TNO Quality Services BV

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TNO report

TQS-RAP-07-2413

Noval Glass Group LTD
EN12150: Thermally toughened soda lime silicate safety glass
Thermally toughened soda lime silicate safety glass (enamelled)

Date	September 24, 2007
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Contents

1 Introduction

Noval Glass Group LTD has commissioned TNO Quality Services BV with the assessment of the performance of *thermally toughened glass as defined in EN12150-1.*

According to EN12150-2:2004 'Evaluation of conformity' an initial type testing of a thermally toughened glass product is aimed to establish if a product conforms to the definition of thermally toughened soda lime silicate safety glass.
An initial type testing concerns the product aspects, as listed below:

1. Mechanical strength measurements in accordance with EN12150 (EN1288-3)
2. Fragmentation test in accordance with EN12150

No reference of the product description was supplied by the manufacturer. This document shall be added to this initial type test report by the manufacturer. It was to the manufacturer's responsibility that the samples delivered for initial type test are representative to the production and normal production deviations were included in the delivered test samples.

If any deviation of applied materials/process/machines is encountered (and a so-called major change), re-type testing or additional tests may be required. This decision and responsibility belongs to the manufacturer. The product description is the lead for determining the window of these rules.

The following paragraphs describe the tests, the results and the conclusions.

2 Experimental

2.1 Producer of the test samples

Production plant of the samples	***: Noval Glass Group LTD***
Sampling date	***: 23-09-2007***
Line ID where the samples are made	***: Line #3***

Manufacturer:
Noval Glass Group LTD
No.33 Shandong Road, Qingdao P.R.China

Under responsibility of:
Noval Glass Group LTD
No.33 Shandong Road, Qingdao P.R.China

2.2 Product description

Product:	Thermally toughened soda lime silicate safety glass
Nominal thickness:	5; 6; 8; 10; 12; 15; 19 mm
Dimensions of tested glass specimens:	1100 x 360 mm
Number of test specimens:	35 (5 samples per thickness) Fragmentation test 10 samples per thickness EN1288-3

2.3 Tests

The executed type test consists of the following two tests:
- Mechanical strength measurement in accordance with EN12150 (EN1288-3)
- Fragmentation test in accordance with EN12150

The test samples are assumed to be float glass according to EN572 and manufactured in accordance of EN12150. The mechanical strength measurement requires a minimum of 10 samples and the fragmentation test requires 5 samples of a dimension of 360 by 1100 mm. The samples are tested according the requirements of EN12150 taking into account samples distribution schemes as specified in EN12150.

2.3.1 *Mechanical strength measurement*

The value of mechanical strength can only be given as a statistical value associated with a particular probability of breakage and with a particular type of loading. The mechanical strength values apply to quasi-static loading of the 95% confidence interval.

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

The test is executed according EN1288 Part 3: Test with specimen supported at two points (four point bending).

2.3.2 *Fragmentation test*

The fragmentation test determines whether the glass breaks in the manner prescribed for a thermally toughened soda lime silicate safety glass. Each test specimen was impacted, using a pointed steel tool, at the prescribed position of the EN12150-1. Then, via a hammer and centre punch the glass is broken. In order to prevent scattering of the fragments the specimen is positioned in a frame. The frame is about 3-4 mm larger than the test specimen. The fragments remain interlocked after breakage yet extension of the specimen is not hindered. Between 4 and 5 minutes of the impact and within 1 minute the particle count has been done. The particle count is executed the region of coarsest fracture and outside the so-called excluded area like defined in the EN12150-1. The following table defines the minimal amount of the crack free within the mask of this assessment of 50 by 50 mm.

- 3 mm float shall result in minimal 15 particles.
- 4 mm up to and including 12 mm float shall result in minimal 40 particles.
- 15 mm up to and including 19 mm shall result in minimal 30 particles.

The following photos are examples of an assessment:

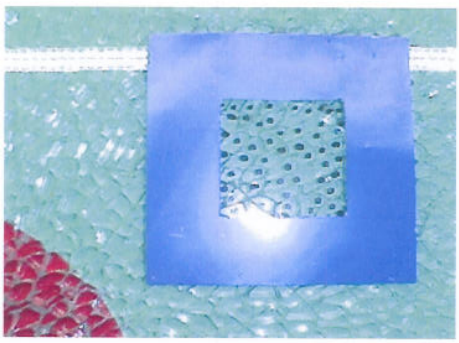

Photo 1: Typical example passing the requirements

Photo 2: typical example failing the requirements

3 Results

3.1 General

All samples have been tested by the China Safety Global Certification Center (CSGC) which is an approved test body and appointed by Certification and Accrediation of the P.R China (CNCA) and accredited by China National Accrediation Board for Certifiers (CNAB).

