REPORT

Contact person
Per-Arne Thuresson
SP Construction & Mechanical engineering +46 (0)10-516 51 44
per-arne.thuresson@sp.se

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ErgoSafe AB
Box 100 69
300 10 HALMSTAD, SWEDEN

Balustrade testing
(1 annex)

1 Introduction

SP has, on behalf of ErgoSafe AB, conducted testing with static loads and heavy impact on the balcony balustrade.

Purpose: Through testing, to examine the ability of the balustrades to withstand static loads and loads from heavy impact.

Test site: SP's laboratory for Construction and Mechanical Engineering.

2 Test object

Name: ClickitUp

Execution: The tested balustrades had the following dimensions: width 1500 mm, height above the concrete slab 1100 mm. The balustrade consisted of 2 post holders (baseplates) and a balustrade section consisting of two posts with a bonded glazed unit between the posts. The balustrade also had a movable inner panel that can be lifted so that the total height of the balustrade is 1900 mm. A drawing of the balustrade can be found in annex 1.

Test sample: Carried out by the client without the participation of SP.

Arrival at SP: 02/07/2015.

3 Test method and scope of testing

Test method: The Swedish Balcony Association's technical instructions dated January 2015.
The implementation of testing is described in chapter 4 together with the result.

Scope: Three tests with heavy impact and three tests with a static load.

Test date: 02/07/2015.

4 Implementation and result of testing

4.1 Static load

The balustrade was bolted to the top of the mounting fixture as per the client's instructions. Also see figure 1 below. Testing with a static load was performed through applying a pendulum load to the upper edge of the balustrade (1100 mm from the floor). The load was continuously increased by 0.5 kN per minute until the prescribed value was reached or failure occurred. Deflection of the balustrade was registered at the imposed load. The results are given in table 1 below.

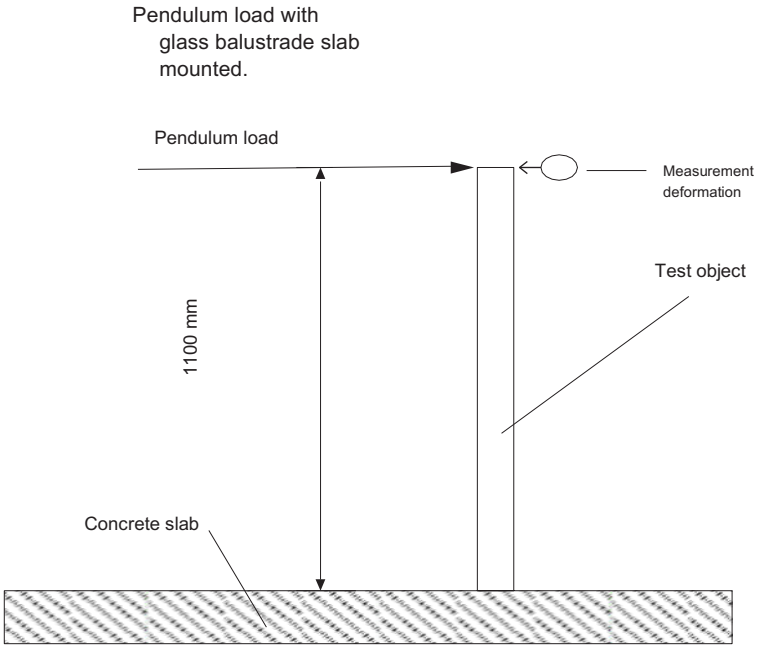

Figure 1 Test set up static load with balustrade top mounted.

Table 1 Result from testing with a static load.

Test	Construction category	Load q_k (kN/m)	Deflection at $q_{imposed}=0.5\ q_k$ (mm)	Ultimate load (kN)	Meets requirements
1	A, B, C1	0.5		>2.5 (requirement ≥ 1.0 kN)	Yes
2	A, B, C1	0.5		>2.5 (requirement ≥ 1.0 kN)	Yes
3	A, B, C1	0.5		>2.5 (requirement ≥ 1.0 kN)	Yes
4	C2-C4, D	1.0		>2.5 (requirement ≥ 2.0 kN)	Yes
5	C2-C4, D	1.0		>2.5 (requirement ≥ 2.0 kN)	Yes
6	C2-C4, D	1.0		>2.5 (requirement ≥ 2.0 kN)	Yes

4.2 Heavy impact

Testing with heavy impact was conducted according to applicable parts of SS-EN 12600:2002. Note that the test procedure is adapted to the test object. Figure of the test procedure is presented below.

The balustrade profile was bolted on top of the mounting fixture as per the client's instructions. The drop weight of 50 kg was allowed to hit the glass balustrade from the inside and in the centre of the lower panel, drop height 450 mm. The movable panel was in the raised position during testing. Visual inspection was performed after each impact.

The results from the test are presented in table 2 below.

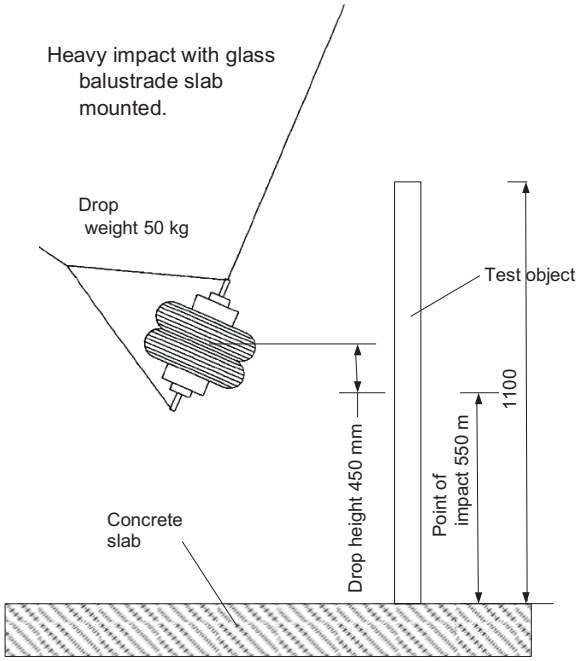

Figure 2 Test set up heavy impact with the balustrade top

mounted Table 2 Result from testing with heavy impact.

Test	Drop height (mm)	Note	Meets requirements
1	450	No failure	Yes
2	450	No failure	Yes
3	450	No failure	Yes

The test result in this report refers only to the tested examples.

4 Measurement uncertainty

The measurement uncertainty when measuring force, deflection, drop height and weighing of the drop weight was <1.0%. The specified measurement uncertainty corresponds to an approximate 95% confidence interval around the measurement value. This interval has been calculated in accordance with EA-4/16 (EA guidelines on the expression of uncertainty in quantitative testing). This normally means quadratic addition of included standard uncertainties and multiplication of the weighted standard uncertainty obtained with the coverage factor k=2.

5 Verdict

The tested balustrades meet the strength requirements according to the Swedish Balcony Association's technical instructions dated January 2015 for building types A, B C1. The balustrades also meet the requirements for building types C2-C4 and D.

SP Technical Research Institute of Sweden
SP Bygg & Mekanik - Structures and Components

Performed by

Signed by: Per-Arne Thuresson
Reason: Jag är författare till det här dokumentet
Date & Time: 2015-07-16 14:53:52 +02:00

Per-Arne Thuresson

Reviewed by

Signed by: Torbjörn Granberg
Reason: I have reviewed this document
Date & Time: 2015-07-16 15:02:24

Torbjörn Granberg

Annex

1 Drawings (3 pages)