G1623.01-113-11-R0
ACOUSTICAL PERFORMANCE TEST REPORT
ASTM E90

Rendered to:

MI WINDOWS AND DOORS, LLC

SERIES/MODEL: 1650 Vinyl

TYPE: Double Hung Window

Summary of Test Results			
Data File No.	**Glazing (Nominal Dimensions)**	**STC**	**OITC**
G1623.01A	3/4" IG (1/8" annealed, 1/2" air space, 1/8" annealed)	27	24
G1623.01B	7/8" IG (1/8" annealed exterior, 1/2" air space, 2.7 mm, 0.030" QPVB, 2.7 mm laminated interior), Glass temperature 75°F	32	27
G1623.01C	7/8" IG (1/8" annealed, 1/4" air space, 1/8" annealed center , 1/4" air space, 1/8" annealed)	30	25

Reference should be made to Intertek-ATI Report No. G1623.01-113-11 for complete test specimen description. This page alone is not a complete report. Flanking limit tests and reference specimen tests are available upon request.

Acoustical Performance Test Report

MI WINDOWS AND DOORS, LLC
P.O. Box 370
650 West Market Street
Gratz, Pennsylvania 17030-0370

Report No	G1623.01-113-11
Test Dates	08/26/16
And	09/06/16
Report Date	09/27/16

Project Scope
Architectural Testing, Inc., an Intertek company ("Intertek-ATI"), was contracted to conduct a sound transmission loss test. The complete test data is included as Appendix B of this report. The client provided the test specimen.

Test Methods
Testing for this project was conducted in accordance with the following standards. The equipment listed in the attachments meets the requirements of the following standards.

ASTM E90-09, *Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements*
ASTM E413-10, *Classification for Rating Sound Insulation*
ASTM E1332-10a, *Standard Classification for Rating Outdoor-Indoor Sound Attenuation*
ASTM E2235-04 (2012), *Standard Test Method for Determination of Decay Rates for Use in Sound Insulation Test Methods*

Test Procedure
All measurements were conducted in the HT test chambers at Intertek-ATI located in York, Pennsylvania. The sensitivity of the microphones was checked before measurements were conducted.

The transmission loss values were obtained for a single direction of measurement. Two background noise sound pressure level and five sound absorption measurements were conducted at each of five microphone positions.

Two sound pressure levels were made simultaneously in the receive and source rooms at each of five microphone positions.

The air temperature and relative humidity conditions were monitored and recorded during all measurements.

Specimen Installation
A sound transmission loss test was initially performed on a filler wall.

The specimen plug was removed from the filler wall assembly. A filler wall-reducing element, consisting of two separate 2x6 wood frames filled with concrete, was used to adjust the test opening size to accommodate the test specimen. A dense neoprene gasket was placed between the two wood and concrete frames. The specimen was placed on an isolation pad in the custom test opening. Duct seal was used to seal the perimeter of the specimen to the test opening on both sides. The interior side of the specimen, when installed, was approximately 1/4" from being flush with the receive room side of the filler wall. A stethoscope was used to check for any abnormal air leaks around the test specimen prior to testing. Operable portions of the test specimen, if any, were cycled at least five times prior to testing.

Test Calculations
Transmission loss (TL) at each 1/3 octave frequency is the average source room sound pressure level minus the average receive room sound pressure level, plus, 10 times the log of the specimen area divided by the sound absorption of the receive room with the sample in place.

STC Rating
To obtain the Sound Transmission Class (STC), read the TL of the contour curve at 500 Hz. The sum of the deficiencies below the contour curve must not exceed 32. The maximum deficiency at any one frequency must not exceed 8.

OITC Rating
The Outdoor-Indoor Transmission Class (OITC) is calculated by subtracting the logarithmic summation of the TL values from the logarithmic summation of the A-weighted transportation noise spectrum stated in ASTM E1332.

