



BS EN 1288-3:2000

Glass in building - Determination of the bending strength of glass -
Part 3: Test with specimen supported at two points (four point bending)

Technical Report

Report No: R14260-11
Author: M Wass
Date: 31st July 2015

Customer

Pearsons Glass Limited
Maddrell Street
Liverpool
L3 7EH

Details

Project Name: Four point bend test
Product Name: Clear Float
Size: 4mm - 15mm
Test standards: BS EN 1288-3:2000

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Testing Conducted by:	Wintech Engineering Ltd Halesfield 2 Telford Shropshire TF7 4QH
Test Conducted at:	Address as above
Test Conducted for:	Pearsons Glass Limited
Standard Specified:	BS EN 1288-3:2000
Project No:	14260
Product to be tested:	4mm - 15mm Clear Float Glass
Type of glass:	Thermally toughened soda lime silicate safety glass
Pre-treatment and surface condition of test specimen:	Clear Toughened
Description of edge finish:	Polished symmetrical edge
Orientation of glass under test:	N/A
Number of test specimens:	14
Date testing completed:	30 June 2015
Testing Conducted by:	M Swanborough & D Adams
Report Compiled by:	M Wass Technical Director
Technical Approval: (Authorising Signatory)	M Swanborough Laboratory Development Manager



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1. INTRODUCTION

This report describes tests conducted at the test laboratory of Wintech Engineering Ltd to a selection of glass samples on behalf of Pearsons Glass Limited.

The test methods were in accordance with BS EN 1288-3:2000 - Glass in building - Determination of the bending strength of glass - Part 3: Test with specimen supported at two points (four point bending) as specified in BS EN 12150-2:2004 - Glass in building - Thermally toughened soda lime silicate safety glass - Part 2: Evaluation of conformity/product standard.

Wintech Engineering Ltd is accredited by the United Kingdom Accreditation Service as UKAS Testing Laboratory No. 2223.

2. TEST ARRANGEMENT

2.1 TEST RIG

Test specimens, supplied for testing in accordance with the relevant European Standard, were mounted into the 4 Point bend testing machine.

A uniformly increasing bending stress was applied at a rate of $(2.0 \pm 0.4) \text{N/mm}^2 \cdot \text{s}$ until breakage occurred. The maximum load was recorded together with the time taken to reach the load.

2.2 INSTRUMENTATION

2.2.1 FOUR POINT BEND TESTING MACHINE

The testing machine load measuring device is within the error limits of to $\pm 2.0\%$. The supporting rollers and bending rollers have a diameter of 50mm and a length of 365mm, all of the rollers are free to rotate.

2.2.2 MEASUREMENT

The thickness of the samples were measured using a digital calliper accurate to 0.01mm. The width and length of the sample was measured with a tape measure accurate to the nearest 1.0mm

2.2.3 TEMPERATURE & HUMIDITY

A data logger capable of measuring temperature with accuracy of $\pm 1^\circ\text{C}$ and humidity with accuracy of $\pm 5\% \text{Rh}$ was used. The sample was stored and tested in the laboratory in the permitted range of $23 \pm 5^\circ\text{C}$ and 40-70% humidity. During the test the temperature did not vary by more than 1°C in order to avoid the development of thermal stresses.

3. TEST PROCEDURES

3.1 SEQUENCE OF TESTING

PRIOR TO TEST

1. The width of the sample was determined by the arithmetic mean of at least 3 individual measurements
2. The thickness of the test sample was determined by the arithmetic mean of at least 4 individual measurements to the nearest 0.05mm

- a) The measured positions lie outside to bending rollers, to avoid damage to sample
- b) The measurements were taken from both ends of the test sample.

3. The test specimen was mounted as per Figure 1 below. Strips of rubber 3mm thick and of hardness (40 ± 10) IRHD were placed between the sample and the supporting and bending rollers. An adhesive film was applied to the side of the specimens facing the bending rollers in order to facilitate the location of the failure origin.

