

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

Rendered to:

MI WINDOWS AND DOORS, LLC

SERIES/MODEL: 390

**This product also is labeled under the following names:
HM390, BB390 and WW390**

TYPE: Polyvinyl Chloride (PVC) XO Sliding Glass Door

Summary of Test Results			
Data File No.	Glazing Option (Nominal Dimensions)	STC	OITC
C5251.01A	1" IG (1/8" tempered, 3/4" air space, 1/8" tempered)	27	21
C5251.01B	1" IG (1/8" tempered exterior, 11/16" air space, 3/16" tempered interior)	31	25
C5251.01C3	1" IG (1/8" tempered exterior, 5/8" air space, 1/4" ["Q" Series Interlayer] laminated interior), Glass temperature 75°F	34	28

Reference should be made to Architectural Testing, Inc. Report No. C5251.01-113-11 for complete test specimen description. The complete test results are listed in Appendix B.

ACOUSTICAL PERFORMANCE TEST REPORT

Rendered to:

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

Report No: C5251.01-113-11
Test Dates: 01/09/13
And: 03/08/13
Report Date: 05/13/13
Record Retention End Date: 05/13/17

Test Sample Identification:

Series/Model: 390

Type: Polyvinyl Chloride (PVC) XO Sliding Glass Door

Overall Frame Size: 71-1/2" by 79-1/2"

Glazing (Nominal Dimensions):

Option A: 1" IG (1/8" Tempered, 3/4" Air Space, 1/8" Tempered)

Option B: 1" IG (1/8" Tempered Exterior, 11/16" Air Space, 3/16" Tempered Interior)

Option C: 1" IG (1/8" Tempered Exterior, 5/8" Air Space, 1/4" ["Q" Series Interlayer] Laminated Interior), Glass Temperature 75°F

Project Scope: Architectural Testing, Inc. was contracted by MI Windows and Doors, LLC to conduct sound transmission loss tests on Series/Model 390, sliding glass doors. 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 (Reapproved 2012), *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 sliding glass door specimens. The filler wall achieved an STC rating of 69.

The 6'-8" by 7'-2" plug was removed from the filler wall assembly. A 2x6 wood frame was used to reduce the test opening size to accommodate the test specimen. 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 installed in the opening. Duct seal was used to seal the perimeter of the door to the wood frame on both sides. The interior side of the sliding glass door, when installed, was approximately 1/4" from being flush with the receiving room side of the filler wall. The panel was opened and closed at least five times prior to testing. A stethoscope was used to check for any abnormal air leaks before the test.

Test Procedure: The sliding glass door 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	71-1/2" by 79-1/2"	
Thickness	4-7/8"	
Corners	Mitered	
	Fasteners	Welds
	Seal Method	None
Material	Vinyl	
	Reinforcement	Aluminum located in meeting stile
	Thermal Break Material	N/A
Daylight Opening Size	32-1/8" by 72-3/8"	

N/A-Non Applicable

Sample Descriptions: (Continued)

Panel Construction:

		Active Panel
Size	37" by 77-1/4"	
Thickness	1-5/8"	
Corners	Mitered	
Fasteners	Welds	
Seal Method	None	
Material	Vinyl	
Reinforcement	Aluminum located in stiles	
Thermal Break Material	N/A	
Daylight Opening Size	32-1/8" by 72-3/8"	

Note: The overall size of the active panel size for test Option C5251.01C3 was 36-5/8" by 77-1/4".

Glazing Option A:

Measured Overall Insulation Glass Unit Thickness	1.032"
Spacer Type	Silicone foam (Premium Enhanced)

	Exterior Sheet	Gap	Interior Sheet
Measured Thickness	0.118"	0.796"	0.118"
Muntin Pattern	N/A	N/A	N/A
Material	Tempered	Air*	Tempered
Laminate Material	N/A	N/A	N/A

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

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

Sample Descriptions: (Continued)

Glazing Option B:

Measured Overall Insulation Glass Unit Thickness	0.907"
Spacer Type	Silicone foam (Premium Enhanced)

	Exterior Sheet	Gap	Interior Sheet
Measured Thickness	0.118"	0.607"	0.182"
Muntin Pattern	N/A	N/A	N/A
Material	Tempered	Air*	Tempered
Laminate Material	N/A	N/A	N/A

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

Glazing Option C:

Measured Overall Insulation Glass Unit Thickness	0.976"
Spacer Type	Silicone foam (Premium Enhanced)

