Test Report 8900949. Issue 2

Q-Railing Europe GmbH & Co.KG

Introduction.

This report has been prepared by Gary Essam and relates to the activity detailed below:

Job/Registration Details		Client Details
Job number:	**8900949**	Q-Railing Europe GmbH & Co.KG Marie-Curie-Strasse 8-14 Emmerich am Rhein 46446 Germany
Job type:	Testing	
Start Date:	07/03/2018	
Test type:	Type testing – extension to scope	
Sample ID:	Not applicable	
Registration:	**KM 656489**	
Scheme:	BS 6180:2011	
Protocol:	PP937	
Scheme Manager:	Peter Rossington	

The report has been approved for issue by Mark Manito – Team Manager

Issue 2 of this report supersedes all previous issues. The amendments on all pages giving rise to this issue can be ascertained by contacting the authorising signatory.

Approved For Issue	
	Issue Date: 16 August 2018

Objectives.

Type test for product certification

Product Scope.

Balustrade systems

Report Summary.

The samples met with the recommendations of the standard to which assessments have been made

Description of Test Samples.

Sample Description
Easy Glass Smart Top mount Easy Glass Smart Fascia mount

Test Requirements.

BS 6180:2011 Clauses 6.3.1 and 6.4.1 only. Type testing + Results Tables - Barriers in and about buildings - Code of practice

Clause	Requirements	
6	**DESIGN CRITERIA**	
6.3	**Loading**	
6.3.1	**General**	N/As
6.4	**Deflection**	
6.4.1	**Barriers for the protection of people**	N/As
Results Tables	**Actual test results** *See Table A - BS 6180:2011*	

Summary of Test Comments.

Clause	Comments
6.3.1 & 6.4.1	BS 6180:2011 is a code of practice and the loaded deflections of barrier systems are given as recommendations only. The Structural Use of Glass in Buildings (Second Edition), February 2014, O'Regan, C., The Institution of Structural Engineers states "It must be noted that BS 6180 is a guideline and as such it is ultimately up to the designer to determine acceptable deflection limits on the balustrade under consideration." Further, the tables for summaries for suitability on pages 13 to 16 are given for indication only The testing was supervised at the Emmerich am Rhien site of Q-Railing on 7 and 8 March and 31 July 2018

Glossary of Terms.

PASS: Complies. Tested by BSI engineers at BSI laboratories.

PASS1: Complies. Witnessed by BSI engineers in manufacturers laboratory.

PASS2: Complies. Tests carried out by third party lab; results accepted by BSI.

PASS*: Report resulted in uncertainty and states that Compliance is more probable than non-compliance.

FAIL: Non compliance – Product does not meet the requirements of this clause.

FAIL*: Report resulted in uncertainty and states that Non-compliance is more probable than compliance.

N/A: Not applicable to design under consideration.

N/As: Not assessed

N/T: Not tested due to similarity to previously tested item; reference earlier test report.

Conditions of Issue.

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Table A - BS 6180:2011

Test Results.

CLAUSE

6 DESIGN CRITERIA

6.3 Loading

6.3.1 General

Minimum horizontal imposed loads appropriate to the design of parapets, barriers, balustrades and other elements of structure intended to retain, stop or guide people, should be determined in accordance with Table 2 [of BS 6180:2011], which recommends a uniformly distributed line load for the barrier and a uniformly distributed and point load applied to the infill. These are not additive and should be considered as three separate load cases, all loads being determined according to the type of occupancy which reflects the possible in-service conditions.

Horizontal uniformly distributed line loads should be applied at the design height as presented in Table 1 [of BS 6180:2011] or at the design level 1100mm for barriers higher than the design height.

Uniformly distributed load should be applied at the area below the design height.

Point load should be applied at the most onerous point anywhere on the barrier structure.

6.4 Deflection

6.4.1 Barriers for the protection of people

Barriers for the protection of people should be of adequate strength and stiffness to sustain the applied loads given in Table 2 [of BS 6180:2011]. In addition, a barrier that is structurally safe should not possess sufficient flexibility to alarm building users when subject to normal service conditions. Therefore, for serviceability considerations, the limiting condition for deflection appropriate for a barrier for the protection of people is that the total horizontal displacement of the barrier at any point from its original unloaded position should not exceed the deflection limits determined from the relevant structural design code (where applicable) for the material used, or 25 mm, whichever is the smaller.

