Architectural Testing

ASTM E 90 SOUND TRANSMISSION LOSS TEST REPORT

Rendered to:

MI WINDOWS AND DOORS, INC.

SERIES/MODEL: 1650

TYPE: Double Hung Window

Summary of Test Results			
ATI Data File No.	**Glazing Option (Nominal Dimensions)**	**STC**	**OITC**
82672.01A	7/8" IG (1/8" annealed, 5/8" air space, 1/8" annealed)	25	20
82672.01B	7/8" IG (1/8" annealed, 1/4" air space, 1/8" annealed, 1/4" air space, 1/8" annealed)	30	26
82672.01C	27/32" IG (3/32" annealed, 9/32" air space, 3/32" annealed, 9/32" air space, 3/32" annealed)	28	23

Reference should be made to ATI Report No. 82672.01-113-11 for complete test specimen description. The complete test results are listed in Appendix B.

130 Derry Court
York, PA 17406-8405
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Architectural Testing

ACOUSTICAL PERFORMANCE TEST REPORT

Rendered to:

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

Report No:	82672.01-113-11
Test Date:	04/25/08
Report Date:	05/13/08
Expiration Date:	04/25/12

Test Sample Identification:

Series/Model: 1650

Type: Double Hung Window

Overall Size: 47-1/4" by 59"

Glazing Option A (Nominal Dimensions): 7/8" IG (1/8" Annealed, 5/8" Air Space, 1/8" Annealed)

Glazing Option B (Nominal Dimensions): 7/8" IG (1/8" Annealed, 1/4" Air Space, 1/8" Annealed, 1/4" Air Space, 1/8" annealed)

Glazing Option C (Nominal Dimensions): 27/32" IG (3/32" Annealed, 9/32" Air Space, 3/32" Annealed, 9/32" Air Space, 3/32" Annealed)

Project Scope: Architectural Testing, Inc. was contracted by MI Windows and Doors, Inc. to conduct sound transmission loss tests on a Series/Model 1650, double hung window. 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.

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Test Methods: The acoustical test was conducted in accordance with the following:

ASTM E 90-04, *Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.*

ASTM E 413-04, *Classification for Rating Sound Insulation*.

ASTM E 1332-90 (Re-approved 2003), *Standard Classification for Determination of Outdoor-Indoor Transmission Class.*

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 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 48" by 72" and 72" by 48" test specimens. The filler wall achieved an STC rating of 64.

A filler wall reducing element was used to reduce the test opening size to 47" wide by 59-1/2" high. The reducing element consisted of a double 2x4 wood stud wall construction with three layers of 5/8" drywall on both sides. The stud cavities in the wall were insulated with two layers of R-13 fiberglass insulation. The window was placed on a foam 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 sash were 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 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		47-1/4" by 59"
Thickness		4"
Corners		Mitered
	Fasteners	Welds
	Seal Method	None
Material		Vinyl
	Reinforcement	N/A
	Thermal Break Material	N/A

Sash Construction:

		Bottom Sash	Top Sash
Size		43-7/8" by 28-3/4"	43-1/8" by 28"
Thickness		1-1/4"	1-1/4"
Corners		Mitered	Mitered
	Fasteners	Welds	Welds
	Seal Method	None	None
Material		Vinyl	Vinyl
	Reinforcement	Aluminum / horizontal members	Aluminum / meeting rail
	Thermal Break Material	N/A	N/A
Daylight Opening Size		40-1/4" by 25-1/8"	40-1/4" by 25-1/8"

Sample Descriptions: (Continued)

Glazing Option A:

Measured Overall Insulation Glass Unit Thickness	0.873"
Spacer Type	Steel U Shaped

	Exterior Sheet	**Gap**	**Interior Sheet**
Measured Thickness	0.116"	0.641"	0.116"
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	Silicone
Glazing Bead Material	Vinyl

Glazing Option B:

Measured Overall Insulation Glass Unit Thickness	0.841"
Spacer Type	Aluminum

	Exterior Sheet	**Gap**	**Middle Sheet**	**Gap**	**Interior Sheet**
Measured Thickness	0.116"	0.245"	0.116"	0.248"	0.116"
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	Silicone
Glazing Bead Material	Vinyl

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

Sample Descriptions: (Continued)

Glazing Option C:

Measured Overall Insulation Glass Unit Thickness	0.835"
Spacer Type	Aluminum

	Exterior Sheet	**Gap**	**Middle Sheet**	**Gap**	**Interior Sheet**
Measured Thickness	0.090"	0.280"	0.090"	0.285"	0.090"
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	Silicone
Glazing Bead Material	Vinyl

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

Sample Descriptions: (Continued)

Components:

TYPE	QUANTITY	LOCATION
Weatherstrip		
0.187" by 0.150" Polypile with center fin	1 Row	Exterior meeting rail
0.187" by 250" Polypile with center fin	2 Rows	Stiles
0.187" by 250" Polypile with center fin	1 Row	Interior meeting rail
5/16" Diameter foam lined hollow bulb gasket	2 Rows	Bottom rail
1" by 1" Polypile pad	2	Corners of interior sash at meeting rail
Hardware		
Constant force balance	4	Jambs
Metal cam lock	2	Interior meeting rail
Metal keeper	2	Exterior meeting rail
Metal tilt bar	4	Bottom corners of both sash
Plastic tilt latch	4	Top corners of both sash
Drainage		
Sloped sill	1	Sill
1" Weep notch	2	Sill

Comments: The total weight of the sample was for glazing option A was 70 lbs. The total weight of the sample for glazing option B was 90 lbs. The total weight of the sample for glazing option C was 70 lbs. At the clients request no drawings will be included with this test report. The window was disassembled, and the components will be retained by ATI 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 1650, double hung window is listed below.

Summary of Test Results			
ATI Data File No.	**Glazing Option (Nominal Dimensions)**	**STC**	**OITC**
82672.01A	7/8" IG (1/8" annealed, 5/8" air space, 1/8" annealed)	25	20
82672.01B	7/8" IG (1/8" annealed, 1/4" air space, 1/8" annealed, 1/4" air space, 1/8" annealed)	30	26
82672.01C	27/32" IG (3/32" annealed, 9/32" air space, 3/32" annealed, 9/32" air space, 3/32" annealed)	28	23

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, Inc. 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(s) tested. This report may not be reproduced, except in full, without the written approval of Architectural Testing, Inc.

For ARCHITECTURAL TESTING, INC:

Brandon C Ward
Digitally Signed by: Brandon C. Ward

Brandon C. Ward
Technician - Acoustical Testing

Todd D Kister
Digitally Signed by: Todd D. Kister

Todd D. Kister
Laboratory Supervisor - Acoustical Testing

BCW:crc

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)
0	05/13/08	N/A	Original Report Issue

Appendix A

Instrumentation:

Instrument	Manufacturer	Model	Description	ATI Number
Analyzer	Agilent Technologies	35670A	Dynamic signal analyzer	Y002929
Receive Room Microphone	G.R.A.S.	40AR	1/2", pressure type, condenser microphone	Y003246
Source Room Microphone	G.R.A.S.	40AR	1/2", pressure type, condenser microphone	Y003245
Receive Room Preamp	G.R.A.S.	26AK	1/2" preamplifier	Y003249
Source Room Preamp	G.R.A.S.	26AK	1/2" preamplifier	Y003248
Microphone Calibrator	Bruel & Kjaer	4228	Pistonphone calibrator	Y002816
Noise Source	Delta Electronics	SNG-1	Two, non-correlated "Pink" noise signals	Y002181
Equalizer	Rane	RPE228	Programmable EQ	Y002180
Power Amplifiers	Renkus-Heinz	P2000	2 - Amplifiers	Y002179 Y001779
Receive Room Loudspeakers	Renkus-Heinz	Trap Jr/9"	2 - Loudspeakers	Y001784 Y001785
Source Room Loudspeakers	Renkus-Heinz	Trap Jr/9"	2 - Loudspeakers	Y002649 Y002650

Test Chamber:

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

	Maximum Size	Description
TL Test Opening	14 ft wide by 10 ft high	Vibration break between source and receive rooms.

