Architectural Testing

ASTM E 90 SOUND TRANSMISSION LOSS TEST REPORT

Rendered to:

MI WINDOWS AND DOORS, INC.

SERIES/MODEL: EC155

TYPE: Fixed Window

Summary of Test Results			
Data File No.	**Glazing Option (Nominal Dimensions)**	**STC**	**OITC**
C1188.01A	3/4" IG (1/8" annealed exterior, 3/8" air space, 1/4" annealed interior)	31	26
C1188.01B	1-1/8" IG (1/8" annealed exterior, 3/4" air space, 1/4" annealed interior)	32	25
C1188.01C	1-1/8" IG (1/4" annealed exterior, 5/8" air space, 1/4" [0.030"Q] laminated interior), Glass temperature 75^{o}F	38	30

Reference should be made to Architectural Testing, Inc. Report No. C1188.01-113-11 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:

MI WINDOWS AND DOORS, INC.
7555 East State Route 69
Prescott Valley, Arizona 86314

Report No:	C1188.01-113-11
Test Dates:	08/07/12
And:	08/08/12
Report Date:	09/06/12
Record Retention End Date:	09/06/16

Test Sample Identification:

Series/Model: EC155

Type: Fixed Window

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

Glazing (Nominal Dimensions):

Option A: 3/4" IG (1/8" Annealed Exterior, 3/8" Air Space, 1/4" Annealed Interior)

Option B: 1-1/8" IG (1/8" Annealed Exterior, 3/4" Air Space, 1/4" Annealed Interior)

Option C: 1-1/8" IG (1/4" Annealed Exterior, 5/8" Air Space, 1/4" [0.030"Q] Laminated Interior), Glass Temperature 75^{o}F

Project Scope: Architectural Testing, Inc. was contracted by MI Windows and Doors, Inc. to conduct sound transmission loss tests on Series/Model EC155, fixed 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 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*.

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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 window specimens. The filler wall achieved an STC rating of 67.

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.

Test Procedure: The sound transmission loss tests were 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		47-1/4" by 59"
Thickness		3-7/8"
Corners		Mitered
	Fasteners	Welds
	Seal Method	None
Material		Vinyl
	Reinforcement	None
	Thermal Break Material	N/A
Daylight Opening Size		43" by 54-3/4"

N/A-Non Applicable

***Note**: The head, sill and jambs contained co-extruded PVC foam.*

Sample Descriptions: (Continued)

Glazing Option A:

Measured Overall Insulation Glass Unit Thickness	0.711"
Spacer Type	Silicone foam (Premium Enhanced)

	Exterior Sheet	**Gap**	**Interior Sheet**
Measured Thickness	0.118"	0.372"	0.221"
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	Double-sided adhesive foam tape, silicone
Glazing Bead Material	Vinyl

Glazing Option B:

Measured Overall Insulation Glass Unit Thickness	1.098"
Spacer Type	Silicone foam (Premium Enhanced)

	Exterior Sheet	**Gap**	**Interior Sheet**
Measured Thickness	0.116"	0.757"	0.225"
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	Double-sided adhesive foam tape, 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	1.085"
Spacer Type	Silicone foam (Premium Enhanced)

	Exterior Sheet	**Gap**	**Interior Sheet**
Measured Thickness	0.225"	0.620"	0.105", 0.030", 0.105"
Muntin Pattern	N/A	N/A	N/A
Material	Annealed	Air*	Laminated
Laminate Material	N/A	N/A	Saflex® Q Series acoustical interlayer

Glazing Method	Exterior
Glazing Material	Double-sided adhesive foam tape, silicone
Glazing Bead Material	Vinyl

Components:

	TYPE	**QUANTITY**	**LOCATION**
Weatherstrip			
	No weatherstrip		
Hardware			
	No hardware		
Drainage			
	1-3/8" by 1/4" Weep slot with flap cover	2	Sill face
	1" by 3/16" Weep slot	2	Sill hollow

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

Comments: The weight of Option A was 94 lbs. The weight of Option B was 98 lbs. The weight of Option C was 120 lbs. The client did not supply drawings on the Series/Model EC155, fixed window. The fixed window 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 EC155, fixed window is listed below.

