



KOZZA RAILING SYSTEMS

BALUSTRADE TESTING IN ACCORDANCE WITH BS 6180:2011

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Prepared for: Besan Metal Insaat Taahhut San Ve Dis Tic Ltd STI
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V3.0	02/02/2024	Third Issue

Distribution List

Name	Role
Mr. Burak Gokbulut	Director, Kozza UK Ltd.
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1.0 Introduction

Specialist Technical Services (U.K) Limited, herein known as STS-UK Group were commissioned by Besan Metal Insaat Taahhut San Ve Dis Tic Ltd STI to undertake a series of balustrade tests on two of their KE100 balustrade systems. All testing was carried out by STS-UK's own direct labour force. The purpose of the testing was to attain results and findings that could be analysed to see if the balustrade systems were capable of resisting safely the imposed loadings. All systems tested were done so in accordance with the BS 6180:2011. Each component was briefly surveyed for damage before and subsequently after testing was carried out.

The testing was carried out on balustrades within the STS-UK Testing Facility. The testing was carried out at the following address:

Site Address: STS-UK Group, Unit 4 Poole Hall Business Park, Poole Hall Road, Ellesmere Port, Cheshire, CH66 1UA, United Kingdom.

Date of Testing: Wednesday 5th April 2023.

2.0 Equipment

The equipment sent by the Client consisted of two (2) separate balustrade systems, each specialising in a different thickness of glass. These were made up from the following components:

- Aluminium Channel X 2
- Rubber Gasket X 4
- Bespoke Plastic Wedge X 6
- 1100x1000mm Glass Panel X 2

All equipment was checked and inspected prior to setup. No noticeable damage was found on inspection and deemed fit for testing.

All systems were installed as per the installation video on the Kozza Railing Systems YouTube page. The Channels were secured into a concrete base using M8 drop-in anchors with M8 Button screws.

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3.0 Methodology



To accurately determine the conformity of the setup, firstly a brief visual survey of the balustrade installed was carried out. This was to determine whether the balustrade was deemed unfit for purpose, or any obvious signs of issue could be identified in which may impact the quality of the results attained. Following this, a series of load testing sequences were undertaken. These sequences were carried out in accordance with BS 6180:2011.

All testing was carried out using a combination of manually hydraulic rams and electronic instrumentation. All rams used were measured using calibrated electronic pressure gauges, connected back to a central logging system. Measurement of displacement was carried out using a series of calibrated 1000mm draw-wire sensors with an accuracy of $\pm 0.01\text{mm}$. All electronic readings taken were recorded at a rate of 1000Hz and were saved for review.

Within BS 6180:2011 Table 2 shows the static load requirements for the standard, this shows the following:

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	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

Table 1 – Static Test Requirements (BS 6180:2011 Table 2)

* END OF PAGE *

The information following information below is taken directly from BS 6180:2011 and refers to each test required in Table 1 of this Report, above.

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, 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 load should be applied at design height as presented in Table 1 or at design level (1 100 mm) for barriers higher than the design height.

Uniformly distributed load should be applied to 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. 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, 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**. 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.

Each test was deemed a success if the system demonstrated that it did not suffer excessive non-elastic displacements (maximum 25mm), and the target load values were achieved as described in Table 1 of this Report, above. If excessive non-elastic displacements do occur the system would be declared non-compliant to the specified requirement.

Following all testing each sample was visually examined again to ensure there was no obvious damage caused during the testing process. Any before and after damage would be recorded and photographic evidence taken for reference.

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4.0 Results

Upon a brief visual survey of the samples to be tested, no areas of the installed system raised concern. There were no signs of visual damage at the time of testing which could be deemed to influence the overall result or performance of the samples under testing in the manner indicated.



The below table details the test numbers, the proof loading details, the recorded displacement and result of the testing stating whether the test was deemed a pass or fail in relation BS 6180:2011.

Test	Glass Thickness (mm)	Target Load	Load Achieved	Maximum Displacement (mm)	Classification
Line Load	17.52	0.74kN/m	0.74kN/m	18.91	Pass
Infill	17.52	1.00kN/m ²	1.00kN/m ²	3.72	Pass
Point	17.52	0.50kN	0.50kN	5.06	Pass
Line Load	21.52	0.74kN/m	0.74kN/m	23.47	Pass
Infill	21.52	1.00kN/m ²	1.00kN/m ²	8.03	Pass
Point	21.52	0.50kN	0.50kN	4.24	Pass

Table 2 – Test Results

5.0 Conclusion

After analysis of all these results. It can be said that the 20.52mm and 17.52mm KE100 balustrade systems performed to the requirements when compared against the testing criteria set out in BS 6180:2011 Table 1 when tested in the manner described within this Report, on the day of testing.