	Exterior Sheet	Gap	Interior Sheet
Measured Thickness	0.118"	0.618"	0.105", 0.030", 0.105"
Muntin Pattern	N/A	N/A	N/A
Material	Tempered	Air*	Laminated
Laminate Material	N/A	N/A	Saflex [®] "Q" Series acoustical interlayer*

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

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

Sample Descriptions: (Continued)

Components:

TYPE	QUANTITY	LOCATION
Weatherstrip		
0.187" by 0.320" Polypile	2 Rows	Rails, lock stile
0.187" by 0.320" Polypile	1 Row	Meeting stiles
Hardware		
Roller assembly set	2	Active panel bottom rail
Handle with lock	1	Lock stile
Keeper	1	Lock jamb
Drainage		
1-1/4" by 1/8" Weep slot	2	Sill face
1/2" by 1/8" Weep slot	2	Sill face
1-1/4" by 1/8" Weep slot	2	Sill hollow
1" by 1/4" Weep slot	2	Sill hollow
1-1/2" by 1/4" Weep notch	2	Aluminum sill track

Comments: The weight of Option A was 162 lbs. The weight of Option B was 188 lbs. The weight of Option C was 212 lbs. The sliding glass door 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 390, sliding glass door is listed below.

Summary of Test Results			
Data File No.	Glazing Option (Nominal Dimensions)	STC	OITC
C5251.01A	1" IG (1/8" tempered, 3/4" air space, 1/8" tempered)	27	21
C5251.01B	1" IG (1/8" tempered exterior, 11/16" air space, 3/16" tempered interior)	31	25
C5251.01C3	1" IG (1/8" tempered exterior, 5/8" air space, 1/4" ["Q" Series Interlayer] laminated interior), Glass temperature 75°F	34	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:

Daniel P. Platts
Technician - Acoustical Testing

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 (6)

Appendix-C: Photographs (1)

Revision Log

<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
0	05/13/13	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	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	02/13
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 Environmental 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

SOUND TRANSMISSION LOSS
ASTM E 90

Test Date	01/09/13		
ATI No.	C5251.01A		
Client	MI Windows and Doors, LLC		
Specimen	Series/Model: 390, sliding glass door with 1" IG (1/8" tempered, 3/4" air space, 1/8" tempered)		
Operator	Daniel P. Platts		
Sample Area	3.67 m ²		
Filler Area	9.33 m ²		
	Source	Receive	Specimen
Temp C	22	21	21
RH %	49	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 Deficiencies	Trans Coef Diff
80	37	5.5	91	70	32	20	2.2	-	8.7
100	36	5.6	93	68	38	24	2.7	-	10.3
125	37	5.5	98	71	45	25	1.3	0	16.2
160	40	5.3	97	77	48	19	1.0	0	24.6
200	38	4.7	102	90	58	11	1.0	6	43.2
250	35	5.3	103	85	60	15	1.2	5	40.4
315	32	6.0	103	84	66	17	0.9	6	45.1
400	28	6.0	104	81	68	20	0.8	6	43.5
500	24	6.0	104	77	68	25	0.3	2	38.9
630	23	5.6	105	76	69	28	0.3	0	37.4
800	21	5.9	106	73	71	31	0.2	0	36.2
1000	16	6.1	105	71	74	32	0.3	0	38.3
1250	13	6.8	104	68	72	33	0.5	0	34.9
1600	9	7.1	107	70	71	34	0.6	0	33.1
2000	6	7.4	106	66	72	37	0.3	0	30.6
2500	6	8.5	105	62	75	39	0.3	0	31.8
3150	6	9.7	106	64	77	37	0.4	0	35.3
4000	7	12.0	106	72	81	30	0.4	1	47.3
5000	7	15.4	105	66	84	33	0.5	-	46.2

