Architectural Testing

ASTM E 90 SOUND TRANSMISSION LOSS TEST REPORT

Rendered to:

WINDLOCH LLC

SERIES/MODEL: WS 75

TYPE: Casement Window

Summary of Test Results			
Data File No.	**Glazing Option (Nominal Dimensions)**	**STC**	**OITC**
C4711.01A	1-1/16" IG (5/16" heat strengthened exterior, 1/2" air space, 1/4" heat strengthened interior)	38	33
C4711.01C	1-1/2" IG (1/2" laminated exterior, 3/4" air space, 1/4" heat strengthened interior), Glass temperature 75°F	41	35
C4711.01D	1-1/8" IG (1/4" heat strengthened, 5/8" air space, 1/4" heat strengthened)	35	28

Reference should be made to Architectural Testing, Inc. Report No. C4711.01-113-11 for complete test specimen description. The complete test results are listed in Appendix B.

130 Derry Court
York, PA 17406-8405
phone: 717-764-7700
fax: 717-764-4129
www.archtest.com

Architectural Testing

ACOUSTICAL PERFORMANCE TEST REPORT

Rendered to:

WINDLOCH LLC
3788 SW Armadillo Trail
Arcadia, Florida 34266

Report No:	C4711.01-113-11
Revision 1:	05/13/13
Test Dates:	01/14/13
And:	01/15/13
Report Date:	01/24/13
Record Retention End Date:	01/24/17

Test Sample Identification:

Series/Model: WS 75

Type: Tilt-Turn Window

Overall Size: 47" by 59-1/8"

Glazing (Nominal Dimensions):

Option A: 1-1/16" IG (5/16" Heat Strengthened Exterior, 1/2" Air Space, 1/4" Heat Strengthened Interior)

Option C: 1-1/2" IG (1/2" Laminated Exterior, 3/4" Air Space, 1/4" Heat Strengthened Interior), Glass Temperature 75°F

Option D: 1-1/8" IG (1/4" Heat Strengthened, 5/8" Air Space, 1/4" Heat Strengthened)

Project Scope: Architectural Testing, Inc. was contracted by WindLoch LLC to conduct sound transmission loss tests on Series/Model WS 75, tilt-turn windows. 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 samples were provided by the client.

Test Methods: The acoustical test was 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 (Reapproved 2012), *Standard Test Method for Determination of Decay Rates for Use in Sound Insulation Test Methods*.

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Test Equipment: The equipment used to conduct this test meets the requirements of ASTM E 90. The microphones were calibrated before conducting the sound transmission loss test. 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 window specimens. The filler wall achieved an STC rating of 68.

A filler wall reducing element was used to reduce the test opening size. The reducing element consisted of two separate 2x6 wood frames filled with concrete to reduce the test opening size to accommodate the test specimen. A dense neoprene gasket was placed between the two wood and concrete frames. The window was placed on an isolation pad in the new test opening. Duct seal was used to seal the perimeter of the window to the test opening on both sides. The interior side of the window frame, when installed, was approximately 1/4" from being flush with the receiving room side of the filler wall. A stethoscope was used to check for any abnormal air leaks around the test specimen prior to testing. The vent was opened and closed at least five times prior to testing.

Test Procedure: The window was closed and locked for this test. The sound transmission loss tests were conducted in accordance with the ASTM E 90 test method using a single direction of measurement. 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		47" by 59-1/8"
Thickness		2-15/16"
Corners		Mitered
	Fasteners	Keyed, staked, screwed
	Seal Method	Sealant
Material		Aluminum
	Reinforcement	N/A
	Thermal Break Material	Insulbar

N/A-Non Applicable

Sample Descriptions: (Continued)

Vent Construction:

		Vent
Size		43-15/16" by 56"
Thickness		3"
Corners		Mitered
	Fasteners	Keyed, staked, screwed
	Seal Method	Sealant
Material		Aluminum
	Reinforcement	N/A
	Thermal Break Material	None
Daylight Opening Size		39-9/16" by 51-5/8"

Vent Glazing Option A:

Measured Overall Insulation Glass Unit Thickness	1.085"
Spacer Type	Aluminum

	Exterior Sheet	**Gap**	**Interior Sheet**
Measured Thickness	0.312"	0.548"	0.225"
Muntin Pattern	N/A	N/A	N/A
Material	Heat Strengthened*	Air*	Heat Strengthened*
Laminate Material	N/A	N/A	N/A

