Intertek | Architectural Testing

PERFORMANCE TEST REPORT

Rendered to:

HILTI CORPORATION

PRODUCT: Extreme Weather Window & Door Insulating Foam Sealant

Report No.: G1169.02-106-31
Report Date: 11/16/16
Test Record Retention Date: 10/25/20
Revision 1: 11/17/16

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Rendered to:

HILTI CORPORATION
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Report No.:	G1169.02-106-31
Test Start Date:	09/12/16
Test Completion Date:	10/25/16
Report Date:	11/16/16
Test Record Retention Date:	10/25/20
Revision 1:	11/17/16

Product: Extreme Weather Window & Door Insulating Foam Sealant

Project Summary: Architectural Testing, Inc., an Intertek Company ("Intertek-ATI"), was contracted by Hilti Corporation to evaluate their Extreme Weather Window & Door Insulating Foam Sealant. The product description, test procedures, and test results are reported herein. The Dimensional Stability overall average change for 14 days is ≤10% for the specimens conditioned at 40 ±2ºC (104 ±4ºF) / 90 ±5% relative humidity, 30 ±2ºC (86 ±4ºF) / 30 ±5% relative humidity, and -20 ±2ºC (-4 ±4ºF) / ambient relative humidity.

Test Method: The test specimens were evaluated in accordance with AAMA 812-04(2010), *Voluntary Practice for Assessment of Single Component Aerosol Expanding Polyurethane Foams for Sealing Rough Openings of Fenestration Installations*.

Product Description: Hilti Corporation provided eleven, 750 ml. cans of Extreme Weather Window & Door Insulating Foam Sealant to Intertek-ATI. The foam has a manufacture date of March 24, 2016, lot/batch number 4276-R786.00-KS02 and is slightly yellow in appearance. Refer to the product related photo in Appendix A.

Test Procedures and Test Results: The results are reported in the following tables. All conditioning and testing was performed at standard laboratory conditions averaging 70.0ºF and 50.0% relative humidity unless otherwise noted. Refer to the test related photos in Appendix A.

Pressure Build

The foam was dispensed into the cavity of a wooden construct consisting of a 3.5" square piece of 3/4" thick untreated pine with a 2" diameter hole in the center secured to a 4" square piece of 7/16" thick plywood. The excess foam was removed so the height of the foam was flush with the top of the cavity. The construct was placed on an Instron Model 3369 Universal Test Machine (ICN: 005740) equipped with a 1-1/2" diameter mandrel so the mandrel was flush to the top of the construct and centrally located above the hole. The test was allowed to continue uninterrupted for a period extending at least one hour after the peak pressure had been achieved.

Maximum Pressure Build

Specimen	Maximum Load (lb_f)	Maximum Pressure Build (psi)	Time to Achieve Maximum Pressure Build (min)
1	0.41	0.23	42
2	0.40	0.23	49
3	0.22	0.12	32
4	0.08	0.05	15
5	0.09	0.05	33
Average	**0.24**	**0.14**	**34**

Test Procedures and Test Results: (Continued)

Beam Deflection

A 60" long by 3" wide by 1" thick aluminum beam was connected to a rigid three-sided wooden construct, such that a 1/2" wide cavity was created between the 3" by 60" face of the beam and a 3" by 60" face of wood. Movement indicators (ICNs: 65779, 65774, Int00007) were placed in contact with the top exposed face of the beam. The cavity was then filled with the foam product. The product was allowed to expand freely for a period of 24 hours and the peak deflection at the center of the beam was recorded. The pressure build test results were used to calculate the theoretical peak deflection at the center of the beam for a 60" long by 3" wide by 1" thick aluminum beam.