Summary of Test Results			
Data File No.	**Glazing Option (Nominal Dimensions)**	**STC**	**OITC**
C1188.01A	3/4" IG (1/8" annealed exterior, 3/8" air space, 1/4" annealed interior)	31	26
C1188.01B	1-1/8" IG (1/8" annealed exterior, 3/4" air space, 1/4" annealed interior)	32	25
C1188.01C	1-1/8" IG (1/4" annealed exterior, 5/8" air space, 1/4" [0.030"Q] laminated interior), Glass temperature 75^{o}F	38	30

***Note**: 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.*

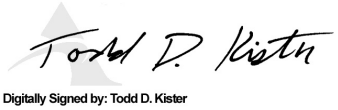
The complete test results are listed in Appendix B. Flanking limit tests and reference specimen tests are available upon request.

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:

Daniel P. Platts
Technician - Acoustical Testing



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: Photographs (1)

Revision Log

Rev. #	Date	Page(s)	Revision(s)
0	09/06/12	N/A	Original Report Issue

Appendix A

Instrumentation:

Instrument	Manufacturer	Model	Description	ATI Number	Date of Calibration
Analyzer	Hewlett Packard	HP35670A	Real time analyzer	Y002929	06/14/11 *
Data Acquisition Unit	Agilent	34970A	Data Acquisition Unit	62211	07/16/12
Receive Room Microphone	GRAS	40 AR	1/2" Microphone	Y003239	02/09/12
Source Room Microphone	GRAS	40 AR	1/2" Microphone	Y003247	02/09/12
Receive Room Preamplifier	GRAS	26 AK	1/2" Preamplifier	063260	03/26/12
Source Room Preamplifier	GRAS	26 AK	1/2" Preamplifier	005656	06/14/12
Microphone Calibrator	Bruel & Kjaer	Type 4228	Pistonphone Calibrator	Y002816	02/09/12
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	Y002652	09/26/11
Source Room Environemental Indicator	Vaisala	HMW60Y	Temperature and Humidity Sensor	005066	09/07/11
Weather Station	Davis Instruments	VantagePRO 6150C	Weather Station	Y003257	05/30/12

**- 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.	C1188.01A	**Date**	08/08/12
Client	MI Windows and Doors, Inc.		
Specimen	Series/Model: EC155, fixed window with 3/4" IG (1/8" annealed exterior, 3/8" air space, 1/4" annealed interior)		
Specimen Area	1.80 Square Meters		
Filler Area	11.20 Square Meters		
Operator	Daniel P. Platts		

	Bkgrd	Absorp	Source	Receive	Filler	Specimen
Temp C	20.7	24.0	23.6	22.0	23.0	22.6
RH %	48.9	39.5	48.6	44.9	43.7	45.5

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	44.3	5.3	87.8	61.9	35.8	22	2.97	0	6.7
100	39.3	5.5	88.5	61.8	41.2	22	2.91	0	11.4
125	42.3	5.3	94.9	62.6	47.8	28	2.22	0	12.2
160	45.2	4.6	94.3	64.5	47.0	26	1.27	0	13.3
200	43.4	4.9	100.0	73.4	52.1	22	0.97	0	21.9
250	44.4	5.3	100.6	77.0	54.8	19	1.49	5	28.0
315	42.6	5.4	101.3	76.8	55.7	20	0.89	7	28.1
400	37.4	5.6	101.0	74.2	61.2	22	1.22	8	31.4
500	42.9	5.5	101.3	70.1	67.5	26	0.35	5	33.2
630	41.5	5.5	103.2	67.3	72.6	31	0.85	1	33.6
800	34.2	5.8	104.1	64.7	73.3	34	0.25	0	31.0
1000	27.4	6.2	104.0	61.7	75.9	37	0.54	0	31.0
1250	28.9	6.5	101.4	57.0	77.5	39	0.48	0	30.7
1600	25.4	6.8	104.6	59.4	84.6	39	0.30	0	37.2
2000	23.5	7.1	104.1	60.1	83.3	38	0.34	0	37.4
2500	19.7	8.3	104.1	60.0	83.0	38	0.28	0	37.5
3150	14.3	9.8	105.0	59.7	83.0	38	0.48	0	37.1
4000	12.6	11.6	104.5	60.5	81.5	36	0.60	0	37.7
5000	9.6	15.5	103.0	56.8	81.6	37	0.83	0	36.8