Glazing Method	Exterior structural
Glazing Material	Foam tape, silicone
Glazing Bead Material	N/A

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

Sample Descriptions: (Continued)

Vent Glazing Option C:

Measured Overall Insulation Glass Unit Thickness	1.521"
Spacer Type	Aluminum

	Exterior Sheet	**Gap**	**Interior Sheet**
Measured Thickness	0.512"	0.776"	0.233"
Muntin Pattern	N/A	N/A	N/A
Material	Laminated	Air*	Heat Strengthened*
Laminate Material	PVB*	N/A	N/A

Glazing Method	Exterior structural
Glazing Material	Foam tape, silicone
Glazing Bead Material	N/A

Vent Glazing Option D:

Measured Overall Insulation Glass Unit Thickness	1.106"
Spacer Type	Aluminum

	Exterior Sheet	**Gap**	**Interior Sheet**
Measured Thickness	0.225"	0.652"	0.229"
Muntin Pattern	N/A	N/A	N/A
Material	Heat Strengthened*	Air*	Heat Strengthened*
Laminate Material	N/A	N/A	N/A

Glazing Method	Exterior structural
Glazing Material	Foam tape, silicone
Glazing Bead Material	N/A

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

Sample Descriptions: (Continued)

Components:

TYPE	QUANTITY	LOCATION
Weatherstrip		
1/2" Custom leaf gasket	1 Row	Perimeter of frame and vent
1" Custom center gasket	1 Row	Perimeter of frame
1/2" Leaf gasket	1 Row	Perimeter of vent
Hardware		
Multi-point tilt-turn hinge system	1	Hinge stile, hinge jamb
Multi-point lock system	1	Lock stile, rails
Keeper	6	Lock jamb, head, sill
Snubber set	2	Hinge stile, hinge jamb
Drainage		
No drainage		

Comments: The weight of Option A was 158 lbs. The weight of Option C was 192 lbs. The weight of Option D was 146 lbs. The design drawing (included in Appendix C) supplied by the client, accurately describes the Series/Model WS 75, tilt-turn window. The dimensions on the drawing that are circled and/or checked were verified against the accessible components of the test specimen. The test specimen was returned per the client's request, so the internal components and dimensions could not be verified against the drawings. Photographs of the test specimen are included in Appendix D.

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 WS 75, tilt-turn window is listed below.

Summary of Test Results			
Data File No.	**Glazing Option (Nominal Dimensions)**	**STC**	**OITC**
C4711.01A	1-1/16" IG (5/16" heat strengthened exterior, 1/2" air space, 1/4" heat strengthened interior)	38	33
C4711.01C	1-1/2" IG (1/2" laminated exterior, 3/4" air space, 1/4" heat strengthened interior), Glass temperature 75°F	41	35
C4711.01D	1-1/8" IG (1/4" heat strengthened, 5/8" air space, 1/4" heat strengthened)	35	28

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: Daniel P. Platts

Daniel P. Platts
Technician - Acoustical Testing

Digitally Signed by: Todd D. Kister

Todd D. Kister
Laboratory Supervisor - Acoustical Testing

DPP:jmcs

Attachments (pages): This report is complete only when all attachments listed are included.
- Appendix-A: Equipment description (1)
- Appendix-B: Complete test results (6)
- Appendix-C: Design drawing (1)
- Appendix-D: Photographs (1)

Revision Log

Rev. #	Date	Page(s)	Revision(s)
0	01/24/13	N/A	Original Report Issue
1	05/13/13	Cover Page, Pages 1, 4, 6, Appendix B	Corrected Glazing Option D air space size from 3/4" to 5/8" "
		Appendix C	Corrected drawing

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	Y003246	08/12
Source Room Microphone	GRAS	40 AR	1/2" Microphone	Y003245	08/12
Receive Room Preamplifier	GRAS	26 AK	1/2" Preamplifier	Y003249	08/12
Source Room Preamplifier	GRAS	26 AK	1/2" Preamplifier	Y003248	08/12
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	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	09/12
Source Room Environemental Indicator	Vaisala	HMW60Y	Temperature and Humidity Sensor	Y002653	03/12
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

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SOUND TRANSMISSION LOSS

ASTM E 90

Test Date	01/14/13
ATI No.	C4711.01A
Client	WindLoch LLC
Specimen	Series/Model: WS 75, tilt-turn window with 1-1/16" IG (5/16" heat strengthened exterior, 1/2" air space, 1/4" heat strengthened interior)
Operator	Daniel Platts - Craig Fox
Sample Area	1.79 m^2
Filler Area	11.20 m^2