Appendix B

Complete Test Results

SOUND TRANSMISSION LOSS

ASTM E90

Architectural Testing

ATI No.	82672.01A	**Date**	04/25/08
Client	MI Windows and Doors, Inc.		
Specimen	Series/Model: 1650, double hung window with 7/8" IG (1/8" annealed, 5/8" air space, 1/8" annealed)		
Specimen Area	19.36 Sq Ft		
Filler Area	120.64 Sq Ft		
Operator	Brandon C. Ward		

	Bkgrd	Absorp	Source	Receive	Filler	Specimen
Temp F	75.1	75.4	74.8	75.2	72.8	75.1
RH %	47.8	47.6	43.5	47.6	43.0	46.6

Freq (Hz)	Bkgrd SPL (dB)	Absorp (Sabines /Sq Ft)	Source SPL (dB)	Receive SPL (dB)	Filler TL (dB)	Specimen TL (dB)	95% Conf Limit	No. of Defici-encies	Trans Coef Diff
80	39.8	64.3	86.2	66.1	36.1	15	4.28	0	13.2
100	38.9	60.8	88.2	65.9	39.1	18	4.10	0	13.7
125	39.1	49.6	93.8	68.2	48.6	21	2.90	0	19.2
160	43.0	51.2	94.6	68.7	47.2	22	0.42	0	17.6
200	41.9	54.9	100.0	79.1	49.1	16	0.46	0	24.8
250	37.1	55.0	100.8	86.7	52.5	10	1.93	8	34.9
315	36.3	56.2	99.8	78.5	54.2	17	1.34	4	29.6
400	34.8	59.5	99.1	73.9	58.1	20	1.08	4	29.8
500	32.9	59.3	100.2	69.4	61.0	26	0.59	0	27.1
630	27.5	58.5	102.5	70.4	63.8	27	0.68	0	28.5
800	28.6	60.4	102.9	66.7	66.3	31	0.25	0	27.1
1000	26.3	64.4	102.4	65.0	72.3	32	0.54	0	32.2
1250	25.8	69.1	105.9	65.5	80.0	35	0.27	0	37.2
1600	21.9	71.7	111.7	70.4	81.5	36	0.28	0	38.0
2000	15.2	75.8	107.7	64.7	82.1	37	0.40	0	37.1
2500	7.0	85.8	106.1	62.0	77.1	38	0.36	0	31.6
3150	7.6	102.7	107.1	63.4	79.2	37	0.24	0	34.7
4000	6.6	123.0	105.9	68.1	80.0	30	0.25	0	42.3
5000	6.9	161.4	104.0	64.7	79.5	30	0.38	0	41.4

STC Rating = **25** *(Sound Transmission Class)*
Deficiencies = **16** *(Number of deficiencies versus contour curve)*
OITC Rating = **20** *(Outdoor/Indoor Transmission Class)*

Note: *The acoustical chambers are qualified for measurements down to 80 hertz. Data reported below 80 hertz is for reference only.*