Where the infill of a barrier is subjected to imposed loads given in Table 2 [of BS 6180:2011], or if appropriate, other calculated design loads, the displacement of any point of the barrier should not exceed L/65 or 25 mm, whichever is the smaller where L is the given in **8.3**, **8.4** or defined in **8.5** [of BS 6180:2011]. A suitable fracture load, factored by a minimum partial safety factor of 4.0 (as recommended in BS 4592-0) should be obtained from the material manufacturer when considering glass barrier design.

Test Results (Continued).

Table 2 Minimum horizontal imposed loads for parapets, barriers and balustrades

Type of occupancy for part of the building or structure	Examples of specific use	Horizontal uniformly distributed line load (kN/m)	Uniformly distributed load applied to the infill (kN/m^2)	A point load applied to part of the infill (kN)
Domestic and residential activities	(i) All areas within or serving exclusively one single family dwelling including stairs, landings, etc. but excluding external balconies and edges of roofs	0.36	0.5	0.25
	(ii) Other residential, i.e. houses of multiple occupancy and balconies, including Juliette balconies and edges of roofs in single family dwellings	0.74	1.0	0.5
Offices and work areas not included elsewhere, including storage areas	(iii) Light access stairs and gangways not more than 600 mm wide	0.22	-	-
	(iv) Light pedestrian traffic routes in industrial and storage buildings except designated escape routes	0.36	0.5	0.25
	(v) Areas not susceptible to overcrowding in office and institutional buildings, also industrial and storage buildings except as given above	0.74	1.0	0.5
Areas where people might congregate	(vi) Areas having fixed seating within 530 mm of the barrier, balustrade or parapet	1.5	1.5	1.5
Areas with tables or fixed seatings	(vii) Restaurants and bars	1.5	1.5	1.5
Areas without obstacles for moving people and not susceptible to overcrowding	(viii) Stairs, landings, corridors, ramps 0.74	0.74	1.0	0.5
	(ix) External balconies including Juliette balconies and edges of roofs. Footways and pavements within building curtilage adjacent to basement/sunken areas	0.74	1.0	0.5

Test Results (Continued).

Table 2 Minimum horizontal imposed loads for parapets, barriers and balustrades (Continued)

Type of occupancy for part of the building or structure	Examples of specific use	Horizontal uniformly distributed line load (kN/m)	Uniformly distributed load applied to the infill (kN/m^2)	A point load applied to part of the infill (kN)
Areas susceptible to overcrowding	(x) Footways or pavements less than 3 m wide adjacent to sunken areas	1.5	1.5	1.5
	(xi) Theatres, cinemas, discotheques, bars, auditoria, shopping malls, assembly areas, studio. Footways or pavements greater than 3 m wide adjacent to sunken areas.	3.0	1.5	1.5
	(xii) Grandstands and stadia [A)]	-	-	-
Retail areas	(xiii) All retail areas including public areas of banks/building societies or betting shops	1.5	1.5	1.5
Vehicular	(xiv) Pedestrian areas in car parks, including stairs, landings, ramps, edges or internal floors, footways, edges of roofs	1.5	1.5	1.5
	(xv) Horizontal loads imposed by vehicles [B)]	-	-	-

A) See requirements of the appropriate certifying authority
B) See Annex A

Test Results (Continued).

TEST METHODS

A single 1m length of each type of barrier system was bolted to a metal structure with an "I" section measuring nominally 240mm x 240mm in accordance with the manufacturer's instructions. The structure was, in turn, fixed to the concrete floor of the testing facility.

Horizontal uniformly distributed line loads

The horizontal uniformly distributed line loads were applied to the glass using a manually operated hydraulic ram through a calibrated load cell to a 1m long aluminium beam which was positioned on the glass at a nominal 1100mm from the equivalent ground level unless otherwise indicated.

The deflection measurements of the glass on the opposite site to the application of the load at 1100mm from the equivalent ground level (unless otherwise indicated) were taken from a fixed datum point at the same level using a calibrated digital indicator.

The assemblies were tested without handrails as these were considered to be the worst case. Typical arrangements for the application of the horizontal uniformly distributed line load are shown below.