Measured Peak Deflection

Specimen	Peak Deflection (in)
1	0.010
2	0.018
3	0.023
Average	**0.017**

Theoretical Calculated Peak Deflection

Peak Deflection (in)
0.00273

The theoretical calculated peak deflection at the center of the beam is based on the following formula:

$$deflection = \frac{5WL^3}{384EI}$$

where,

W is the average pressure build / 10 (psi) multiplied by beam length (in) multiplied by beam width (in)

L is the length of the beam (in)

E is the Modulus of Elasticity for the beam material (10,100,000 psi for an aluminum beam)

I is the Moment of Inertia of the beam (the 1" thick standard beam provided by Intertek-ATI has a Moment of Inertia of 0.25 in^4)

Test Procedures and Test Results: (Continued)

Dimensional Stability

Two 6" by 4" by 7/16" thick pieces of AC grade plywood and 3/4" spacers were assembled to produce a 4" by 4" by 3/4"cavity. The cavity was filled with the foam and allowed to set for at least 24 hours. At the end of the cure period, the spacers were removed and the excess foam cut flush with the edges of the plywood. The specimen's inner plywood to plywood dimensions were measured at the corners as near as possible to the interior foam surface utilizing Calipers (ICNs: 65460, 65688, 65366) and then exposed to one of the following three conditions for 14 days: 40 ±2ºC (104 ±4ºF) / 90 ±5% relative humidity in an ESPEC Environmental Chamber (ICN: 64509), 30 ±2ºC (86 ±4ºF) / 30 ±5 % relative humidity in an ESPEC Environmental Chamber (ICN: 63435), and -20 ±2ºC (-4 ±4ºF) / ambient relative humidity in a freezer (ICN: Int000209). At 7 and 14 days the specimen's inner plywood to plywood dimensions were measured at the corners as near as possible to the interior foam surface.

Dimensional Stability: 40 ±2ºC (104 ±4ºF) / 90 ±5% Relative Humidity

Specimen	Reading	Measurement (in)		
		Initial	7 Day	14 Day
1	1	0.749	0.729	0.726
	2	0.741	0.721	0.716
	3	0.750	0.735	0.731
	4	0.741	0.722	0.718
2	1	0.745	0.721	0.717
	2	0.743	0.716	0.712
	3	0.750	0.714	0.711
	4	0.739	0.708	0.705
3	1	0.751	0.739	0.734
	2	0.759	0.741	0.738
	3	0.744	0.726	0.724
	4	0.755	0.738	0.734

Specimen	Average Change (%)		Standard Deviation (%)	
	7 Day	14 Day	7 Day	14 Day
1	-2.483	-3.020	0.327	0.352
2	-3.963	-4.433	0.686	0.616
3	-2.160	-2.625	0.381	0.244
Overall	-2.869	**-3.359**	0.932	0.900

Test Procedures and Test Results: (Continued)

Dimensional Stability
(Continued)

Dimensional Stability: 30 ±2ºC (86 ±4ºF) / 30 ±5% Relative Humidity

Specimen	Reading	Measurement (in)		
		Initial	7 Day	14 Day
1	1	0.742	0.737	0.737
	2	0.741	0.736	0.735
	3	0.736	0.736	0.735
	4	0.739	0.735	0.732
2	1	0.742	0.737	0.734
	2	0.749	0.749	0.748
	3	0.757	0.745	0.741
	4	0.750	0.740	0.735
3	1	0.736	0.727	0.724
	2	0.743	0.742	0.741
	3	0.736	0.733	0.727
	4	0.741	0.735	0.733

Specimen	Average Change (%)		Standard Deviation (%)	
	7 Day	14 Day	7 Day	14 Day
1	-0.472	-0.642	0.321	0.355
2	-0.898	-1.331	0.711	0.923
3	-0.644	-1.051	0.475	0.571
Overall	-0.671	**-1.008**	0.511	0.666

Test Procedures and Test Results: (Continued)

Dimensional Stability
(Continued)

