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CONSULTING ENGINEERS

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MATERIALS TESTING

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REPORT 26890/M

TESTING OF GLAZED PROTECTIVE BALUSTRADES

FOR BALCONY (UK) LIMITED

Reference: Balcony Limited letter of Instruction dated 19th May 2004, received from Mr Effi Wolff.

1. INTRODUCTION

The brief, as requested by Balcony (UK) Ltd was to perform a series of in-house verification load/deflection tests on representative “mock-ups” of the two principle balustrade systems being proposed for installation in the UK by Balcony (UK) Limited.

The two systems submitted for this verification were identified as being Balcony “Type 1” and Balcony “Type 2” systems. For the purposes of this testing these balcony types have been allocated the following reference numbers;- MK 237 “Type 1” & MK 238 “Type 2”.

For the purposes of this testing, the mock-ups representing each of the above mentioned balcony types comprised two straight lengths of glazed balustrade. System 1 spanned 2.8 metres between supports and System 2 spanned 3.5 metres between supports. Each system contained three 8.0 mm thick panels of toughened glass, each panel was clamped securely to the base structure of the “mock-up” via an aluminium extrusions located along the systems bottom edge. A continuous extruded aluminium handrail was also attached along the top edges of the three glass panels and its ends securely fixed to vertical abutments. Neither of the balustrade systems contained balusters.

The purpose of this testing was to determine the structural integrity of the barrier system whose primary function is the provision of edge protection for the building’s intended users.

Testing as performed in our Metallurgy Structures Laboratory by our Engineers was carried out during the 14th to 16th June 2004 and was conducted in accordance with the requirements of BS 6180 : 1999 and BS 6399 : 1996 for occupancy C3 and category usage (ix).

Installation of each balustrade system onto the test rigs was performed by Engineers representing Balcony (UK) Limited.

2. TESTING PROCEDURES & RESULTS

Load Deflection Testing

Load deflection testing of each type of balustrade system was carried out by applying all three of the recommended horizontal imposed loading arrangements, as specified by or referred to by, either BS 6180 :1999 and/or BS 6399 Part 1 : 1996.

Each loading arrangement was applied quasi statically and separately to both balcony systems using the following imposed load configurations :-

2.1 Horizontal uniformly distributed line loading of 0.74 kN/m.

The specified uniformly distributed line load of 0.74 kN/m was applied to the system at six positions along the handrail. Each position corresponded with the 1/4 points of the three glass panels and was achieved by means of three one metre long spreader beams. These were arranged such, that each beam would apply the test force via wooden packers located against the balustrades hand rail feature. All three spreader beams were arranged such that the test forces were applied horizontally to the balustrade and at its design height of 1100 mm above datum (this being the proposed finished level of the floor to which the system would be attached).

Corresponding displacement of the system during incremental loading, as recorded at its design height was achieved by means of three independently referenced Dial Test Indicators accurate to within 0.1 mm.

2.2 Concentrated Point load requirement of 0.5 kN force.

This concentrated load was again applied to part of the middle glass panel of each balustrade system by means of a 25 x 25 mm square indenter which was located in the centre edge position of the panel.

Corresponding displacement of the panel during loading, as recorded at a position opposite the centre of the indenter was achieved by means of a single independently referenced Dial Test Indicator accurate to within 0.1 mm.

2.3 Uniformly distributed load requirement of 1.0 kN/m sq.

Testing was again carried out on both of the balustrade systems infill panels. This loading arrangement was carried out by means of a 600 x 600 mm square indenter positioned in the central area of the balustrades middle infill panel of glass.

Corresponding displacement of the panel during loading, as recorded at a position opposite the centre of the indenter was achieved by means of a single independently referenced Dial Test Indicator accurate to within 0.1 mm.

Results for each of the test arrangements described above are shown on Test Certificates 26890/M/1 to 26890/M/6 of this report. Information regarding each system type is also provided in Appendix A.

3. CONCLUSIONS

From a review of the load deflection data obtained during this verification event it can be seen that both systems, identified as "Type 1" and "Type 2" balcony's comply with the displacement requirements, for Uniformly Distributed Line Loading, Uniformly Distributed Loading and Concentrated Point Loading arrangements as specified in section 6, clause 6.4, para 6.4.1. of B S 6180 : 1999.

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For the attention of Effi Wolff

SRPM/srpm/am

for Sandberg LLP

S R P Morris
Engineer

24th June 2004

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This Report Comprises
3 Pages of Text
6 Test Certificates
Appendix A

For the attention of Effi Wolff

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TEST CERTIFICATES

1 to 6

APPENDIX A

Plates 1 to 7

Balcony (UK) Ltd

System Arrangements for Balustrade Types 1 and 2 (15 pages)