Easy Glass Smart Top Mount System

Easy Glass Smart Fascia Mount System

Uniformly distributed load applied to the infill

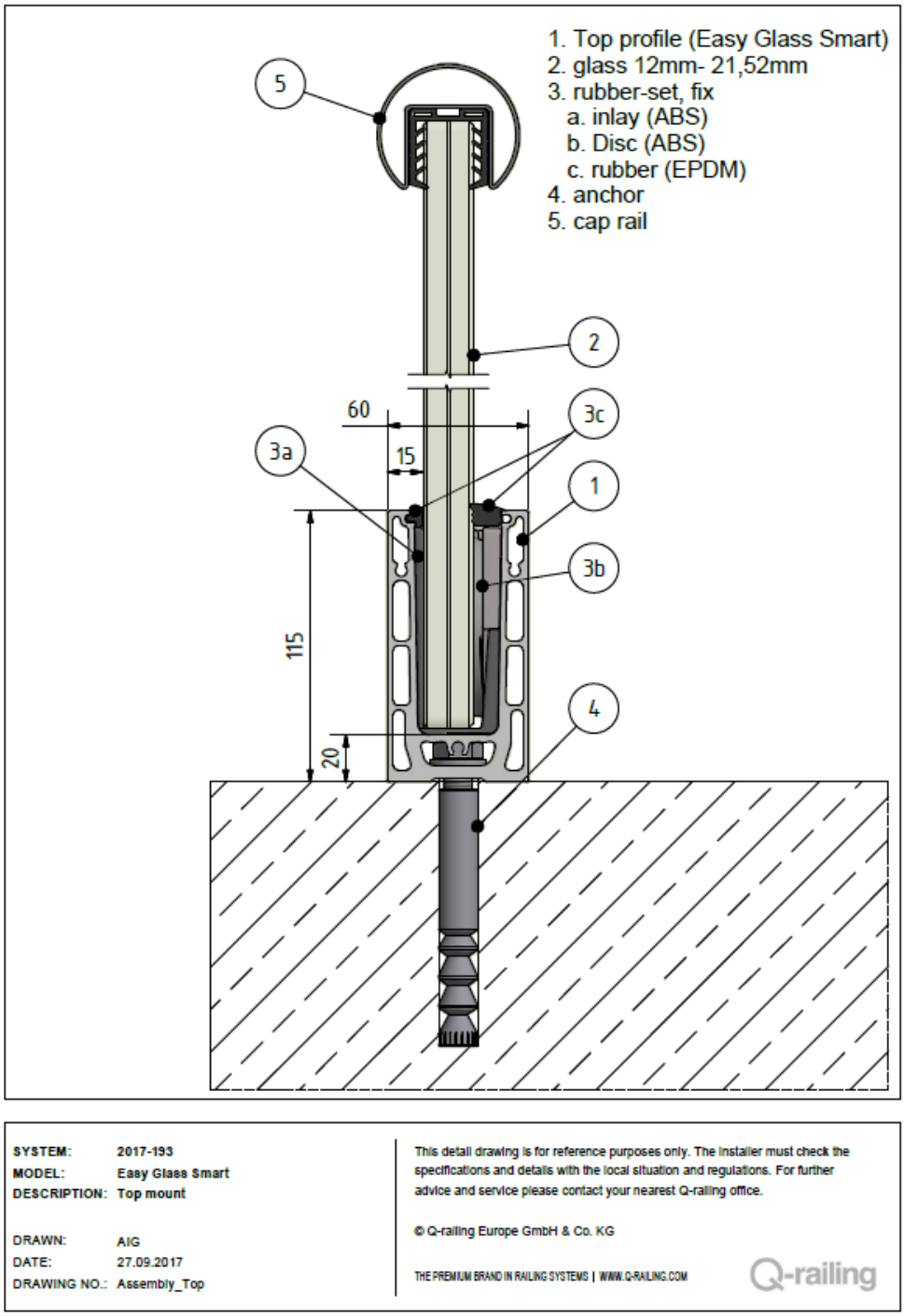
The system incorporated free standing glass as structural elements assemblies was not considered applicable.

Point load applied to part of the infill

This test was not considered applicable to the system tested because of the free standing glass as a structural element

Test Results (Continued).

