

## TEST REPORT No. 337959

**Place and date of issue:** Bellaria-Igea Marina - Italia, 24/11/2016

**Customer:** REGAL ALÜMINYUM KÜPESTE AKS. SAN. TIC. LTD. STI - Emek Mah. Sivataş Cad. No:2 -  
34785 SANCAKTEPE/ISTANBUL - Turkey

**Date test requested:** 20/10/2016

**Order number and date:** 71310, 21/10/2016

**Date sample received:** 04/11/2016

**Test date:** 14/11/2016

**Purpose of test:** resistance to horizontal static loading in accordance with standard NF P01-013:1988 and resistance to dynamic impact with a 50 kg soft body in accordance with standard NF P08-301:1991 of a railing

**Test site:** Istituto Giordano S.p.A. - Via Erbosa, 72 - 47043 Gatteo (FC) - Italia

**Origin of sample:** sampled and supplied by the Customer

**Identification of sample received:** No. 2016/2236

### Sample name\*

The test sample is called "REGAL ALUMINIUM GLASS RAILING SYSTEM".

(\*) according to that stated by the Customer

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Revis. PB

This test report consists of 8 sheets.

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### **Description of sample\***

The test sample consists of a glass railing with the following characteristic:

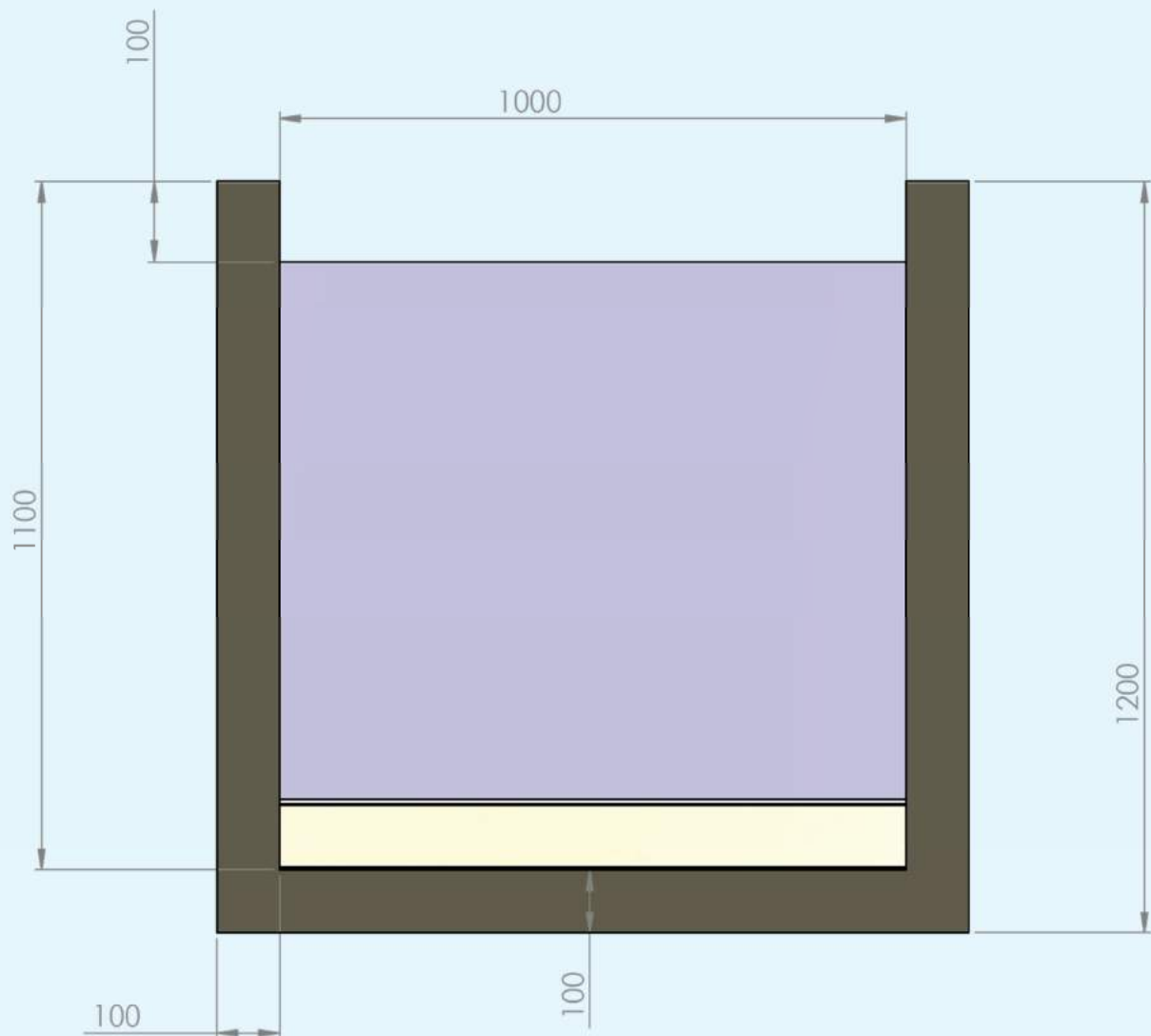
- measured overall width = 1000 mm;
- overall height = 1000 mm.

Further details of sample technical specifications can be seen in Customer-supplied schematic drawings shown hereafter.



