NATIONAL TEST REPORT
(BS6180:2011)

EASY GLASS® VIEW

MOD.6923

Attention: For an Easy Glass View Juliet balcony configuration without a cap rail, only toughened laminated glass is allowed to use. BS6180: see chapter 8.5.2. Handrail attachment

Test Report

Report No	2370/8710132 Part 1 of 2 Issue 3 This Report consists of 15 pages
Licence/Certificate No	KM 656489
Client	Q-Railing Europe GmbH & Co.KG Marie-Curie-Strasse 8-14 Emmerich am Rhein 46446 Germany
Authority & date	BSI Service Management Order Number 8710132
Items tested	Easy Glass View Barrier System
Standard	BS 6180:2011 clauses 6.3.1 and 6.4.1 only Type testing for product certification
	Issue 3 of this report supersedes all previous issues. The amendments on pages 3 and 13 giving rise to this issue can be ascertained by contacting the authorising signatory.
Results	See text
Prepared by	G R Essam Principal Engineer
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Issue Date	14 June 2017
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TESTING AND EXAMINATION OF A BARRIER SYSTEM SUBMITTED AS TYPE TEST SAMPLES

INTRODUCTION

For the purposes of product certification the barrier system submitted on behalf of Q-Railing Europe GmbH & Co and detailed below was tested against the recommendations of BS 6180:2011 clauses 6.3.1 and 6.4.1 only, as detailed in the following pages of this Report.

It is emphasized that assessments have not been made to the Standard.

The testing was supervised at the Emmerich am Rhein site of Q-Railing Europe GmbH & Co on 11 and 12 April 2017.

TEST ITEMS

Easy Glass View Barrier System, model number 6923, with the following glass panels:

A) 1800mm x 1100mm x 12.76mm two layer laminated toughened glass[1)]
B) 2000mm x 1100mm x 12.00mm monolithic toughened glass
C) 2200mm x 1100mm x 16.76mm two layer laminated toughened glass[2)]
D) 2500mm x 1100mm x 15.00mm monolithic toughened glass
E) 2500mm x 1100mm x 16.76mm two layer laminated toughened glass[2)]
F) 2500mm x 1100mm x 21.52mm four layer laminated toughened glass
G) 3000mm x 1100mm x 21.52mm four layer laminated toughened glass

Notes:
1) Also applicable to 13.52mm four layer laminated toughened glass
2) Also applicable to 17.52mm four layer laminated toughened glass

EXAMINATION AND TEST

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.

EXAMINATION AND TEST (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

EXAMINATION AND TEST (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

EXAMINATION AND TEST (CONTINUED)

TEST METHODS

A single section of each size 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 upper edge of the glass using a number of equally spaced pneumatic cylinders operating through wire ropes and pulleys. The common air pressure supplied to each cylinder was measured using a calibrated load cell and display unit.

The deflection measurements of the upper edge of the glass were taken from a fixed datum point at the same level using a calibrated digital indicator.

Typical arrangement for application of horizontal uniformly distributed line loading assembly

Uniformly distributed load applied to the infill

The uniformly distributed loads were applied to the glass in a horizontal orientation with the mounting profiles of the barrier system clamped to steel girders, as described above, using bags of sand. The loads were calculated according to the total glass area.

The deflection measurements at the centre of the glass were taken from fixed datum points using a calibrated digital indicator.

EXAMINATION AND TEST (CONTINUED)

TEST METHODS (Continued)

Uniformly distributed load applied to the infill (Continued)

Typical arrangement for application of uniformly distributed load applied to the barrier system

EXAMINATION AND TEST (CONTINUED)

TEST METHODS (Continued)

