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Test report
Pendulum impact tests on ESG flat glass using PVC foil

Applicant: LG Hausys Europe GmbH
Lyoner Straße 15
60528 Frankfurt

Date of order: 15 April 2009

Attachments: Photographic documentation

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This test report comprises 5 text pages and 1 attachment.

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Körperschaft des öffentlichen Rechts
Sitz und Registergericht Nürnberg HRA14622
Direktor: Peter Thumann
Vors. d. Aufsichtsrates: Bernd Grossmann

1 General

The company LG Hausys Europe GmbH supplies float glass products. The glass which has a flexible patterned plastic film (PVC) adhered to the back is intended for the furniture industry sector or interior work. Two different types of printed patterns were used for the intended field of application and submitted to test in accordance with DIN EN 12600 for determination of the classification. The tests as required for the above mentioned classification were conducted in the testing hall of the LGA Testing Agency for Structural Design branch Würzburg, on 30 April 2009.

2 Documents, references

DIN EN 12600 : 04-2003 Glass in building – Pendulum tests

3 Material description

The panes consist of float glass (lime – soda - glass) thickness 4 mm. On the back, there is a laminated PVC foil with the thickness of 0,23mm, provided with a decorative print. As the glasses were used for decorative purposes, they print shows two different designs - 'red flower' and 'GHAB73'.

4 Test performance

4.1 General

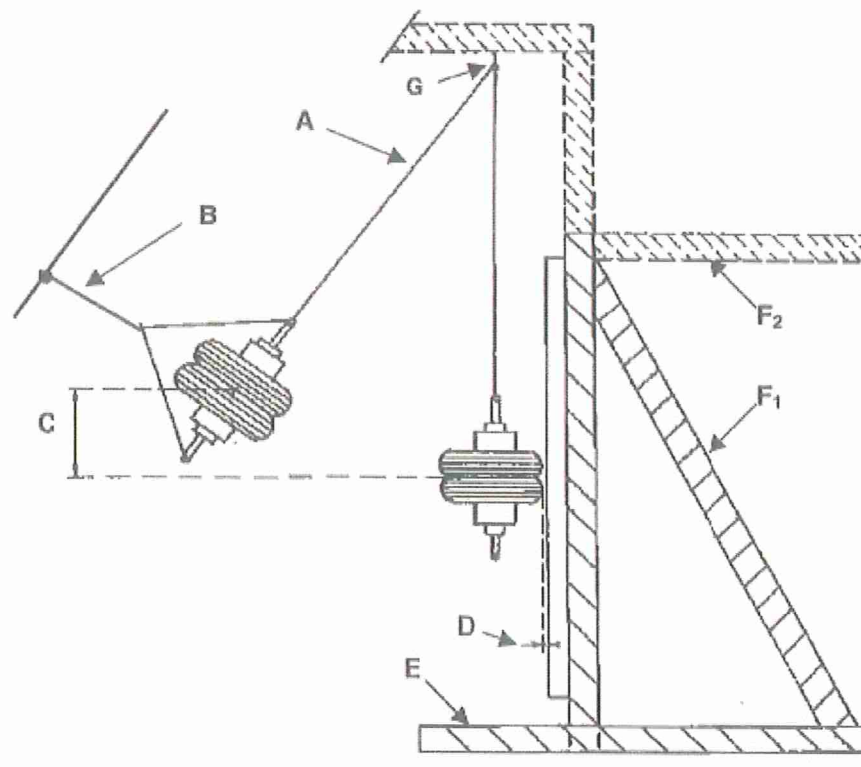
The pendulum was attached to the bracket by using a suspension cable with the length of ca. 2,0 m thus enabling that the attached 50 kg - dual tyre compactor may be moved in the vertical as well as in the horizontal direction, quickly and any way you need it. The impactor will be raised manually to achieve the desired drop height.

The dual tyre was taken in accordance with standard DIN EN 12600: 2003-04. The internal pressure of 3,50 bar as specified in the standard was applied.

The pivot components as specified in the standard, actually bringing the pendulum weight were not manufactured precisely following the standard. The form was simplified to a small extent.

The test performance requires only compliance with the characteristics of the pendulum impact surface and pendulum weight as defined in the standard. So, the aforementioned alteration was considered to be not of concern. The compliance with the required pendulum weight was checked by weighing.

The frame consists of aluminum sections of 60 x 120 mm with the clear dimensions of 847 x 1909 mm. The frame is used to hold the test piece by means of rectangular parts which clamp the test piece. To simplify the mounting the rectangular parts were compressed by using a clamping device. Between the glass test piece and the aluminum frame there is along its perimeter a plastic strip inserted. A steel frame anchored in the testing hall shall give sufficient holding stability to the frame.



Key words to explain the figure:

- A = Suspension cable
- B = Traction rope
- C = Drop height
- D = Distance impactor – test specimen
- E = Cross members
- F1 = Support member
- F2 = Optional support member
- G = Bracket ($5\text{ mm} \leq D \leq 15\text{ mm}$)

Figure 1: Test apparatus for performing the pendulum impact test in accordance with DIN EN 12600: 2003-04

4.2 Test performance

The glass panes together with the foils were placed in the clamping frame and fixed by means of the compressive rectangular parts.

