Test Report

AZUMA
Design

Balustrade

Client – Sentrel

Product – Timber Cable Balustrade

Tested By

Azuma Design Pty Ltd

AZT0257.20

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 + C 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/NZS1170.1:2002 Structural design actions- Permanent, imposed and other actions (Clause 3.6, Table 3.3)
- 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	11.77 mm	0.58 mm	Nil
Ultimate (900 N) – Outwards	18.61 mm	1.34 mm	Nil
Serviceability (600 N) – Downwards	5 mm	0 mm	Nil
Ultimate (900 N) – Downwards	8 mm	0 mm	Nil
Uniformly Distributed Loads			
Serviceability Vertical (750 N/m)	8 mm	0 mm	Nil
Ultimate Vertical (1125 N/m)	13 mm	0 mm	Nil
Serviceability Horizontal (750 N/m)	24.84 mm	3.28 mm	Nil
Ultimate Horizontal (1125 N/m)	44 mm	15 mm	Nil

Serviceability Requirements – Maximum allowable deflection for this test specimen is 26.89 mm as per AS1288.
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	Sentrel Timber Balustrade Panel
Customer	Sentrel
Address	PO BOX 122 Bellingen NSW 2454
Azuma Testing Number	AZT0257.20
Date of Test	23/06/2020
Overall Size	2895 mm (Width) x 1020 mm (Height)
Test Sample Description	Vertical tensioned cable balustrade panel. Spotted Gum horizontal rails with stainless cable infill and 5 x 25.4 mm tube spacing poles. Fixed between posts with Sentrel brackets. Timber handrail fixed to top of timber panel.

4.2 Barrier

Material	Spotted Gum Structure, Stainless Steel Wire, Poles
Panel Size	2755 mm (Width) x 925 mm (Height)
Material Size	Timber (Top Rail) – 42 mm (Width) x 70 mm (Height) Timber (Bottom Rail) - 42 mm (Width) x 67 mm (Height)
Handrail Used	Yes
Gap between bottom of barrier and ground level	93 mm
Wire Detail	316 Stainless Steel, 2.5 mm 7 x 7 lay
Wire Tension	1700 Nm
Spacing Between Wire	64 mm
Vertical Tube Spacing	576 mm and 588.5 mm
Vertical Tube Diameter	25.4 mm at 1.2 mm thickness

4.3 Posts

Product No./Name	Welded Base Post
Material	Aluminium
Overall Dimensions	65 mm (Width) x 65 mm (Depth) x 1185 mm (Height)
Base Plate (if applicable)	113 mm (Width) x 113 mm (Depth) x 10 mm (Thick)
Drawing Supplied	No
Fixing Method	4 off M6 x 75 mm (Length) anchor screws in 10 mm holes
Substrate	Concrete
Spacing Between Posts	3255 mm

4.4 Handrail

Product No./Name	Timber Handrail
Material	Spotted Gum
Overall Dimensions	2753 mm (Length) x 30 mm (Height) x 90 mm Width)
Fixing Method to Panel	Screw Fixed
Fixing Method at Ends	Not Fixed

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
Variation Factor, $\mathbf{k_t}$, (AS/NZS 1170.0 Appendix B, Table B1) Only Applicable for **Prototype** Balustrades	N/A

4.2.2 Calculations

4.2.2.1 Serviceability Deflection Criteria

The following maximum deflection limits apply to this product:

$$\frac{Height}{60} + \frac{Width}{240} = \frac{925}{60} + \frac{2755}{240} = 26.89\ mm$$

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 glass panel is:

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

4.2.2.3 Uniform Strength Calculation

The required uniformly distributed load for the glass panel is:

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

4.2.2.4 Wind Load Strength Calculation (Infill Barrier Only)

The required wind load for the glass panel is:

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

5 Results

5.1 Concentrated Load

5.1.1 Serviceability

Load Location		Centre of top rail		
Direction	**Load Applied**	**Datum**	**Reading During Load**	**Reading After Load**
Outwards	600 N	0.46 mm	12.23 mm	1.04 mm
Notes: Nil				
Downwards	600 N	1005 mm	1000 mm	1005 mm
Notes: Nil				

5.1.2 Ultimate

Load Location		Centre of top rail		
Load Type	**Load Applied**	**Datum**	**Reading During Load**	**Reading After Load**
Outwards	900 N	1.04 mm	19.65 mm	2.38 mm
Any damage, signs of breakage or fracture observed		Nil		
Notes: Nil				
Downwards	900 N	1005 mm	997 mm	1005 mm
Any damage, signs of breakage or fracture observed		Nil		
Notes: Nil				