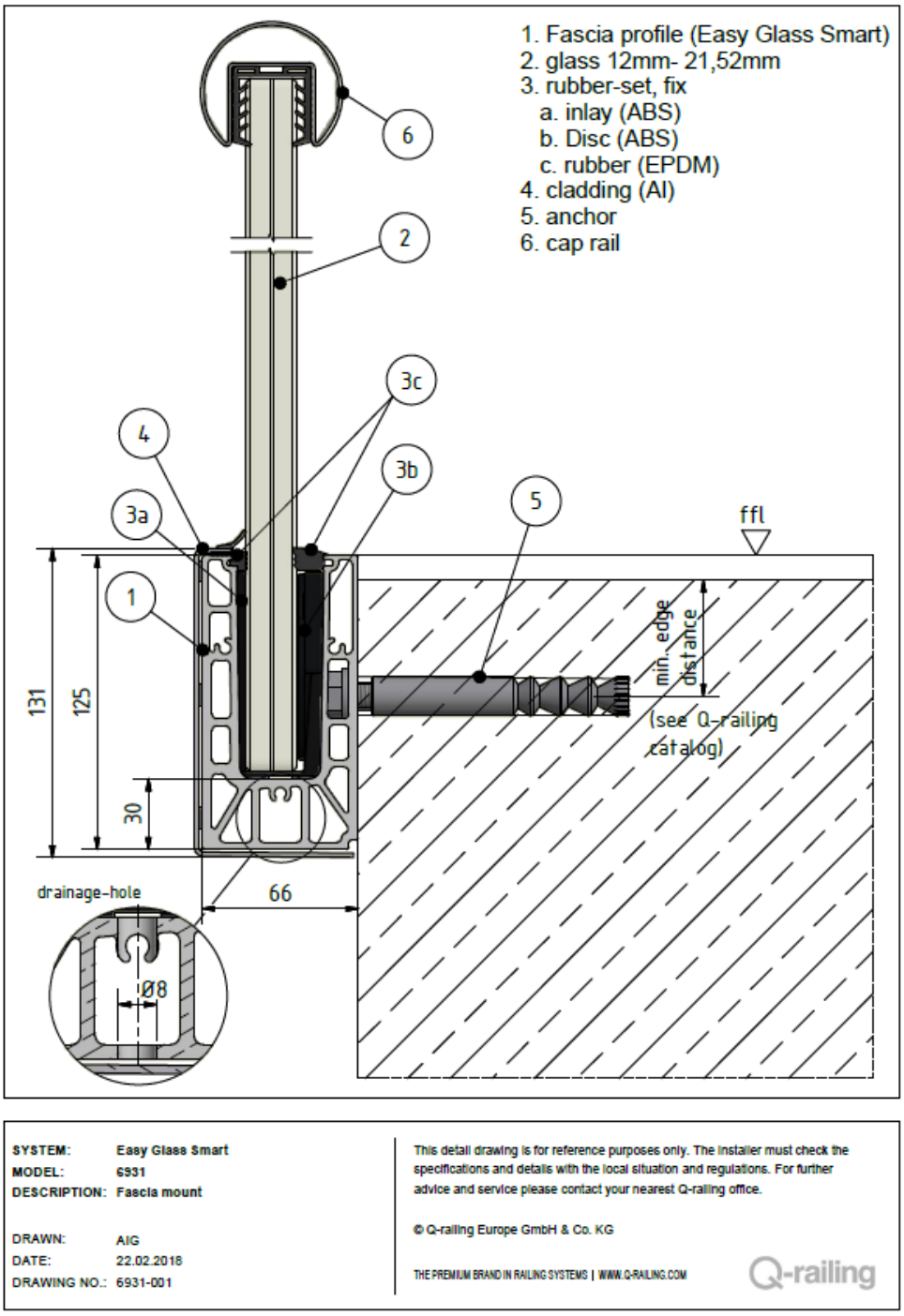
TEST METHODS (Continued)



General assembly drawing of Easy Glass Smart Top Mounted System
Note: The assemblies were tested without handrails and on a steel base. For concrete mounting the anchors must be calculated separately

Test Results (Continued).

TEST METHODS (Continued)



General assembly drawing of Easy Glass Smart Top Mounted System
Note: The assemblies were tested without handrails and on a steel base. For concrete mounting the anchors must be calculated separately

Test Results (Continued).