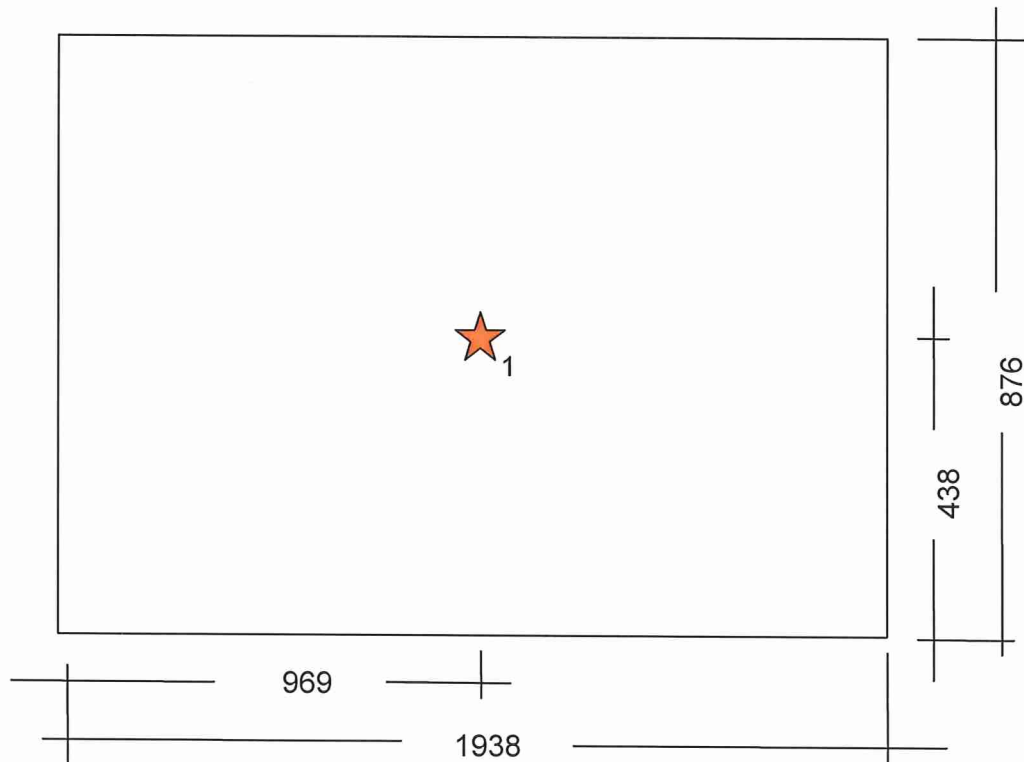
In accordance with standard DIN 12600 the drop height shall start at the lowest drop height = 190 mm and increased up to 450 mm (second test). The first glass test was started with the drop height of 900 mm; however, the glass pane was cut through in the middle. The other pendulum impact tests were carried out with the drop height of maximum 450 mm.

The impact points were in the centre of the glass panes.

The glass panes were tested in the broken state such that the ball of $\varnothing 76\text{ mm}$ may penetrate the cracks only with the applied force of $> 25\text{ N}$.

The glass panes when broken were hold together due to the foil on the back. It may be stated that the glass panes broke, however, there were no significant crack widths to be stated. Only an inconsiderable number of real tiny glass crumbles fell down (see fig. 14).

TESTS, date of test performance: 30 April 2009
Glass W x H = 1938 mm x 876 mm
4 mm ESG / 0,76 mm



Impact point pendulum

Fig. 2 Representation of the glass geometry and
impact points e

Test No.	Impact body	Drop height [mm]	Test specimen / Impact point	Findings
1	Pendulum	190	1 / 1	No finding
2	Pendulum	450	1 / 1	Broken
3	Pendulum	900	1 / 1	In the middle torn
4	Pendulum	190	2 / 1	No finding
5	Pendulum	450	2 / 1	Broken
6	Pendulum	190	3 / 1	No finding
7	Pendulum	450	3 / 1	Broken
8	Pendulum	190	4 / 1	No finding
9	Pendulum	450	4 / 1	Broken
10	Pendulum	190	5 / 1	No finding
11	Pendulum	450	5 / 1	Broken
12	Pendulum	190	6 / 1	No finding
13	Pendulum	450	6 / 1	Broken
14	Pendulum	190	7 / 1	No finding
15	Pendulum	450	7 / 1	Broken
16	Pendulum	190	8 / 1	No finding
17	Pendulum	450	8 / 1	Broken

Fig. 3 Summary of the test findings

5 Conclusion

Four test specimen which have a flexible plastic film adhered to the back (PVC foil, two different patterns) were tested in accordance with standard DIN EN 12600. The panes of glass products are conforming to classification 2 (B) 2 (drop height 450 mm).

Responsible test engineer and
Director of the Testing Agency for Structural Design branch Würzburg


Dipl.-Ing. Katz
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