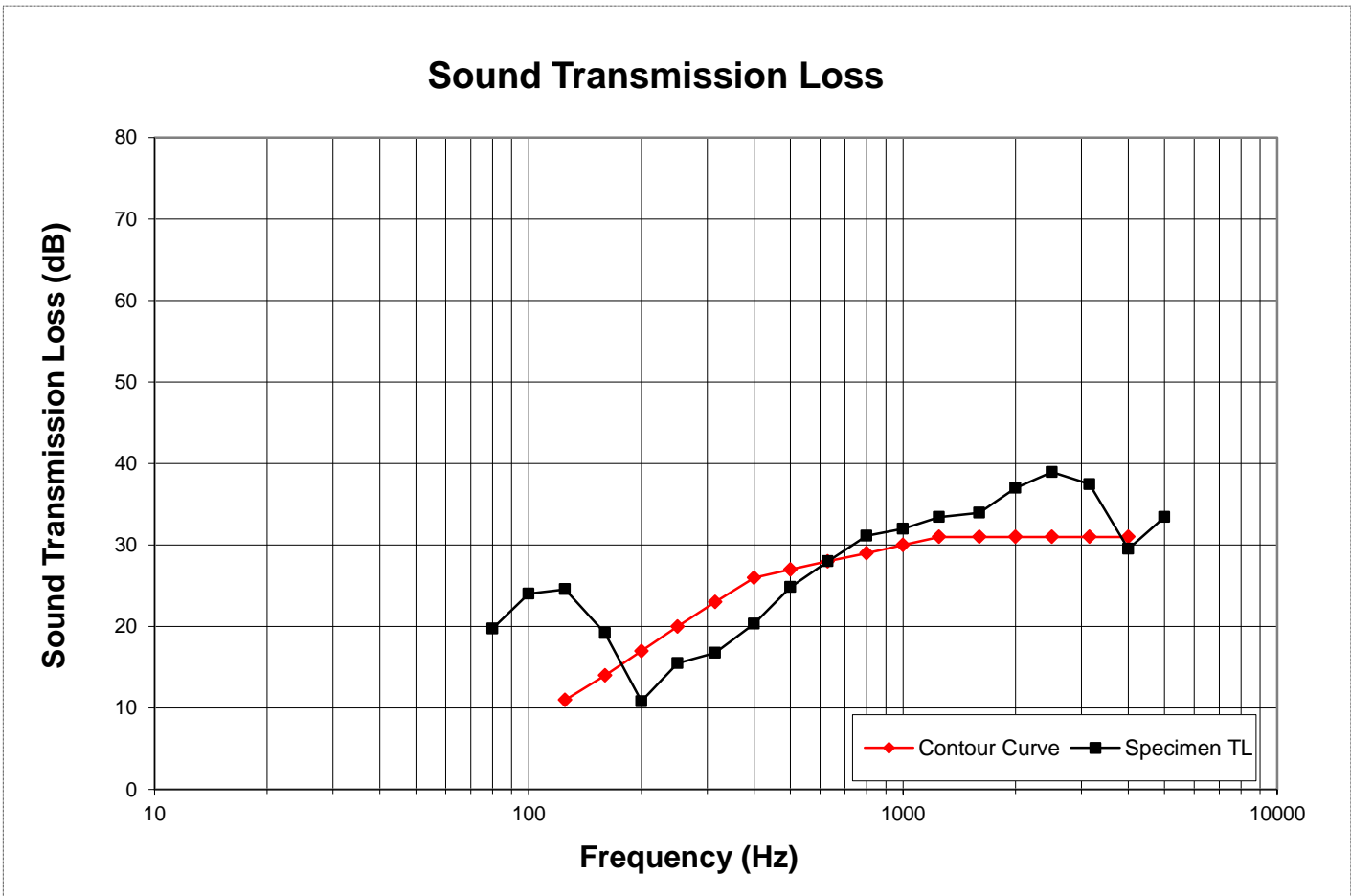
STC Rating **27** *(Sound Transmission Class)*
Deficiencies **26** *(Number of deficiencies versus contour curve)*
OITC Rating **21** *(Outdoor Indoor Transmission Class)*

- 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.

SOUND TRANSMISSION LOSS

ASTM E 90

Test Date	01/09/13		
ATI No.	C5251.01A		
Client	MI Windows and Doors, LLC		
Specimen	Series/Model: 390, sliding glass door with 1" IG (1/8" tempered, 3/4" air space, 1/8" tempered)		
Operator	Daniel P. Platts		
Sample Area	3.67 m ²		
Filler Area	9.33 m ²		
	Source	Receive	Sample
Temp C	22	21	21
RH %	49	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.

