Architectural Testing

ASTM E 90 SOUND TRANSMISSION LOSS TEST REPORT

Rendered to:

VELUX AMERICA INC.

SERIES/MODEL: FCM 4646 0005B

TYPE: Fixed Curb Mounted Skylight

Summary of Test Results			
Data File No.	**Glazing (Nominal Dimensions)**	**STC**	**OITC**
C1893.01	3/4" IG (5/32" tempered, 7/16" argon, 5/32" tempered)	27	24

Reference should be made to Architectural Testing, Inc. Report No. C1893.01-113-11 for complete test specimen description. The complete test results are listed in Appendix B.

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Architectural Testing

ACOUSTICAL PERFORMANCE TEST REPORT

Rendered to:

VELUX AMERICA INC.
P.O. Box 5001
Greenwood, South Carolina 29648-5001

Report No:	C1893.01-113-11
Test Date:	08/24/12
Report Date:	08/30/12
Record Retention End Date:	08/30/16

Test Sample Identification:

Series/Model: FCM 4646 0005B

Type: Fixed Curb Mounted Skylight

Overall Size: 51-1/4" by 51-1/4"

Glazing (Nominal Dimensions): 3/4" IG (5/32" Tempered, 7/16" Argon, 5/32" Tempered), Glass Temperature 75^{o}F

Project Scope: Architectural Testing, Inc. was contracted by VELUX America Inc. to conduct a sound transmission loss test on a Series/Model FCM 4646 0005B, fixed curb mounted skylight. A summary of the results is listed in the Test Results section, and the complete test data is included as Appendix B of this report. The sample was provided by the client.

Test Methods: The acoustical tests were conducted in accordance with the following:

ASTM E 90-09, *Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions*.

ASTM E 413-10, *Classification for Rating Sound Insulation*.

ASTM E 1332-10a, *Standard Classification for Rating Outdoor-Indoor Sound Attenuation.*

ASTM E 2235-04, *Standard Test Method for Determination of Decay Rates for Use in Sound Insulation Test Methods*.

Test Equipment: The equipment used to conduct these tests meets the requirements of ASTM E 90. The microphones were calibrated before conducting sound transmission loss tests. The test equipment and test chamber descriptions are listed in Appendix A.

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Sample Installation: Sound transmission loss tests were initially performed on a filler wall that was designed to test window specimens. The filler wall achieved an STC rating of 68.

The specimen plug was removed from the filler wall assembly. The window was placed on a foam isolation pad in the test opening. A split wood frame was placed into the opening. A dense neoprene gasket and duct seal were used to seal the wood frame to the inside perimeter of the filler wall opening. The test specimen was then fastened to the exterior of the wood frame opening with screws. Duct seal was used to seal the skylight perimeter to the wood frame on both sides. The interior side of the skylight frame, when installed was flush with the source room side of the filler wall. A stethoscope was used to check for any abnormal air leaks before the test.

Test Procedure: The sound transmission loss test was conducted in accordance with ASTM E 90 test method using a single direction of movement. The sound transmission loss test consisted of the following measurements: One background noise sound pressure level and five sound absorption measurements were conducted at each of the five microphone positions. Two sound pressure level measurements were made simultaneously in both rooms, at each of the five microphone positions. The air temperature and relative humidity conditions were monitored and recorded during the background, absorption, source, and receive room measurements.

Sample Descriptions:

Frame Construction:

		Frame
Size		51-1/4" by 51-1/4"
Thickness		3"
Corners		Mitered
	Fasteners	Keyed
	Seal Method	Sealant
Material		Aluminum
	Reinforcement	None
	Thermal Break Material	None
Daylight Opening Size		46-1/2" by 46-1/2"

Sample Descriptions: (Continued)

Glazing:

Measured Overall Insulation Glass Unit Thickness	0.742"
Spacer Type	Stainless steel box spacer system

	Exterior Sheet	**Gap**	**Interior Sheet**
Measured Thickness	0.150"	0.442"	0.150"
Muntin Pattern	N/A	N/A	N/A
Material	Tempered	Argon*	Tempered
Laminate Material	N/A	N/A	N/A

Glazing Method	Exterior
Glazing Material	EPDM frame gaskets, silicone
Glazing Bead Material	Aluminum

Components:

	TYPE	**QUANTITY**	**LOCATION**
Weatherstrip			
	Inner frame gasket	1 Row	Interior frame perimeter
Hardware			
	No hardware		
Drainage			
	Condensation weep holes		Gasket corners

** - Stated per Client/Manufacturer, N/A-Non Applicable*

Comments: The weight of the sample was 76 lbs. The client did not supply drawings on the Series/Model FCM 4646 0005B, fixed curb mounted skylight. The fixed curb mounted skylight was disassembled, and the components will be retained by Architectural Testing for four years. Photographs of the test specimen are included in Appendix C.

