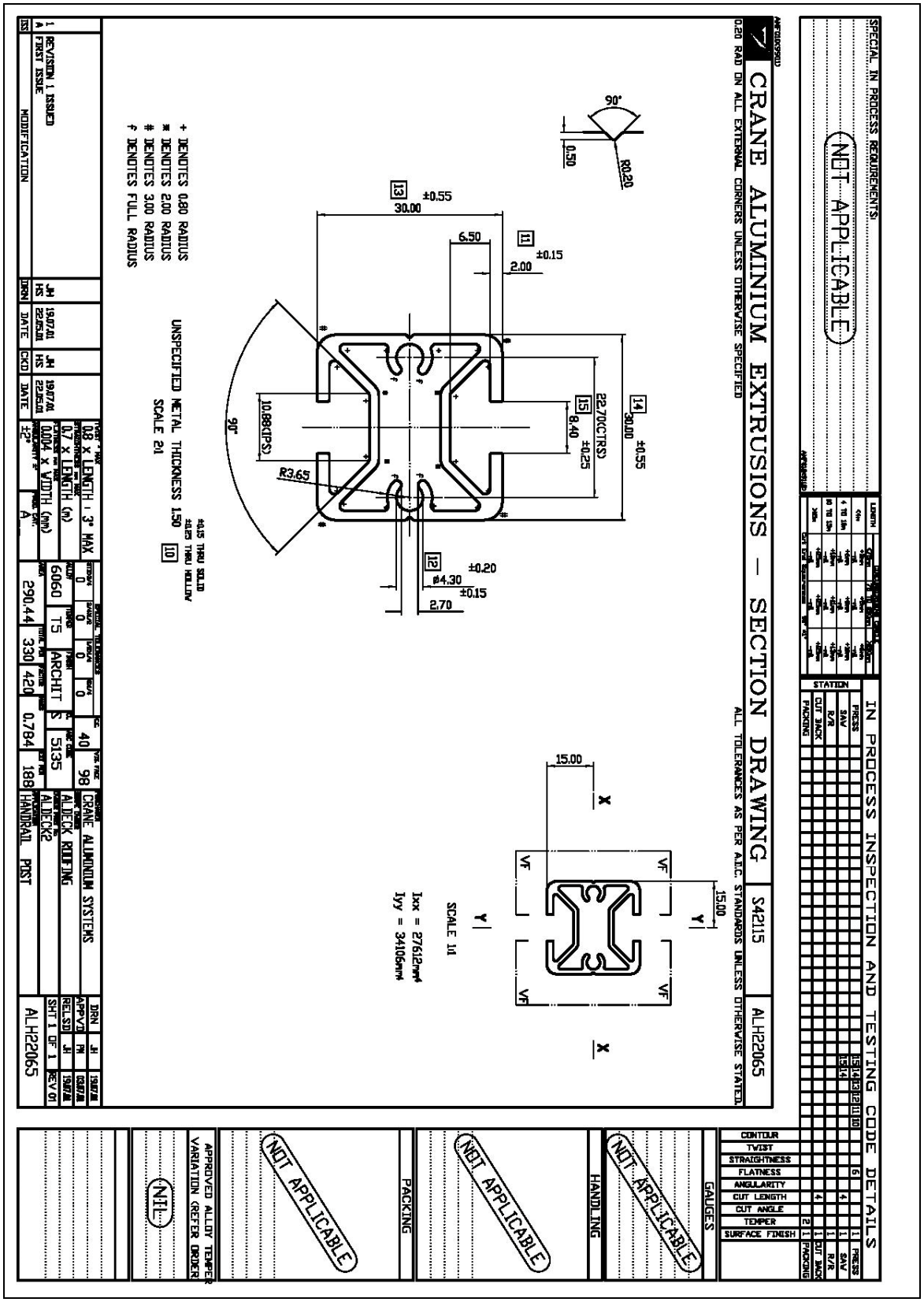
7 CONCLUSION

Vipac carried out performance testing on components of a temporary perimeter handrail system in accordance with Section 4.1 and Appendix A of AS/NZS 4994.1:2009 *Temporary edge protection Part 1: General requirements* as directed by Aldeck Group Pty Ltd. Table 3 summarises the components tested and the results of each test (when tested as a component only not as a system). The results from all components tested indicate they comply with the requirements outlined in Section 4.1 of AS/NZS 4994.1:2009 for use on roofs with a slope up to and including 15° from horizontal.