3.2 Fragmentation test

In the following table the results are given:

5mm enamelled tempered glass:Production line:#3

No.1		No.2		No.3		No.4		No.5	
Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)
44	19	52	24	89	14	68	26	55	21
Assessment between 4 and 5 minutes [Y / N] : Y									

6mm enamelled tempered glass:Production line:#3

No.1		No.2		No.3		No.4		No.5	
Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)
166	17	178	9	185	7	187	10	160	8
Assessment between 4 and 5 minutes [Y / N] : Y									

8mm enamelled tempered glass:Production line:#3

No.1		No.2		No.3		No.4		No.5	
Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)
178	9	195	10	187	9	207	9	193	8
Assessment between 4 and 5 minutes [Y / N] : Y									

10mm enamelled tempered glass:Production line:#3

No.1		No.2		No.3		No.4		No.5	
Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)
101	12	107	12	103	12	110	23	97	20
Assessment between 4 and 5 minutes [Y / N] : Y									

12mm enamelled tempered glass:Production line:#3

No.1		No.2		No.3		No.4		No.5	
Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)
86	16	84	14	88	13	82	16	89	14
Assessment between 4 and 5 minutes [Y / N] : Y									

15mm enamelled tempered glass:Production line:#3

No.1		No.2		No.3		No.4		No.5	
Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)
41	24	43	22	45	17	31	29	38	22
Assessment between 4 and 5 minutes [Y / N] : Y									

19mm enamelled tempered glass:Production line:#3

No.1		No.2		No.3		No.4		No.5	
Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)	Min. number of particles in 25cm²	Length of longest particle(mm)
35	25	37	23	33	26	39	25	33	25
Assessment between 4 and 5 minutes [Y / N] : Y									

The conclusion is that the tested thicknesses are ***passing*** the requirements of the fragmentation test.

3.3 Bending strength

In the following table the results are given:

No.	Facing upwards or downwards	Thickness (mm)	Length (mm)	Width (mm)	Mech. Strength (N/mm^2)	Brake between rollers [Y/N]	Time to breakage (s)
1	↓	4.90	1100	360	124.4	Y	92
2	↓	4.83	1100	360	131.2	Y	97
3	↓	4.92	1100	360	124.1	Y	83
4	↓	4.91	1100	360	136.8	Y	95
5	↓	4.91	1100	360	134.2	Y	108
6	↓	4.89	1100	360	134.2	Y	109
7	↓	4.91	1100	360	127.6	Y	92
8	↓	4.91	1100	360	114.0	Y	85
9	↓	4.90	1100	360	131.3	Y	94
10	↓	4.89	1100	360	143.3	Y	96

No.	Facing upwards or downwards	Thickness (mm)	Length (mm)	Width (mm)	Mech. Strength (N/mm^2)	Brake between rollers [Y/N]	Time to breakage (s)
1	↑	4.91	1100	360	194.8	Y	113
2	↑	4.88	1100	360	183.5	Y	107
3	↑	4.90	1100	360	177.2	Y	96
4	↑	4.90	1100	360	177.9	Y	107
5	↑	4.90	1100	360	188.3	Y	114
6	↑	4.91	1100	360	170.4	Y	102
7	↑	4.91	1100	360	161.6	Y	101
8	↑	4.92	1100	360	189.4	Y	98
9	↑	4.90	1100	360	170.9	Y	109
10	↑	4.91	1100	360	185.7	Y	102

The conclusion is that the results are ***passing*** the requirements of the mechanical strength.

4 Conclusion

All aspects are checked to establish if the *thermally toughened soda lime silicate safety glass* product of Noval Glass Group LTD conforms to the definition of soda lime silicate safety glass.

The mechanical strength and the fragmentation test ***fulfil*** the requirements mentioned in EN12150 for soda lime silicate safety glass products.

When and if changes are made in production method and/or equipment, assessment according the EN12150 shall be reconsidered and re-test shall be done when the changes can lead to different toughening of the glass. The decision and responsibility lies at the producer.

5 Signature

Eindhoven, September 2007

TNO Quality Services BV

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Summary of report **Date: 9-24-2007**

EN 12150
Thermally toughened soda lime silicate safety glass

for details, see test report

Producer: Noval Glass Group LTD
No.33 Shandong Road, Qingdao P.R.China

Under responsibility of: Noval Glass Group LTD
No.33 Shandong Road, Qingdao P.R.China

Product:
Thermally toughened soda lime silicate safety glass (enamelled)
(5; 6; 8; 10; 12; 15; 19 mm)

Test Result:

PASS

The tested samples are complying with the requirements of EN12150.

Signature:

L. van der Ven - le Comte
Project leader

A.J. Piers
Programme leader