Test Results: The STC (Sound Transmission Class) rating was calculated in accordance with ASTM E 413. The OITC (Outdoor-Indoor Transmission Class) was calculated in accordance with ASTM E 1332. A summary of the sound transmission loss test results on the Series/Model FCM 4646 0005B, fixed curb mounted skylight is listed below.

Summary of Test Results			
Data File No.	**Glazing (Nominal Dimensions)**	**STC**	**OITC**
C1893.01	3/4" IG (5/32" tempered, 7/16" argon, 5/32" tempered)	27	24

***Note**: Transmission loss coefficient differences less than 6 indicate the lower limit of the transmission loss for this specimen. On each data sheet listed in Appendix B, the cells are highlighted red for the transmission loss values limited in this way. Due to the calculations and sample size, transmission loss coefficient differences between 6 and 15 indicate there has been a filler wall correction applied. On each data sheet listed in Appendix B, cells highlighted in green indicate transmission loss values affected in this way.*

The complete test results are listed in Appendix B. Flanking limit tests and reference specimen tests are available upon request.

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

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 specimen tested. This report may not be reproduced, except in full, without the written approval of Architectural Testing.

For ARCHITECTURAL TESTING, INC:

Digitally Signed by: Kurt A. Golden

Kurt A. Golden
Senior Technician - Acoustical Testing

Digitally Signed by: Todd D. Kister

Todd D. Kister
Laboratory Supervisor - Acoustical Testing

KAG:jmcs

Attachments (pages): This report is complete only when all attachments listed are included.
- Appendix-A: Equipment description (1)
- Appendix-B: Complete test results (2)
- Appendix-C: Photographs (1)

Revision Log

Rev. #	Date	Page(s)	Revision(s)
0	08/30/12	N/A	Original Report Issue

Appendix A

Instrumentation:

Instrument	Manufacturer	Model	Description	ATI Number	Date of Calibration
Analyzer	Hewlett Packard	HP35670A	Real time analyzer	004112	07/11 *
Data Acquisition Unit	Agilent	34970A	Data Acquisition Unit	62211	07/12
Receive Room Microphone	GRAS	40 AR	1/2" Microphone	Y003239	02/12
Source Room Microphone	GRAS	40 AR	1/2" Microphone	Y003247	02/12
Receive Room Preamplifier	GRAS	26 AK	1/2" Preamplifier	063260	03/12
Source Room Preamplifier	GRAS	26 AK	1/2" Preamplifier	005656	06/12
Microphone Calibrator	Bruel & Kjaer	Type 4228	Pistonphone Calibrator	Y002816	02/12
Noise Source	Delta Electronics	SNG-1	Noise Generator	Y002181	N/A
Equalizer	Rane	RPE 228	Programmable Equalizer	005714	N/A
Power Amplifiers	Crown	Xti 2000	Two, Amplifiers	005769 005770	N/A
Receive Room Loudspeakers	Renkus-Heinz Inc.	Trap Jr./9	Two, Loudspeakers	Y001784 Y001785	N/A
Source Room Loudspeakers	Renkus-Heinz Inc.	Trap Jr./9	Two, Loudspeakers	Y002649 Y002650	N/A
Receive Room Environmental Indicator	Vaisala	HMW60Y	Temperature and Humidity Sensor	Y002652	09/11
Source Room Environemental Indicator	Vaisala	HMW60Y	Temperature and Humidity Sensor	005066	09/11
Weather Station	Davis Instruments	VantagePRO 6150C	Weather Station	Y003257	05/12

**- Note: The calibration frequency for this equipment is every two years per the manufacturer's recommendation.*

Test Chamber:

	Volume	Description
Receive Room	234 m^3 (8291.3 ft^3)	Rotating vane and stationary diffusers Temperature and humidity controlled Isolation pads under the floor
Source Room	206.6 m^3 (7296.3 ft^3)	Stationary diffusers only Temperature and humidity controlled

	Maximum Size	Description
TL Test Opening	4.27 m (14 ft) wide by 3.05 m (10 ft) high	Vibration break between source and receive rooms

N/A-Non Applicable

Appendix B

Complete Test Results

SOUND TRANSMISSION LOSS

ASTM E 90

Architectural Testing

ATI No.	C1893.01	**Date**	08/24/12
Client	VELUX America Inc.		
Specimen	Series/Model: FCM 4646 0005B, fixed curb mounted skylight with 3/4" IG (5/32" tempered, 7/16" argon, 5/32" tempered)		
Specimen Area	1.69 Square Meters		
Filler Area	11.30 Square Meters		
Operator	Kurt Golden		

	Bkgrd	Absorp	Source	Receive	Filler	Specimen
Temp C	23.8	23.5	22.7	21.9	23.5	23.0
RH %	41.5	40.8	49.8	45.3	44.2	44.4

Freq (Hz)	Bkgrd SPL (dB)	Absorp (Square Meters)	Source SPL (dB)	Receive SPL (dB)	Filler TL (dB)	Specimen TL (dB)	95% Conf Limit	No. of Defici-encies	Trans Coef Diff
80	40.6	5.4	92.4	62.8	34.4	26	2.63	0	1.6
100	38.8	5.1	92.2	63.6	41.2	24	2.83	0	9.2
125	40.7	4.8	98.7	69.1	47.9	25	2.24	0	14.5
160	42.8	4.7	97.9	70.5	49.2	23	1.87	0	18.0
200	40.4	4.9	103.1	77.3	52.1	21	1.17	0	22.6
250	37.5	5.4	103.1	82.5	55.1	16	0.86	4	31.3
315	34.9	5.5	103.6	80.5	58.7	18	0.65	5	32.6
400	31.3	5.9	102.7	78.8	63.7	18	0.93	8	37.0
500	28.3	6.0	103.1	74.1	68.8	23	0.76	4	37.1
630	26.0	5.6	103.6	70.6	73.6	28	0.43	0	37.5
800	25.4	5.5	104.2	65.9	74.4	33	0.43	0	33.0
1000	22.8	5.9	103.3	60.4	76.9	37	0.56	0	31.2
1250	19.5	6.4	100.3	53.1	78.8	42	0.35	0	29.0
1600	15.7	6.6	103.6	53.0	86.1	45	0.28	0	33.1
2000	15.7	6.9	103.0	49.2	85.5	48	0.29	0	29.6
2500	15.7	8.0	103.0	55.4	84.9	41	0.27	0	35.8
3150	14.3	9.8	103.6	66.0	87.5	30	0.56	1	49.3
4000	12.1	12.0	102.9	59.9	87.9	35	0.76	0	45.1
5000	10.7	15.1	101.9	48.4	86.9	44	0.86	0	34.6

STC Rating = **27** *(Sound Transmission Class)*

Deficiencies = **22** *(Number of deficiencies versus contour curve)*

OITC Rating = **24** *(Outdoor/Indoor Transmission Class)*

Notes:

1) The acoustical chambers are qualified for measurements down to 80 hertz. Data reported below 80 hertz is for reference only.