Figure 1: Outwards Ultimate Load

Figure 2: Downwards Ultimate Load

5.2 Uniform Load

5.2.1 Serviceability

Width of Uniform Load		2753 mm			
Load Location		Top Rail			
Direction	Uniformly Distributed Load	Load Applied	Datum	Reading During Load	Reading After Load
Vertical	350 N/m				
	750 N/m	2062.5 N	1005 mm	997 mm	1005 mm
Notes: Nil					
Horizontal	350 N/m				
	750 N/m	2062.5 N	0.57 mm	25.41 mm	3.85 mm
	1500 N/m				
	3000 N/m				
Notes: Nil					

5.2.2 Ultimate

Width of Uniform Load		2753 mm		
Load Location		Top Rail		
Load Type	Load Applied	Datum	Reading During Load	Reading After Load
Vertical	3093.73 N	1005 mm	992 mm	1005 mm
Any damage, signs of breakage or fracture observed		Nil		
Notes: Nil				
Horizontal	3093.73 N	227 mm	183 mm	212 mm
Any damage, signs of breakage or fracture observed		Nil		
Notes: Nil				

Figure 3: Vertical Uniform Ultimate Load

Figure 4: Horizontal Uniform Ultimate 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.

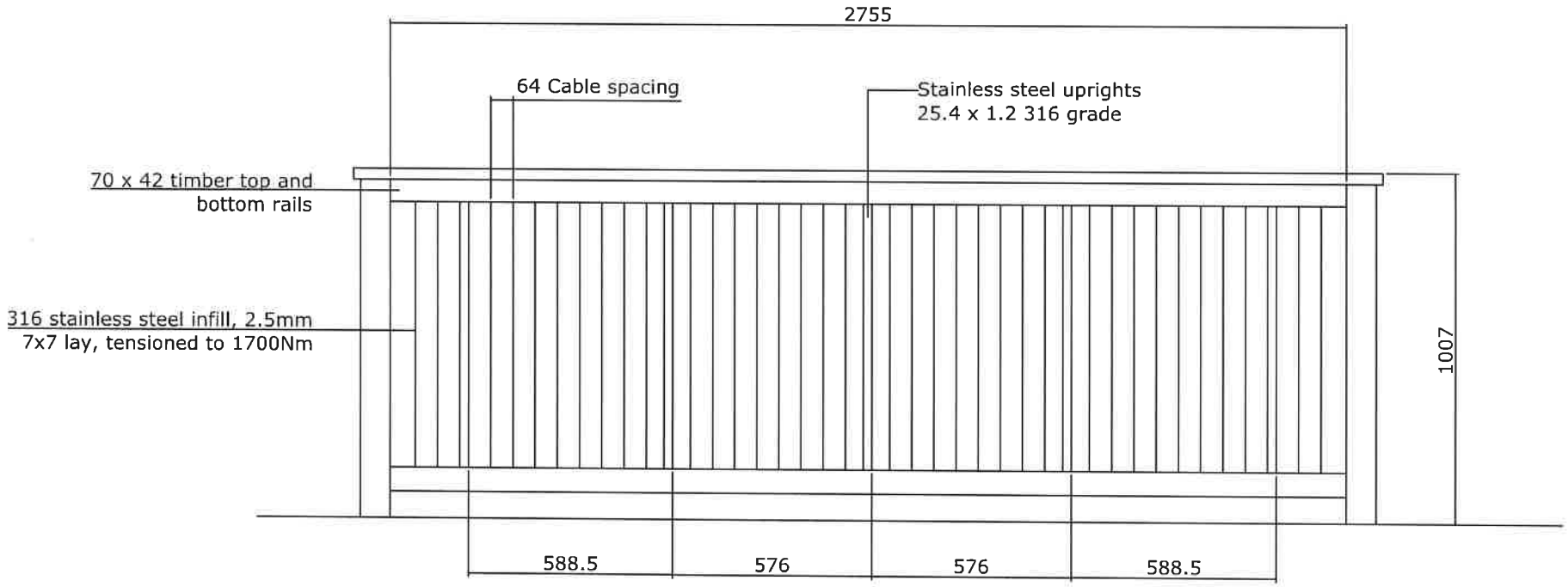
6.2 Signatories

Tested By: Ash Horne

Signature: AHorne

Date: 23/06/2020

END OF REPORT



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