Test Report

AZUMA
Design

Balustrade

Client – Sentrel

Product – I-Rail

Tested By

Azuma Design Pty Ltd

AZT0130.20

Nata Accredited Laboratory No. 15147

Test results in this report are relevant only to the sample tested

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards

1 Customer Requirements

To test the sample as per loads specified in `Clause 3.6, Table 3.3 of AS1170.1- 2002' and combination factors as specified in Clause 4.2 of AS/NZS 1170.0:2002 by the test methods specified in Appendix B of AS1657-2018.

2 Referenced Standards

- AS/NZS 1170.0:2002 Structural design actions - General principles (Clause 4.2 and Appendix B - Table B1)
- AS/NZS 1170.1:2002 Structural design actions- Permanent, imposed and other actions (Clause 3.6, Table 3.3)
- AS/NZS 1170.1 Supp 1:2002 Structural design actions - Permanent, imposed and other actions - Commentary (Supplement to AS/NZS 1170.1:2002) (C3.6 Barriers)
- AS1657-2018 Fixed platforms, walkways, stairways and ladders- Design, construction and installation (Appendix B + C)

3 Result Summary

Load Type	Deflection	Permanent Deflection	Breakage
Concentrated Loads			
Serviceability (600 N) - Outwards	12 mm	1 mm	Nil
Ultimate (1080 N) – Outwards	20 mm	0 mm	Nil
Serviceability (600 N) – Downwards	3 mm	0 mm	Nil
Ultimate (1080 N) - Downwards	7 mm	1 mm	Nil
Uniformly Distributed Loads			
Serviceability Vertical (750 N/m)	7 mm	0 mm	Nil
Ultimate Vertical (750 N/m)	11 mm	0 mm	Nil
Serviceability Horizontal (750 N/m)	21 mm	8 mm	Nil
Ultimate Horizontal (750 N/m)	43 mm	11 mm	Nil

Serviceability Requirements – Maximum allowable deflection for this test specimen is, as per AS/NZS1170.0 (Sup):

$$\frac{height}{60} + \frac{length}{240} = \frac{1010}{60} + \frac{2700}{240} = 28.083\ mm$$

Ultimate Requirements – No structural damage to the test specimen. Deflection is measured for reference only.

4 Test Sample Description

4.1 General

Model No./Name	I – Rail (2700)
Customer	Sentrel
Address	46 Commerce St, Wauchope NSW 2446
Azuma Testing Number	AZT0130.20
Date of Test	15/04/2020
Overall Size	2830 mm (Length) x 1010 mm (Height)
Test Sample Description	Aluminium fencing panel with vertical stainless steel pickets which lock into the top and bottom rails. Two end posts with cradle brackets and caps hold the panel. The posts have welded on base plates with full edge welds. Base plate is fixed to concrete with 4 off hex head bolts per post.

4.2 Barrier

Material	Top and Bottom Rail: 6005A T5 Aluminium Pickets: 316 Stainless Steel
Panel Size	2700 mm (Width) x 880 mm (Height)
Size of Elements	Top and Bottom Rail: 75 x 40 x 3 mm (Extrusion) Pickets : 12.7 x 1.2 mm (Round Tube)
Gap between bottom of barrier and ground level	90 mm

4.3 Posts

Material	6063 T5 Aluminium
Overall Dimensions	65 mm (Width) x 65 mm (Depth) x 1010 mm (Height)
Base Plate (if applicable)	110 mm (Width) x 110 mm (Depth) x 5 mm (Thickness)
Drawing Supplied	See Attached (Provided by Customer)
Fixing Method	Per post 4 X Bolt M6 x 75 mm Hex head
Substrate	Concrete
Spacing Between Posts	2732 mm

4.4 Handrail

Product No./Name	Aluminium Handrail
Material	6063 T5 Aluminium
Overall Dimensions	80 mm (Depth) x 32 mm (Height)x 2.5 mm (Thickness) x 2700 mm (Length)
Fixing Method to Panel	Snap on to top panel
Fixing Method at Ends	Held in brackets