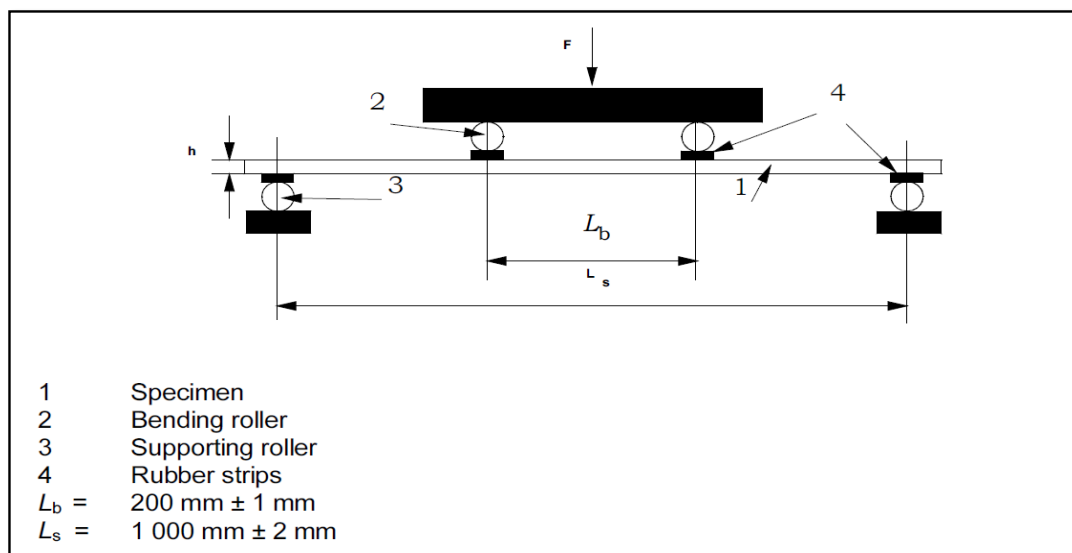
MAIN TEST

4. The test samples were bent with a uniformly increasing bending stress at a rate of (2 ± 0.4) N/mm².s until breakage occurred. The maximum load was recorded together with the time taken to reach the load.

END OF TEST

5. After completion of the bending test the following information was recorded and calculated
 - a) The origin of the break
 - b) The maximum load to break
 - c) The time to break
 - d) The bending strength

FIGURE 1 (Mounting of specimen as described in BS EN 1288-3:2000)



4. TEST RESULTS

The samples were tested in accordance with BS EN 1288-3:2000. The results are as follows:

Sample Description and Orientation	Average specimen width mm	Specimen Length mm [L]	Average thickness mm [h]	Maximum force - N [Fmax]	Bending Strength - N/mm ² [σ _{bB}]	Time to breakage - s	Breakage on edge of glass	Breakage within bending rollers
4mm clear	359.67	1100.00	3.91	613.0	147.0	70	Yes	Yes
4mm clear	359.50	1100.00	3.88	539.0	130.8	67	Yes	Yes
5mm clear	360.00	1100.00	4.87	1065.0	163.0	79	Yes	Yes
5mm clear	360.00	1100.00	4.89	1014.0	154.1	73	Yes	Yes
6mm clear	360.00	1099.00	5.93	1519.0	159.0	85	Yes	Yes
6mm clear	359.83	1099.00	5.98	1438.0	148.4	80	Yes	Yes
8mm clear	359.67	1100.00	7.98	2940.0	172.1	74	Yes	Yes
8mm clear	359.33	1100.00	8.02	2550.0	148.4	75	Yes	Yes
10mm clear	361.00	1100.00	9.88	4754.0	180.1	84	Yes	Yes
10mm clear	360.00	1100.00	9.88	4749.0	180.5	82	Yes	Yes
12mm clear	361.00	1100.00	11.99	6895.0	177.2	87	Yes	Yes
12mm clear	360.00	1100.00	11.99	7341.0	188.9	93	Yes	Yes
15mm clear	358.33	1100.00	14.98	10174.0	167.0	86	Yes	Yes
15mm clear	359.67	1100.00	15.03	9144.0	148.6	75	Yes	Yes

Table 1 - Values for the mechanical strength of thermally toughened soda lime silicate safety glass (BS EN 12150-1:2000)

Type of glass	Values for mechanical strength (N/mm ²)
Float: Clear Tinted Coated	120
Enamelled Float (Enamelled surface in tension)	75
Patterned glass and drawn sheet	90

4.1 SUMMARY

All samples achieved a pass according to the criteria in BS EN 12150-1:2000.

End Of Report