Dimensional Stability: **-20 ±2ºC (-4 ±4ºF) / Ambient Relative Humidity**

Specimen	Reading	Measurement (in)		
		Initial	7 Day	14 Day
1	1	0.752	0.751	0.754
	2	0.751	0.750	0.750
	3	0.749	0.749	0.750
	4	0.744	0.746	0.746
2	1	0.754	0.752	0.755
	2	0.753	0.752	0.756
	3	0.747	0.748	0.752
	4	0.758	0.760	0.760
3	1	0.745	0.742	0.743
	2	0.740	0.738	0.740
	3	0.747	0.748	0.747
	4	0.750	0.752	0.753

Specimen	Average Change (%)		Standard Deviation (%)	
	7 Day	14 Day	7 Day	14 Day
1	0.001	0.134	0.189	0.189
2	0.000	0.366	0.242	0.229
3	-0.068	0.033	0.319	0.276
Overall	-0.023	**0.178**	0.234	0.257

The dimensional stability is based on the formula:

$$d = \left(\frac{b}{c} \times 100\%\right) - 100\%$$

where,

b is the measured inner plywood to plywood dimension after exposure

c is the measured inner plywood to plywood dimension prior to exposure

Intertek-ATI will service this report for the entire test record retention period. Test records that are retained such as detailed drawings, datasheets, representative samples of test specimens, or other pertinent project documentation will be retained by Intertek-ATI for the entire test record retention period.

Results obtained are tested values and were secured using the designated test methods. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimens tested. This report may not be reproduced, except in full, without the written approval of Intertek-ATI.

For INTERTEK-ATI:

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Attachments (pages) This report is complete only when all attachments listed are included.
Appendix A - Photographs (3)

Revision Log

Rev. #	Date	Page(s)	Revision(s)
0	11/16/16	N/A	Original report issue
1	11/17/16	Throughout	Corrected product name from Gun Grade Winter Filler Foam to Extreme Weather Window & Door Insulating Foam Sealant