4 Barrier Loads

4.1 Procedure

From AS1657-2018 Fixed platforms, walkways, stairways and ladders- Design, construction and installation:

Appendix B for Concentrated and Uniform Loads –

1. Preload the test sample as specified to half the required load.
2. Remove the preload force and record the datum.
3. Gradually increase the force acting on the midspan of the rail until the imposed action is reached. Hold the test force for 300 seconds.
4. Record the deflection at the midspan at the loading point.
5. Remove the test force and after 2 minutes record the permanent deflection reading.

Appendix C for Infill Loads –

1. Apply to the centre of the infill over an area of 300 mm x 300 mm a preload of half the required load horizontally outwards from the direction of the platform. The preload shall be applied for a period of not less than 60 seconds.
2. Remove the preload and measure and record the distance from the centre of the infill to the datum point.
3. Apply horizontally outwards to the centre of the infill over an area of 300 mm x 300 mm (for a point load) or the panel area (for a wind/pressure load) the required load. The load shall be applied for a period of not less than 300 seconds.
4. With the load applied, measure the horizontal distance from the centre of the infill to the datum point.
5. Remove the load and inspect the infill and supporting components for any permanent deformation or failure.
6. Remove the test force and after 2 minutes record the permanent deflection reading.

4.2 Testing Parameters

4.2.1 Multipliers

Combination Factor, $\mathbf{E}_d$, (AS/NZS 1170.0 Section 4)	1.5

4.2.2 Calculations

4.2.2.1 Serviceability Deflection Criteria

The following maximum deflection limits apply to this product:

$$\frac{height}{60} + \frac{length}{240} = \frac{1010}{60} + \frac{2700}{240} = 28.083\,mm$$

This value is only applicable while it remains less than 30 mm, otherwise 30 mm is maximum allowable deflection.

4.2.2.2 Concentrated Strength Calculation

The required concentrated load for the balustrade panel is:

$$Force\ (N) = Imposed\ Action\ (N)\ * Combination\ Factor$$

4.2.2.3 Uniform Strength Calculation

The required uniformly distributed load for the balustrade panel is:

$$Force\ (N) = Imposed\ Action\ (N/m)\ * Width\ (m) * Combination\ Factor$$

4.2.2.4 Wind Load Strength Calculation (Infill Barrier Only)

The required wind load for the balustrade panel is:

$$Force\ (N) = Pressure\ (Pa)\ * Area\ (m^2) * Combination\ Factor$$

5 Results

5.1 Concentrated Load

5.1.1 Serviceability

Load Location		Centre of the Top Rail		
Direction	**Load Applied**	**Datum**	**Reading During Load**	**Permanent Deflection**
Outwards	600 N	283 mm	271 mm	282 mm
Notes: Nil				
Downwards	600 N	1006 mm	1003 mm	1006 mm
Notes: Nil				

5.1.2 Ultimate

Load Location		Centre of the Top Rail		
Load Type	**Load Applied**	**Datum**	**Reading During Load**	**Permanent Deflection**
Outwards	1080 N	282 mm	262 mm	282 mm
Any damage, signs of breakage or fracture observed		Nil		
Notes: Nil				
Downwards	1080 N	1006 mm	999 mm	1005 mm
Any damage, signs of breakage or fracture observed		Nil		
Notes: Nil				