Point load applied to part of the infill

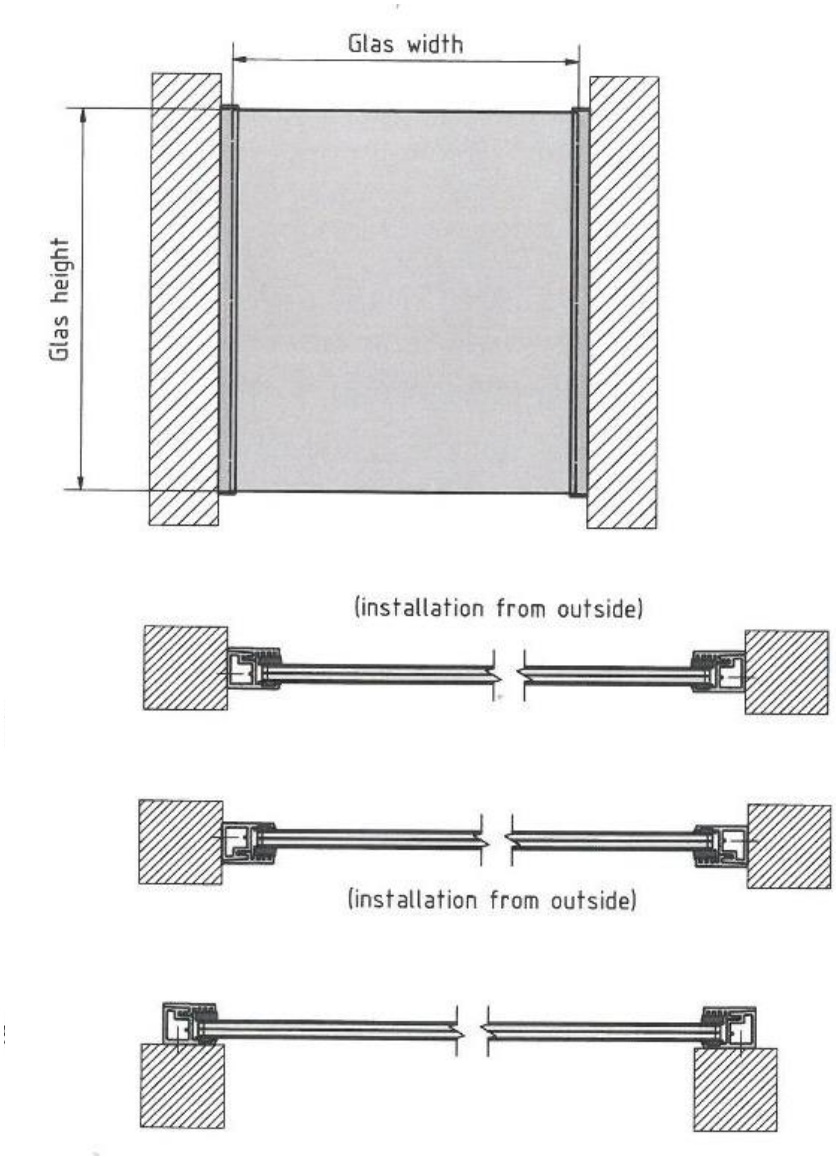
The point loads were applied to the centre of the glass through a 100mm x 100mm wooden block using a hydraulic cylinder. The loads were measured using a calibrated load cell and display unit.

The deflection measurements on the opposite side of the glass to the loading point were taken from a fixed datum point using a calibrated digital indicator.

Typical arrangement for application of point load to the centre of the barrier system

EXAMINATION AND TEST (CONTINUED)