Specimen Descriptions

		Frame	Bottom Sash	Top Sash
Size		47-1/4" by 59"	43-1/4" by 28-3/4"	43-1/4" by 28-1/8"
Thickness		4"	1-3/8"	1-3/8"
	Corners	Mitered	Mitered	Mitered
	Fasteners	Welds	Welds	Welds
	Seal Method	N/A	N/A	N/A
Material		Vinyl	Vinyl	Vinyl
	Reinforcement	N/A	Steel in lock and keeper rail	N/A
	Thermal Break Material	N/A	N/A	N/A
Daylight Opening Size		N/A	40" by 25-1/8"	40" by 25-1/8"

Glazing Option A

Measured Overall Insulation Glass Unit Thickness	0.732"
Spacer Type	DuraLite®

	Exterior Sheet	Gap	Interior Sheet
Measured Thickness	0.118"	0.500"	0.114"
Muntin Pattern	N/A	N/A	N/A
Material	Annealed	Air*	Annealed
Laminate Material	N/A	N/A	N/A

Glazing Method	Exterior
Glazing Material	Foam tape
Glazing Bead Material	Vinyl

** - Stated per Client/Manufacturer, N/A-Not Applicable*

Specimen Descriptions (Continued)

Glazing Option B

Measured Overall Insulation Glass Unit Thickness	0.865"
Spacer Type	DuraLite®

	Exterior Sheet	Gap	Interior Sheet
Measured Thickness	0.113"	0.517"	0.100", 0.030", 0.105" 2.7 mm, 0.030"Q, 2.7 mm
Muntin Pattern	N/A	N/A	N/A
Material	Annealed	Air*	Laminated
Laminate Material	N/A	N/A	PVB

Glazing Method	Exterior
Glazing Material	Foam tape
Glazing Bead Material	Vinyl

Glazing Option C

Measured Overall Insulation Glass Unit Thickness	0.890"
Spacer Type	DuraLite®

	Exterior Sheet	Gap	Center Sheet	Gap	Interior Sheet
Measured Thickness	0.118"	0.264"	0.117"	0.278"	0.113"
Muntin Pattern	N/A	N/A	N/A	N/A	N/A
Material	Annealed	Air*	Annealed	Air*	Annealed
Laminate Material	N/A	N/A	N/A	N/A	N/A

Glazing Method	Exterior
Glazing Material	Foam tape
Glazing Bead Material	Vinyl

** - Stated per Client/Manufacturer, N/A-Not Applicable*

Specimen Descriptions (Continued)

Components

	Type	Quantity	Location
Weatherstrip			
	0.187" by 290" Polypile with center fin	1 Row	Head, sill, lock rail, meeting rail, top sash top rail
	0.187" by 290" Polypile with center fin	2 Rows	Stiles
	3/8" Diameter foam-lined bulb gasket with dual 1/8" leaf	2 Rows	Bottom rail
Hardware			
	Cam lock	2	Lock rail
	Keeper	2	Keeper rail
	Child safety lock	2	Top sash stiles
	Constant force balance	4	Jambs
	Tilt latch and bar	4	Sash corners
Drainage			
	Sloped sill	1	Sill
	1" Weep notch	4	Sill

Test Option	**Total Weight** (lbs)	**Average Weight** (lbs/ft^2)
A	71	3.67
B	91	4.70
C	94	4.86

Comments

There was a 1/2" by 2-1/4" self-adhesive open cell foam strip adhered to the outer section of the jambs and head for the test. The client did not supply a report drawing of the test specimen. Intertek-ATI will store samples of test specimens for four years.

Intertek-ATI 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 Intertek-ATI for the entire test record retention period. The test record retention period ends four years after the test date.

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 is intended to help in the client's quality assurance program, but it does not represent a continuous or exhaustive evaluation of the specimen tested or of other products or materials that were not evaluated. The statements and data provided herein do not constitute approval, disapproval, certification, or acceptance of performance or materials.

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For INTERTEK-ATI:

Digitally Signed by: Amanda Smith

Amanda N. Smith
Technician - Acoustical Testing

Digitally Signed by: Kurt A. Golden

Kurt A. Golden
Project Lead – Acoustical Testing

ANS: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: Photographs (1)

Revision Log

Rev. #	Date	Page(s)	Revision(s)
R0	09/27/16	N/A	Original Report Issue

Appendix A

Instrumentation:

Instrument	Manufacturer	Model	Description	ATI Number	Date of Calibration
Data Acquisition Unit	National Instruments	PXI-1033	Data Acquisition card	65126	05/16 *
Source Room Microphone	PCB Piezotronics	378B20	Microphone and Preamplifier	64902	07/16
Source Room Microphone	PCB Piezotronics	378B20	Microphone and Preamplifier	64903	12/15
Source Room Microphone	PCB Electronics	378B20	Microphone and Preamplifier	65103	12/15
Source Room Microphone	PCB Piezotronics	378B20	Microphone and Preamplifier	64905	12/15
Source Room Microphone	PCB Piezotronics	378B20	Microphone and Preamplifier	64906	12/15
Receive Room Microphone	PBC Piezotronics	378B20	Microphone and Preamplifier	64907	12/15
Receive Room Microphone	PCB Piezotronics	378B20	Microphone and Preamplifier	64908	12/15
Receive Room Microphone	PCB Piezotronics	378B20	Microphone and Preamplifier	64909	12/15
Receive Room Microphone	PCB Piezotronics	378B20	Microphone and Preamplifier	64910	12/15
Receive Room Microphone	PCB Piezotronics	378B20	Microphone and Preamplifier	64911	12/15
Receive Room Environmental Indicator	Comet	T7510	Receive Room	64915	03/16
Source Room Environmental Indicator	Comet	T7510	Source Room	64914	03/16
Microphone Calibrator	Norsonic	1251	Pistonphone Calibrator	65105	05/16

**- 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-Not Applicable

Appendix B

Complete Test Results

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AIRBORNE SOUND TRANSMISSION LOSS

ASTM E 90

Test Date	08/26/16					
Data File No.	G1623.01A					
Client	MI Windows and Doors, LLC					
Description	Series/Model: 1650 Vinyl, double hung window with 3/4" IG (1/8" annealed, 1/2" air space, 1/8" annealed)					
Specimen Area	1.80 m²	Receive Temp.	21.9 °C		Source Temp.	22.1 °C
Technician	Matthew D. Tre	Receive Humidity	46%		Source Humidity	49%

Freq (Hz)	Background SPL (dB)	Absorption (m²)	Source SPL (dB)	Receive SPL (dB)	Specimen TL (dB)	95% Confidence Limit	Number of Deficiencies
80	41.2	4.7	104	84	16.3	1.65	-
100	39.0	5.4	104	75	25.6	1.30	-
125	40.6	5.0	104	74	25.8	1.09	0
160	44.5	4.6	104	76	23.4	0.74	0
200	42.6	4.9	105	81	19.5	0.77	0
250	37.2	5.5	105	83	17.4	0.99	3
315	33.8	5.7	98	77	15.3	0.47	8
400	31.8	5.8	95	69	21.2	0.40	5
500	26.6	5.8	95	63	27.3	0.33	0
630	24.0	5.6	99	65	29.0	0.26	0
800	22.7	5.9	99	61	33.0	0.21	0
1000	21.3	6.1	96	55	35.4	0.20	0
1250	18.3	6.6	97	55	36.4	0.21	0
1600	14.6	7.0	101	59	36.6	0.33	0
2000	9.9	7.4	94	52	35.9	0.21	0
2500	7.7	8.4	92	49	36.6	0.14	0
3150	6.5	10.3	94	51	35.2	0.16	0
4000	6.3	12.8	93	55	29.9	0.17	1
5000	7.1	16.5	92	51	30.5	0.22	-

STC Rating	**27**	*(Sound Transmission Class)*
Deficiencies	17	*(Sum of Deficiencies)*
OITC Rating	**24**	*(Outdoor-Indoor Transmission Class)*

Notes:

1) Receive Room levels less than 5 dB above the Background levels are red.

