TECHNICAL REPORT

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Our Ref:	**TRELF83679**
Date:	28 November 2018
Delivery Date:	16 November 2018
Test Dates:	26 - 27 November 2018

For the attention of Simon Mitchell

SAMPLE(S) FOR TEST:

3000mm Redwood Juliet Balcony

TEST REQUIREMENTS:	**RESULT:**
BS 6180:2011: Barriers in and about buildings – Code of practice - Domestic applications (ii) – Clause 6.4.1	PASS

FIRA International Ltd
Registered office: 6 Coronet Way, Centenary Park, Eccles, M50 1RE, UK
Registered in England No: 3181481

TEST PROCEDURE

The horizontal balustrade is laid horizontally and mounted in a universal test rig with both ends fully supported by and clamped to Aluminium channel sections.

Balustrade Handrail Stiffness Test

A uniformly distributed load is applied to the handrail using hydraulic rams and a calibrated compression load cell.

It has been found that in general the aforementioned test method causes balustrades to deflect by amounts greater than the 25mm required by the standard. However in such cases the increased deflection does not necessarily present a safety hazard to the user, as the balustrade remains intact. In such cases the BM TRADA Certification Ltd Balustrade Product Conformity Scheme states that, where the aforementioned deflection limit is exceeded, the unit will be deemed to have satisfied the requirements of the scheme provided that it is capable of passing the strength of handrail test. See Annex A.

Handrail Strength Test

A uniformly distributed load is applied to the handrail using hydraulic rams and a calibrated compression load cell. The load is maintained for a period of 15 minutes, at the end of which the balustrade is inspected for structural damage.

In-fill strength

A uniformly distributed load is applied to the handrail using calibrated weights and load bags laid on top of a foam sheet, which rests on the in-fill. The load is maintained for a period of 15 minutes, at the end of which the balustrade is inspected for structural damage. Experience has shown that if the in-fill can sustain the load when it is initially applied, then unless there is visual movement or lots of cracking noises at the fixings it not necessary to hold the load for 15 minutes.

Baluster Strength

The point load is applied thought the application of calibrated weights and load bags hung from a hook in the middle of the baluster. Five balusters are subjected to the testing to establish consistency. Experience has shown that if the in- fill can sustain the load when it is initially applied, then unless there is visual movement or lots of cracking noises at the fixings it not necessary to hold the load for 15 minutes, at the end of which the balustrade is inspected for structural damage.

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UNIT DESCRIPTION

3000mm Redwood Juliet Balcony unit with handrail and bottom rail, mounting points/plates. Infill consists of metal spindles.

Overall Dimensions: 3000mm Wide x 1100mm High

To be tested to domestic (ii) 0.74Kn

Qty	Item	Material
1	Handrail	40mm x 12mm Metal
2	Mid/Bottom Rail	40mm x 10mm Metal
29	Spindles	10mm Ø Metal
5	Mounting Plates	51mm x 6mm Metal

All dimensions are approximate.

PRECONDITIONING AND MOISTURE CONTENT

FIRA cannot validate date of manufacture and therefore it is assumed that at least 4 weeks has elapsed between date of manufacture and delivery to FIRA.
Unless otherwise stated on the first page of this report the sample was stored in indoor ambient conditions for at least the minimum duration as required by this standard prior to test. Wherever possible timber moisture content is verified prior to test. Where this is not possible the moisture content is assumed to be in the range 8 – 12 %.

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TEST RESULTS

BS 6180:2011, Clause 6.4.1 Balustrade horizontal deflection test

Item: 3000mm Redwood Juliet Balcony

Test Level: Domestic Applications (ii)

Initial Inspection: No apparent faults

The tests required were carried out in accordance with the standard. Where applicable details of the loads applied and their positions of application are retained at FIRA and are available on request. Structural testing machines are set to operate at the tolerances stated in the standard. Uncertainty of Measurement calculations have not been applied. FIRA Uncertainty of Measurement values are available on request.

Load Table

	Domestic Level (ii)	Design Load x BS 5268-2:2002 Safety Factor
Load per Meter	0.74 KN/m	01.66 KN/m
UDL Required	1998N	Not required
UDL Achieved	1998N	Not required
UDL to In-fill	1.0 kN/m^2	Not required
PL Balusters Required	0.5 kN	Not required
PL Balusters Achieved	0.5 kN	Not required

Results Table

	Test Requirements		Result – Domestic level (ii)
Handrail stiffness	Design load	Initial loading	73mm
		Deflection	Pass – 25mm
Handrail strength	BS 5268-2:2002	Initial loading	Not required
		After 15 mins	Not required
In-fill strength	Design load	Initial loading	Not required
Strength of Balusters		Initial loading	Pass – 50Kg per Baluster (x5)

In extreme weather conditions the ambient test temperature and/or humidity may fall outside the requirements of the standard. Such changes have not been shown to affect the validity of the results. Details of the ambient conditions at time of test are available on request.