STC Rating =	**31**	*(Sound Transmission Class)*
Deficiencies =	**26**	*(Number of deficiencies versus contour curve)*
OITC Rating =	**26**	*(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.

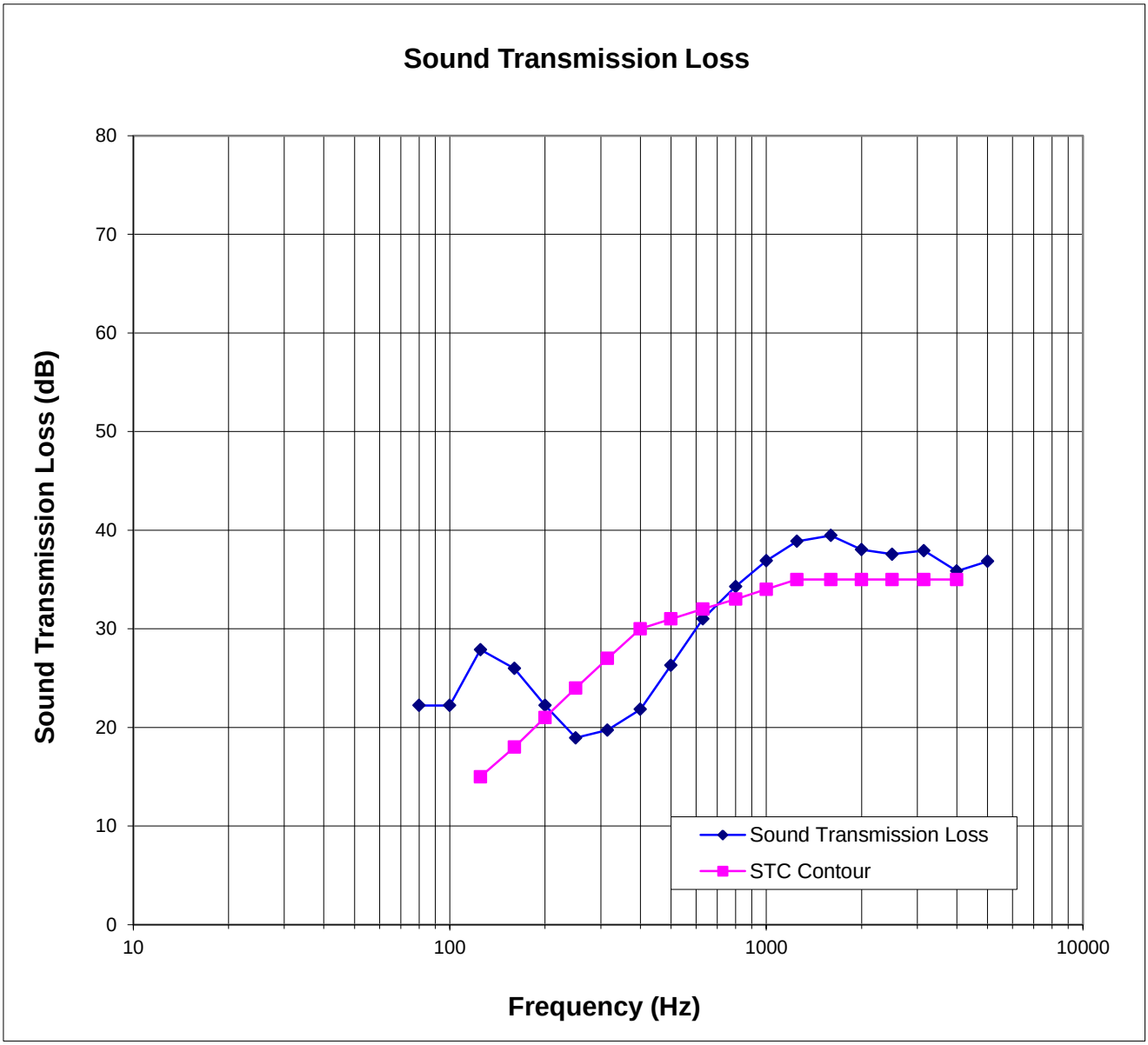
2) Transmission loss coefficient differences less than 6 indicate the lower limit of the transmission loss for this specimen. These cells are highlighted red.