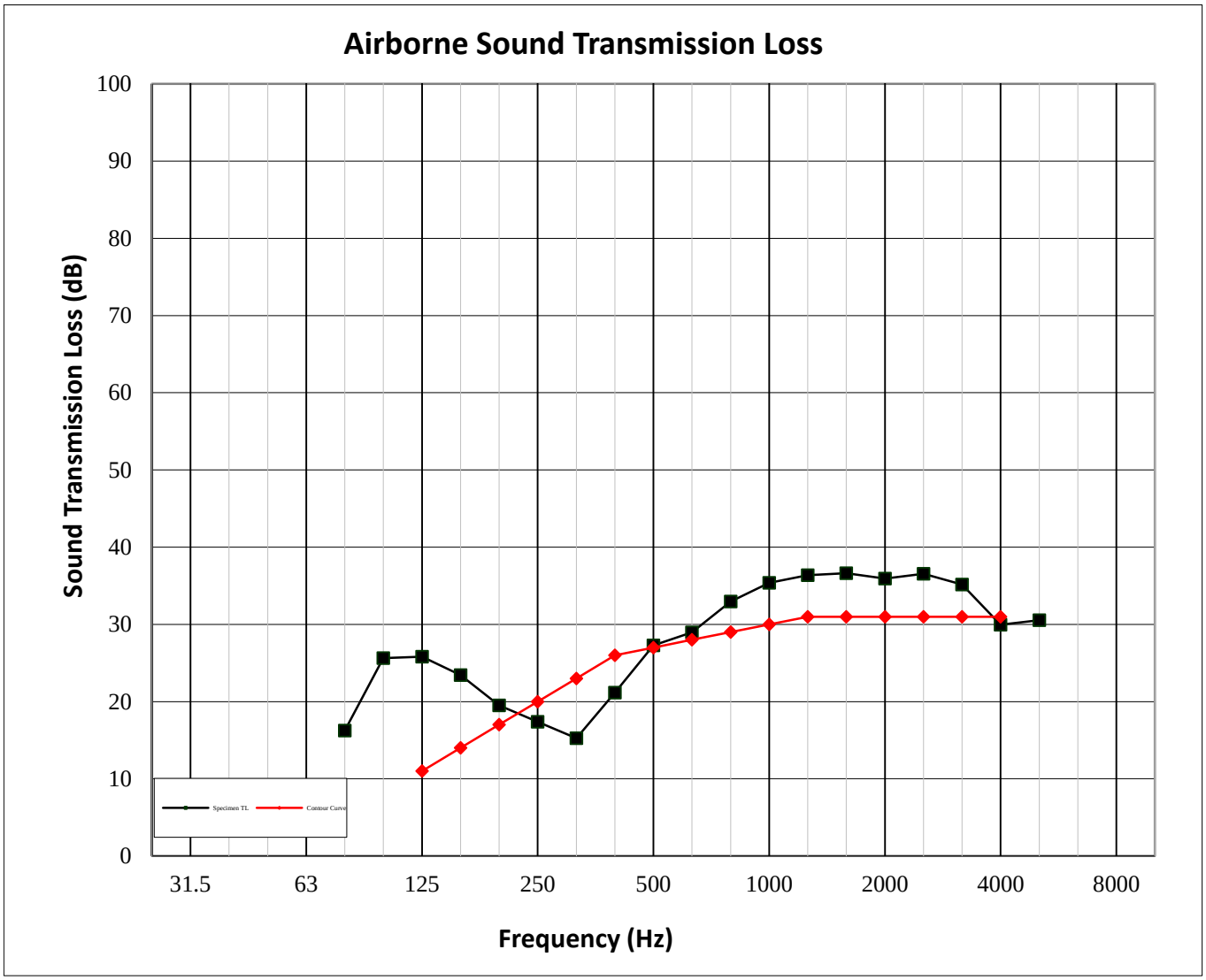
2) Specimen TL levels listed in red indicate the lower limit of the transmission loss.

3) Specimen TL levels listed in green indicate that there has been a filler wall correction applied

AIRBORNE SOUND TRANSMISSION LOSS

ASTM E 90

Test Date	08/26/16					
Data File No.	G1623.01A					
Client	MI Windows and Doors, LLC					
Description	Series/Model: 1650 Vinyl, double hung window with 3/4" IG (1/8" annealed, 1/2" air space, 1/8" annealed)					
Specimen Area	1.80 m²	Receive Temp.	21.9 °C		Source Temp.	22.1 °C
Technician	Matthew D. Tre	Receive Humidity	46%		Source Humidity	49%



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AIRBORNE SOUND TRANSMISSION LOSS

ASTM E 90

Test Date	09/06/16					
Data File No.	G1623.01B					
Client	MI Windows and Doors, LLC					
Description	Series/Model: 1650 Vinyl, double hung window with 7/8" IG (1/8" annealed exterior, 1/2" air space, 2.7 mm, 0.030" QPVB, 2.7 mm laminated interior), Glass temperature 75°F					
Specimen Area	1.80 m²	Receive Temp.	21.9 °C		Source Temp.	21.8 °C
Technician	Amanda N. Smit	Receive Humidity	49%		Source Humidity	50%