	Source	Receive	Specimen
Temp C	22	22	22
RH %	48	48	48

Freq (Hz)	**Bkgrd SPL** (dB)	**Absorp** (m^2)	**Source SPL** (dB)	**Receive SPL** (dB)	**Filler TL** (dB)	**Specimen TL** (dB)	**95% Conf Limit**	**No. of Defi-ciencies**	**Trans Coef Diff**
80	37	5.2	92	63	36	25	1.8	-	3.7
100	37	6.0	93	62	40	27	2.6	-	6.0
125	39	5.2	98	64	48	30	2.2	0	10.9
160	41	4.4	97	67	47	26	1.6	0	13.2
200	37	4.7	102	72	51	26	0.9	2	16.8
250	31	5.2	103	69	56	29	1.2	2	19.0
315	30	6.1	103	65	59	33	0.4	1	17.7
400	28	5.9	104	64	64	34	0.8	3	21.8
500	24	6.0	104	62	68	37	0.5	1	23.7
630	22	5.8	105	62	72	39	0.5	0	25.8
800	21	5.7	105	59	78	41	0.3	0	29.1
1000	16	6.1	105	58	83	42	0.4	0	32.7
1250	15	6.6	104	59	86	40	0.4	2	38.2
1600	10	7.0	107	64	89	37	0.6	5	43.7
2000	6	7.4	106	64	88	36	0.3	6	44.5
2500	6	8.3	105	59	86	39	0.2	3	39.0
3150	6	9.7	106	55	88	44	0.3	0	35.2
4000	6	11.8	107	50	88	48	0.3	0	31.7
5000	6	15.2	105	44	87	52	0.5	-	26.8

STC Rating **38** *(Sound Transmission Class)*
Deficiencies 25 *(Number of deficiencies versus contour curve)*
OITC Rating **33** *(Outdoor Indoor Transmission Class)*

Notes:

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

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

3) Receive Room levels less than 5 dB above the background levels are highlighted in yellow.

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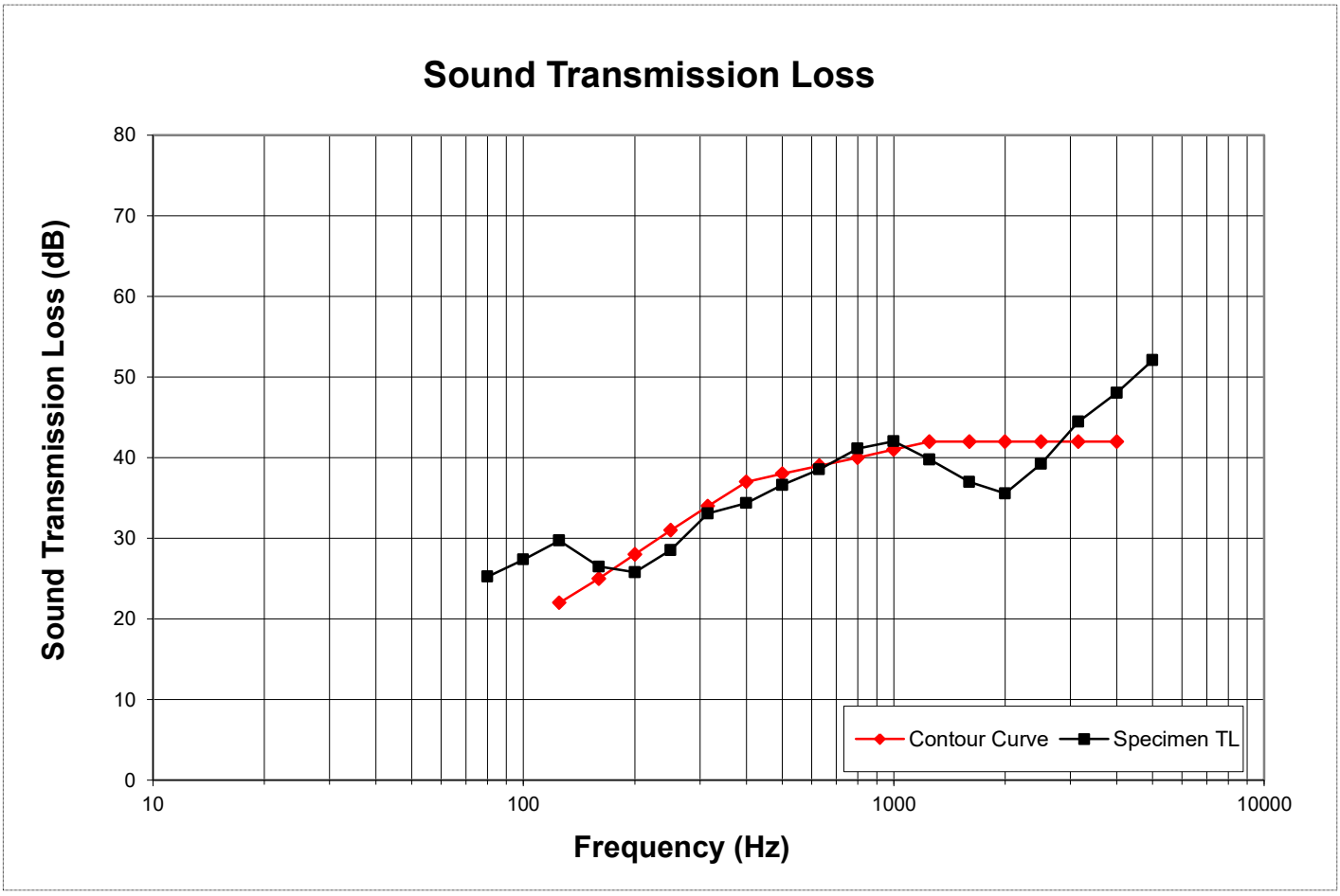
SOUND TRANSMISSION LOSS