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.	C1188.01A	**Date**	08/08/12
Client	MI Windows and Doors, Inc.		
Specimen	Series/Model: EC155, fixed window with 3/4" IG (1/8" annealed exterior, 3/8" air space, 1/4" annealed interior)		
Specimen Area	1.80 Square Meters		
Filler Area	11.20 Square Meters		
Operator	Daniel P. Platts		



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SOUND TRANSMISSION LOSS

ASTM E 90

Architectural Testing

ATI No.	C1188.01B	**Date**	08/08/12
Client	MI Windows and Doors, Inc.		
Specimen	Series/Model: EC155, fixed window with 1-1/8" IG (1/8" annealed exterior, 3/4" air space, 1/4" annealed interior)		
Specimen Area	1.80 Square Meters		
Filler Area	11.20 Square Meters		
Operator	Daniel P. Platts		

	Bkgrd	Absorp	Source	Receive	Filler	Specimen
Temp C	23.3	25.5	23.2	24.5	23.0	24.1
RH %	46.5	40.2	43.8	42.8	43.7	43.3

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	39.7	5.8	88.1	63.6	35.8	20	3.58	0	8.5
100	40.7	5.3	88.5	63.4	41.2	21	3.03	0	13.0
125	43.2	5.1	94.9	63.7	47.8	27	2.51	0	13.2
160	44.8	4.4	94.1	67.0	47.0	23	1.24	0	15.8
200	43.9	4.6	99.8	81.1	52.1	15	1.16	7	29.5
250	41.4	5.5	100.3	77.1	54.8	18	1.22	7	28.5
315	39.2	5.3	101.1	72.5	55.7	24	0.60	4	23.9
400	37.4	5.5	101.1	72.8	61.2	23	1.27	8	29.8
500	42.8	5.6	101.4	68.9	67.5	28	0.34	4	31.9
630	37.6	5.4	103.4	66.4	72.6	32	0.87	1	32.4
800	29.3	5.9	104.3	63.0	73.3	36	0.43	0	29.2
1000	24.4	6.1	104.4	60.5	75.9	39	0.64	0	29.4
1250	27.6	6.7	101.7	54.5	77.5	41	0.34	0	28.1
1600	22.3	6.8	105.1	58.7	84.6	41	0.21	0	36.0
2000	21.2	7.2	104.6	58.2	83.3	40	0.48	0	35.0
2500	16.1	8.2	104.5	58.1	83.0	40	0.38	0	35.3
3150	11.0	10.1	105.3	56.1	83.0	42	0.45	0	33.3
4000	9.2	11.7	105.0	56.8	81.5	40	0.62	0	33.4
5000	8.0	15.1	103.4	49.4	81.6	45	0.71	0	28.9

STC Rating =	**32**	*(Sound Transmission Class)*
Deficiencies =	**31**	*(Number of deficiencies versus contour curve)*
OITC Rating =	**25**	*(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.