SUMMARY OF TESTING

Horizontal uniformly distributed line loads

Easy Glass Smart Top Mount System

Reference	Glass type	Glass size	Number of discs used	0.36 kN/m line load deflection (mm)	0.74 kN/m line load deflection (mm)	1.50 kN/m line load deflection (mm)	25mm equivalent line load (kN/m) (for information)	Comments
A	12mm monolithic	1000mm x 1100mm	4	14.09	-	-	0.62	
B	12mm monolithic	1000mm x 1100mm	4	11.46	24.51	-	0.75	Loaded and measured at 1000mm from profile
C	12mm monolithic	1000mm x 1100mm	4	7.54	16.30		1.10	Loaded and measured at 900mm from profile
D	12.76 PVB laminated	1000mm x 1100mm	4	24.54	-	-	-	
E	15mm monolithic	1000mm x 1100mm	4	9.09	19.58	-	0.92	
F	16.76 Trosifol laminated	1000mm x 1100mm	4	7.68	16.74	-	-	
G	17.52 PVB laminated	1000mm x 1100mm	4	10.07	24.02	-	0.74	
H	17.52 PVB laminated	1000mm x 1100mm	5	9.36	22.91	-	0.77	
I	17.52 EVA laminated	1000mm x 1100mm	4	10.77	23.42	-	0.78	
IA	19mm monolithic	1000mm x 1200mm	5	8.37	18.74	-	0.97	Loaded and measured at 1100mm from profile
IB	19mm monolithic	1000mm x 1200mm	5	10.06	22.84	-	0.81	Loaded and measured at 1200mm from profile
J	21.52 PVB laminated	1000mm x 1100mm	4	9.16	20.81	-	0.85	
K	21.52 Trosifol laminated	1000mm x 1200mm	6	4.80	10.58	24.48	1.53	

Test Results (Continued).

SUMMARY OF TESTING (CONTINUED)

Horizontal uniformly distributed line loads (Continued)

Easy Glass Smart Fascia Mount System

Reference	Glass type	Glass size	Number of discs used	0.36 kN/m line load deflection (mm)	0.74 kN/m line load deflection (mm)	1.50 kN/m line load deflection (mm)	25mm equivalent line load (kN/m) (for information)	Comments
L	12mm monolithic	1000mm x 1200mm	4 (inside)	19.85	-	-	0.45	
M	12mm monolithic	1000mm x 1200mm	4 (inside)	11.51	24.93	-	-	Loaded and measured at 900mm from top of profile
N	15mm monolithic	1000mm x 1200mm	4 (inside)	11.73	26.05(1)	-	0.71	
O	15mm monolithic	1000mm x 1200mm	4 (outside)	10.50	25.31(1)	-	0.73	
P	16.76 Trosifol	1000mm x 1200mm	4 (inside)	9.44	22.09	-	0.92	
Q	17.52 PVB laminated	1000mm x 1200mm	4 (inside)	14.88	-	-	0.56	
R	17.52 EVA laminated	1000mm x 1200mm	4 (inside)	11.79	27.47(1)	-	0.67	
S	21.52 EVA laminated	1000mm x 1200mm	4 (outside)	7.07	18.93	-	0.94	
T	21.52 EVA laminated	1000mm x 1200mm	4 (inside)	8.40	20.38	-	0.88	
U	21.52 PVB laminated	1000mm x 1200mm	4 (outside)	8.22	22.87	-	0.77	
V	21.52 PVB laminated	1000mm x 1200mm	4 (inside)	9.28	23.34	-	0.74	

(1) Recorded for information

Test Results (Continued).

