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TEST REPORT ECC/141.862/07

TOUGHENED GLASS

SEVERAL TESTS

Interested party: **ROHDEN VIDROS LTDA**
Rua Bruno Heidrich, 4915 – SC 422
Taio - SC

Tests: (45.786)

1. TESTED MATERIAL:

One sample of toughened glass, 6.0 mm thickness, delivered by the interested party in our laboratory on 08/01/07, characterized below:

- Glass: Float.
- Thickness: 6.0 mm.
- Temper process: Horizontal

2. TESTS DONE - METHODOLOGIES:

2.1. **Verification of the dimensions, warping and visual defects, according to item 6 of British and European standard BS EN 12150-1:2000 – Glass in Building – Thermally toughened soda lime silicate safety glass - Part 1: definition and description.**

2.2. **Verification of the thermal resistance, according to item 9.3 of British and European standard BS EN 12150-1:2000 – Glass in Building – Thermally toughened soda lime silicate safety glass - Part 1: definition and description.**

2.3. **Verification of the fragmenting, according to item 8 of British and European standard BS EN 12150-1:2000 – Glass in Building – Thermally toughened soda lime silicate safety glass - Part 1: definition and description.**

2.4. Impact test and safety classification, according to British and European standard BS EN 12600:2002 – Glass in Building – Pendulum test – Impact test method and classification for flat glass.

3. RESULTS OBTAINED:

3.1. Verification of the dimensions, warping and visual defects

3.1.1. Determination of thickness

CP Nº	Thicknesses (mm)				
	E1	E2	E3	E4	Average (mm)
01	5.9	5.9	5.9	5.9	**5.9**
02	5.9	5.9	5.9	5.9	**5.9**
03	5.9	5.9	5.9	5.9	**5.9**
BS EN 12150-1:2000 Limit					**5.8 to 6.2**

Test execution date: 08/08/07.
Room temperature: 23.0ºC

3.1.2. Determination of linear dimensions:

Dimensions in mm			
CP nº	Length (B)	Width (H)	Verification of the angle with greater and smaller dimension frames.
01	500.6	499.3	The test body is within the limits of the frame
02	499.8	499.2	The test body is within the limits of the frame
03	500.6	498.4	The test body is within the limits of the frame
Tolerance (t) for length and width, According to BS EN 2150-1:2000:			
(+2.5 / - 2.5)mm, or in other words, between 497.5 and 502.5 mm.			

Test execution date: 08/08/07.
Room temperature: 23.0ºC

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3.1.3. Verification of visual aspect:

CP nº	Verifications
01	Absence of defects
02	Absence of defects
03	Absence of defects

Test execution date: 08/08/07.
Room temperature: 23.0ºC

3.1.4. Verification of the edges:

CP nº	Verifications
01	Absence of anomalies
02	Absence of anomalies
03	Absence of anomalies

Test execution date: 08/08/07.
Room temperature: 23.0º C

3.1.5. Verification of planeness:

CP nº	Type of warping	Warping
01	Total (mm/mm)	0.0006
	Located (mm/300mm)	0.10
02	Total (mm/mm)	0.0004
	Located (mm/300mm)	0.10
03	Total (mm/mm)	0.0005
	Located (mm/300mm)	0.15
BS EN 12150-1:2000 Limit		Total Warping $\leq$ 0.003 mm/mm
		Located Warping $\leq$ 0.5 mm/300mm

Test execution date: 08/08/07.
Room temperature: 23ºC

3.2. Verification of thermal resistance

C.P. n.º	OCCURRENCES
01	No Occurrence.
02	No Occurrence.
03	No Occurrence.

Test execution date: 08/08/07.
Room temperature: 24.0ºC
Water Temperature: 20ºC

3.3. Fragmentation test

C.P. n.º	Nº OF FRAGMENTS		
	Central	Perimetral (*)	Total
01	41	20	61
02	44	20	64
03	36	18	54
04	44	19	63
05	43	17	60
BS EN 12150-1:2000 Limit			**≥ 40**

(*) For the perimetral fragments ½ fragments were considered.