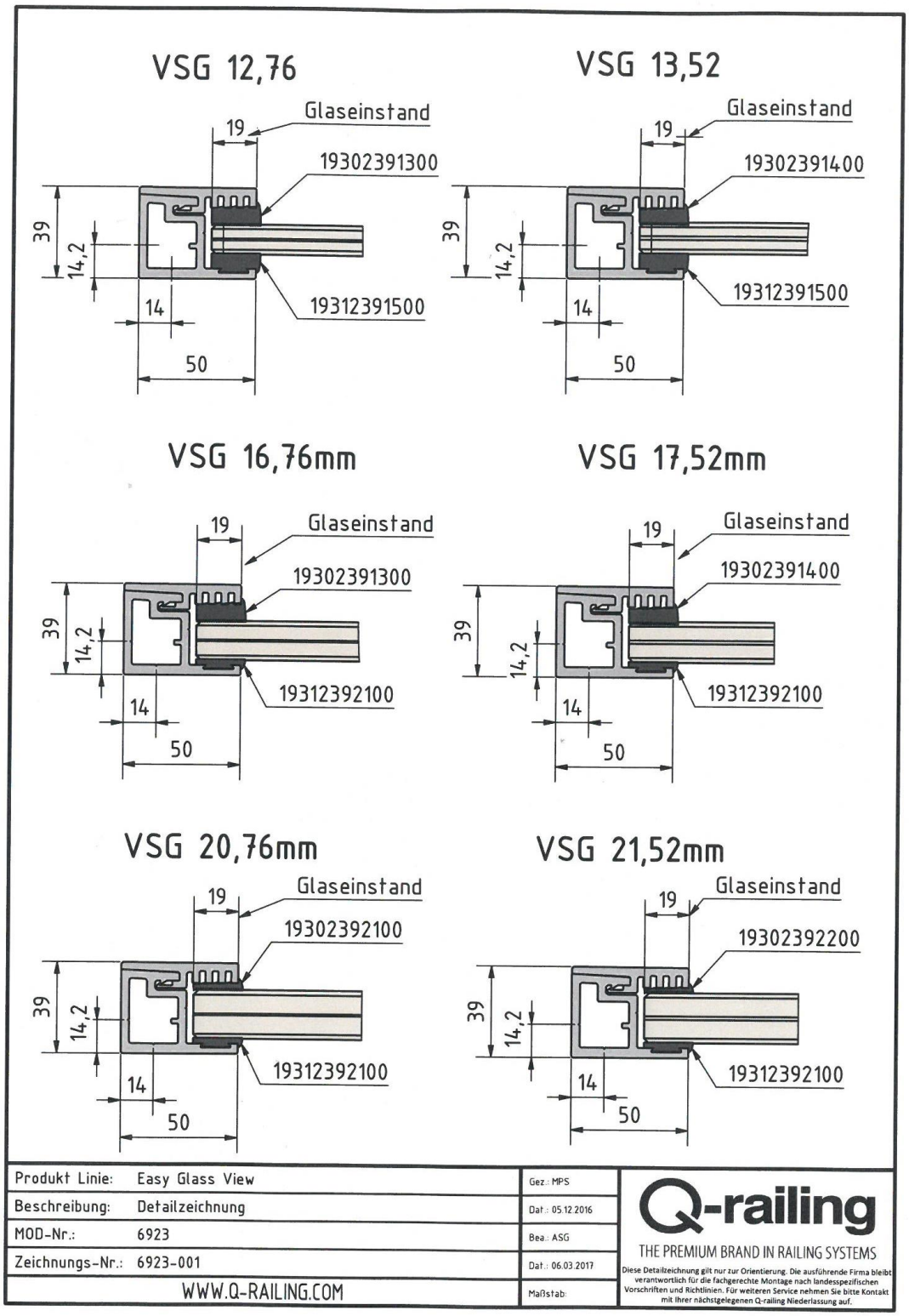
TEST METHODS (Continued)



Easy Glass View assembly drawing

EXAMINATION AND TEST (CONTINUED)