CONCLUSION

When tested, the 3000mm Redwood Juliet Balcony Supplied by Panel UK Ltd satisfied the selected combined rules of BS 6180:2011: Barriers in and about buildings.

The 3000mm Redwood Juliet Balcony is therefore considered to be suitable for domestic (ii) applications.

See Annex B.

Tested by: James Moore

Reported by: James Moore

Approved by: Paul Soley

Deputy Operations Manager

ANNEX A

Test Requirements

HAND RAIL TEST

Stiffness test

Initially a stiffness test is to be carried out by applying the test loads for 15 minutes checking that the net deflection of the handrail at mid length between supports is less than 25mm. In accordance with BS 6180: 2011, the test loads were taken from table 2. These are based on the type of occupancy for part of the building structure. See Annex B.

The net handrail deflection is defined as:

$d_{h,net}$ = $d_{h,total} – d_{newel} - d_{stringer}$, where

$d_{h,total}$ = Total deflection at mid span of handrail in the direction of the load

d_{newel} = Deflection of the newel in the direction of the load. Deflection is to be measured at the crossing point between centreline of hand rail and centre line of newel.

$d_{stringer}$ = Deflection of mid span of the stringer in the direction of load. Deflection is to be measured at mid span of the stringer. This measurement is not applicable to balustrades with cut stringers (raised bottom rail).

For balustrades with glass components, the maximum deflection is L/65 or 25 mm whichever is the smaller. The definition of L should be sought in sections 8.3, 8.4 or 8.5 in BS 6180, as it is dependent on the actual design.

If the balustrade fails the deflection test, without experiencing permanent damage, it is suggested that a strength test be carried out.

Strength test

BS 6180 “Code of practice for barriers in and about buildings” only refers to a maximum deflection limit under design load. However this limit has proven difficult to comply with although many balustrades have been used safely for many years.

TRADA has taken a practical view on this and suggests that the overall defection is of less importance providing the balustrade passes a strength test in accordance with Section 8 of BS 5268-2.

In accordance with this method the balustrade is to be loaded with an ultimate load of design load multiplied with the product of K_{73} and K_{85} of BS 5268-2. The balustrade is to sustain this load for 15 minutes without failing (breaking).

As per guidance in BS 6180, the design loads have been taken from Table 2.

TRADA suggests that loads on stairs can be considered “medium term”, which means that the overall load safety factor (K_{73} x K_{85}) will range from 1.79 (if five identical balustrades are tested) and 2.24 (if only one balustrade is tested).

SPINDLE / INFILL TESTS

Individual spindles

BS 6180 does not give a deflection limit for spindles, which means that a strength / point load test is required unless calculations can prove that the spindles can withstand the design load given in Table 2.

As these tests are relatively “quick and easy” to do, it is suggested that a minimum of 5 balusters are tested, giving a safety factor of 1.79 for “5268” loads. The test loads to be applied are given in table 2 of BS 6180: 2011.

ANNEX B

Taken from BS 6180: 2011: Barriers in and about buildings – Code of Practice

Type of occupancy for part of the building or structure	Examples of specific use
Domestic and residential activities	(i) All areas within or serving exclusively one single family dwelling including stairs, landings, etc. but excluding external balconies and edges of roofs
	(ii) Other residential, i.e. houses of multiple occupancy and balconies, including Juliette balconies and edges of roofs in single family dwellings
Offices and work areas not included elsewhere including storage areas	(iii) Light access stairs and gangways not more than 600 mm wide
	(iv) Light pedestrian traffic routes in industrial and storage buildings except designated escape routes
	(v) Areas not susceptible to overcrowding in office and industrial buildings also industrial and storage buildings except as given above
Areas where people may congregate	(vi) Areas having fixed seating within 530 mm of the barrier, balustrade or parapet
Areas with tables or fixed seating	
	(vii) Restaurants and bars
Areas without obstacles for moving people and not susceptible to overcrowding	(viii) Stairs, landings, corridors, ramps
	(ix) External balconies and edges of roofs. Footways and pavements within building curtilage adjacent to basement/sunken areas
Areas susceptible to overcrowding	(x) Footways or pavements less than 3 m wide adjacent to sunken areas
	(xi) Theatres, cinemas, discotheques, bars, auditoria, shopping malls, assembly areas, studio. Footways or pavements greater than 3 m wide adjacent to sunken areas
	(xii) Grandstands and stadia
Retail areas	(xiii) All retail areas including public areas of banks/building societies or betting shops.
Vehicular	(xiv) Pedestrian areas in car parks including stairs, landings, ramps, edges or internal floors, footways, edges of roofs
	(xv) Horizontal loads imposed by vehicles

**********End of Report**********