Figure 1: Serviceability Outwards Load

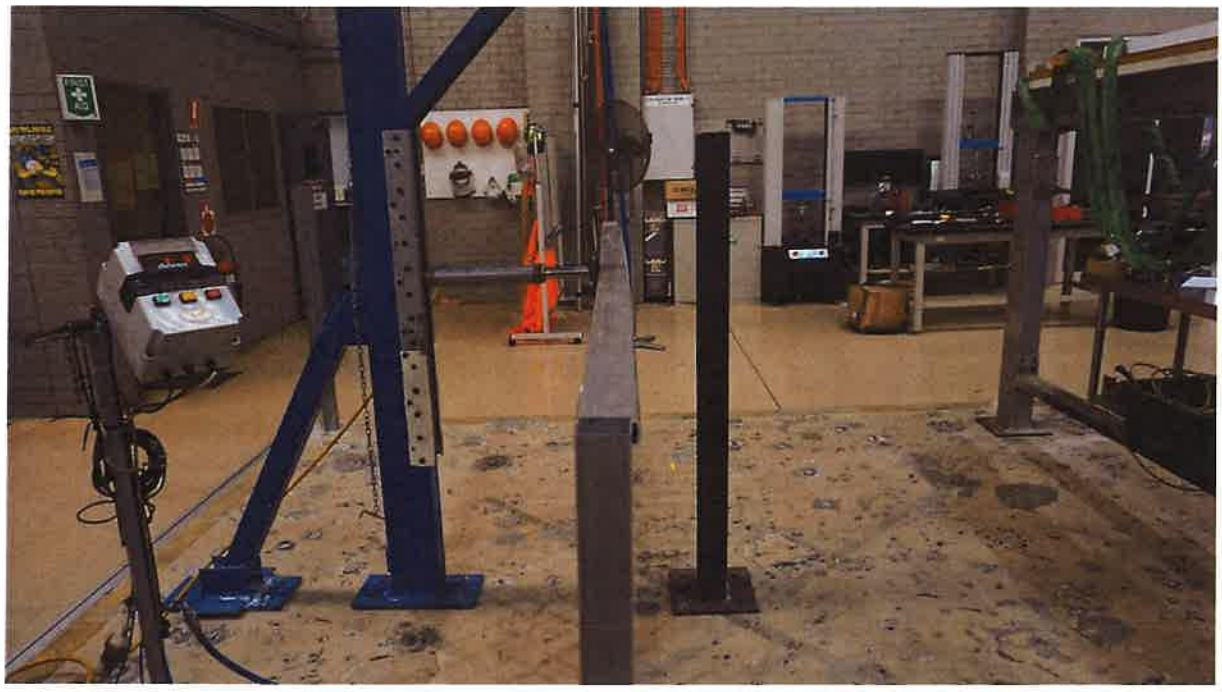


Figure 2: Ultimate Outwards Load

Figure 3: Serviceability Downwards Load

Figure 4: Ultimate Downwards Load

5.2 Uniform Load

5.2.1 Serviceability

Width of Uniform Load		2700 mm			
Load Location		Along top rail			
Direction	**Uniformly Distributed Load**	**Load Applied**	**Datum**	**Reading During Load**	**Permanent Deflection**
Vertical	350 N/m				
	750 N/m	2025 N	1006 mm	999 mm	1006 mm
Notes: Nil					
Horizontal	350 N/m				
	750 N/m	2025 N	290 mm	269 mm	282 mm
	1500 N/m				
	3000 N/m				
Notes: Nil					

5.2.2 Ultimate

Width of Uniform Load		2700 mm		
Load Location		Along top rail		
Load Type	**Load Applied**	**Datum**	**Reading During Load**	**Permanent Deflection**
Vertical	3037.5 N	1006 mm	995 mm	1006 mm
Any damage, signs of breakage or fracture observed		Nil		
Notes: Nil				
Horizontal	3037.5 N	282 mm	239 mm	271 mm
Any damage, signs of breakage or fracture observed		Nil		
Notes: Nil				

Figure 5: Serviceability Uniform Vertical Load

Figure 6: Ultimate Uniform Vertical Load

Figure 7: Serviceability Uniform Horizontal Load

Figure 8: Ultimate Uniform Horizontal Load

6 Conclusion and Signatories

6.1 Conclusion

From the results achieved the sample is deemed to satisfy the loading requirements as per table 3.3 of AS1170.1- 2002 for the following classification:

- for a Category 'A' Domestic and residential activities - Other Residential (See C3);
- for a Category 'B, E' Offices and work areas not included elsewhere including storage areas - Fixed platforms, walkways, stairways and ladders for access (see NOTE 2).
- for a Category 'C3' Areas without obstacles for moving people and not susceptible to over-crowding - Stairs, landings, external balconies, edges of roofs, etc.