SOUND TRANSMISSION LOSS
ASTM E 90

Test Date	01/09/13		
ATI No.	C5251.01B		
Client	MI Windows and Doors, LLC		
Specimen	Series/Model: 390, sliding glass door with 1" IG (1/8" tempered exterior, 11/16" air space, 3/16" tempered interior)		
Operator	Daniel P. Platts		
Sample Area	3.67 m ²		
Filler Area	9.33 m ²		
	Source	Receive	Specimen
Temp C	21	20	21
RH %	48	48	48

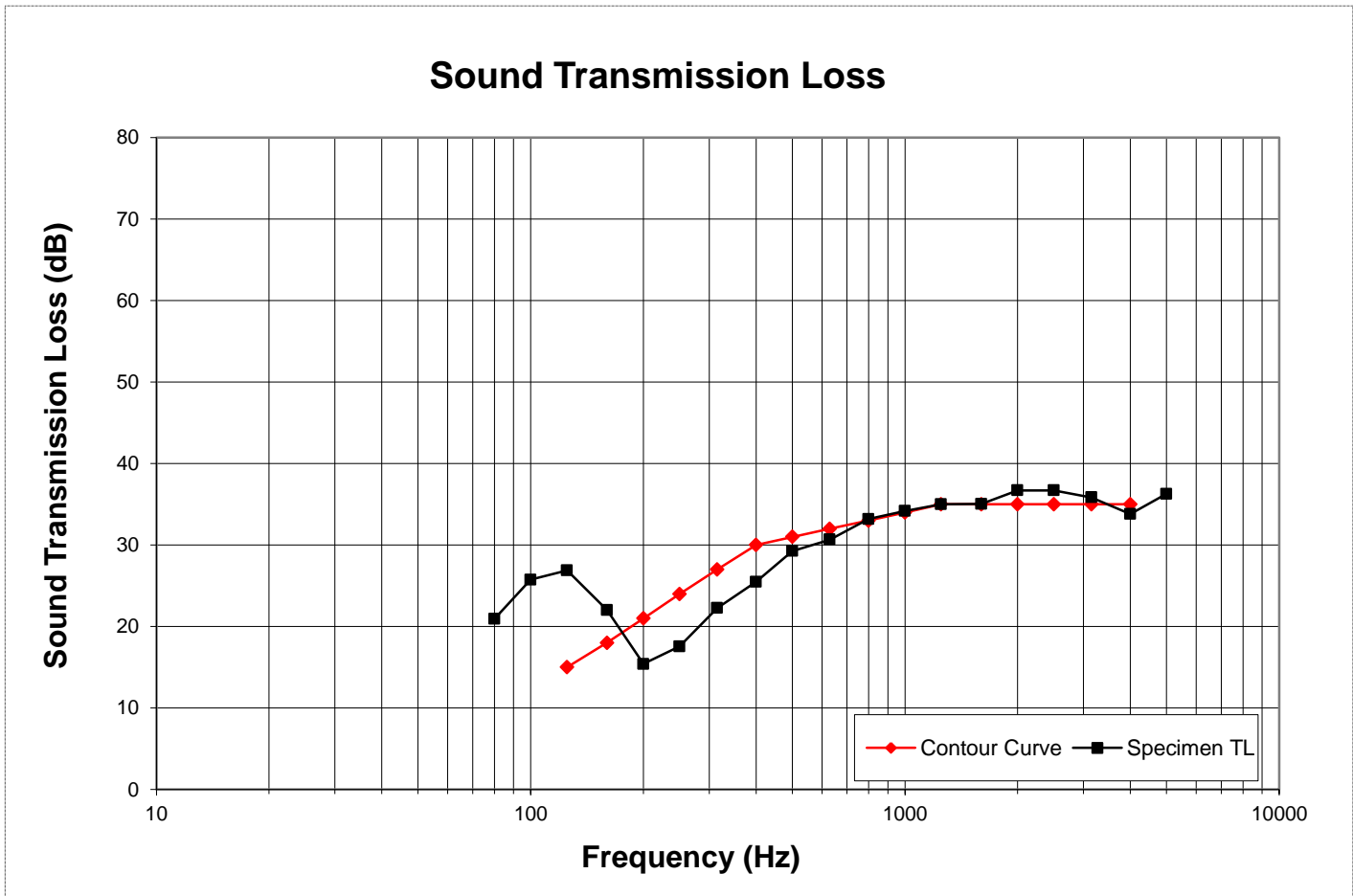
Freq (Hz)	Bkgrd SPL (dB)	Absorp (m ²)	Source SPL (dB)	Receive SPL (dB)	Filler TL (dB)	Specimen TL (dB)	95% Conf Limit	No. of Deficiencies	Trans Coef Diff
80	39	5.3	91	70	32	21	2.1	-	7.7
100	37	5.2	93	66	38	26	2.9	-	8.8
125	40	5.5	97	69	45	27	1.2	0	14.1
160	41	5.1	97	74	48	22	1.2	0	21.7
200	39	5.1	102	85	58	15	0.7	6	38.6
250	35	5.6	102	83	60	18	1.6	6	38.3
315	31	5.9	103	79	66	22	0.9	5	39.6
400	30	5.8	104	76	68	25	0.8	5	38.4
500	27	6.0	104	73	68	29	0.3	2	34.5
630	25	5.7	106	73	69	31	0.5	1	34.7
800	24	5.7	106	71	71	33	0.4	0	34.1
1000	18	5.9	105	69	74	34	0.3	0	36.2
1250	18	6.6	104	67	72	35	0.5	0	33.3
1600	13	7.0	107	70	71	35	0.5	0	32.0
2000	7	7.3	106	66	72	37	0.4	0	30.9
2500	7	8.5	105	65	75	37	0.3	0	34.0
3150	6	9.9	106	66	77	36	0.4	0	36.9
4000	6	11.9	106	67	81	34	0.3	1	43.0
5000	6	15.4	105	63	84	36	0.3	-	43.4

