

TEST REPORT

Lucideon Reference: 173446 (QT44718/2/RK)/Ref. 8

Project Title: Balustrade Testing of FH Brundle's Elegance Romeo Balcony Rail in Accordance with BS 6180 UNI 10806 (Italy), BS 4592 & BS 8300

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1 INTRODUCTION

FH Brundle design and manufacture balustrades and balustrade components to be used as architectural features in new and existing buildings. As part of their product development they required an extensive programme of testing on the whole systems and on components, to determine their products performance in accordance with British and other European standards.

All tests were to be carried out to BS 6180:2011 Barriers in and about buildings.

Other standards used for testing were BS 4592-0:2006+A1:2012 Flooring, stair treads and handrails for industrial use. Common design requirements and recommendations for installation and Italian standard UNI 10806 (Italy).

2 TEST ARRANGEMENT

2 No. concrete blocks of dimensions 2000 mm x 700 mm x 500 mm were fastened to the laboratory strong-floor end to end to give a top surface of length 4000 mm.

For the bottom rail test, the Elegance Romeo Balcony Rail was attached to the top surface of said concrete block by way of 3 No. fixings, one at the outer ends and another in the centre of the span, as highlighted in Figure 1 per manufacturer's instructions.

For the top rail test the centre fixing was removed.

3 TEST METHOD

For the bottom rail test a hardwood spreader beam was placed along the entirety of the length of the rail to simulate a uniformly distributed Line-load.

A reaction frame consisting of 2 No. steel stanchions and a steel cross-member was fastened to the laboratory strong-floor such that a ram could be clamped to the steel cross member at the same height as the hardwood spreader.

A calibrated load cell was attached to the hydraulic ram by way of a steel cage, to measure the load during testing.

A calibrated linear voltage displacement transducer (LVDT), to measure the deflection, was attached to the opposite side of the glass panel as the load was applied in the centre width of the panel at 1100 mm from the finished floor height.

Though this forms no part of BS 6180, the test was still carried out in accordance with the loading increments.

A load was steadily applied up to each loading increment or until a deflection of 25 mm was reached as highlighted within BS 6180. The load at the last increment was then recorded.



For the UNI 10806 (Italy) the line load was increased to a load per metre as denoted by a representative of FH Brundle. This was generally taken as 2 kNm^{-1} unless otherwise stated due to the deflections found during testing.

For the top rail test as previously stated the centre fixing was removed. A 4 No. legged pyramidal frame was placed over the centre of the rail and a clamp placed around the rail.

The clamp was attached to a threaded bar which ran through the centre of the pyramidal frame and through a hydraulic ram and a load cell. The threaded bar was fastened to the top of the load cell such that when a force was applied through the hydraulic ram the load cell would register the force attempting to pull the rail from its fixings. This was to simulate a person leaning on the handrail.

Photographs can be seen in the Plates.

4 RESULTS

Table 1 - BS 6180 Results

Type of Occupancy for Part of the Building	Examples of Specific Use	Horizontal Uniformly Distributed Line Load (kN/m)	Elegance Romeo Balcony Bottom Rail
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	0.36	✓
	(ii) other residential, i.e. houses of multiple occupancy and balconies, including Juliette balconies and edges of roofs in single family dwellings	0.74	✓
Offices and work areas not included elsewhere, including storage areas	(iii) light access stairs and gangways not more than 600 mm wide	0.22	✓
	(iv) light pedestrian traffic routes in industrial and storage buildings except designated escape routes	0.36	✓
	(v) areas not susceptible to overcrowding in office and institutional buildings, also industrial and storage buildings except as given above	0.74	✓
Areas where people might congregate	(vi) areas having fixed seating within 530 mm of the barrier, balustrade or parapet	1.50	✓



Type of Occupancy for Part of the Building	Examples of Specific Use	Horizontal Uniformly Distributed Line Load (kN/m)	Elegance Romeo Balcony Bottom Rail
Areas with tables or fixed seating	(vii) restaurants and bars	1.50	✓
Areas without obstacles for moving people and not susceptible to overcrowding	(viii) stairs, landings corridors ramps	0.74	✓
	(ix) external balconies including Juliette balconies and edges of roofs; footways and pavements within building cartilage adjacent to basement/sunken areas	0.74	✓
Areas susceptible to overcrowding	(x) footways or pavements less than 3 m wide adjacent to sunken areas	1.50	✓
	(xi) theatres, cinemas, discotheques, bars, auditoria, shopping malls, assembly areas, studios; footways or pavements greater than 3 m wide adjacent to sunken areas	3.00	X
	(xii) grandstands and stadia	(Note 1)	-
Retail areas	(xiii) all retail areas including public areas of banks/building societies or betting shops	1.50	✓
Vehicular	(xiv) pedestrian areas in car parks, including stairs, landings, ramps, edges of internal floors, footways, edges of roofs	(Note 2)	X
	(xv) horizontal loads imposed by vehicles	(Note 2)	X



Table 2 - UNI 10806 (Italy) Results

System Name	Load (kNm⁻¹)	Deflection (mm)
Elegance Romeo Balcony Bottom Rail	2.5	9.99

Table 3 - Elegance Romeo Balcony Top Rail Results

System Name	Max Point Load (kN)	Deflection (mm)
Elegance Romeo Balcony Top Rail	0.81	25.31

NOTE: The results given in this report apply only to the samples that have been tested.