NOTE: All classifications with equal or lower load specifications may be applied to this sample. For more information as to their specific use please see table 3.3 of AS1170.1 - 2002.

NOTE 2: This usage (under B,E) is for access to and safe working places normally used by operating, inspection, maintenance and servicing personnel.

Results relate only to the item tested.

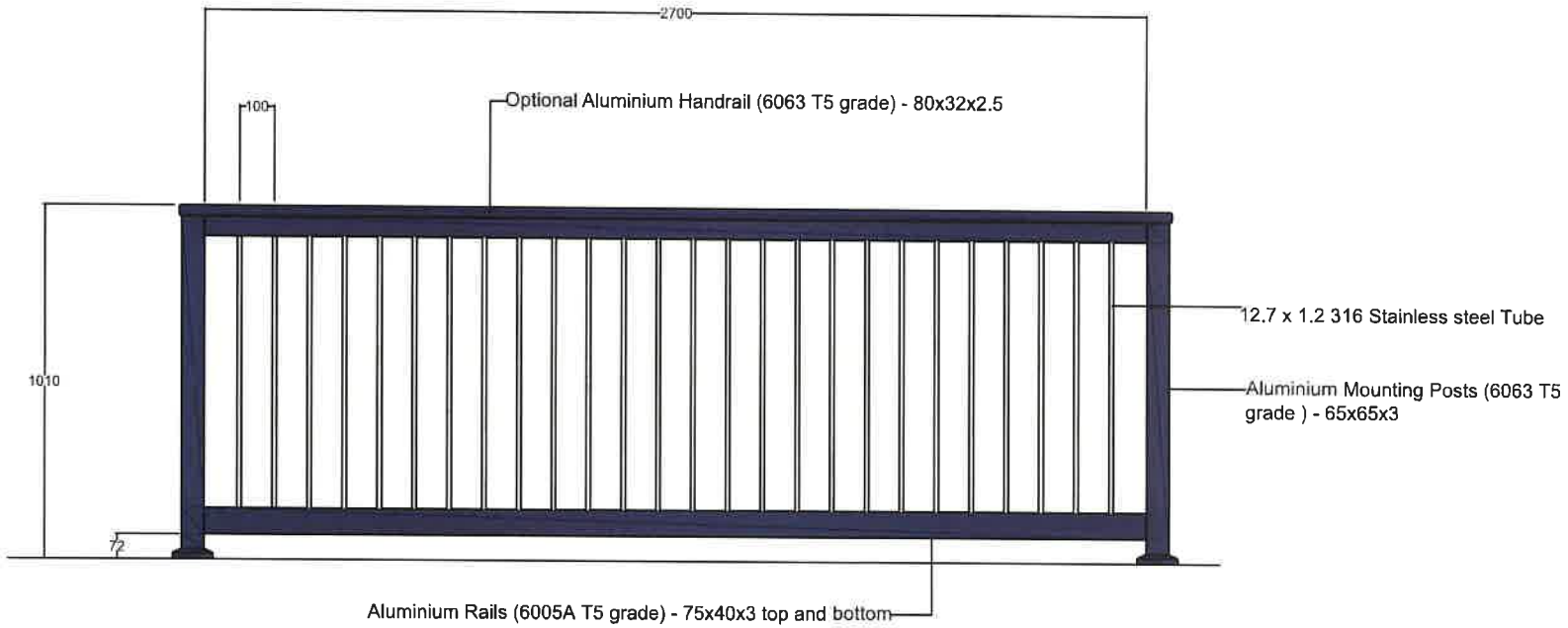
6.2 Signatories

Tested By: Ash Horne

Signature: AHorne

Date: 15/04/2020

END OF REPORT



Sentrel iRail System