

Bellaterra, April 30th, 2018

Test Report nº: **18/17112-1284**

Client: **Q-RAILING EUROPE GMBH & CO. KG**
Marie Curie Straße, 8-14
D-46446 EMMERICH AM RHEIN (GERMANY)

TEST REPORT

1.- TESTED SAMPLES:

A railing system for fall protection for permanent use in building works and consists of, a lower profile in extruded aluminum that must be firmly attached to the building structure, a unit of tempered and laminated double glass inserted in the metal section, and with a wedges defined as Q-Disc that give rigidity to the railing. The system can receive different thicknesses and compositions of laminated glass. The samples are tested with units of laminated and tempered glass.

The manufacturer, have the model's classification by railing's families according the section and dimensions of the used metal profile, the type of placement on building works and the possibility of tilt adjustment, if any.

The models in question belongs to the family are:

EASY GLASS SMART (TOP & FASCIA)

that share the resistant geometry of the aluminum profile and where there is the **TOP** version designed for attachment to the upper surface of the floor and the **FASCIA** version designed to be placed at the edge of the floor.

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

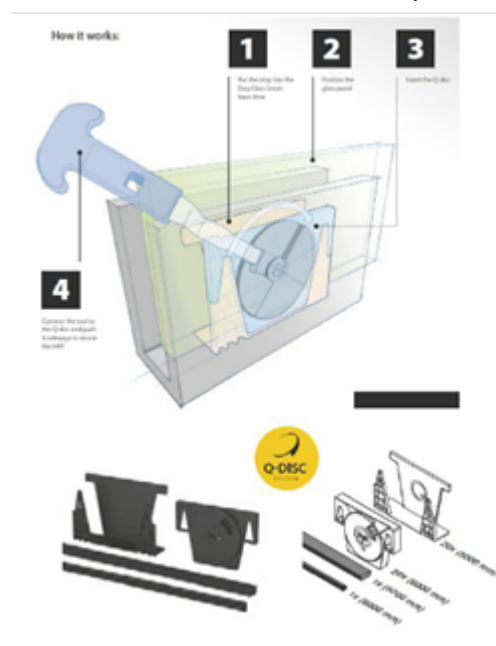
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3.- RAILING IDENTIFICATION:

VERSION	TOP	FASCIA
PICTURE		
PROFILE	166930500xx	166931500xx
ALUMINIUM	AW-6063-T6	AW-6063-T6
ANCHORS	According to the catalogue	According to the catalogue
SPACING ANCHORS	1 unit @ 200 mm	1 unit @ 250 mm
CONCRETE	C20/25	C20/25
GLASS HEIGHT	1100 mm	1200 mm
DISCS ABS-GF	1 unit @ 250 mm, Torque: 32Nm	2 unit @ 250 mm, Torque: 32Nm

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 tests were carried out on April, 24th and 25th of 2018 with different combinations of profile and tempered and laminated 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 resistance that need to have.

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	Mount	Glass	Load kN/m	Maximum deflection mm.	Residual deflection mm.
Easy Glass Smart Q-DISC	Top	6.6.2	0,8	74,9	2,7
		6.6.2	1,6	99,8	2,2
		8.8.2	0,8	40,3	2,7
		8.8.2	1,6	81,4	1,8
		8.8.2	3,0	154,6	2,3
		10.10.4	3,0	118,3	5,2
	Fascia	6.6.2	0,8	79,0	2,6
		6.6.2	1,6	98,4	2,9
		8.8.2	0,8	45,1	2,1
		8.8.2	1,6	93,0	1,5
		10.10.4	0,8	32,0	3,7
		10.10.4	1,6	68,1	0,2
		10.10.4	3,0	141,5	3,1

4.2.- Resistance to dynamic impact:

4.2.1.- Standard soft body dynamic test:

The test consist in to drop a heavy and big body on the filling of the railing, at the end on the central part of the glass, as defined in the chapter 9.2.3 of the standard UNE 85-238-91. The special body has a mass of 50 Kg.

The impact energy will be of 600J (0,5kN x 1,20m).

The test will be done at the internal and central part of the railing.

4.2.2.- Hard body dynamic test:

The test consist in to drop a small and hard ball, this is a steel ball with a mass of 0,5 Kg and 50mm of diameter. The energy of the impact will be 3,75 J (0,005kN x 0,75m).

The test will impact at the center of the railing and any damage will be checked.

Impacts results:

System	Mount	Glass	Impact 600J	Impact 3,75 J
Easy Glass Smart Q-DISC	Top	6.6.2	No Damage	No Damage
		8.8.2	No Damage	No Damage
	Fascia	6.6.2	No Damage	No Damage
		8.8.2	No Damage	No Damage

5.- CONCLUSIONS:

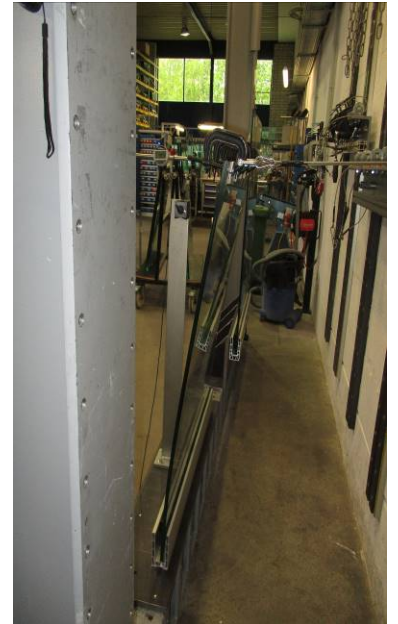
Considering that have tested the worst cases of the family and considering that thicker laminated and tempered glass provides more resistance, it can be concluding according the CTE the suitable models are:

System	Mount	Glass type	Resistance kN/m		
			0,8	1,6	3,0
Easy Glass Smart Q-DISC	Top	6.6.2	✓	✓	X
		8.8.2	✓	✓	✓
		10.10.4	✓	✓	✓
	Fascia	6.6.2	✓	✓	X
		8.8.2	✓	✓	X
		10.10.4	✓	✓	✓

(X) = Profile not designed for this class.

These loads must to be compared with according the use categories of the CTE, related in this document.

Below we can see some pictures of the tests done.



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