

Bellaterra, December 28th, 2018

Test Report nº: **18/18635-3682**

Petitioner: **Q-RAILING EUROPE GMBH & CO. KG**

Marie Curie Straße, 8-14

D-46446 EMMERICH AM RHEIN (GERMANY)

TEST REPORT

1.- TESTED SAMPLES:

A railing for the protection of falls, of permanent use in building works formed by a lower profile made of extruded aluminum and which must be firmly anchored to the building structure, a double laminated glass unit (tempered or float) inserted in the metallic profile and with Q-Disc wedges that provide rigidity of assembly. The system is fit to receive different thicknesses and laminated glass compositions. It is tested with laminated and tempered or float glass units.

The manufacturer distinguishes the models of its rails by families according to the section and dimensions of the metallic profile used, its type of placement on site and the possibility of adjustment in inclination, where appropriate.

The models that concern us correspond to the family:

EASY GLASS PRIME (TOP & FASCIA)

that share a resistant geometry of the aluminium profile and where the TOP version exists that is intended for anchoring in the upper surface of the floor and the FASCIA version that is for its placement in the floor slab.

2.- TEST REQUESTED:

2.1.-) First, is requested the verification of the Spain mandatory standard for railings according the class of resistance named "Código Técnico de la Edificación (CTE) Documento Básico de Seguridad de Utilización y Accesibilidad, Sección SUA 1 Seguridad frente al riesgo de caídas, Apartado 3.2 Desniveles, características de las barreras de protección, Sub-apartado 3.2.2. Resistencia".

2.2.-) Second, also is requested the dynamic impact test for railings according the standard UNE 85-238-91: Barandillas. Métodos de ensayo

The results reflected in this report refer only to the sample tested and under the conditions indicated in the standards or test methods cited in this document. LGAI Technological Center, S.A. is not responsible for the documentation provided by the applicant.

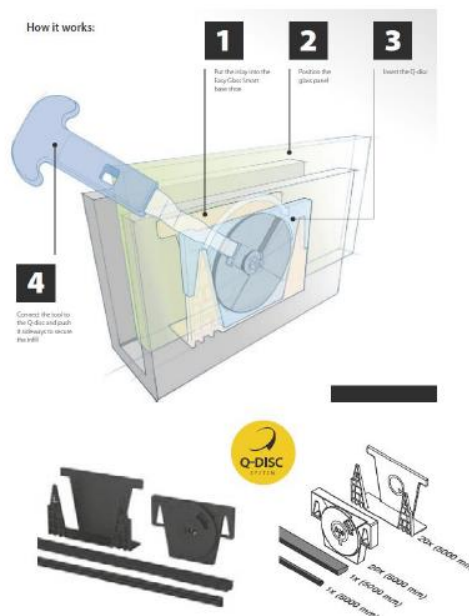
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3.- RAILING IDENTIFICATION:

VERSION	TOP	FASCIA
SKETCH	<p>1. Bodenprofil (Easy Glass Prime) 2. Glas 16,76mm- 25,52mm 3. Gummi-set, justierbar a. Base (ABS) b. Inlay (ABS) c. Disc (ABS) d. Gummi (EPDM) 4. Anker 5. Handlauf</p> <p>drainage Loch</p>	<p>1. Bodenprofil (Easy Glass Prime) 2. Glas 16,76mm- 25,52mm 3. Gummi-set, justierbar a. Base (ABS) b. Inlay (ABS) c. Disc (ABS) d. Gummi (EPDM) 4. Anker</p> <p>drainage Loch</p>
PROFILE REFERENCE	16696050018	16696050018
ALUMINIUM TYPE	AW-6063 T6	AW-6063 T6
ANCHOR TYPE	According to catalogue	According to catalogue
ANCHORS DISTANCE	1 ud. @ 200 mm	1 ud. @ 200 mm
SUPPORT TYPE	CONCRETE C20/25 - METALLIC BEAM	CONCRETE C20/25 - METALLIC BEAM
GLASS HEIGHT	1100 mm	1200 mm
DISCS ABS-GF	1 ud. @ 250 mm; Torque: 32 N/m	1 ud. @ 250 mm; Torque: 32 N/m

The railing profile must be firmly fixed to the building structure, either concrete or metal, with the anchors defined by the manufacturer and according to its assembly instructions, always checking the tightening torque. The tightening torque of the Q-DISC system must also be ensured according to the manufacturer's instructions with a specific tool.



4.- TESTS:

The test were carried out on December 10th and 11th, 2018, with different combinations of profiles, support and glasses.

4.1.- Resistance test with horizontal outward load:

The standard "Código Técnico de la Edificación (CTE) Documento Básico de Seguridad de Utilización y Accesibilidad, Sección SUA 1 Seguridad frente al riesgo de caídas, Apartado 3.2 Desniveles, características de las barreras de protección, Sub-apartado 3.2.2. Resistencia", specifies that the railings need to have a category of resistance according where are located.

The CTE, in the document DB-SE-AE (Seguridad Estructural, Acciones en la Edificación) specifies the use categories that appear in the following table with the required resistance.

The railing is tested with a lineal and horizontal load at the top of the banister in kN/m, and outwards during 3 minutes. At the end of the test, disorders in performance or stability are not allowed.

