

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

**Rendered to:**

**REHAU CONSTRUCTION LLC**

**SERIES/MODEL: 4500**

**TYPE: Fixed Window**

<b>Summary of Test Results</b>			
<b>Data File No.</b>	<b>Glazing Option (Nominal Dimensions)</b>	<b>STC</b>	<b>OITC</b>
A1834.01A	1-3/8" IG (1/4" laminated, 7/8" air space, 1/4" laminated), Glass temperature 75°F	39	28
A1834.01B	1-5/16" IG (5/16" laminated exterior, 3/4" air space, 1/4" laminated interior), Glass temperature 75°F	40	31

Reference should be made to Architectural Testing, Inc. Report No. A1834.01-113-11 for complete test specimen description. The complete test results are listed in Appendix B.

## ACOUSTICAL PERFORMANCE TEST REPORT

Rendered to:

REHAU CONSTRUCTION LLC  
1501 Edwards Ferry Road  
Leesburg, Virginia 20176

Report No: A1834.01-113-11  
Test Date: 06/14/10  
Report Date: 08/25/10  
Expiration Date: 06/14/14

### **Test Sample Identification:**

**Series/Model:** 4500

**Type:** Fixed Window

**Overall Size:** 36" by 60"

**Glazing Option A (Nominal Dimensions):** 1-3/8" IG (1/4" Laminated, 7/8" Air Space, 1/4" Laminated), Glass Temperature 75°F

**Glazing Option B (Nominal Dimensions):** 1-5/16" IG (5/16" Laminated Exterior, 3/4" Air Space, 1/4" Laminated Interior), Glass Temperature 75°F

**Project Scope:** Architectural Testing, Inc. was contracted by REHAU Construction LLC to conduct sound transmission loss tests on a Series/Model 4500, fixed 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.

**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 413-04, *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.*

**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 48" by 72" and 72" by 48" specimens. The filler wall achieved an STC rating of 69.

A filler wall reducing element was used to reduce the test opening size to 36-1/2" wide by 60-1/2" 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.

**Test Procedure:** 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:**

		<b>Frame</b>
<b>Size</b>		36" by 60"
<b>Thickness</b>		3-1/4"
<b>Corners</b>		Mitered
	Fasteners	Welds
	Seal Method	None
<b>Material</b>		Vinyl
	Reinforcement	Steel located in all members
	Thermal Break Material	N/A
<b>Daylight Opening Size</b>		30-3/8" by 54"

*N/A-Non Applicable*

Sample Descriptions: (Continued)

**Glazing Option A:**

<b>Measured Overall Insulation Glass Unit Thickness</b>	1.354"
<b>Spacer Type</b>	Aluminum

	<b>Exterior Sheet</b>	<b>Gap</b>	<b>Interior Sheet</b>
<b>Measured Thickness</b>	0.105" - 0.030" - 0.105"	0.874"	0.105" - 0.030" - 0.105"
<b>Muntin Pattern</b>	N/A	N/A	N/A
<b>Material</b>	Laminated	Air*	Laminated
<b>Laminate Material</b>	PVB	N/A	PVB

<b>Glazing Method</b>	Interior
<b>Glazing Material</b>	Flexible bulb gasket with 1/8" leaf
<b>Glazing Bead Material</b>	Vinyl with dual 1/8" leaf gasket

**Glazing Option B:**

<b>Measured Overall Insulation Glass Unit Thickness</b>	1.257"
<b>Spacer Type</b>	Silicone foam

	<b>Exterior Sheet</b>	<b>Gap</b>	<b>Interior Sheet</b>
<b>Measured Thickness</b>	0.116" - 0.060" - 0.116"	0.726"	0.105" - 0.029" - 0.105"
<b>Muntin Pattern</b>	N/A	N/A	N/A
<b>Material</b>	Laminated	Air*	Laminated
<b>Laminate Material</b>	PVB	N/A	PVB

<b>Glazing Method</b>	Interior
<b>Glazing Material</b>	Flexible bulb gasket with 1/8" leaf
<b>Glazing Bead Material</b>	Vinyl with dual 1/8" leaf gasket

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

**Sample Descriptions:** (Continued)

**Components:**

TYPE	QUANTITY	LOCATION
<b>Weatherstrip</b>		
No weatherstrip		
<b>Hardware</b>		
No hardware		
<b>Drainage</b>		
1" by 1/4" Weep slot with cover	2	Sill face
1" by 1/4" Weep slot	2	Sill hollow

**Comments:** The weight of the sample with glazing Option A was 108 lbs. The weight of the sample with glazing Option B was 114 lbs. The design drawing (included in Appendix C) supplied by the client, accurately describes the Series/Model 4500, fixed window. The dimensions on the drawing that are circled and/or checked were verified against the test specimen. 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 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 4500, fixed window is listed below.