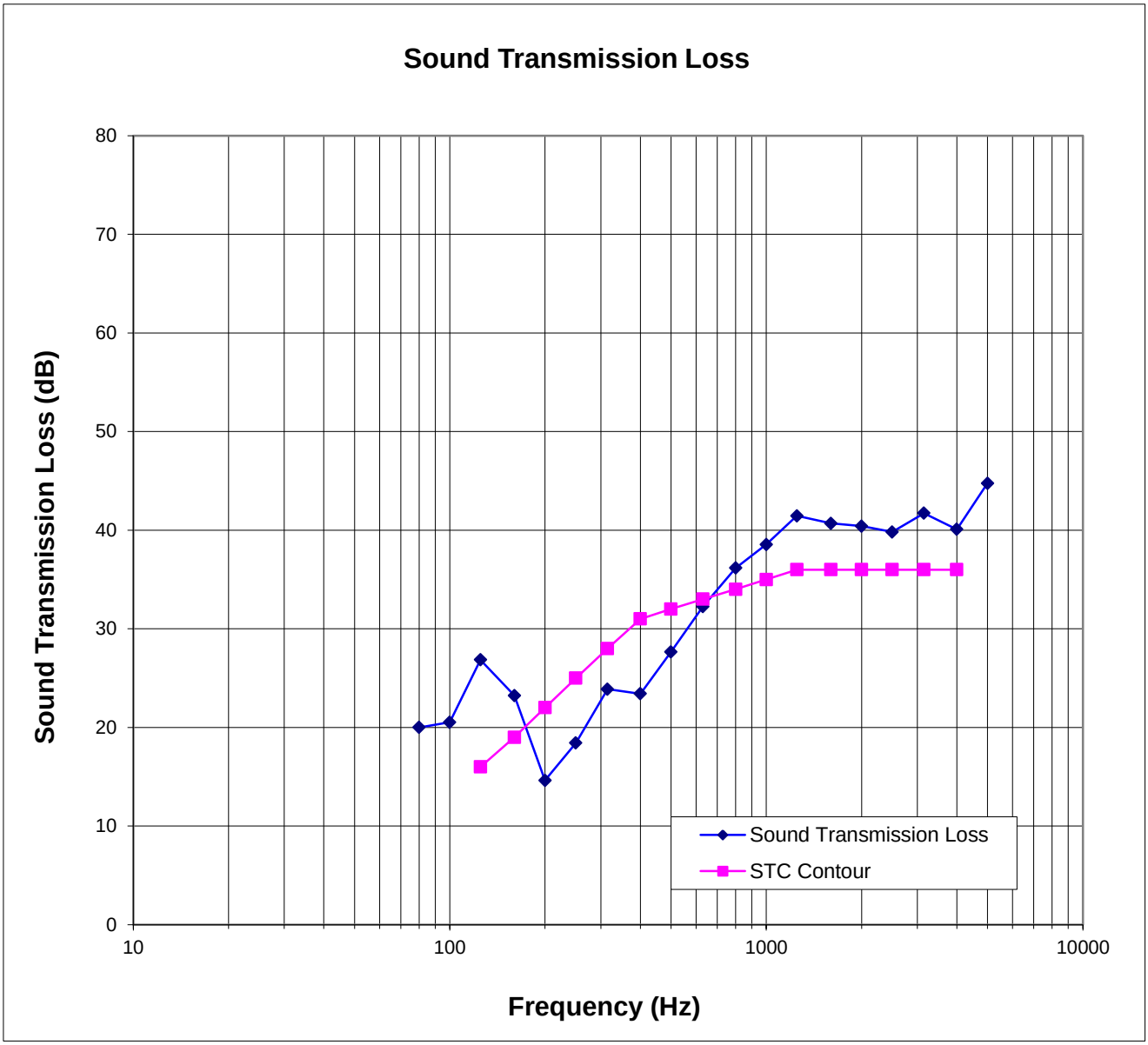
2) Transmission loss coefficient differences less than 6 indicate the lower limit of the transmission loss for this specimen. These cells are highlighted red.

