

**ASTM E 90 SOUND TRANSMISSION LOSS  
TEST REPORT**

**Rendered to:**

**VELUX AMERICA INC.**

**SERIES/MODEL: FCM 4646 0006**

**TYPE: Fixed Curb Mounted Skylight**

<b>Summary of Test Results</b>			
<b>Data File No.</b>	<b>Glazing (Nominal Dimensions)</b>	<b>STC</b>	<b>OITC</b>
B0238.01	23/32" IG (5/32" tempered exterior, 5/16" argon, 1/4" laminated interior), Glass temperature 75°F	33	28

Reference should be made to Architectural Testing, Inc. Report No. B0238.01-113-11 for complete test specimen description. The complete test results are listed in Appendix B.

## ACOUSTICAL PERFORMANCE TEST REPORT

Rendered to:

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

Report No: B0238.01-113-11  
Test Date: 06/10/11  
Report Date: 07/21/11  
Expiration Date: 06/10/15

### **Test Sample Identification:**

**Series/Model:** FCM 4646 0006

**Type:** Fixed Curb Mounted Skylight

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

**Glazing (Nominal Dimensions):** 23/32" IG (5/32" Tempered Exterior, 5/16" Argon, 1/4" Laminated Interior), Glass Temperature 75°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 0006, 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.

**Sample Installation:** Sound transmission loss tests were initially performed on a filler wall that was designed to test 48" by 72" and 72" by 48" specimens. The filler wall achieved an STC rating of 68.

The 72" by 48" plug was removed from the filler wall assembly and a 24" by 48" filler wall, reducing element was installed. The reducing element utilized the same construction as the filler wall. A split 2x6 wood frame was placed into the 48" by 48" 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 drywall 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 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:**

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

**Sample Descriptions:** (Continued)

**Glazing:**

<b>Measured Overall Insulation Glass Unit Thickness</b>	0.728"
<b>Spacer Type</b>	Stainless steel box spacer system

	<b>Exterior Sheet</b>	<b>Gap</b>	<b>Interior Sheet</b>
<b>Measured Thickness</b>	0.150"	0.320"	0.099", 0.060", 0.099"
<b>Muntin Pattern</b>	N/A	N/A	N/A
<b>Material</b>	Tempered	Air*	Laminated
<b>Laminate Material</b>	N/A	N/A	PVB

<b>Glazing Method</b>	Exterior
<b>Glazing Material</b>	EPDM frame gaskets, silicone
<b>Glazing Bead Material</b>	Aluminum

**Components:**

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

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

**Comments:** The weight of the sample was 92 lbs. The client supplied drawings on the Series/Model FCM 4646 0006, fixed curb mounted skylight, but they were not included in this report. 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 0006, fixed curb mounted skylight is listed below.

Summary of Test Results			
Data File No.	Glazing (Nominal Dimensions)	STC	OITC
B0238.01	23/32" IG (5/32" tempered exterior, 5/16" argon, 1/4" laminated interior), Glass temperature 75°F	33	28

*Note: Due to the calculations and sample size, 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, cells highlighted in red indicate transmission loss values limited in this way. For 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.

Detailed drawings, data sheets, representative samples of test specimens, a copy of this report, or other pertinent project documentation will be retained by Architectural Testing for a period of four years from the original test date. At the end of this retention period, such materials shall be discarded without notice and the service life of this report will expire. Results obtained are tested values and were secured by 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 specimen tested. This report may not be reproduced, except in full, without the written approval of Architectural Testing.

For ARCHITECTURAL TESTING, INC:

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Daniel P. Platts  
Technician - Acoustical Testing

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Todd D. Kister  
Laboratory Supervisor - Acoustical Testing

DPP:jmc

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)