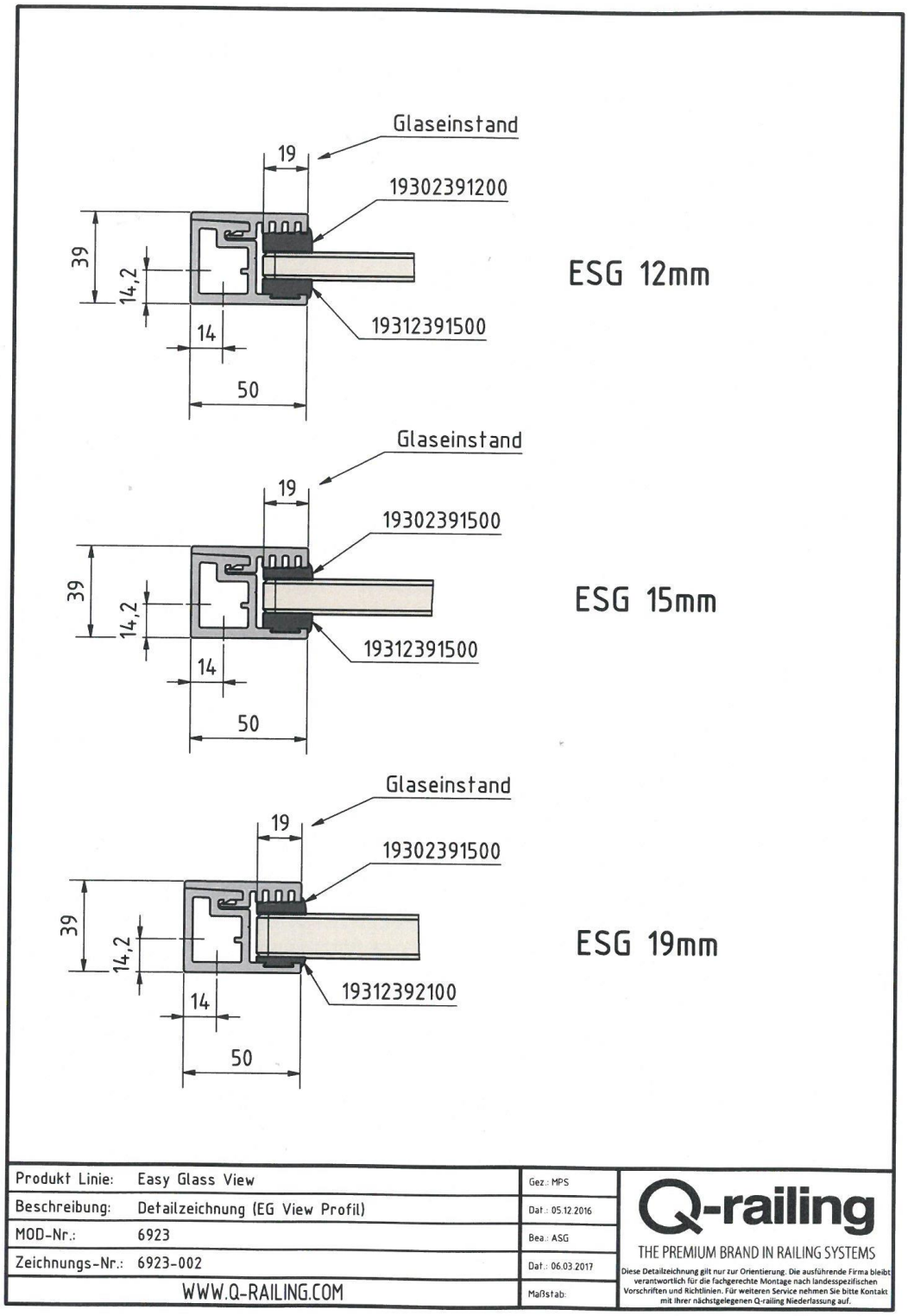
TEST METHODS (Continued)



Easy Glass View assembly drawing

EXAMINATION AND TEST (CONTINUED)

TEST METHODS (Continued)



Easy Glass View assembly drawing

EXAMINATION AND TEST (CONTINUED)