STC Rating **31** *(Sound Transmission Class)*
Deficiencies **26** *(Number of deficiencies versus contour curve)*
OITC Rating **25** *(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.

SOUND TRANSMISSION LOSS
ASTM E 90

Test Date	01/09/13		
ATI No.	C5251.01B		
Client	MI Windows and Doors, LLC		
Specimen	Series/Model: 390, sliding glass door with 1" IG (1/8" tempered exterior, 11/16" air space, 3/16" tempered interior)		
Operator	Daniel P. Platts		
Sample Area	3.67 m ²		
Filler Area	9.33 m ²		
	Source	Receive	Sample
Temp C	21	20	21
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.

SOUND TRANSMISSION LOSS
ASTM E 90

Test Date	03/08/13		
ATI No.	C5251.01C3		
Client	MI Windows and Doors, LLC		
Specimen	Series/Model: 390, sliding glass door with 1" IG (1/8" tempered exterior, 5/8" air space, 1/4" ["Q" Series Interlayer] laminated interior), Glass temperature 75°F		
Operator	Kurt Golden		
Sample Area	3.67 m ²		
Filler Area	9.33 m ²		
	Source	Receive	Specimen
Temp C	22	21	21
RH %	48	44	45

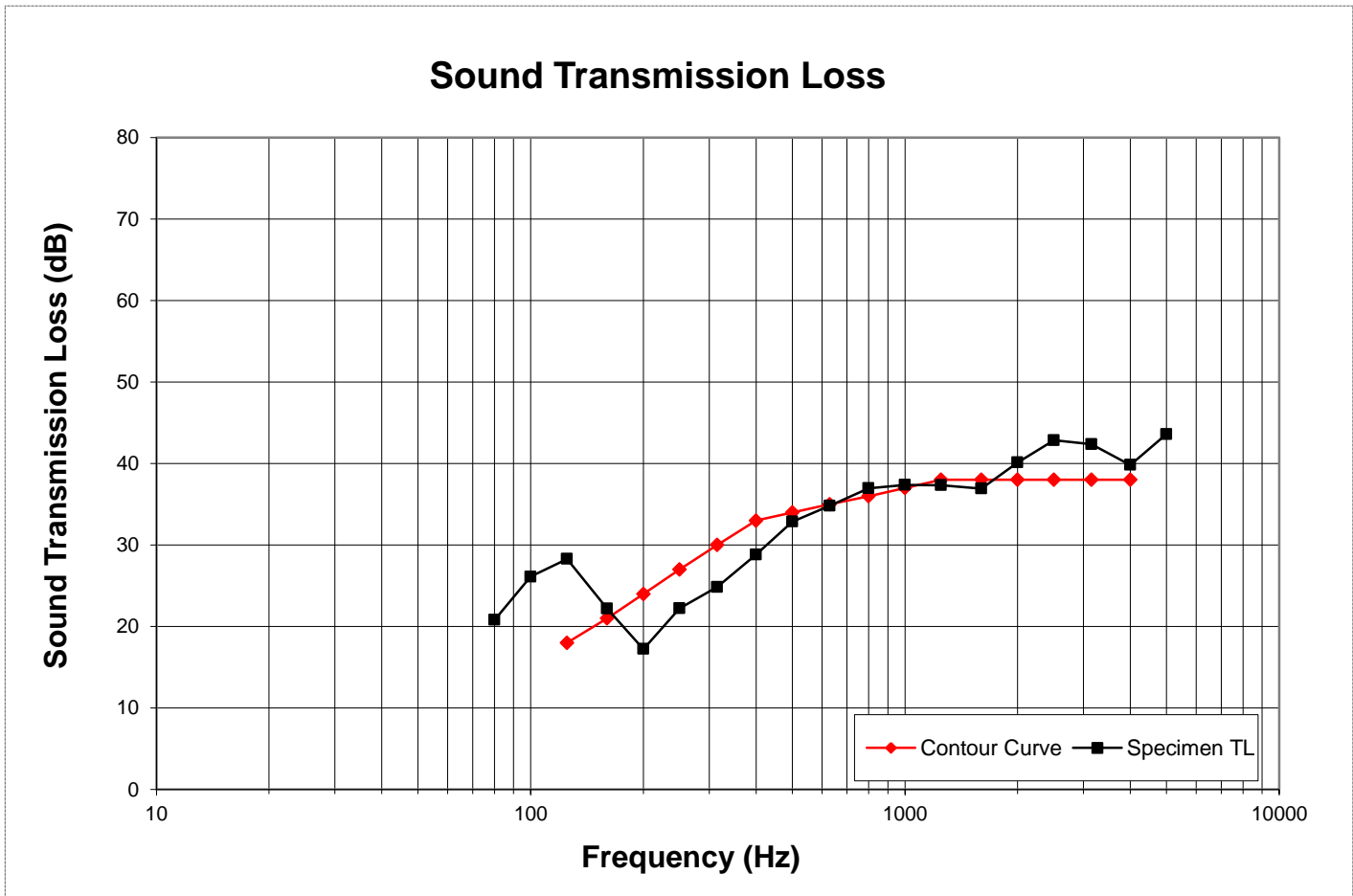
Freq (Hz)	Bkgrd SPL (dB)	Absorp (m ²)	Source SPL (dB)	Receive SPL (dB)	Filler TL (dB)	Specimen TL (dB)	95% Conf Limit	No. of Deficiencies	Trans Coef Diff
80	40	5.3	90	68	32	21	1.7	-	7.8
100	43	6.1	92	64	38	26	2.7	-	8.5