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### Revision Log

<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
0	07/21/11	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	06/08/09 *
Data Acquisition Unit	Agilent	34970A	Data Acquisition Unit	62211	07/24/10
Receive Room Microphone	GRAS	40 AR	1/2" Microphone	Y003246	08/17/10
Source Room Microphone	GRAS	40 AR	1/2" Microphone	Y003245	08/17/10
Receive Room Preamplifier	GRAS	26 AK	1/2" Preamplifier	Y003249	08/17/10
Source Room Preamplifier	GRAS	26 AK	1/2" Preamplifier	Y003248	08/17/10
Microphone Calibrator	Bruel & Kjaer	Type 4228	Pistonphone Calibrator	Y002816	02/17/11
Noise Source	Delta Electronics	SNG-1	Noise Generator	Y002181	N/A
Equalizer	Rane	RPE 228	Programmable Equalizer	Y002180	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	005066	08/20/10
Source Room Environmental Indicator	Vaisala	HMW60Y	Temperature and Humidity Sensor	Y002652	09/15/10
Weather Station	Davis Instruments	VantagePRO 6150C	Weather Station	Y003257	05/16/11

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

### Test Chamber:

	Volume	Description
Receive Room	234 m <sup>3</sup> (8291.3 ft <sup>3</sup> )	Rotating vane and stationary diffusers Temperature and humidity controlled Isolation pads under the floor
Source Room	206.6 m <sup>3</sup> (7296.3 ft <sup>3</sup> )	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

<b>ATI No.</b>	B0238.01	<b>Date</b>	06/10/11
<b>Client</b>	VELUX America Inc.		
<b>Specimen</b>	Series/Model: FCM 4646 0006, fixed curb mounted skylight with 23/32" IG (5/32" tempered exterior, 5/16" argon, 1/4" laminated interior), Glass temperature 75°F		
<b>Specimen Area</b>	1.69 Square Meters		
<b>Filler Area</b>	11.30 Square Meters		
<b>Operator</b>	Daniel P. Platts		


	Bkgrd	Absorp	Source	Receive	Filler	Specimen
<b>Temp C</b>	23.1	26.4	22.6	24.9	23.5	24.2
<b>RH %</b>	42.8	33.4	44.5	38.8	44.2	39.9

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 Deficiencies	Trans Coef Diff
80	41.3	5.2	89.8	57.0	34.4	29	2.06	0	-1.8
100	38.5	5.5	92.1	65.5	41.2	22	3.56	0	11.4
125	40.2	5.3	96.5	65.7	47.9	26	2.06	0	13.7
160	44.0	4.6	96.5	67.2	49.2	25	1.76	0	16.0
200	44.0	4.8	101.9	72.7	52.1	25	0.87	0	19.2
250	44.0	5.5	101.9	73.7	55.1	23	0.85	3	23.8
315	44.3	5.8	101.3	72.8	58.7	23	0.68	6	27.4
400	42.2	5.8	101.5	72.2	63.7	24	1.10	8	31.5
500	45.3	5.8	103.3	71.0	68.8	27	0.48	6	33.7
630	39.1	5.5	104.8	70.6	73.6	29	0.43	5	36.2
800	32.3	5.6	104.9	67.6	74.4	32	0.26	3	34.1
1000	29.3	5.8	104.4	62.7	76.9	36	0.40	0	32.3
1250	33.9	6.4	103.8	57.1	78.8	41	0.41	0	29.6
1600	26.0	6.8	106.0	56.0	86.1	44	0.29	0	33.9
2000	26.1	7.6	105.7	52.4	85.5	47	0.23	0	30.5
2500	19.3	8.5	105.7	52.7	84.9	46	0.26	0	30.6
3150	15.3	10.6	106.6	58.0	87.5	41	0.38	0	38.6
4000	11.4	13.1	106.5	53.5	87.9	44	0.27	0	35.4
5000	8.5	17.4	105.1	44.1	86.9	51	0.46	0	27.8

**STC Rating = 33**      *(Sound Transmission Class)*  
**Deficiencies = 31**      *(Number of deficiencies versus contour curve)*  
**OITC Rating = 28**      *(Outdoor/Indoor Transmission Class)*