Sample	Description	Test Standard	Result
1	Offset bracket (Z design) with C-purlin clamp, 660mm steel base and aluminium post	AS/NZS 4994.1:2009 Appendix A	Pass
2	Gable end clamp with 660mm steel base and aluminium post	AS/NZS 4994.1:2009 Appendix A	Pass
3	Beam clamp with 660mm steel base, 600mm extension bar and aluminium post	AS/NZS 4994.1:2009 Appendix A	Pass
4	Offset bracket (C design) with C-purlin clamp, 660mm steel base and aluminium post	AS/NZS 4994.1:2009 Appendix A	Pass
5	PFC beam clamp with 660mm steel base and aluminium post	AS/NZS 4994.1:2009 Appendix A	Pass
6	Beam clamp with 660mm steel base and aluminium post	AS/NZS 4994.1:2009 Appendix A	Pass
7	Timber beam clamps with 660mm steel base and aluminium post	AS/NZS 4994.1:2009 Appendix A	Pass
8	Timber beam clamp with offset bracket (C design), 660mm steel base and aluminium post	AS/NZS 4994.1:2009 Appendix A	Pass
9	Beam clamp with long tail 660mm steel base and aluminium post	AS/NZS 4994.1:2009 Appendix A	Pass

Table 3: Summary of test results

APPENDIX A – ALUMINIUM POST MATERIAL INFORMATION



APPENDIX B – MATERIAL INFORMATION

Sample	Part	Material
1	Offset bracket (Z design)	40x40x4mm and 30x30x3mm galvanised steel tube
	C-purlin clamp	100x50x4mm mild steel tube
	660mm steel base	40x40x4mm mild steel tube
	Aluminium post	See Appendix A
	Connecting tube	30x30x3mm galvanised steel tube
2	Gable end clamp	50x50x5mm mild steel tube
	660mm steel base	40x40x4mm mild steel tube
	Aluminium post	See Appendix A
	Connecting tube	30x30x3mm galvanised steel tube
3	Beam clamp	100x50x4mm mild steel tube
	660mm steel base	40x40x4mm mild steel tube
	600mm extension bar	40x40x4mm mild steel tube
	Base mid support	50x50x5mm mild steel tube
	Aluminium post	See Appendix A
	Connecting tube	30x30x3mm galvanised steel tube
4	Offset bracket (C design)	40x40x4mm and 30x30x3mm galvanised steel tube
	C-purlin clamp	100x50x4mm mild steel tube
	660mm steel base	40x40x4mm mild steel tube
	Aluminium post	See Appendix A
	Connecting tube	30x30x3mm galvanised steel tube

5	Beam clamp	100x50x4mm mild steel tube
	660mm steel base	40x40x4mm mild steel tube
	Aluminium post	See Appendix A
	J-bar	30x30x3mm galvanised steel tube
6	Beam clamp	100x50x4mm mild steel tube
	660mm steel base	40x40x4mm mild steel tube
	Aluminium post	See Appendix A
	Connecting tube	30x30x3mm galvanised steel tube
7	Timber beam clamps	3mm mild steel plate and 40x40x4mm mild steel tube
	660mm steel base	40x40x4mm mild steel tube
	Aluminium post	See Appendix A
	Connecting tube	30x30x3mm galvanised steel tube
8	Timber beam clamps	3mm mild steel plate and 40x40x4mm mild steel tube
	Offset bracket (C design)	40x40x4mm and 30x30x3mm galvanised steel tube
	660mm steel base	40x40x4mm mild steel tube
	Aluminium post	See Appendix A
	Connecting tube	30x30x3mm galvanised steel tube
9	Beam clamp	100x50x4mm mild steel tube
	Long tail 660mm steel base	40x40x4mm mild steel tube
	Aluminium post	See Appendix A

Table 4: Summary of component materials