IAS ACCREDITED

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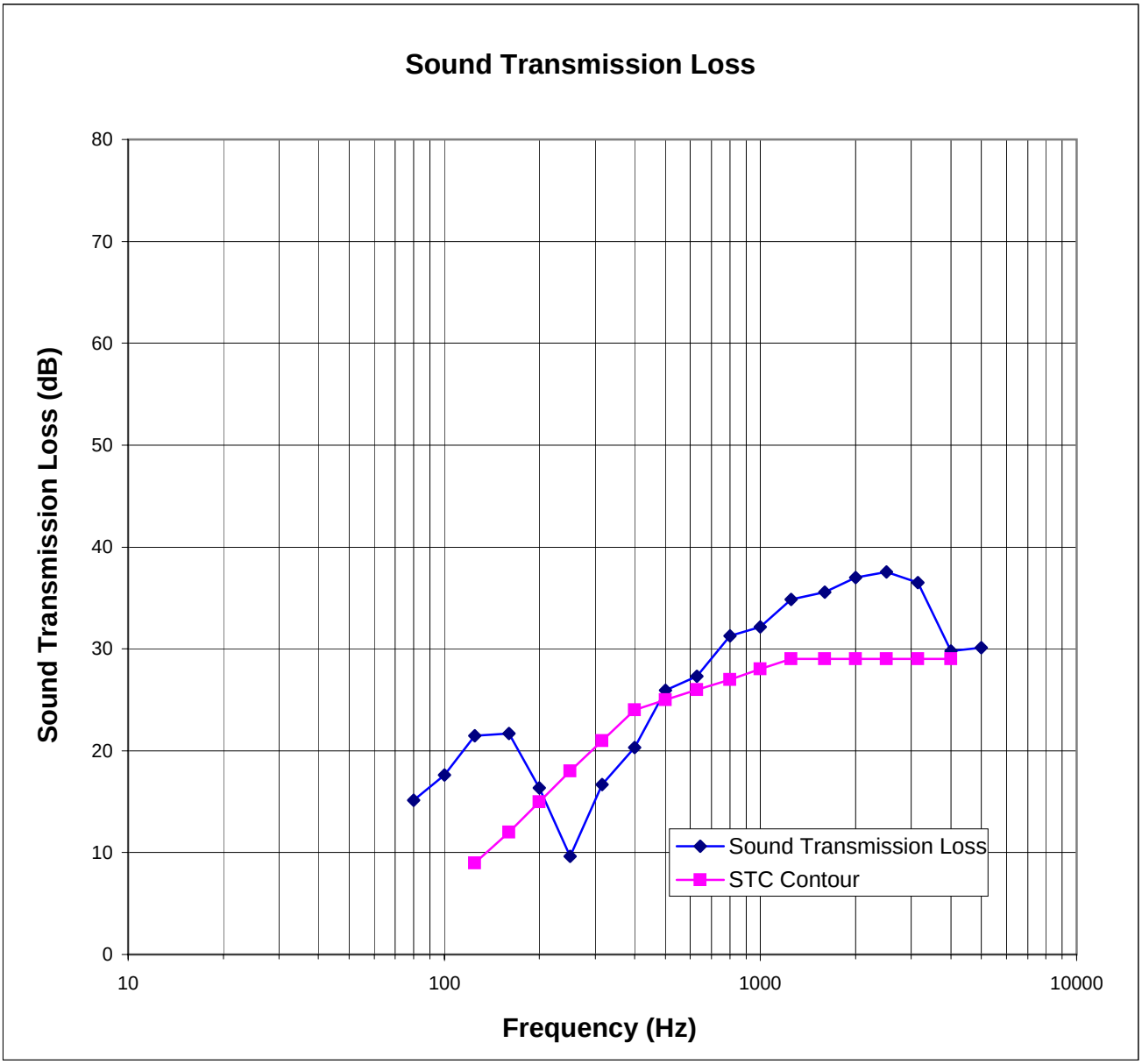
Architectural Testing

ATI No.	82672.01A	**Date**	04/25/08
Client	MI Windows and Doors, Inc.		
Specimen	Series/Model: 1650, double hung window with 7/8" IG (1/8" annealed, 5/8" air space, 1/8" annealed)		
Specimen Area	19.36 Sq Ft		
Filler Area	120.64 Sq Ft		
Operator	Brandon C. Ward		



SOUND TRANSMISSION LOSS

ASTM E90

Architectural Testing

ATI No.	82672.01B	**Date**	04/25/08
Client	MI Windows and Doors, Inc.		
Specimen	Series/Model: 1650, double hung window with 7/8" IG (1/8" annealed, 1/4" air space, 1/8" annealed, 1/4" air space, 1/8" annealed)		
Specimen Area	19.36 Sq Ft		
Filler Area	120.64 Sq Ft		
Operator	Brandon C. Ward		

	Bkgrd	Absorp	Source	Receive	Filler	Specimen
Temp F	75.2	75.3	74.5	75.2	72.8	75.1
RH %	39.7	40.0	42.2	40.0	43.0	40.5

Freq (Hz)	Bkgrd SPL (dB)	Absorp (Sabines /Sq Ft)	Source SPL (dB)	Receive SPL (dB)	Filler TL (dB)	Specimen TL (dB)	95% Conf Limit	No. of Defici-encies	Trans Coef Diff
80	43.6	64.8	86.0	62.6	36.1	19	3.23	0	10.0
100	40.8	56.6	88.4	62.8	39.1	21	3.04	0	10.1
125	40.4	51.7	93.7	64.5	48.6	25	2.94	0	15.8
160	42.7	49.6	94.7	64.8	47.2	26	0.84	0	13.5
200	42.1	54.5	99.9	72.9	49.1	23	0.66	0	18.6
250	37.2	54.2	101.0	78.3	52.5	18	1.59	5	26.3
315	36.3	61.6	99.8	74.9	54.2	20	1.01	6	26.4
400	35.2	62.2	99.0	70.6	58.1	23	0.95	6	26.8
500	32.8	61.3	100.2	69.1	61.0	26	0.65	4	27.0
630	26.2	61.9	102.4	69.3	63.8	28	0.70	3	27.8
800	26.4	64.4	102.8	67.1	66.3	30	0.22	2	27.9
1000	24.1	67.6	102.4	65.9	72.3	31	0.61	2	33.2
1250	24.3	72.9	105.9	65.8	80.0	34	0.34	0	37.7
1600	19.6	72.4	111.7	70.9	81.5	35	0.40	0	38.5
2000	14.4	77.8	107.6	64.7	82.1	37	0.35	0	37.3
2500	7.4	90.8	106.1	62.2	77.1	37	0.39	0	32.0
3150	7.8	106.7	107.1	62.2	79.2	37	0.29	0	33.8
4000	7.0	133.8	105.9	65.3	80.0	32	0.25	2	39.8
5000	7.6	178.1	104.1	61.9	79.5	33	0.38	0	38.9