Test execution date: 08/08/07.

3.4. Impact and classification of toughened safety glass.

To calculate the limit of mass detached from each test body, the following formula was used:

$$\text{Limit of mass (g)} = \frac{\text{Average Mass (kg/m}^2\text{) (*)}}{1\,000} \times 6\,500(**)\text{mm}^2$$

(*) An average mass of 13.4 Kg/m^2 per square meter of glass plate with a 6 mm thickness was considered.

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Differential of height in comparison to the center of the 190 mm impacter:		
CP nº	Occurrences	**Glass mass (G) (*)**
01	No Occurrence.	--
02	No Occurrence.	--
03	No Occurrence.	--
04	No Occurrence.	--
Differential of height in comparison to the center of the 450mm impacter:		
CP nº	Occurrences	**GLASS MASS (G) (*)**
01	No Occurrence.	--
02	No Occurrence.	--
03	No Occurrence.	--
04	No Occurrence.	--
Differential of height in comparison to the center of the 1,200mm impacter:		
CP nº	Occurrences	**GLASS MASS (G) (*)**
01	No Occurrence.	--
02	No Occurrence.	--
03	broke	65.96
04	No Occurrence.	--
Limit of mass detached according to BS EN 12600:2002		***87.10g***

(*) Mass of the ten largest fragments.

Test execution date: 08/13/07.

4. OBSERVATIONS:

4.1. **In relation to the tested sample the following conclusions can me made in relation to the requirement of BS Em 12150-1:2000 and BS 12600:2002:**

TESTS (BS EN 12150-1:2000 and BS EN 12600:2002)	REQUIREMENTS
Verification of the dimensions	Heeds
Verification of warping	Heeds
Verification of visual defects	Heeds
Verification of thermal resistance	Heeds
Verification of fragmentation	Heeds
Safety Classification	Class 1

4.3 - Test concluded in August 2007.

São Paulo, August 15, 2007.

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TEST REPORT ECC/143.480/07

TOUGHENED GLASS

SEVERAL TESTS

Interested party: **ROHDEN VIDROS LTDA**
Rua Bruno Heidrich, 4915 – SC 422
Taio - SC

Tests: (45.786)

1. TESTED MATERIAL:

One sample of toughened glass, 4.0 mm thickness, delivered by the interested party in our laboratory on 08/01/07, characterized below:

- Glass: Float.
- Thickness: 4.0 mm.
- Temper process: Horizontal

2. TESTS DONE - METHODOLOGIES:

2.1. **Verification of the dimensions, warping and visual defects, according to item 6 of British and European standard BS EN 12150-1:2000 – Glass in Building – Thermally toughened soda lime silicate safety glass - Part 1: definition and description.**

2.2. **Verification of the thermal resistance, according to item 9.3 of British and European standard BS EN 12150-1:2000 – Glass in Building – Thermally toughened soda lime silicate safety glass - Part 1: definition and description.**

2.3. **Verification of the fragmenting, according to item 8 of British and European standard BS EN 12150-1:2000 – Glass in Building – Thermally toughened soda lime silicate safety glass - Part 1: definition and description.**

2.4. Impact test and safety classification, according to British and European standard BS EN 12600:2002 – Glass in Building – Pendulum test – Impact test method and classification for flat glass.

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3. RESULTS OBTAINED:

3.1. Verification of the dimensions, warping and visual defects

3.1.1. Determination of thickness

CP Nº	Thicknesses (mm)				
	E1	E2	E3	E4	Average (mm)
01	3.9	3.9	3.9	3.9	3.9
02	3.9	3.9	3.9	3.9	3.9
03	3.9	3.9	3.9	3.9	3.9
BS EN 12150-1:2000 Limit					**3.8 to 4.2**

Test execution date: 08/08/07.
Room temperature: 22.0ºC

3.1.2. Determination of linear dimensions:

Dimensions in mm			
CP nº	Length (B)	Width (H)	Verification of the angle with greater and smaller dimension frames.
01	500.4	500.6	The test body is within the limits of the frame
02	500.6	500.9	The test body is within the limits of the frame
03	500.7	500.9	The test body is within the limits of the frame
Tolerance (t) for length and width, According to BS EN 2150-1:2000:			
(+2.5 / - 2.5)mm, or in other words, between 497.5 and 502.5 mm.			