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.	C1188.01B	**Date**	08/08/12
Client	MI Windows and Doors, Inc.		
Specimen	Series/Model: EC155, fixed window with 1-1/8" IG (1/8" annealed exterior, 3/4" air space, 1/4" annealed interior)		
Specimen Area	1.80 Square Meters		
Filler Area	11.20 Square Meters		
Operator	Daniel P. Platts		



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SOUND TRANSMISSION LOSS

ASTM E 90

Architectural Testing

ATI No.	C1188.01C	**Date**	08/07/12
Client	MI Windows and Doors, Inc.		
Specimen	Series/Model: EC155, fixed window with 1-1/8" IG (1/4" annealed exterior, 5/8" air space, 1/4" [0.030"Q] laminated interior), Glass temperature 75°F		
Specimen Area	1.80 Square Meters		
Filler Area	11.20 Square Meters		
Operator	Daniel P. Platts		

	Bkgrd	Absorp	Source	Receive	Filler	Specimen
Temp C	23.8	23.0	22.0	20.7	23.0	22.4
RH %	35.2	37.0	46.8	43.1	43.7	40.5

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	41.8	6.1	88.6	62.9	35.8	21	3.56	0	7.5
100	38.5	6.0	89.5	62.3	41.2	22	3.31	0	11.3
125	36.6	4.9	95.8	65.4	47.8	26	2.82	0	13.8
160	44.4	4.5	95.4	69.6	47.0	22	2.38	3	17.4
200	43.1	5.3	100.9	74.2	52.1	22	0.69	6	22.2
250	35.8	5.4	101.5	70.8	54.8	26	1.55	5	21.0
315	31.2	5.2	102.4	66.1	55.7	32	1.13	2	16.2
400	31.8	5.4	101.9	67.1	61.2	30	1.33	7	23.2
500	28.4	6.0	102.0	63.0	67.5	34	0.51	4	25.7
630	22.3	5.6	103.8	60.8	72.6	38	1.07	1	26.6
800	21.0	5.6	104.4	57.9	73.3	42	0.69	0	23.8
1000	18.8	5.8	104.0	55.7	75.9	43	0.67	0	24.7
1250	15.2	6.6	101.4	51.1	77.5	45	0.53	0	24.9
1600	11.0	6.7	104.3	55.5	84.6	43	0.40	0	33.6
2000	8.4	7.0	103.8	56.5	83.3	41	0.36	1	34.0
2500	7.2	8.3	103.8	55.6	83.0	42	0.55	0	33.5
3150	6.5	9.9	104.4	53.7	83.0	43	0.44	0	31.8
4000	6.7	12.2	103.8	50.5	81.5	45	0.59	0	28.5
5000	7.1	16.6	102.3	41.9	81.6	51	0.65	0	22.9

STC Rating =	**38**	*(Sound Transmission Class)*
Deficiencies =	**29**	*(Number of deficiencies versus contour curve)*
OITC Rating =	**30**	*(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.