**Photos of the sample**

(\*) according to that stated by the Customer

**SAMPLE SCHEMATIC DRAWING****Customer-supplied list of components**

Code	Description	Quantities
RGL-1001	Glass panel with plastics and screws	1 pcs
RGL-C001	Side cover	2 m
RGL-1003	Rubber	2 m
RGL-1004	Base profile	1 m
RGL-1006	End cap	2 pcs
RGL-0001	16 mm thickness glass	1 pcs

### **Normative references**

The test was carried out in accordance with the requirements of the following standards:

- NF P01-013:1988 dated August 1988 “Essais des garde-corps. Méthodes et critères” (*“Railing tests. Methods and criteria”*);
- NF P08-301:1991 dated April 1991 “Ouvrages verticaux des constructions - Essais de résistance aux chocs - Corps de chocs - Principe et modalités générales des essais de choc” (*“Vertical building elements - Impact resistance tests - Impact bodies - Impact test principle and general methods”*).

### **Test apparatus**

#### **Resistance to static loading**

The following equipment was used to carry out the resistance to static loading test:

- steel frame simulating actual installation of the sample on the floor (apparatus in-house identification code EDI048);
- set of steel masses for static load test;
- Mitutoyo IDF Digimatic Indicator complete with calibration report issued by Istituto Giordano S.p.A.;
- AEP Transducers 100 kg load cell (apparatus in-house identification code EDI107);
- metric ruler (apparatus in-house identification code EDI083);
- digital thermo-hygrometer (apparatus in-house identification code EDI111).

#### **Resistance to dynamic load**

The test was performed using a sphero-conical bag, diameter 400 mm and height 600 mm, filled with hardened solid glass spheres, diameter 3 mm, until reaching 50 kg overall mass, and suspended by an in-extensible cable of negligible mass so that when hanging at rest it makes contact with the sample at the desired point of impact.

## **Test method**

The sample, secured to the floor, was subjected to the following test.

### **Outward horizontal static loading (without uprights)**

With just underside secured to the floor, the sample was subjected to a load distributed uniformly over three points on the handrail in accordance with figure 2 “Garde-corps sans potelets, ancrés au niveau de l’appui” (“Railings without posts anchored at the base”) of standard NF P01-013:

- preload of 1,3 kN applied gradually until reaching the present value and maintained for 3 min;
- removal of load and resetting of gauge;
- horizontal static load of 1,3 kN applied gradually until reaching the present value and maintained for 60 s, following which deflection whilst loaded was measured;
- removal of load and recording of permanent deflection after 3 min;
- horizontal static safety load of 2,21 kN with coefficient of 1,7 for aluminium, applied and maintained for 5 min, following which deflection whilst loaded was measured;
- removal of safety load and recording of permanent deflection after 3 min and verification of permissible permanent deflection “a” in mm following removal of safety load using the following equation:

$$a \leq \frac{8 \cdot X}{1000}$$

where: X = height of sample from fixing point in mm.

### **Resistance to dynamic loading**

With just underside secured to the floor, the sample was subjected to a dynamic load with energy of 600 J (0,50 kN × 1,20 m).

All impacts were made by releasing the impactors so that they fall from a specified height with a pendulum movement and without initial velocity. The impactors were hung by an inextensible pendulum wire of negligible mass so that when at rest they made contact with the point of intended impact. After each impact, the impactors were prevented from hitting the sample again after bouncing.

### Environmental conditions at the time of testing

Room temperature	(15,8 ± 2) °C
Relative humidity	(59 ± 5) %

### Test results

#### Resistance to outward horizontal static loading of handrail

Applied load (clause 2.2.1.2 of standard NF P01-013) [kN]	Deflection whilst loaded [mm]	Permanent deflection [mm]	Maximum permanent deflection** [mm]	Result
1,30	54,69	5,93	//	//
2,21*	100,31	7,27	8	pass

(\*) safety load with coefficient of 1,7 for aluminium;

(\*\*) permissible permanent deflection "a" calculated in accordance with 2.2.1.2.4 "Déformation admissible des garde-corps métalliques" ("Permissible deflection of metal railings") of standard NF P01-013.

#### Resistance to dynamic load

Impact area	Drop height [m]	Energy [J]	Result
centre of infill	1,2	600	no damage*

(\*) No falling fragments that could cause personal injury were found below.

No gaps were formed between the bars of sufficient size to allow the passage of the gauge specified in figure 7 of standard NF P01-013.

No sample performance loss compared to design specifications was witnessed.



**Photographs of the sample during resistance to horizontal static loading test**



**Photograph of the sample after impact**

### **Findings**

According to the test performed, according to the results obtained and according to what indicated in standard NF P01-013, the test sample, consists of a glass railing, called "REGAL ALUMINIUM GLASS RAILING SYSTEM" and presented by the company REGAL ALÜMINYUM KÜPESTE AKS. SAN. TIC. LTD. STI - Emek Mah. Sivataş Yolu Cad. No:2 - 34785 SANCAKTEPE/ISTANBUL - Turkey, is:

Test	Use	Result
Outward horizontal static loading	Public (1,0 kN/m)	Compliant
Outward horizontal static loading	Private (1,3 kN)	Compliant
Dynamic impact with 50 kg soft body	//	Compliant

The results given refer exclusively to the test sample itself and are only valid under the same conditions in which testing was carried out.



Test Technician  
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Chief Executive Officer  
(Dott. Arch. Sara Lorenza Giordano)