SUMMARY OF SUITABILITY OF EASY GLASS SMART TOP MOUNT BARRIER SYSTEMS

Type of occupancy for part of the building or structure	Examples of specific use	Horizontal uniformly distributed line load (kN/m)	Test reference						
			A	B	C	D	E	F	G
Domestic and residential activities	(i) All areas within or serving exclusively one single family dwelling including stairs, landings, etc. but excluding external balconies and edges of roofs	0.36	✓	✓	✓	✓	✓	✓	✓
	(ii) Other residential, i.e. houses of multiple occupancy and balconies, including Juliette balconies and edges of roofs in single family dwellings	0.74	X	✓	✓	X	✓	✓	✓
Offices and work areas not included elsewhere, including storage areas	(iii) Light access stairs and gangways not more than 600 mm wide	0.22	✓	✓	✓	✓	✓	✓	✓
	(iv) Light pedestrian traffic routes in industrial and storage buildings except designated escape routes	0.36	✓	✓	✓	✓	✓	✓	✓
	(v) Areas not susceptible to overcrowding in office and institutional buildings, also industrial and storage buildings except as given above	0.74	X	✓	✓	X	✓	✓	✓
Areas where people might congregate	(vi) Areas having fixed seating within 530 mm of the barrier, balustrade or parapet	1.5	X	X	X	X	X	X	X
Areas with tables or fixed seatings	(vii) Restaurants and bars	1.5	X	X	X	X	X	X	X

Test Results (Continued).

SUMMARY OF SUITABILITY OF EASY GLASS SMART TOP MOUNT BARRIER SYSTEMS (Continued)

Type of occupancy for part of the building or structure	Examples of specific use	Horizontal uniformly distributed line load (kN/m)	Test reference						
			A	B	C	D	E	F	G
Areas without obstacles for moving people and not susceptible to overcrowding	(viii) Stairs, landings, corridors, ramps 0.74	0.74	X	✓	✓	X	✓	✓	✓
	(ix) External balconies including Juliette balconies and edges of roofs. Footways and pavements within building curtilage adjacent to basement/sunken areas	0.74	X	✓	✓	X	✓	✓	✓
Areas susceptible to overcrowding	(x) Footways or pavements less than 3 m wide adjacent to sunken areas	1.5	X	X	X	X	X	X	X
	(xi) Theatres, cinemas, discotheques, bars, auditoria, shopping malls, assembly areas, studio. Footways or pavements greater than 3 m wide adjacent to sunken areas.	3.0	X	X	X	X	X	X	X
	(xii) Grandstands and stadia [A)]	-	-	-	-	-	-	-	-
Retail areas	(xiii) All retail areas including public areas of banks/building societies or betting shops	1.5	X	X	X	X	X	X	X
Vehicular	(xiv) Pedestrian areas in car parks, including stairs, landings, ramps, edges or internal floors, footways, edges of roofs	1.5	X	X	X	X	X	X	X
	(xv) Horizontal loads imposed by vehicles [B)]	-	-	-	-	-	-	-	-

Test Results (Continued).

SUMMARY OF SUITABILITY OF EASY GLASS SMART TOP MOUNT BARRIER SYSTEMS (Continued)

Type of occupancy for part of the building or structure	Examples of specific use	Horizontal uniformly distributed line load (kN/m)	Test reference					
			H	I	IA	IB	J	K
Domestic and residential activities	(i) All areas within or serving exclusively one single family dwelling including stairs, landings, etc. but excluding external balconies and edges of roofs	0.36	✓	✓	✓	✓	✓	✓
	(ii) Other residential, i.e. houses of multiple occupancy and balconies, including Juliette balconies and edges of roofs in single family dwellings	0.74	✓	✓	✓	✓	✓	✓
Offices and work areas not included elsewhere, including storage areas	(iii) Light access stairs and gangways not more than 600 mm wide	0.22	✓	✓	✓	✓	✓	✓
	(iv) Light pedestrian traffic routes in industrial and storage buildings except designated escape routes	0.36	✓	✓	✓	✓	✓	✓
	(v) Areas not susceptible to overcrowding in office and institutional buildings, also industrial and storage buildings except as given above	0.74	✓	✓	✓	✓	✓	✓
Areas where people might congregate	(vi) Areas having fixed seating within 530 mm of the barrier, balustrade or parapet	1.5	X	X	X	X	X	✓
Areas with tables or fixed seatings	(vii) Restaurants and bars	1.5	X	X	X	X	X	✓

Test Results (Continued).