Freq (Hz)	Background SPL (dB)	Absorption (m²)	Source SPL (dB)	Receive SPL (dB)	Specimen TL (dB)	95% Confidence Limit	Number of Deficiencies
80	37.4	4.2	104	80	21.5	1.71	-
100	37.0	4.7	104	74	27.2	1.49	-
125	39.4	4.8	104	74	25.5	1.79	0
160	41.1	4.6	103	78	21.8	1.38	0
200	41.3	4.7	105	80	21.3	0.90	1
250	36.9	5.4	105	80	20.2	0.92	5
315	31.0	5.5	98	70	22.5	0.31	5
400	26.0	5.8	95	63	27.1	0.41	4
500	22.1	5.9	95	60	30.2	0.32	2
630	20.1	5.7	99	64	30.6	0.42	2
800	17.3	6.0	99	61	32.1	0.22	2
1000	14.1	6.1	95	56	33.9	0.38	1
1250	12.0	6.7	96	55	35.4	0.18	1
1600	8.3	7.1	102	60	35.7	0.20	0
2000	6.1	7.4	94	52	36.1	0.22	0
2500	5.3	8.5	92	48	37.1	0.16	0
3150	5.6	10.1	94	49	37.0	0.17	0
4000	6.3	12.7	93	50	34.2	0.19	2
5000	7.3	16.2	91	47	35.0	0.17	-

STC Rating	**32**	*(Sound Transmission Class)*
Deficiencies	25	*(Sum of Deficiencies)*
OITC Rating	**27**	*(Outdoor-Indoor Transmission Class)*

Notes:

1) Receive Room levels less than 5 dB above the Background levels are red.

2) Specimen TL levels listed in red indicate the lower limit of the transmission loss.

3) Specimen TL levels listed in green indicate that there has been a filler wall correction applied

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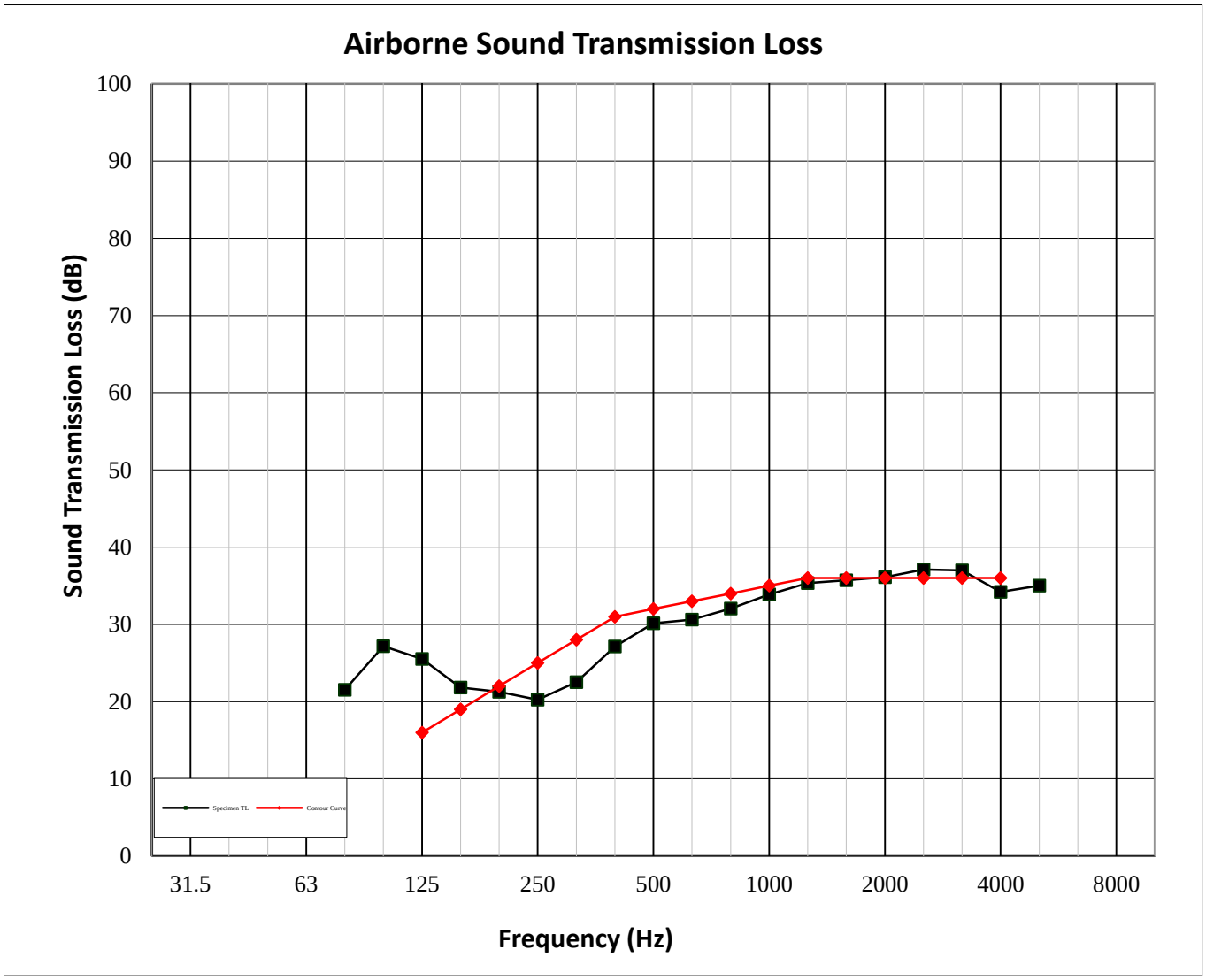
AIRBORNE SOUND TRANSMISSION LOSS