APPENDIX A

Photographs

Photo No. 1
Extreme Weather Window & Door Insulating Foam Sealant

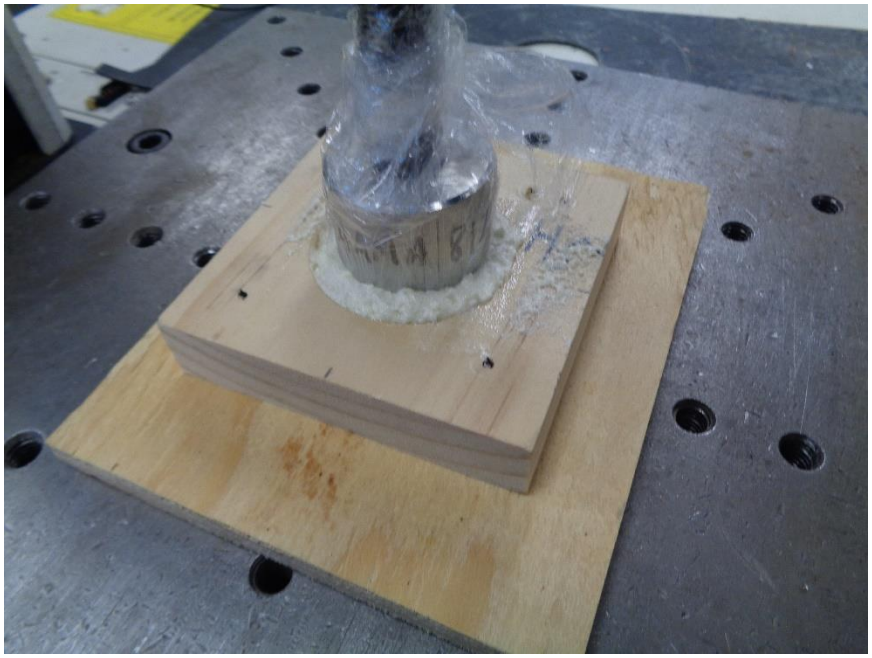

Photo No. 2
Pressure Build Testing

Photo No. 3
Beam Deflection Testing

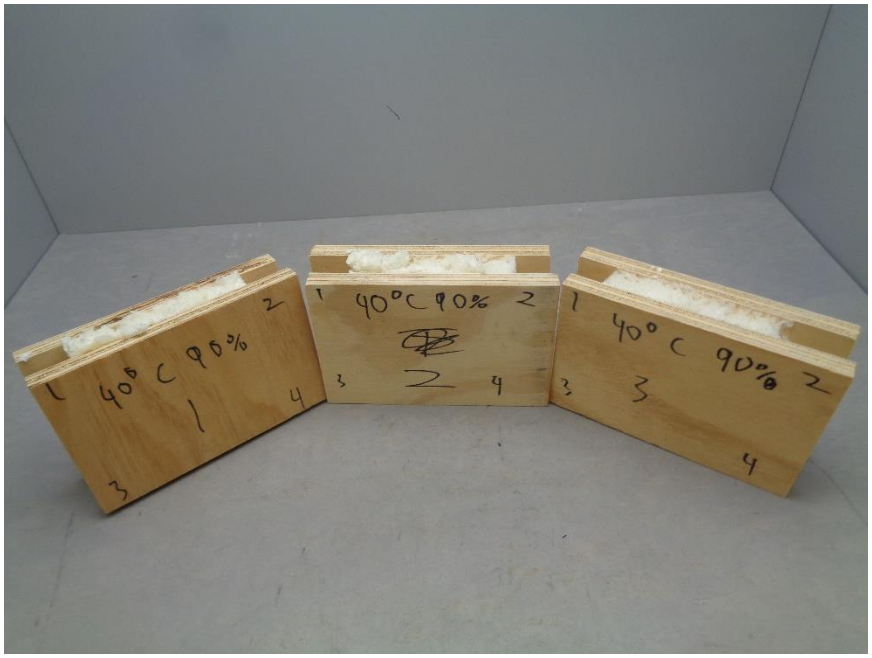

Photo No. 4
40°C / 90% RH Dimensional Stability Specimens

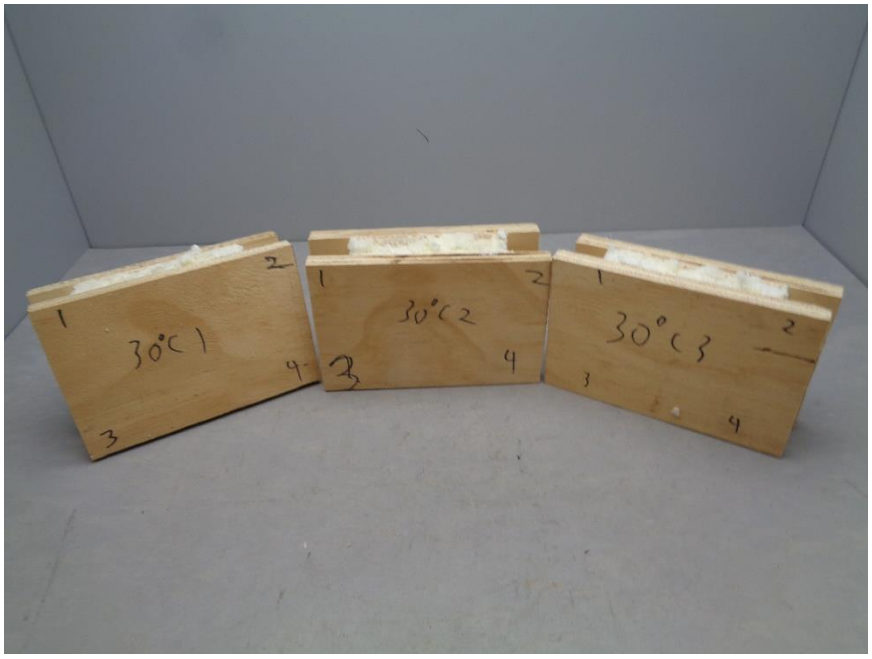

Photo No. 5
30°C / 30% RH Dimensional Stability Specimens

Photo No. 6
-20°C / Ambient RH Dimensional Stability Specimens