STC Rating = **30** *(Sound Transmission Class)*
Deficiencies = **30** *(Number of deficiencies versus contour curve)*
OITC Rating = **26** *(Outdoor/Indoor Transmission Class)*

Note: *The acoustical chambers are qualified for measurements down to 80 hertz. Data reported below 80 hertz is for reference only.*

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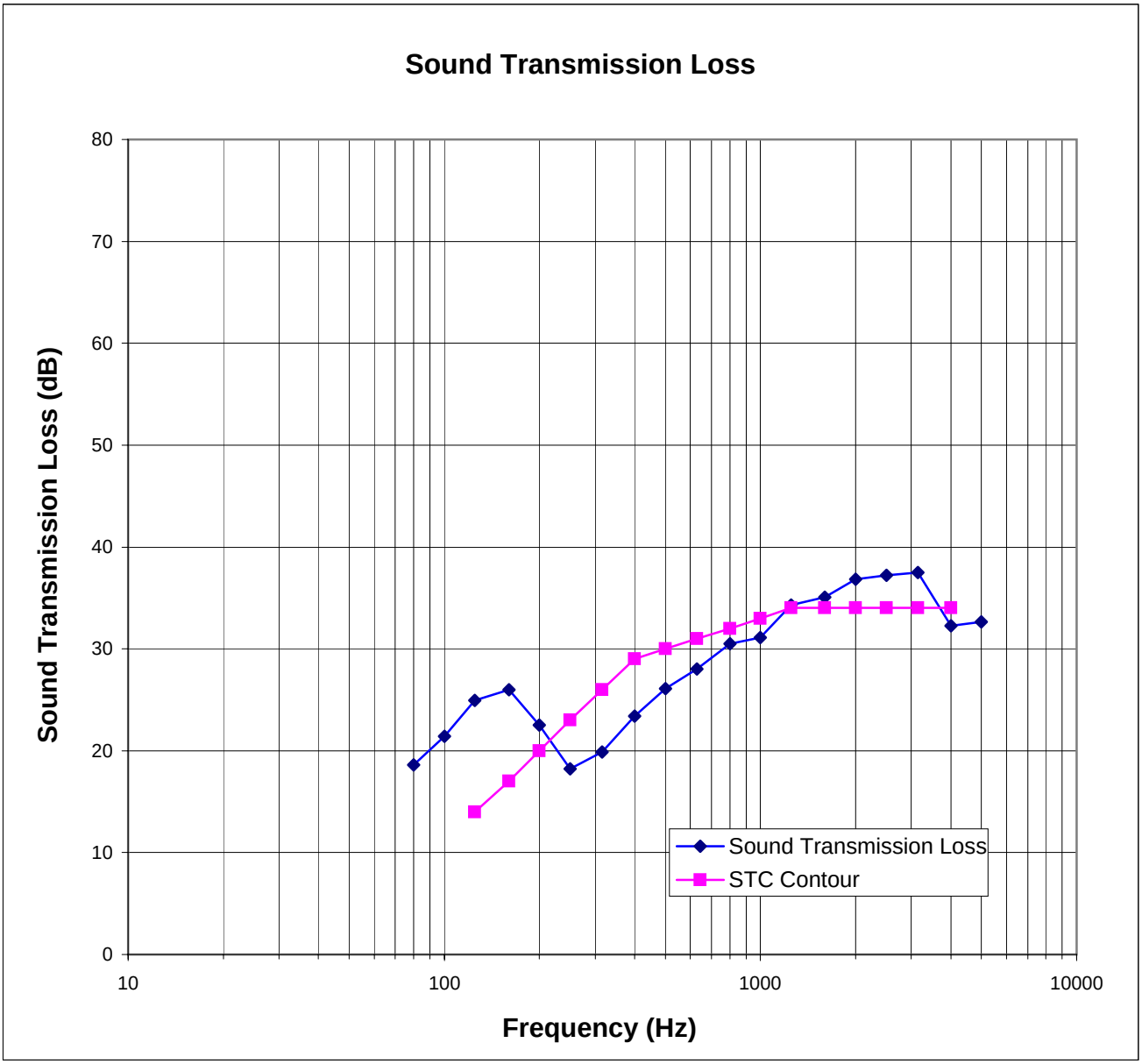
Architectural Testing