ASTM E 90

Test Date	09/06/16						
Data File No.	G1623.01B						
Client	MI Windows and Doors, LLC						
Description	Series/Model: 1650 Vinyl, double hung window with 7/8" IG (1/8" annealed exterior, 1/2" air space, 2.7 mm, 0.030" QPVB, 2.7 mm laminated interior), Glass temperature 75°F						
Specimen Area	1.80 m²	Receive Temp.	21.9 °C		Source Temp.	21.8 °C	
Technician	Amanda N. Smit	Receive Humidity	49%		Source Humidity	50%	



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AIRBORNE SOUND TRANSMISSION LOSS

ASTM E 90

Test Date	08/26/16					
Data File No.	G1623.01C					
Client	MI Windows and Doors, LLC					
Description	Series/Model: 1650 Vinyl, double hung window with 7/8" IG (1/8" annealed, 1/4" air space, 1/8" annealed center, 1/4" air space, 1/8" annealed)					
Specimen Area	1.80 m²	Receive Temp.	21.6 °C		Source Temp.	21.3 °C
Technician	Matthew D. Tre	Receive Humidity	48%		Source Humidity	51%

Freq (Hz)	Background SPL (dB)	Absorption (m²)	Source SPL (dB)	Receive SPL (dB)	Specimen TL (dB)	95% Confidence Limit	Number of Deficiencies
80	39.6	4.8	104	82	18.5	1.70	-
100	36.9	5.6	105	73	27.4	1.36	-
125	39.1	5.2	104	73	26.5	1.16	0
160	44.3	4.7	104	74	25.9	0.86	0
200	43.3	4.7	105	81	20.1	0.86	0
250	37.2	5.3	105	83	17.5	1.00	6
315	32.3	5.6	98	75	17.8	0.37	8
400	29.6	5.9	95	68	22.4	0.38	7
500	27.4	5.9	95	63	26.9	0.32	3
630	24.8	5.6	99	65	29.8	0.21	1
800	24.6	5.9	99	60	33.3	0.25	0
1000	21.5	6.1	96	55	35.4	0.22	0
1250	19.8	6.7	97	54	36.7	0.20	0
1600	15.8	7.1	101	59	36.5	0.31	0
2000	11.1	7.5	94	51	36.6	0.20	0
2500	9.6	8.6	92	48	37.6	0.14	0
3150	7.3	10.4	94	50	36.5	0.13	0
4000	6.7	12.9	93	54	30.7	0.19	3
5000	7.5	16.7	91	51	31.2	0.17	-

STC Rating	**30**	*(Sound Transmission Class)*
Deficiencies	28	*(Sum of Deficiencies)*
OITC Rating	**25**	*(Outdoor-Indoor Transmission Class)*

Notes:

1) Receive Room levels less than 5 dB above the Background levels are red.

2) Specimen TL levels listed in red indicate the lower limit of the transmission loss.