ASTM E 90

Test Date	01/14/13		
ATI No.	C4711.01A		
Client	WindLoch LLC		
Specimen	Series/Model: WS 75, tilt-turn window with 1-1/16" IG (5/16" heat strengthened exterior, 1/2" air space, 1/4" heat strengthened interior)		
Operator	Daniel Platts - Craig Fox		
Sample Area	1.79 m^2		
Filler Area	11.20 m^2		
	Source	Receive	Sample
Temp C	22	22	22
RH %	48	48	48



Note: To obtain the Sound Transmission Class (STC), read the Sound Transmission Loss of the contour curve at 500 Hz. The sum of the deficiencies below the contour curve cannot exceed 32. The maximum deficiencies at any one frequency cannot exceed 8.

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SOUND TRANSMISSION LOSS

ASTM E 90

Test Date	01/15/13
ATI No.	C4711.01C
Client	WindLoch LLC
Specimen	Series/Model: WS 75, tilt-turn window with 1-1/2" IG (1/2" laminated exterior, 3/4" air space, 1/4" heat strengthened interior), Glass temperature 75°F
Operator	Daniel P. Platts
Sample Area	1.79 m^2
Filler Area	11.20 m^2

	Source	Receive	Specimen
Temp C	23	22	22
RH %	49	49	49

Freq (Hz)	**Bkgrd SPL** (dB)	**Absorp** (m^2)	**Source SPL** (dB)	**Receive SPL** (dB)	**Filler TL** (dB)	**Specimen TL** (dB)	**95% Conf Limit**	**No. of Defi-ciencies**	**Trans Coef Diff**
80	36	5.1	94	67	36	24	1.8	-	5.0
100	37	5.6	100	68	40	28	3.0	-	5.7
125	36	5.4	105	70	48	31	2.3	0	9.6
160	38	4.7	106	75	47	27	2.9	1	12.8
200	37	5.6	111	78	51	29	0.7	2	14.1
250	34	5.3	110	72	56	34	0.9	0	14.2
315	30	5.8	107	66	59	37	0.7	0	14.1
400	28	5.7	107	66	64	36	0.7	4	19.8
500	26	6.0	108	63	68	40	0.6	1	20.4
630	24	5.5	111	64	72	42	0.8	0	22.5
800	23	5.9	111	62	78	43	0.1	0	27.1
1000	18	6.3	110	62	83	42	0.4	2	32.3
1250	17	6.7	111	64	86	41	0.5	4	36.5
1600	12	7.1	117	69	89	41	0.5	4	39.2
2000	8	7.4	107	61	88	40	0.3	5	39.9
2500	7	8.4	104	54	86	43	0.2	2	35.1
3150	6	9.8	105	49	88	49	0.3	0	30.7
4000	7	11.6	103	42	88	53	0.5	0	26.7
5000	6	14.4	100	37	87	54	0.5	-	24.9

STC Rating **41** *(Sound Transmission Class)*
Deficiencies 25 *(Number of deficiencies versus contour curve)*
OITC Rating **35** *(Outdoor Indoor Transmission Class)*

Notes:

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

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

3) Receive Room levels less than 5 dB above the background levels are highlighted in yellow.