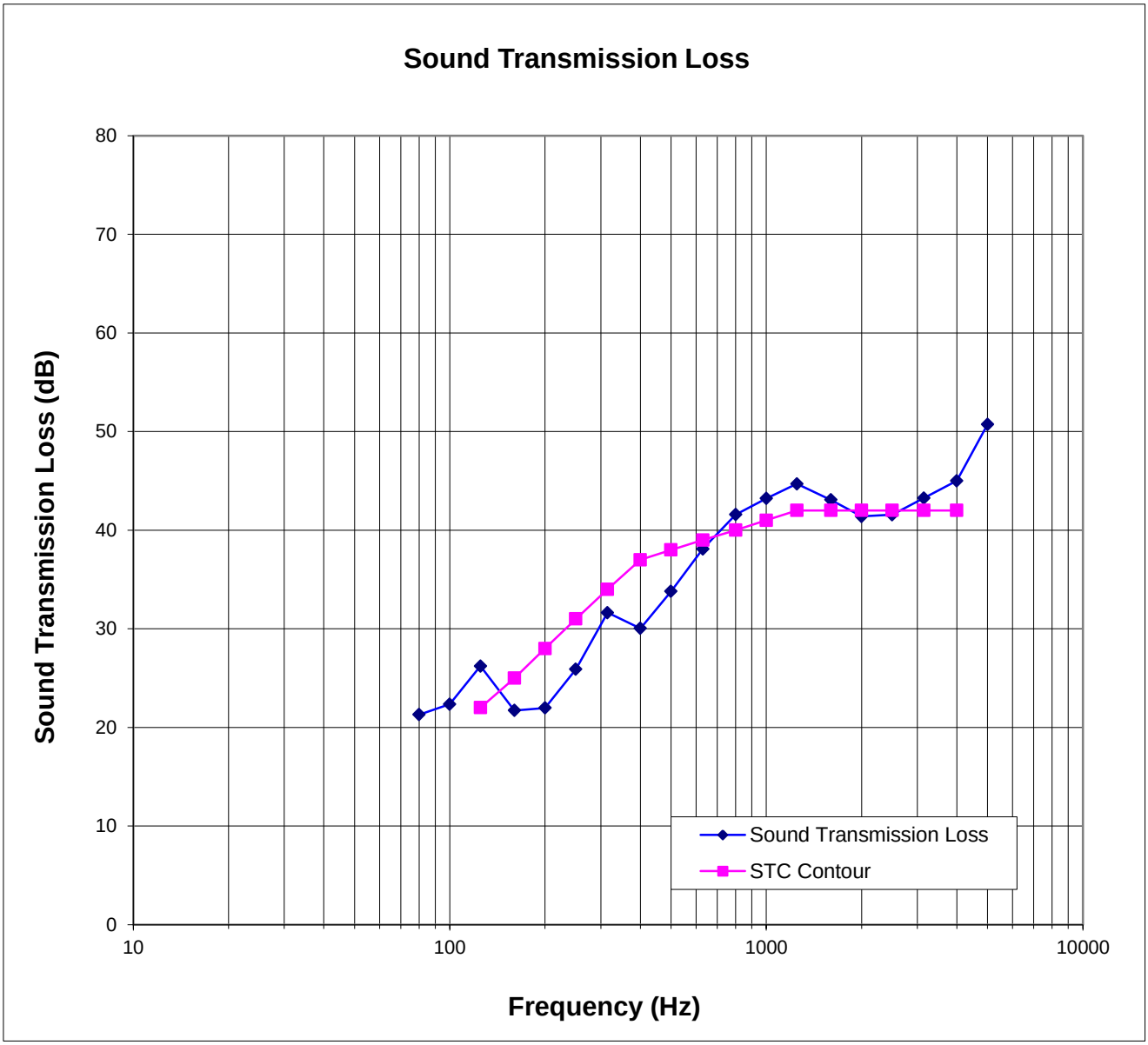
2) Transmission loss coefficient differences less than 6 indicate the lower limit of the transmission loss for this specimen. These cells are highlighted red.

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.	C1188.01C	**Date**	08/07/12
Client	MI Windows and Doors, Inc.		
Specimen	Series/Model: EC155, fixed window with 1-1/8" IG (1/4" annealed exterior, 5/8" air space, 1/4" [0.030"Q] laminated interior), Glass temperature 75°F		
Specimen Area	1.80 Square Meters		
Filler Area	11.20 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