END OF REPORT

PLATES



Plate 1 - Bottom Rail under Load



Plate 2 - Bottom Rail Test Arrangement

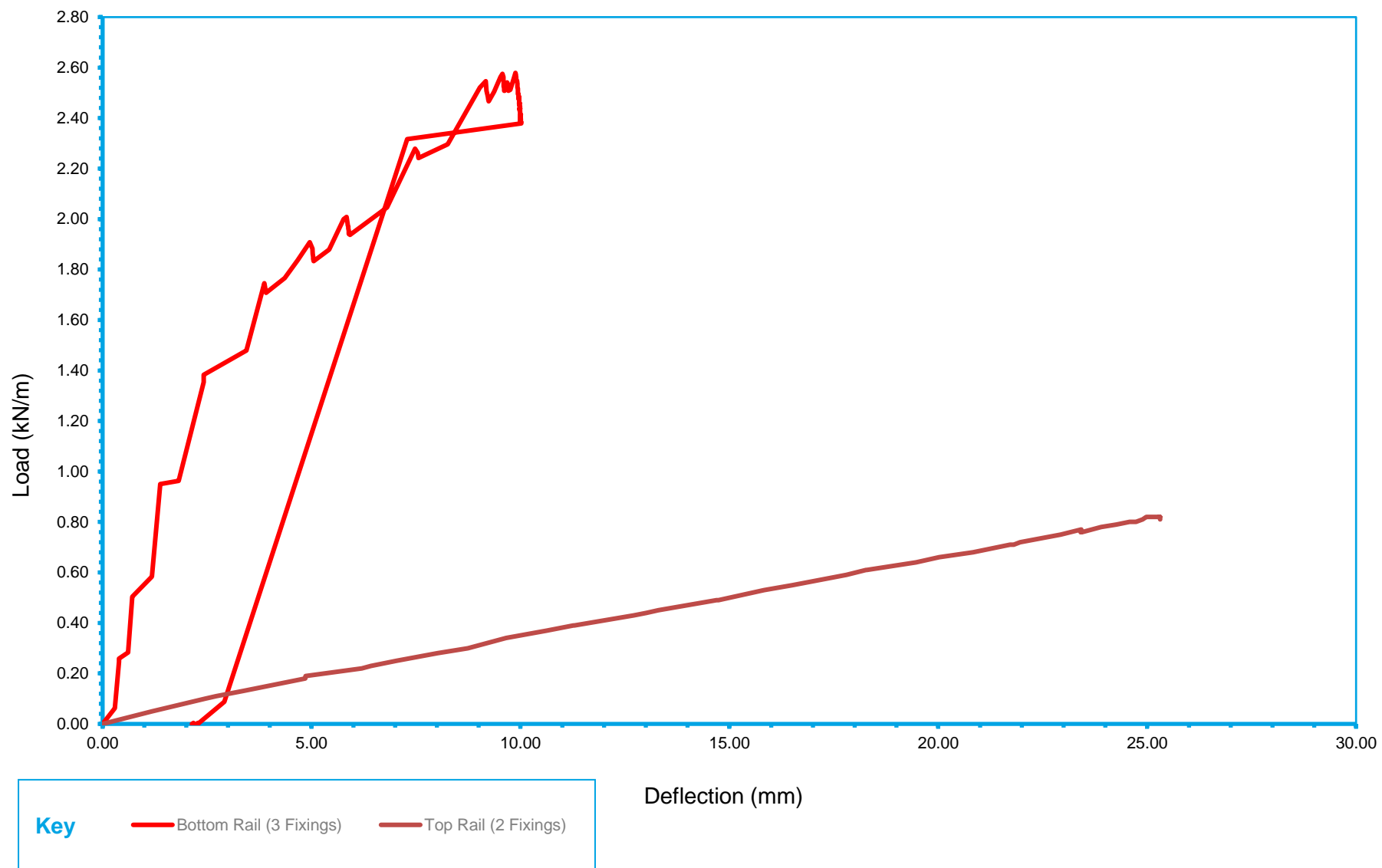


Plate 3 - Top Rail Test Arrangement



Chart 1 - Load Deflection Curves for Load Testing of FH Brundle's 2400 mm Elegance Romeo Balcony Rails With No Glass