3) Specimen TL levels listed in green indicate that there has been a filler wall correction applied

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AIRBORNE SOUND TRANSMISSION LOSS

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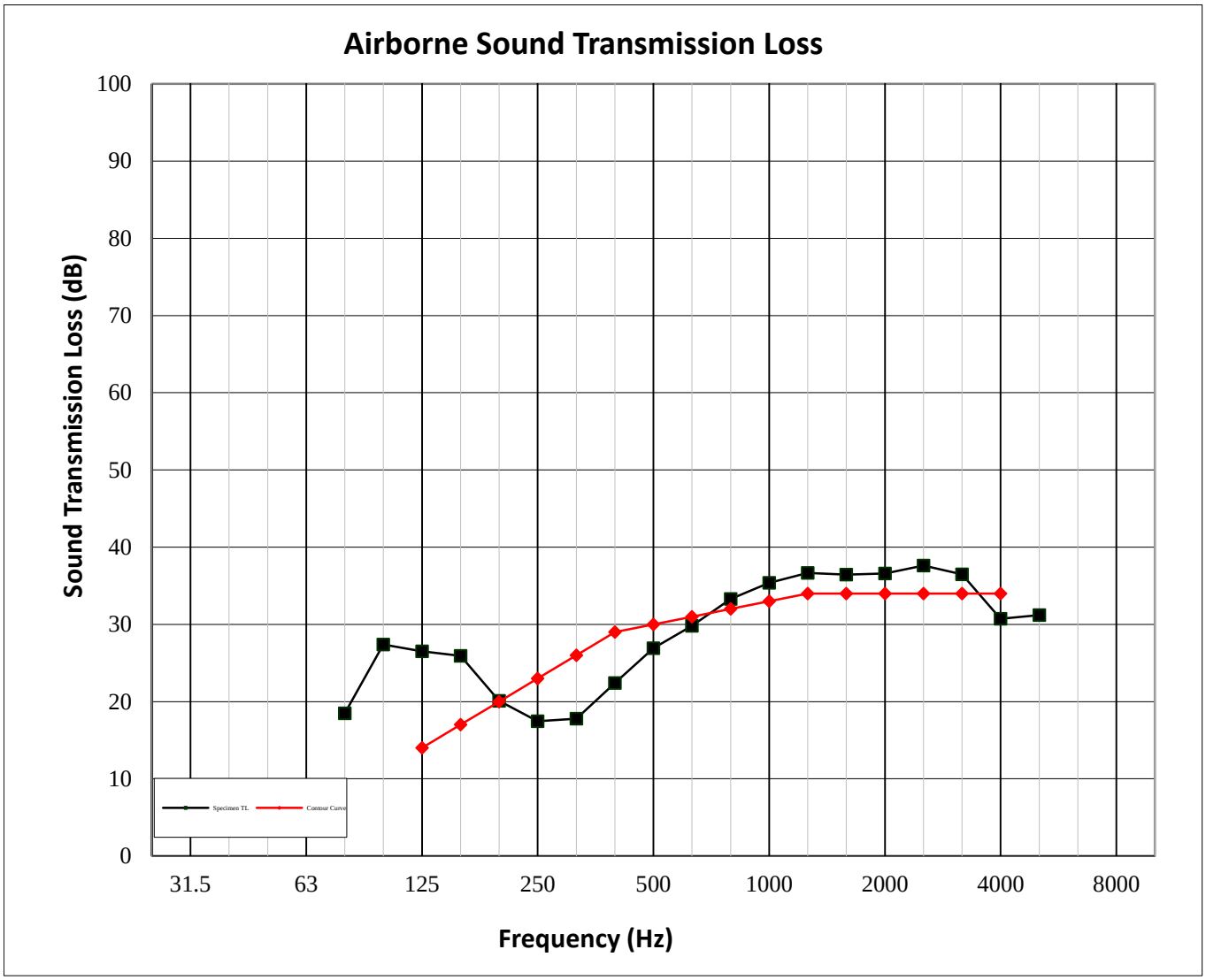
Specimen Area	1.80 m²	Receive Temp.	21.6 °C		Source Temp.	21.3 °C
Technician	Matthew D. Tre	Receive Humidity	48%		Source Humidity	51%



Appendix C

Photographs

Receive Room View of Installed Specimen

Source Room View of Installed Specimen