ATI No.	82672.01B	**Date**	04/25/08
Client	MI Windows and Doors, Inc.		
Specimen	Series/Model: 1650, double hung window with 7/8" IG (1/8" annealed, 1/4" air space, 1/8" annealed, 1/4" air space, 1/8" annealed)		
Specimen Area	19.36 Sq Ft		
Filler Area	120.64 Sq Ft		
Operator	Brandon C. Ward		



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SOUND TRANSMISSION LOSS

ASTM E90

Architectural Testing

ATI No.	82672.01C	**Date**	04/25/08
Client	MI Windows and Doors, Inc.		
Specimen	Series/Model: 1650, double hung window with 27/32" IG (3/32" annealed, 9/32" air space, 3/32" annealed, 9/32" air space, 3/32" annealed)		
Specimen Area	19.36 Sq Ft		
Filler Area	120.64 Sq Ft		
Operator	Brandon C. Ward		

	Bkgrd	Absorp	Source	Receive	Filler	Specimen
Temp F	75.4	75.4	74.7	75.3	72.8	75.2
RH %	39.0	39.5	43.8	39.6	43.0	40.5

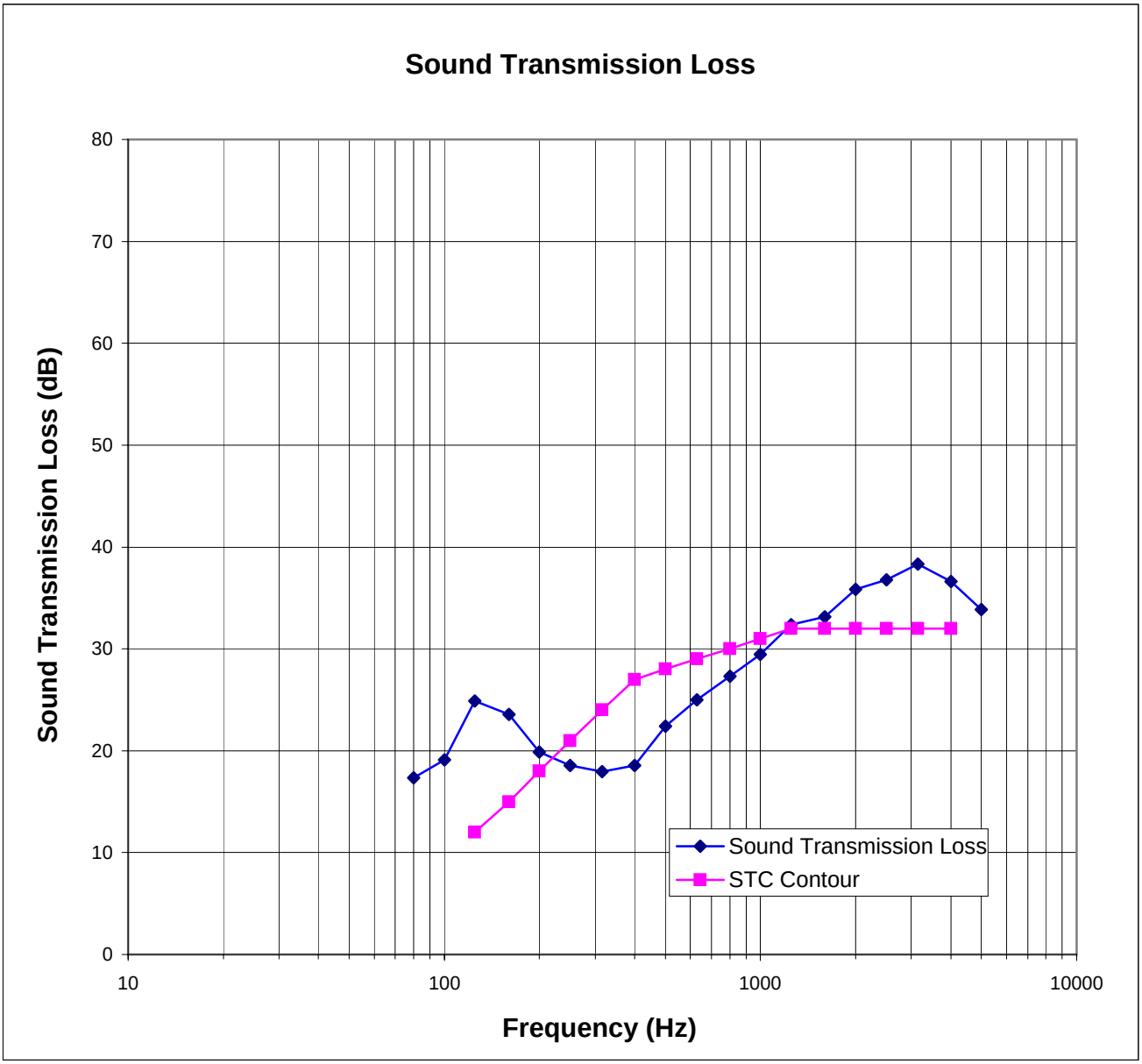
Freq (Hz)	Bkgrd SPL (dB)	Absorp (Sabines /Sq Ft)	Source SPL (dB)	Receive SPL (dB)	Filler TL (dB)	Specimen TL (dB)	95% Conf Limit	No. of Defici-encies	Trans Coef Diff
80	42.6	57.9	86.3	64.5	36.1	17	3.56	0	11.2
100	40.1	56.7	88.0	64.5	39.1	19	3.61	0	12.3
125	41.2	47.7	93.8	65.0	48.6	25	3.48	0	15.8
160	44.9	48.7	94.8	67.2	47.2	24	0.56	0	15.7
200	44.6	52.3	99.7	75.6	49.1	20	0.96	0	21.3
250	40.0	53.8	100.8	77.9	52.5	19	1.53	2	26.0