125	37	5.1	96	67	45	28	1.8	0	12.7
160	39	5.0	96	73	48	22	1.3	0	21.6
200	38	5.1	101	83	58	17	0.6	7	36.7
250	35	5.2	102	78	60	22	1.3	5	33.7
315	32	5.9	103	76	66	25	1.0	5	37.0
400	30	5.9	103	72	68	29	1.1	4	35.0
500	29	6.0	103	68	68	33	0.3	1	30.9
630	27	5.7	105	68	69	35	0.3	0	30.6
800	24	5.8	106	67	71	37	0.3	0	30.4
1000	18	6.0	105	66	74	37	0.6	0	33.0
1250	18	6.6	103	63	72	37	0.4	1	31.0
1600	12	7.0	107	67	71	37	0.5	1	30.1
2000	7	7.4	105	62	72	40	0.2	0	27.5
2500	7	8.6	105	58	75	43	0.2	0	27.9
3150	6	10.1	106	59	77	42	0.5	0	30.4
4000	6	12.2	106	61	81	40	0.3	0	37.0
5000	6	15.9	105	55	84	44	0.7	-	36.1

STC Rating **34** *(Sound Transmission Class)*
Deficiencies **24** *(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.

SOUND TRANSMISSION LOSS
ASTM E 90

Test Date	03/08/13		
ATI No.	C5251.01C3		
Client	MI Windows and Doors, LLC		
Specimen	Series/Model: 390, sliding glass door with 1" IG (1/8" tempered exterior, 5/8" air space, 1/4" ["Q" Series Interlayer] laminated interior), Glass temperature 75°F		
Operator	Kurt Golden		
Sample Area	3.67 m ²		
Filler Area	9.33 m ²		
	Source	Receive	Sample
Temp C	22	21	21
RH %	48	44	45



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

Photographs



Receive Room View of Installed Specimen



Source Room View of Installed Specimen