Use Categories		Use Sub-categories		Resistance kN/ml
A	Residential areas	A1	Houses and room areas in hospitals and hotels	0.8
		A2	Storage rooms	0.8
B	Administrative areas			0.8
C	Public access areas (except the A,B and D areas categories)	C1	Tables and chairs areas	0.8
		C2	Fixed seats areas	0.8
		C3	Areas without obstacles and free movement of people as public halls, administrative building, hotels, showrooms, museums, etc.	1.6
		C4	Fitness areas	1.6
		C5	Agglomeration areas, concert halls, stadiums, etc.	3.0
D	Mall areas, shopping centers	D1	Shops, commercial rooms	0.8
		D2	Supermarkets, hypermarket, department stores...	0.8
E	Traffic and parking areas for light vehicles (<30kN)			1.6
F	Terraces with private access only			1.6
G	Passable roof only for maintenance	G1	Roof with tilt, up to 20°	0.8
			Light roofs	
		G2	Roof with inclination of more than 40°	0.8

The following models of the family have been tested, with the specified railing heights, obtaining these results:

System	Mounting		Glass	Load kN/m	Maximum deflection mm.	Residual deflection mm.	
Easy Glass PRIME Q-DISC	Top On metal beam		8.8.2 (tempered)	0,8	28,6	2,7	
			8.8.2 (tempered)	1,6	58,1	1,3	
			8.8.2 (tempered)	2,4	1,6 kN/m x safety factor 1,5		
			8.8.2 (tempered)	3,0	127,0	2,0	
			10.10.4 (tempered)	3,0	96,2	2,9	
			10.10.4 (tempered)	4,5	3,0 kN/m x safety factor 1,5		
			10.10.4 (float)	0,8	29,0	2,0	
			10.10.4 (float)	1,2	0,8 kN/m x safety factor 1,5		
			10.10.4 (float)	1,6	57,2	2,2	
			10.10.4 (float)	1,8	The glass breaks before 2,4kN/m (1,6kN/m x safety factor 1,5)		
	Top On concrete C20/25	With mechanical anchor Q-Anchor SZ-S 12/10 M8		10.10.4 (tempered)	3,0	Stands the load	
				10.10.4 (tempered)	4,2	The mechanical anchor starts to yield before 4,5 kN/m (3,0kN/m x safety factor 1,5)	
		With chemical anchor Q-Anchor VMZ-IG90 M12		10.10.4 (tempered)	4,5	3,0 kN/m x safety factor 1,5	
	Fascia On metal beam		8.8.2 (tempered)	0,8	34,1	2,0	
			8.8.2 (tempered)	1,2	0,8 kN/m x safety factor 1,5		
			8.8.2 (tempered)	1,6	79,5	2,9	
			8.8.2 (tempered)	2,4	The inner glass breaks without collapsing (1,6kN/m x safety factor 1,5)		
			10.10.4 (tempered)	3,0	125,0	7,0	
			10.10.4 (tempered)	4,5 (*)	3,0 kN/m x safety factor 1,5		
			10.10.4 (float)	0,8	30,6	2,5	
			10.10.4 (float)	1,2	0,8 kN/m x safety factor 1,5		
	Fascia On concrete C20/25	With mechanical anchor Q-Anchor SZ-S 12/10 M8		10.10.4 (tempered)	4,5 (*)	3,0kN/m x safety factor 1,5	

(*) After a push of that characteristics it is necessary that the railing be checked and readjusted.

4.2.- Dynamic impact resistance test:

4.2.1.- Soft body dynamic test.

The test consists of submitting the filling element (in this case glass), to the action of the shock defined in section 9.2.3 of the UNE 85-238-91 standard with a soft body of large dimensions. For the impact, a cone hemispherical bag with a mass of 50 kg is used. The impact energy must be 600 J (0.5 kN x 1.20 m). The shock is made by the inner part of the element and the impact must occur in the geometric centre of the filling element.

4.2.2.- Dynamic hard body test.

It consists of subjecting the filling element (in this case glass), to the action of the shock of a hard body of solid steel of 0,5 Kg of mass and 50 mm of diameter. The impact energy must be 3.75 J (0.005 kN x 0.75 m). The impact must occur in the geometric centre of the filling element. The diameters of the fingerprints created are recorded and whether or not there is a fracture.

Impacts results:

System	Mounting	Glass	Impact 600J	Impact 3,75 J
Easy Glass PRIME Q-DISC	Top	8.8.2 (tempered)	No damage	No damage
		10.10.4 (tempered)	No damage	No damage
		10.10.4 (float)	No damage	No damage (Ø 4 cm print)
	Fascia	8.8.2 (tempered)	No damage	No damage
		10.10.4 (tempered)	No damage	No damage
		10.10.4 (float)	No damage	No damage (little print)

5.- CONCLUSIONS:

Considering that the most unfavourable cases of the family have been tested and taking into account that greater thickness of laminated and tempered glass provides more resistance, it can be concluded that according to the CTE the suitable models are:

System	Mounting	Type of Glass	Resistance kN/m		
			0,8	1,6	3,0
Easy Glass PRIME Q-DISC	Top	8.8.2 (tempered)	✓	✓	✓
		10.10.4 (tempered)	✓	✓	✓
		10.10.4 (float)	✓	✓	X
	Fascia	8.8.2 (tempered)	✓	✓	X
		10.10.4 (tempered)	✓	✓	✓
		10.10.4 (float)	✓	X	X

(X) = Profile not intended for this use

In addition, that should be compared according to the categories of use of the CTE, discussed in this document.

Below are images of the tests performed.



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