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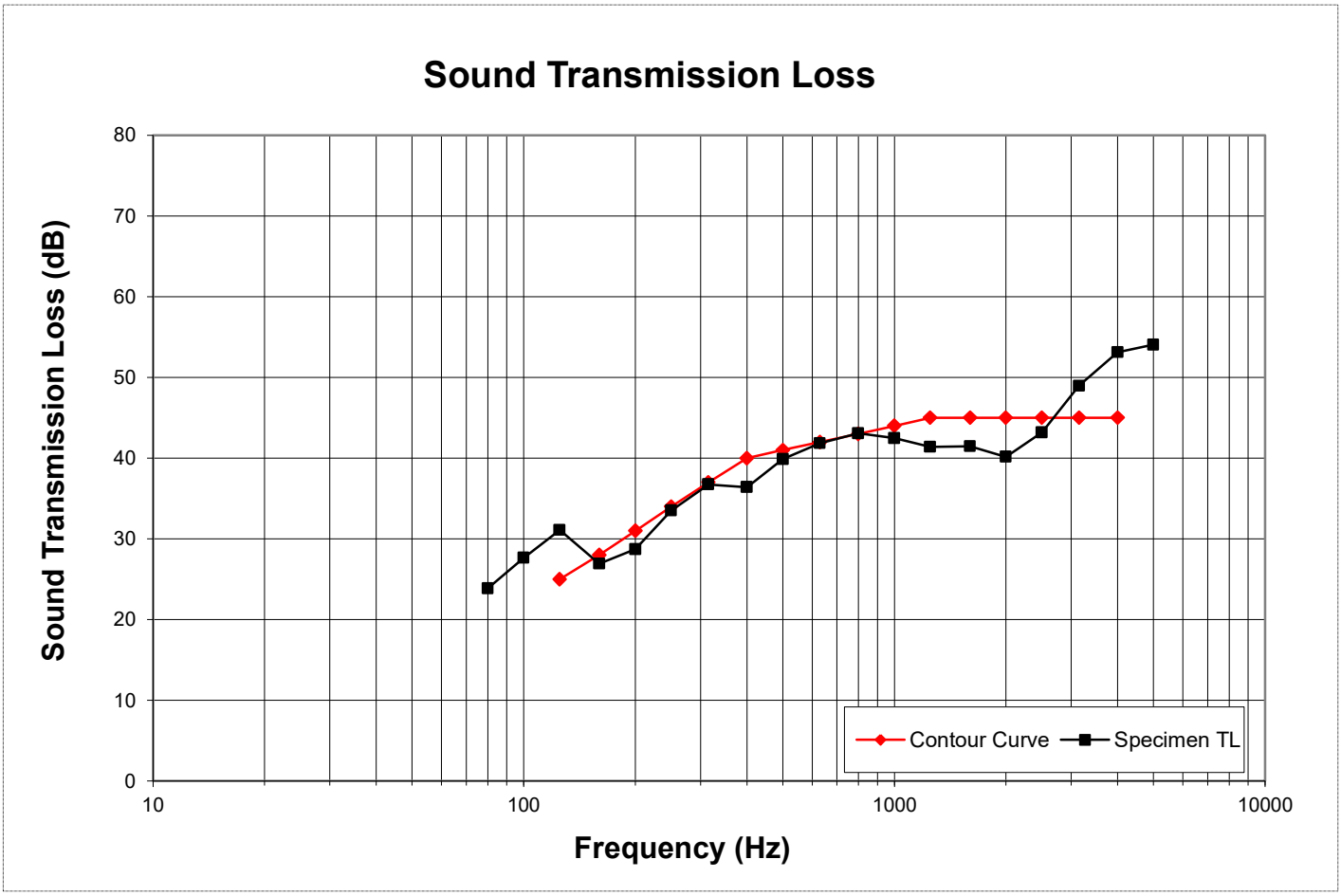
SOUND TRANSMISSION LOSS

ASTM E 90

Test Date	01/15/13		
ATI No.	C4711.01C		
Client	WindLoch LLC		
Specimen	Series/Model: WS 75, tilt-turn window with 1-1/2" IG (1/2" laminated exterior, 3/4" air space, 1/4" heat strengthened interior), Glass temperature 75°F		
Operator	Daniel P. Platts		
Sample Area	1.79 m^2		
Filler Area	11.20 m^2		
	Source	Receive	Sample
Temp C	23	22	22
RH %	49	49	49



Note: To obtain the Sound Transmission Class (STC), read the Sound Transmission Loss of the contour curve at 500 Hz. The sum of the deficiencies below the contour curve cannot exceed 32. The maximum deficiencies at any one frequency cannot exceed 8.