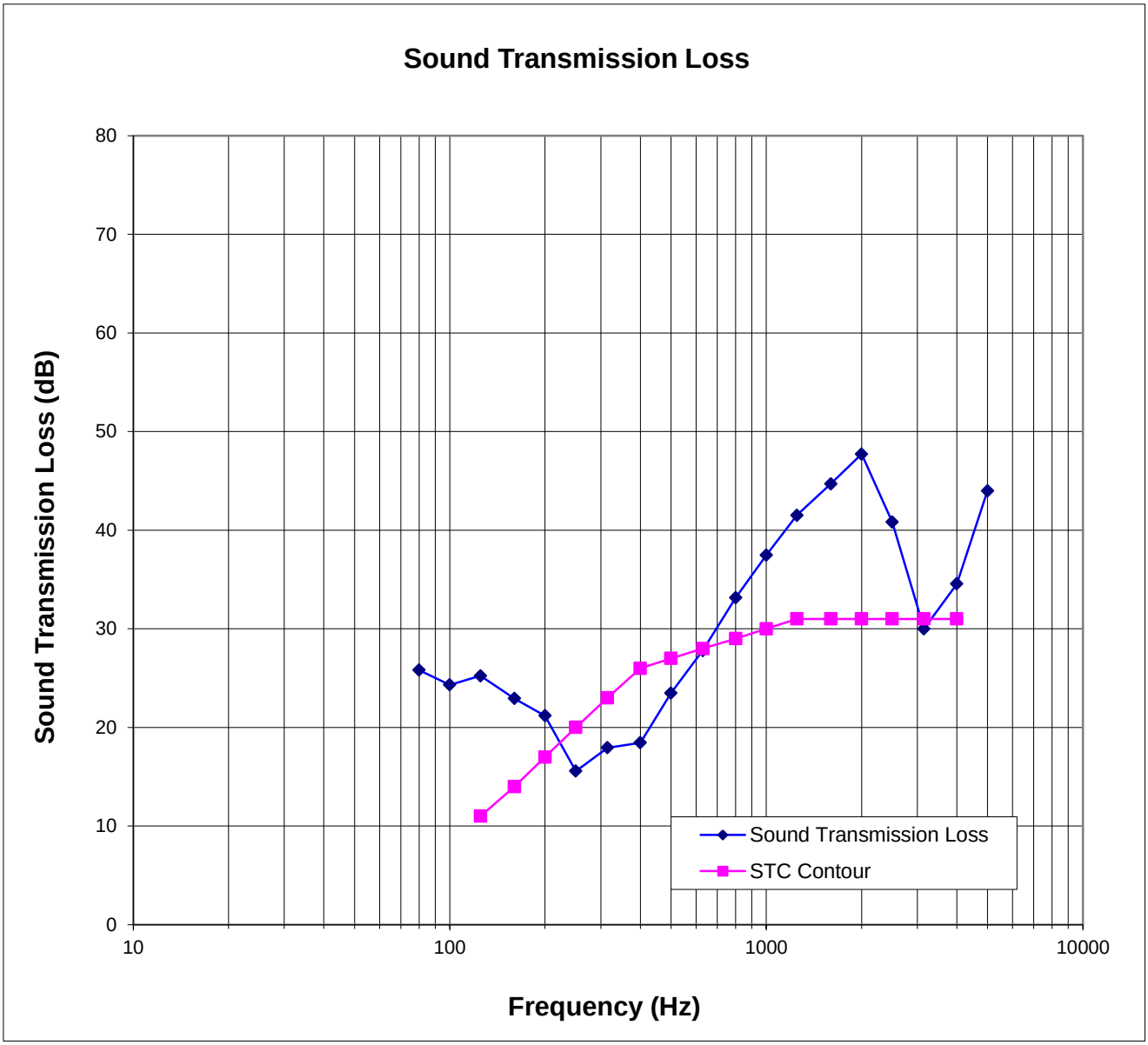
2) Transmission loss coefficient differences less than 6 indicate the lower limit of the transmission loss for this specimen. These cells are highlighted red.

3) Transmission loss coefficient differences between 6 and 15 indicate there has been a filler wall correction applied. These cells are highlighted green.

4) Receive Room levels less than 5dB above the Background levels are highlighted in yellow.

Architectural Testing

ATI No.	C1893.01	**Date**	08/24/12
Client	VELUX America Inc.		
Specimen	Series/Model: FCM 4646 0005B, fixed curb mounted skylight with 3/4" IG (5/32" tempered, 7/16" argon, 5/32" tempered)		
Specimen Area	1.69 Square Meters		
Filler Area	11.30 Square Meters		
Operator	Kurt Golden		



ACCREDITED

Architectural Testing, Inc. is accredited by the International Accreditation Service, Inc. (IAS) under the specific test methods listed under lab code TL-144, in accordance with the recognized International Standard ISO/IEC 17025:2005. The laboratory's accreditation or test report in no way constitutes or implies product certification, approval, or endorsement by IAS. This test report applies only to the specimen that was tested.

Appendix C

Photographs

Receive Room View of Installed Specimen

Source Room View of Installed Specimen