	Name	Signature	Date
Created By: Junior Technician	Benjamin Cartwright		17/03/2021
Checked By: Technical Director	Andrew Gore		17/03/2021

For and on behalf of Specialist Technical Services (U.K) Limited

* END OF REPORT *



APPENDIX A – TESTING CERTIFICATES

TEST CERTIFICATE

BALUSTRADE TESTING IN ACCORDANCE WITH BRITISH STANDARD BS 6180:2011

On behalf of Besan Metal Insaat Taahhut San Ve Dis Tic Ltd STI
Ikitelli Org. San. Bolgesi, Biksan San. Sitesi A-1 Block No: 25-28, Basaksehir, Istanbul, 3449, Turkey

BALUSTRADE TESTING STS-UK GROUP LABORATORY

TEST DESCRIPTION: A series of loads were applied to the balustrade system at a height of 1100mm and width of 1000mm to determine the deflection of the balustrade system when assembled. All testing were carried out in accordance with BS 6180:2011.

REF NO.:	DR-5577	DATE TESTED:	5 th April 2023
JOB NO.:	P10159	CERTIFICATE DATE:	13 th April 2023
CERTIFICATE NO.:	IC11183	SUPPLIER/SOURCE:	Client

TEST DETAILS:			
Product Tested:	KE100 (16mm)	Item Condition:	New
Target Load:	0.74kN	Ambient Temperature:	18°C
Test Location:	STS Laboratory	Procedure or Method:	BS 6180:2011
Test Number:	Two		


TEST RESULTS:

Test	Target Load	Load Achieved	Maximum Displacement (mm)	Classification
Line Load	0.74kN/m	0.74kN/m	18.91	Pass
Infill	1.00kN/m ²	1.00kN/m ²	3.72	Pass
Point	0.50kN	0.50kN	5.06	Pass



ANALYSIS:

Testing was completed successfully with the balustrade system achieving loading values for the 0.74kN specification, with a maximum recorded displacement of 18.91mm, resulting in a pass. All testing was carried out in accordance with BS 6180:2011.

For Specialist Technical Services (U.K) Limited			The results found on this Certificate relate only to the product[s] tested as described above This Test Certificate shall <u>not</u> be reproduced except in full QC: TC001 – Test Certificate – v3.0 Page 1 of 1
Approved By:	Andrew Gore		
Position:	Technical Director		
Signature:			

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TEST CERTIFICATE

BALUSTRADE TESTING IN ACCORDANCE WITH BRITISH STANDARD BS 6180:2011

On behalf of Besan Metal Insaat Taahhut San Ve Dis Tic Ltd STI
Ikitelli Org. San. Bolgesi, Biksan San. Sitesi A-1 Block No: 25-28, Basaksehir, Istanbul, 3449, Turkey

BALUSTRADE TESTING STS-UK GROUP LABORATORY

TEST DESCRIPTION: A series of loads were applied to the balustrade system at a height of 1100mm and width of 1000mm to determine the deflection of the balustrade system when assembled. All testing were carried out in accordance with BS 6180:2011.

REF NO.:	DR-5577	DATE TESTED:	5 th April 2023
JOB NO.:	P10159	CERTIFICATE DATE:	13 th April 2023
CERTIFICATE NO.:	IC11184	SUPPLIER/SOURCE:	Client

TEST DETAILS:			
Product Tested:	KE100 (20mm)	Item Condition:	New
Target Load:	0.74kN	Ambient Temperature:	18°C
Test Location:	STS Laboratory	Procedure or Method:	BS 6180:2011
Test Number:	Three		


TEST RESULTS:

Test	Target Load	Load Achieved	Maximum Displacement (mm)	Classification
Line Load	0.74kN/m	0.74kN/m	23.47	Pass
Infill	1.00kN/m ²	1.00kN/m ²	8.03	Pass
Point	0.50kN	0.50kN	4.24	Pass



ANALYSIS:

Testing was completed successfully with the balustrade system achieving loading values for the 0.74kN specification, with a maximum recorded displacement of 23.47mm, resulting in a pass. All testing was carried out in accordance with BS 6180:2011.

For Specialist Technical Services (U.K) Limited			<p>The results found on this Certificate relate only to the product[s] tested as described above This Test Certificate shall <u>not</u> be reproduced except in full</p> <p>QC: TC001 – Test Certificate – v3.0 Page 1 of 1</p>
Approved By:	Andrew Gore		
Position:	Technical Director		
Signature:			

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APPENDIX B – PHOTOGRAPHIC EVIDENCE



Figure 1 – UDL Example



Figure 2 – Infill Test Example



Figure 3 – Point Load Example