**Notes:**

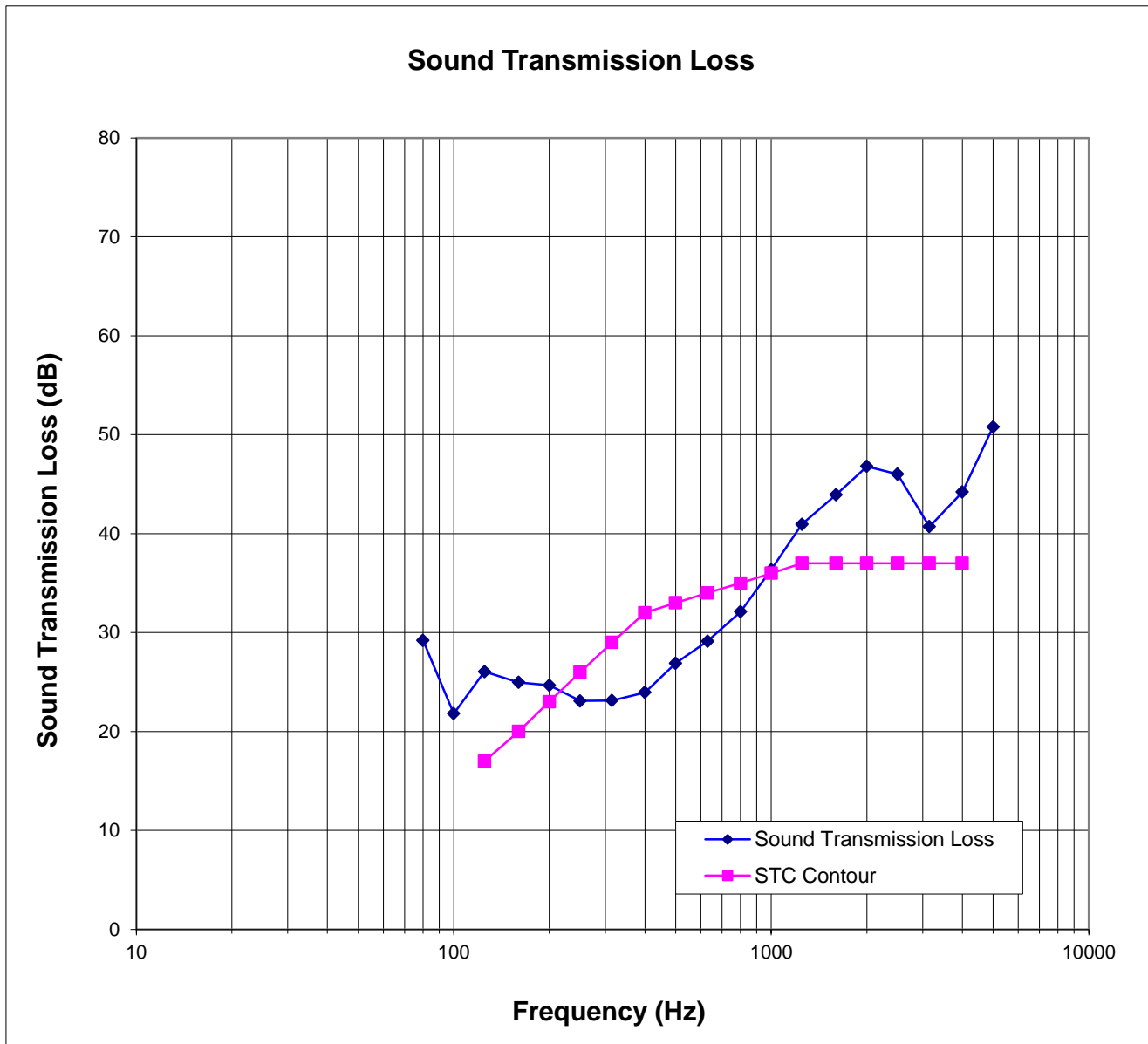
- 1) The acoustical chambers are qualified for measurements down to 80 hertz. Data reported below 80 hertz is for reference only.
- 2) Transmission loss coefficient differences less than 6 indicate the lower limit of the transmission loss for this specimen. These cells are highlighted red.
- 3) Transmission 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.

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### Architectural Testing

ATI No. B0238.01 Date 06/10/11  
Client VELUX America Inc.  
Specimen Series/Model: FCM 4646 0006, fixed curb mounted skylight with 23/32" IG (5/32" tempered exterior, 5/16" argon, 1/4" laminated interior), Glass temperature 75°F  
Specimen Area 1.69 Square Meters  
Filler Area 11.30 Square Meters  
Operator Daniel P. Platts



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**Appendix C**

**Photographs**



**Receive Room View of Installed Specimen**



**Source Room View of Installed Specimen**