



GUJARAT BOROSIL LIMITED
HAIL IMPACT TESTING
of the Low Iron Solar Textured Tempered Glass
Report No. 119-17-3030A, Rev 1
Proposal No. 48989, Revision B

Customer Information

Gujarat Borosil Limited
M.V. Ramana
Ankaleshwar Rajpipla Road, Govali(Vill),
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Laboratory Information

Test engineers: Eric Lau and Andrew Eskildsen; *Westpak™*
Test dates: January 22, 2018 through February 1, 2018
Westpak™ laboratory: San Jose, California

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ISO 9001:2008
10001175 & 10004260





Purpose of Testing

The purpose of testing was to verify that the Equipment Under Test (EUT): Low Iron Solar Textured Tempered Glass was capable of withstanding hailstone impacts. Four (4) units were subjected to the following test input:

Test Input	Standard Referenced	Inspections
Hail Impact	IEC 61215, Edition 2.0, Clause 10.17	During Test

Acceptance criteria are specified by Clause 10.17 of IEC 61215, Edition 2.0.



Product Information

Product: Low Iron Solar Textured Tempered Glass

Panel Number	Thickness (mm)
1	2.5
2	2.5
3	2.0
4	2.8

Panel Quantity	Sample Dimensions	
	in (l x w)	cm (l x w)
4	66.9 x 39.4	169.9 x 100.1

Test Equipment and Instrumentation

Testing performed in the laboratory was conducted at ambient conditions.

Please refer to Appendix I for equipment and instrumentation information and calibration dates.

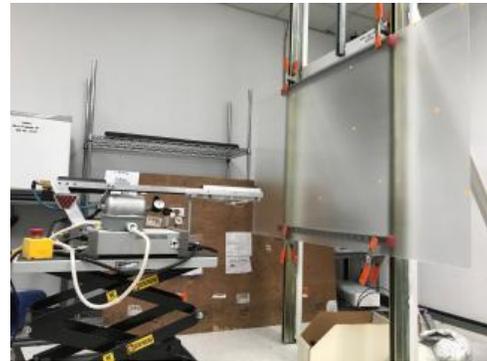


Test Description

Hail Impact

The samples were mounted on a rigid support, with the smooth side facing the launcher. The launcher propelled 1 inch (outer dimension) spheres of ice. If the sample was undamaged, the test was repeated until eleven (11) hail shots were fired.

Number of samples:	4 samples
Target velocity:	23 meters/second
Velocimeter distance:	Less than 1 meter
Shots fired:	44 total (11 per panel)
Shot locations:	Random



Notes:

The fabricated ice balls were frozen in a temperature chamber set at -10°C ($\pm 5^{\circ}\text{C}$). The ice balls were then stored in a temperature chamber set at -4°C ($\pm 2^{\circ}\text{C}$) for a minimum of one hour before testing. Ice balls were removed from the chamber and fired from the launcher within sixty (60) seconds of removal from the chamber.

Refer to the photos on the following page for impact locations per tested panel.

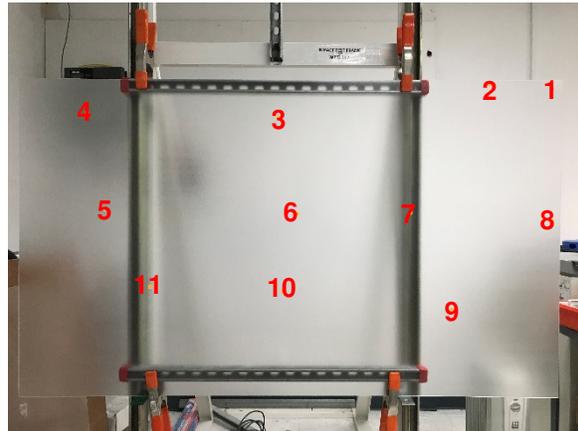


Test Description

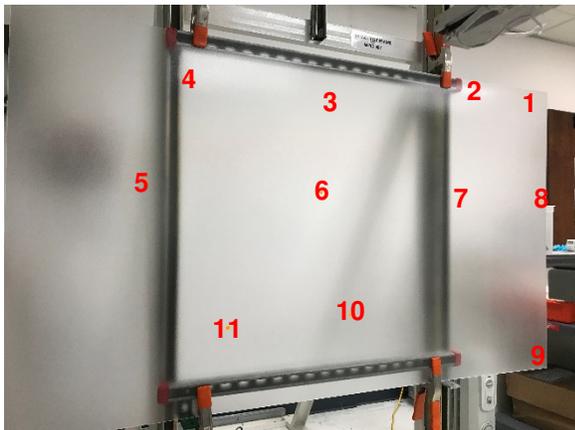
Hail Impact (continued)



Panel 1 (2.5 mm)



Panel 2 (2.5 mm)



Panel 3 (2.0 mm)



Panel 4 (2.8 mm)



Results and Observations

Test Input	Observations	Appendix
Hail Impact	No major visual defects, as specified by Clause 10.17 of IEC 61215, Edition 2.0, were observed on the glass sheets as a result of this test input.	II



Conclusions

Four (4) Low Iron Solar Textured Tempered Glass units were subjected to hail testing as specified by **Gujarat Borosil Limited** referencing the IEC 61215, Edition 2.0, Clause 10.17.

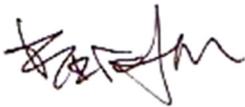
No unusual external physical damage was observed to the units following hail testing; no breakage was observed.

Upon test completion, the units were returned to **Gujarat Borosil Limited** for further evaluation. The results of any such *evaluations* are unavailable to Westpak™ at this time.

There were no anomalies throughout the conduct of this test that would detract from the ability of **Gujarat Borosil Limited** from making reasonable judgments concerning the testing as described herein.

WESTPAK™ is pleased to present this report to **Gujarat Borosil Limited** covering the hail impact testing of the Low Iron Solar Textured Tempered Glass. The test results apply to the samples described in this report. The equipment used to conduct this testing has been recently calibrated and is known to be in good operating condition. In addition the test operator uses good laboratory practice at all times. Therefore, the data is considered accurate and reliable. However, there is no warranty expressed or implied with the submission of this report, and **Gujarat Borosil Limited** assumes all liability for use of the data contained herein.

Respectfully submitted,
WESTPAK, INCORPORATED



Eric Lau
Senior Test Engineer
February 8, 2018
February 12, 2018 (Rev. 1)

Reviewed By



Jorge Campos
Test Engineer III
February 9, 2018

Revision History

Rev. 1 (February 12, 2018)

- Added references to IEC 61215, Edition 2.0, Clause 10.17 on pages 2, 6, and 7.

APPENDIX I

EQUIPMENT AND INSTRUMENTATION

Instrumentation & Equipment	Westpak™ No.	Model No.	Last Calibration Date
Westpak Chronograph	947	WJD 947	Not Required
Agilent Universal Counter for Hail Gun	997	53131A	4/10/2017
Johnson Controls Temperature Controller # 2 for Haier Freezer	1311	A419ABG-3C	10/20/2017
Johnson Controls Temperature Controller # 1 for Haier Freezer	1310	A419ABG-3C	10/19/2017
Hail Ice Mold	1049	WP1049	Not Required
Impact Frame	987	GW 987	Not Required
Notes: All calibration conducted annually on instrumentation only.			

APPENDIX II

HAIL IMPACT TEST DATA