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SOUND TRANSMISSION LOSS

ASTM E 90

Test Date	01/15/13
ATI No.	C4711.01D
Client	WindLoch LLC
Specimen	Series/Model: WS 75, tilt-turn window with 1-1/8" IG (1/4" heat strengthened, 5/8" air space, 1/4" heat strengthened)
Operator	Daniel P. Platts
Sample Area	1.79 m^2
Filler Area	11.20 m^2

	Source	Receive	Specimen
Temp C	23	22	22
RH %	50	48	48

Freq (Hz)	**Bkgrd SPL** (dB)	**Absorp** (m^2)	**Source SPL** (dB)	**Receive SPL** (dB)	**Filler TL** (dB)	**Specimen TL** (dB)	**95% Conf Limit**	**No. of Defi-ciencies**	**Trans Coef Diff**
80	39	5.5	92	66	36	22	2.4	-	7.0
100	37	5.4	94	66	40	23	2.9	-	9.6
125	36	5.4	97	65	48	28	1.9	0	12.6
160	40	4.9	97	73	47	20	1.1	2	19.9
200	38	5.1	102	80	51	18	1.3	7	25.1
250	35	5.4	102	71	56	26	1.4	2	21.2
315	32	5.8	103	69	59	29	0.7	2	21.8
400	29	5.9	104	68	64	30	0.8	4	26.0
500	27	6.0	104	64	68	34	0.5	1	25.8
630	25	5.7	105	62	72	38	0.7	0	26.6
800	23	5.7	105	59	78	41	0.2	0	29.0
1000	18	6.2	105	58	83	42	0.4	0	32.4
1250	18	6.7	104	56	86	42	0.5	0	35.5
1600	12	7.1	107	61	89	41	0.5	0	40.1
2000	7	7.4	106	66	88	34	0.4	5	45.9
2500	7	8.4	105	62	86	36	0.3	3	42.1
3150	6	9.8	106	56	88	43	0.3	0	36.3
4000	6	11.8	107	52	88	47	0.6	0	32.9
5000	6	15.1	105	45	87	51	0.5	-	27.6

STC Rating	**35**	*(Sound Transmission Class)*
Deficiencies	26	*(Number of deficiencies versus contour curve)*
OITC Rating	**28**	*(Outdoor Indoor Transmission Class)*

Notes:

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

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

3) Receive Room levels less than 5 dB above the background levels are highlighted in yellow.