SUMMARY OF TESTING

Horizontal uniformly distributed line loads

System	Mount	Glass size (WxH) (mm x mm)	Glass type	Line load (kN/m)	Deflection (mm)
Easy Glass View System	Side	A) 1800 x 1100	12.76mm laminated	0.36	11.5
				0.74	20.9
				0.91	27.6[1)]
	Inside	A) 1800 x 1100	12.76mm laminated	0.36	10.8
				0.74	20.2
				0.90	26.9[1)]
	Inside[2)]	B) 2000 x 1100	12.00mm monolithic	0.36	12.5
				0.74	24.9
	Inside[2)]	C) 2200 x 1100	16.76mm laminated	0.36	9.2
				0.74	17.9
				0.92	24.7[1)]
	Inside[2)]	D) 2500 x 1100	15.00mm monolithic	0.36	12.3
				0.74	25.1[3)]
	Inside[2)]	E) 2500 x 1100	16.76mm laminated	0.36	12.6
				0.74	23.4
	Inside[2)]	F) 2500 x 1100	21.52mm laminated	0.36	7.6
				0.74	14.3
				1.23	27.3[1)]
	Inside[2)]	G) 3000 x 1100	21.52mm laminated	0.36	13.5
				0.74	28.1[1)]

Notes:
1) Recorded for information
2) Also applicable to side mounted system
3) Marginal result

EXAMINATION AND TEST (CONTINUED)

SUMMARY OF TESTING (Continued)

Uniformly distributed load applied to the infill

System	Mount	Glass size (WxH) (mm x mm)	Glass type	Area load (kN/m²)	Deflection (mm)
Easy Glass View System	Inside[2)]	A) 1800 x 1100	12.76mm laminated	1.0	16.2
	Inside[2)]	B) 2000 x 1100	12.00mm monolithic	1.0	18.8
	Inside[2)]	C) 2200 x 1100	16.76mm laminated	1.0	15.1
	Inside[2)]	D) 2500 x 1100	15.00mm monolithic	1.0	26.2[1)]
	Inside[2)]	E) 2500 x 1100	16.76mm laminated	1.0	24.6
	Inside[2)]	F) 2500 x 1100	21.52mm laminated	1.0	15.3
	Side	G) 3000 x 1100	21.52mm laminated	1.0	26.0[3)]

Notes:
1) Recorded for information
2) Also applicable to side mounted system
3) Calculated deflection by the manufacturer for information

Point load applied to part of the infill

System	Mount	Glass size (WxH) (mm x mm)	Glass type	Point load (kN)	Deflection (mm)
Easy Glass View System	Side	A) 1800 x 1100	12.76mm laminated	0.5	5.6
				1.5	17.2
	Inside	A) 1800 x 1100	12.76mm laminated	0.5	5.6
				1.5	18.4
	Inside[2)]	B) 2000 x 1100	12.00mm monolithic	0.5	7.3
				1.5	17.4
	Inside[2)]	C) 2200 x 1100	16.76mm laminated	0.5	4.6
				1.5	13.9[1)]
	Inside[2)]	D) 2500 x 1100	15.00mm monolithic	0.5	7.7
				1.5	22.9[1)]
	Inside[2)]	E) 2500 x 1100	16.76mm laminated	0.5	6.2
				1.5	18.5[1)]
	Inside[2)]	F) 2500 x 1100	21.52mm laminated	0.5	3.2
				1.5	9.6[1)]
	Side	G) 3000 x 1100	21.52mm laminated	0.5	6.3[1)]

Notes:
1) Calculated deflections by the manufacturer for information
2) Also applicable to side mounted system

EXAMINATION AND TEST (CONTINUED)

SUMMARY OF SUITABILITY OF BARRIER SYSTEMS

Type of occupancy for part of the building or structure	Examples of specific use	Horizontal uniformly distributed line load (kN/m)	Easy Glass View System						
			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
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
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
Areas without obstacles for moving people and not susceptible to overcrowding	(viii) Stairs, landings, corridors, ramps 0.74	0.74	✓	✓	✓	✓	✓	✓	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

EXAMINATION AND TEST (CONTINUED)

SUMMARY OF SUITABILITY OF BARRIER SYSTEMS (Continued)

Type of occupancy for part of the building or structure	Examples of specific use	Horizontal uniformly distributed line load (kN/m)	Easy Glass View System						
			A	B	C	D	E	F	G
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)]	-	-	-	-	-	-	-	-

End of Report