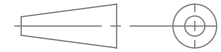
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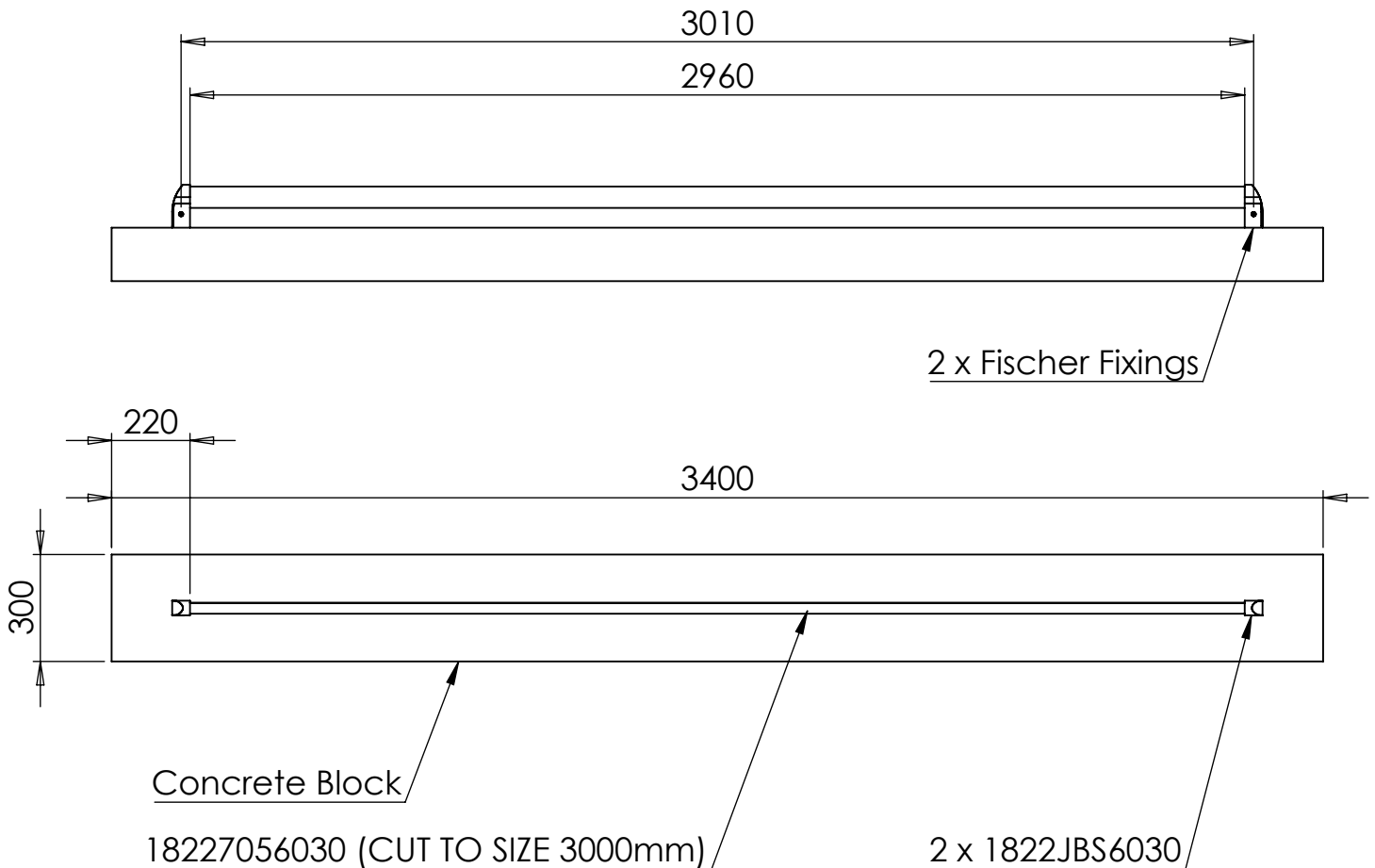
TEST REPORT NUMBER - TR14-001

PRO RAILING - Elegance Romeo Balcony

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE IN MILLIMETERS

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DRAWN	GC	19/10/2017	D
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Load Testing of Pro-Railing Elegance Romeo Balcony System, Which Comprises of Two Brackets & One Oval Horizontal Rail to BS EN 6180:2011 & UNI 10806:1999

Carry out load testing in accordance with BS 6180:2011 Barriers in and about buildings, and EC1-1991-1-1:2002 UK National Annex to Eurocode 1: Actions on structures – Part 1-1: General actions - Densities, self-weight, imposed loads for buildings.

Carry out load testing in accordance with UNI 10806:1999
Prefabricated Railing Systems - Determination of the mechanical strength under static load.

These tests will allow FH Brundle 60mm x 30mm Elegance Romeo Balcony system to be classified for use in accordance with the Code of Practice included within the standards.

Test In Accordance	Parts Required	Foundation Material	Fischer Innovative Solutions Fixings www.fischer.co.uk	Notes
BS EN 6180:2011 UNI 10806:1999	2 x 1822JBS6030 1 x 18227056030	C35 with glass fibres, aggregate size 20mm slump 100	50566 - RG 16 x 90 M10 I A4 + FIS V - Injection Mortar	Bracket Spaced At 3010mm Centres