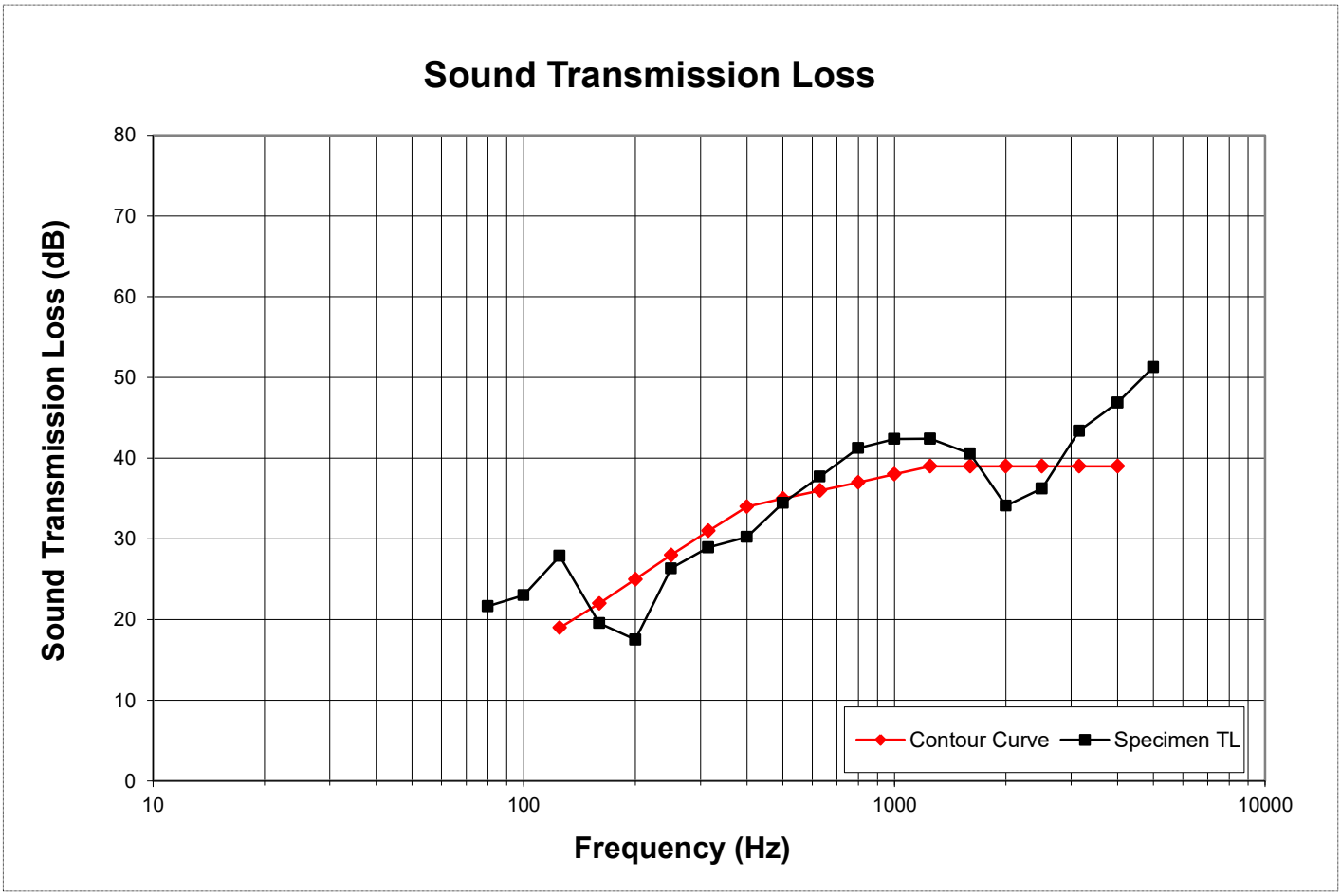
Architectural Testing

ACCREDITED TL-144

SOUND TRANSMISSION LOSS

ASTM E 90

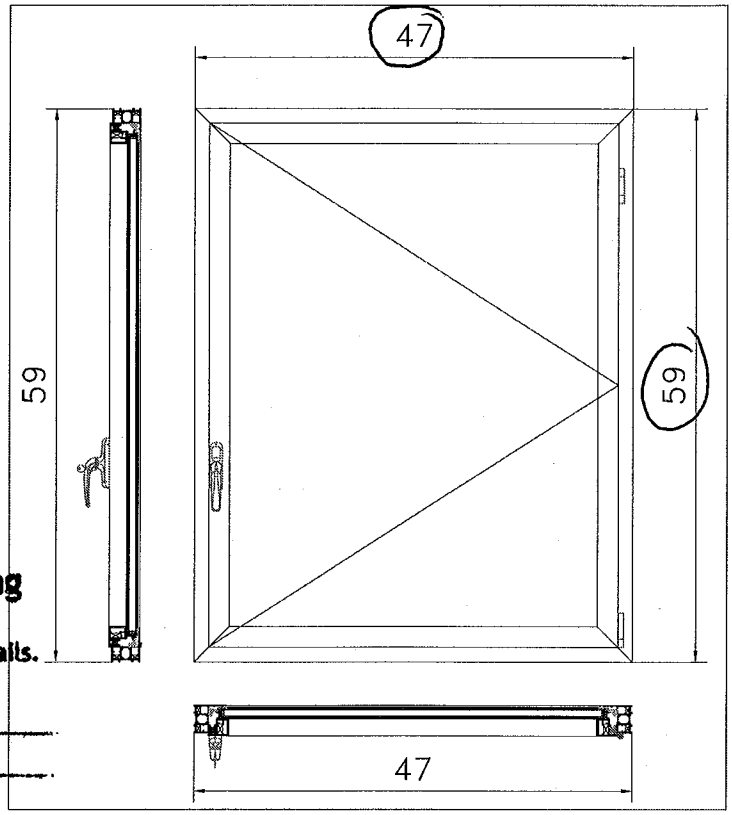
Test Date	01/15/13		
ATI No.	C4711.01D		
Client	WindLoch LLC		
Specimen	Series/Model: WS 75, tilt-turn window with 1-1/8" IG (1/4" heat strengthened, 5/8" air space, 1/4" heat strengthened)		
Operator	Daniel P. Platts		
Sample Area	1.79 m^2		
Filler Area	11.20 m^2		
	Source	Receive	Sample
Temp C	23	22	22
RH %	50	48	48