315	38.2	56.2	99.7	77.1	54.2	18	0.93	6	28.3
400	36.4	62.3	98.9	75.3	58.1	19	0.93	8	31.6
500	33.5	60.9	99.9	72.5	61.0	22	0.65	6	30.7
630	27.5	59.5	102.4	72.5	63.8	25	0.41	4	30.8
800	28.0	63.1	102.6	70.2	66.3	27	0.51	3	31.1
1000	25.5	64.7	102.5	67.8	72.3	29	0.60	2	34.9
1250	25.0	69.4	105.9	68.0	80.0	32	0.44	0	39.7
1600	22.2	72.0	111.9	73.1	81.5	33	0.30	0	40.5
2000	16.4	76.2	107.5	65.7	82.1	36	0.22	0	38.3
2500	11.8	89.5	106.0	62.5	77.1	37	0.22	0	32.4
3150	10.6	106.1	107.0	61.3	79.2	38	0.32	0	32.9
4000	8.3	132.3	105.8	60.9	80.0	37	0.27	0	35.5
5000	7.8	176.0	104.1	60.6	79.5	34	0.43	0	37.6

STC Rating = **28** *(Sound Transmission Class)*
Deficiencies = **31** *(Number of deficiencies versus contour curve)*
OITC Rating = **23** *(Outdoor/Indoor Transmission Class)*

Note: *The acoustical chambers are qualified for measurements down to 80 hertz. Data reported below 80 hertz is for reference only.*

Architectural Testing

ATI No.	82672.01C	**Date**	04/25/08
Client	MI Windows and Doors, Inc.		
Specimen	Series/Model: 1650, double hung window with 27/32" IG (3/32" annealed, 9/32" air space, 3/32" annealed, 9/32" air space, 3/32" annealed)		
Specimen Area	19.36 Sq Ft		
Filler Area	120.64 Sq Ft		
Operator	Brandon C. Ward		



Appendix C
Photographs

Sample Installed in Test Chamber