SUMMARY OF SUITABILITY OF EASY GLASS SMART TOP MOUNT BARRIER SYSTEMS (Continued)

Type of occupancy for part of the building or structure	Examples of specific use	Horizontal uniformly distributed line load (kN/m)	Test reference					
			H	I	IA	IB	J	K
Areas without obstacles for moving people and not susceptible to overcrowding	(viii) Stairs, landings, corridors, ramps 0.74	0.74	✓	✓	✓	✓	✓	✓
	(ix) External balconies including Juliette balconies and edges of roofs. Footways and pavements within building curtilage adjacent to basement/sunken areas	0.74	✓	✓	✓	✓	✓	✓
Areas susceptible to overcrowding	(x) Footways or pavements less than 3 m wide adjacent to sunken areas	1.5	X	X	X	X	X	✓
	(xi) Theatres, cinemas, discotheques, bars, auditoria, shopping malls, assembly areas, studio. Footways or pavements greater than 3 m wide adjacent to sunken areas.	3.0	X	X	X	X	X	X
	(xii) Grandstands and stadia [A)]	-	-	-	-	-	-	-
Retail areas	(xiii) All retail areas including public areas of banks/building societies or betting shops	1.5	X	X	X	X	X	✓
Vehicular	(xiv) Pedestrian areas in car parks, including stairs, landings, ramps, edges or internal floors, footways, edges of roofs	1.5	X	X	X	X	X	✓
	(xv) Horizontal loads imposed by vehicles [B)]	-	-	-	-	-	-	-

Test Results (Continued).

SUMMARY OF SUITABILITY OF EASY GLASS SMART FASCIA MOUNT BARRIER SYSTEMS

Type of occupancy for part of the building or structure	Examples of specific use	Horizontal uniformly distributed line load (kN/m)	Test reference										
			L	M	N	O	P	Q	R	S	T	U	V
Domestic and residential activities	(i) All areas within or serving exclusively one single family dwelling including stairs, landings, etc. but excluding external balconies and edges of roofs	0.36	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	(ii) Other residential, i.e. houses of multiple occupancy and balconies, including Juliette balconies and edges of roofs in single family dwellings	0.74	X	✓	X	X	✓	X	X	✓	✓	✓	✓
Offices and work areas not included elsewhere, including storage areas	(iii) Light access stairs and gangways not more than 600 mm wide	0.22	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	(iv) Light pedestrian traffic routes in industrial and storage buildings except designated escape routes	0.36	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	(v) Areas not susceptible to overcrowding in office and institutional buildings, also industrial and storage buildings except as given above	0.74	X	✓	X	X	✓	X	X	✓	✓	✓	✓
Areas where people might congregate	(vi) Areas having fixed seating within 530 mm of the barrier, balustrade or parapet	1.5	X	X	X	X	X	X	X	X	X	X	X
Areas with tables or fixed seatings	(vii) Restaurants and bars	1.5	X	X	X	X	X	X	X	X	X	X	X

Test Results (Continued).

SUMMARY OF SUITABILITY OF EASY GLASS SMART FASCIA MOUNT BARRIER SYSTEMS (Continued)

Type of occupancy for part of the building or structure	Examples of specific use	Horizontal uniformly distributed line load (kN/m)	Test reference										
			L	M	N	O	P	Q	R	S	T	U	V
Areas without obstacles for moving people and not susceptible to overcrowding	(viii) Stairs, landings, corridors, ramps 0.74	0.74	X	✓	X	X	✓	X	X	✓	✓	✓	✓
	(ix) External balconies including Juliette balconies and edges of roofs. Footways and pavements within building curtilage adjacent to basement/sunken areas	0.74	X	✓	X	X	✓	X	X	✓	✓	✓	✓
Areas susceptible to overcrowding	(x) Footways or pavements less than 3 m wide adjacent to sunken areas	1.5	X	X	X	X	X	X	X	X	X	X	X
	(xi) Theatres, cinemas, discotheques, bars, auditoria, shopping malls, assembly areas, studio. Footways or pavements greater than 3 m wide adjacent to sunken areas.	3.0	X	X	X	X	X	X	X	X	X	X	X
	(xii) Grandstands and stadia [A)]	-	-	-	-	-	-	-	-	-	-	-	-
Retail areas	(xiii) All retail areas including public areas of banks/building societies or betting shops	1.5	X	X	X	X	X	X	X	X	X	X	X
Vehicular	(xiv) Pedestrian areas in car parks, including stairs, landings, ramps, edges or internal floors, footways, edges of roofs	1.5	X	X	X	X	X	X	X	X	X	X	X
	(xv) Horizontal loads imposed by vehicles [B)]	-	-	-	-	-	-	-	-	-	-	-	-

*** End of Report ***