Note: To obtain the Sound Transmission Class (STC), read the Sound Transmission Loss of the contour curve at 500 Hz. The sum of the deficiencies below the contour curve cannot exceed 32. The maximum deficiencies at any one frequency cannot exceed 8.

Appendix C

Design Drawing



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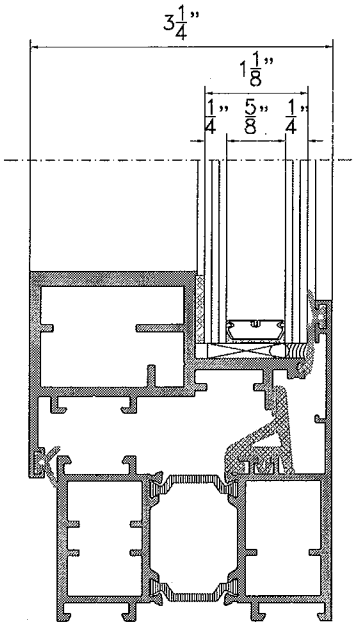
Test sample complies with these details.
Deviations are noted.

Report# C4711.01

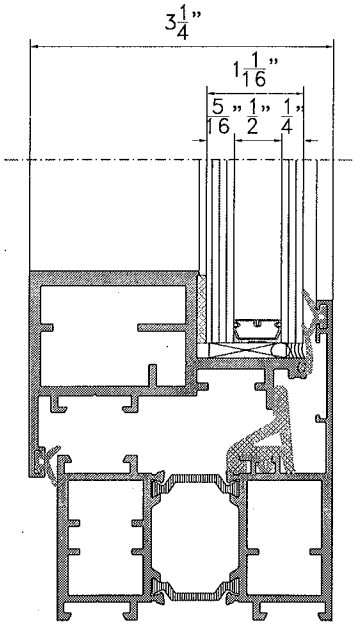
Date 5/8/13 Tech DPP

$1\frac{1}{8}$" IGU
$\frac{1}{4}$" Clear
$\frac{5}{8}$" Air
$\frac{1}{4}$" Clear



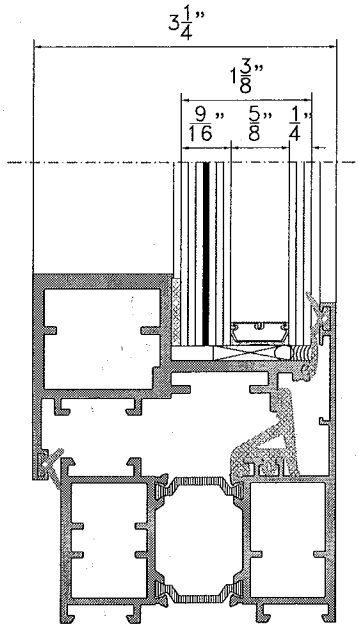
28 OITC

$1\frac{1}{8}$" IGU
$\frac{1}{4}$" Clear
$\frac{1}{2}$" Air
$\frac{5}{16}$" Clear



33 OITC

$1\frac{1}{8}$" IGU
$\frac{1}{4}$" Clear
$\frac{5}{8}$" Air
$\frac{9}{16}$" Lam. Clear



35 OITC

WINDLOCH
3788 SW ARMADILLO TRL
ARCADIA, FL 34266
(718)-640-8391
(941)-626-8272
(941)-718-4868 Fax
info@windloch.com
WWW.WINDLOCH.COM

PROJECT NAME: **ACOUSTICAL TEST IN ATI**		CAD FILE : **1100-1.dwg**
DESCRIPTION: **Acoustical Elevation and Details**		DATE: **Dec/16/12** REV. **1** SCALE: **1:2**
DESIGN BY: **YOAV BEN-SHIMON**	SYSTEM MODEL: **WS 75**	DRAWING NUMBER: **1**

Appendix D

Photographs

Receive Room View of Installed Specimen

Source Room View of Installed Specimen