Test execution date: 08/08/07.
Room temperature: 23.0ºC

3.1.3. Verification of visual aspect:

CP nº	Verifications
01	Absence of defects
02	Absence of defects
03	Absence of defects

Test execution date: 08/08/07.
Room temperature: 23.0ºC

3.1.4. Verification of the edges:

CP nº	Verifications
01	Absence of anomalies
02	Absence of anomalies
03	Absence of anomalies

Test execution date: 08/08/07.
Room temperature: 23.0º C

3.1.5. Verification of planeness:

CP nº	Type of warping	Warping
01	Total (mm/mm)	0.0005
	Located (mm/300mm)	0.10
02	Total (mm/mm)	0.0004
	Located (mm/300mm)	0.10
03	Total (mm/mm)	0.0004
	Located (mm/300mm)	0.10
BS EN 12150-1:2000 Limit		Total Warping ≤ 0.003 mm/mm
		Located Warping ≤ 0.5 mm/300mm

Test execution date: 08/09/07.
Room temperature: 20ºC

3.2. Verification of thermal resistance

C.P. n.º	OCCURRENCES
01	No Occurrence.
02	No Occurrence.
03	No Occurrence.

Test execution date: 08/09/07.
Room temperature: 24.0°C
Water Temperature: 20°C

3.3. Fragmentation test

C.P. n.º	Nº OF FRAGMENTS		
	Central	Perimetral (*)	Total
01	74	40	94
02	69	41	90
03	63	44	85
04	70	42	91
05	75	44	97
BS EN 12150-1:2000 Limit			**≥ 40**

(*) For the perimetral fragments ½ fragments were considered.

Test execution date: 08/08/07.

3.4. Impact and classification of toughened safety glass.

To calculate the limit of mass detached from each test body, the following formula was used:

$$\text{Limit of mass (g)} = \frac{\text{Average Mass (kg/m}^2\text{) (*)}}{1\,000} \times 6\,500(**)\text{mm}^2$$

(*) An average mass of 8.6 Kg/m^2 per square meter of glass plate with a 4 mm thickness was considered.

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Differential of height in comparison to the center of the 190 mm impacter:		
CP nº	Occurrences	**Glass mass (G) (*)**
01	No Occurrence.	--
02	No Occurrence.	--
03	No Occurrence.	--
04	No Occurrence.	--
Differential of height in comparison to the center of the 450mm impacter:		
CP nº	Occurrences	**GLASS MASS (G) (*)**
01	No Occurrence.	--
02	No Occurrence.	--
03	No Occurrence.	--
04	No Occurrence.	--
Differential of height in comparison to the center of the 1,200mm impacter:		
CP nº	Occurrences	**GLASS MASS (G) (*)**
01	No Occurrence.	--
02	broke	18.58
03	broke	21.94
04	No Occurrence.	--
Limit of mass detached according to BS EN 12600:2002		***55.90g***

(*) Mass of the ten largest fragments.

Test execution date: 08/13/07.

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4. OBSERVATIONS:

4.1. **In relation to the tested sample the following conclusions can me made in relation to the requirement of BS Em 12150-1:2000 and BS 12600:2002:**

TESTS (BS EN 12150-1:2000 and BS EN 12600:2002)	REQUIREMENTS
Verification of the dimensions	Heeds
Verification of warping	Heeds
Verification of visual defects	Heeds
Verification of thermal resistance	Heeds
Verification of fragmentation	Heeds
Safety Classification	Class 1

4.3 - Test concluded in August 2007.

São Paulo, August 15, 2007.

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