<b>Summary of Test Results</b>			
<b>Data File No.</b>	<b>Glazing Option (Nominal Dimensions)</b>	<b>STC</b>	<b>OITC</b>
A1834.01A	1-3/8" IG (1/4" laminated, 7/8" air space, 1/4" laminated), Glass temperature 75°F	39	28
A1834.01B	1-5/16" IG (5/16" laminated exterior, 3/4" air space, 1/4" laminated interior), Glass temperature 75°F	40	31

*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.

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 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 specimens tested. This report may not be reproduced, except in full, without the written approval of Architectural Testing.

For ARCHITECTURAL TESTING, INC:

---

Kurt A. Golden  
Senior Technician - Acoustical Testing


---

Todd D. Kister  
Laboratory Supervisor - Acoustical Testing

KAG:jmcs

Attachments (pages): This report is complete only when all attachments listed are included.

- Appendix-A: Equipment description (1)
- Appendix-B: Complete test results (4)
- Appendix-C: Design drawing (1)
- Appendix-D: Photographs (1)

	Architectural Testing, Inc. is accredited by the International Accreditation Service, Inc. (IAS) under the specific test methods listed under lab code TL-144, in accordance with the recognized International Standard ISO/IEC 17025:2005. The laboratory's accreditation or test report in no way constitutes or implies product certification, approval, or endorsement by IAS. This test report applies only to the specimen that was tested.
-------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

### Revision Log

<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
0	08/25/10	N/A	Original Report Issue

## Appendix A

### Instrumentation:

Instrument	Manufacturer	Model	Description	ATI Number	Last Calibrated
Analyzer	Agilent Technologies	35670A	Dynamic signal analyzer	004112	06/08/09*
Data Acquisition Unit	Agilent Technologies	34970A	Data Acquisition Unit	62211	07/29/09
Receive Room Microphone	G.R.A.S.	40AR	1/2", Pressure type, condenser microphone	Y003246	08/18/09
Source Room Microphone	G.R.A.S.	40AR	1/2", Pressure type, condenser microphone	Y003245	08/18/09
Receive Room Preamp	G.R.A.S.	26AK	1/2" Preamplifier	Y003249	08/08/09
Source Room Preamp	G.R.A.S.	26AK	1/2" Preamplifier	Y003248	08/18/09
Microphone Calibrator	Bruel & Kjaer	4228	Pistonphone calibrator	Y002816	02/18/10
Noise Source	Delta Electronics	SNG-1	Two, Uncorrelated "Pink" noise signals	Y002181	N/A
Equalizer	Rane	RPE228	Programmable EQ	Y002180	N/A
Power Amplifiers	Crown	XTi 2000	Two, Amplifiers	005769 005770	N/A
Receive Room Loudspeakers	Renkus-Heinz	Trap Jr/9"	Two, Loudspeakers	Y001784 Y001785	N/A
Source Room Loudspeakers	Renkus-Heinz	Trap Jr/9"	Two, Loudspeakers	Y002649 Y002650	N/A
Receiving Room Environmental Indicator	Vaisala	HMW60Y	Temperature / Humidity Indicator	Y002652	08/23/09
Source Room Environmental Indicator	Vaisala	HMW60Y	Temperature / Humidity Indicator	005066	08/18/09
Weather Station	Davis Instruments	6150C	Laboratory Barometric Pressure, Temperature, and Humidity	Y003257	04/08/10

\*- Note: The calibration frequency for this equipment is every two years per the manufacturer's recommendation.

### Test Chamber:

	Volume	Description
Receiving Room	234 m <sup>3</sup> (8291.3 ft <sup>3</sup> )	Rotating vane and stationary diffusers Temperature and humidity controlled Isolation pads under the floor
Source Room	206.6 m <sup>3</sup> (7296.3 ft <sup>3</sup> )	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

<b>ATI No.</b>	A1834.01A	<b>Date</b>	06/14/10
<b>Client</b>	REHAU Construction LLC		
<b>Specimen</b>	Series/Model: 4500, fixed window with 1-3/8" IG (1/4" laminated, 7/8" air space, 1/4" laminated), Glass temperature 75°F		
<b>Specimen Area</b>	1.39 Square Meters		
<b>Filler Area</b>	11.60 Square Meters		
<b>Operator</b>	Kurt Golden		


	Bkgrd	Absorp	Source	Receive	Filler	Specimen
Temp C	24.1	25.8	24.9	24.9	23.4	24.9
RH %	43.4	39.2	41.5	41.5	43.6	41.4

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 Deficiencies	Trans Coef Diff
80	47.2	4.6	90.1	65.6	36.0	20	2.16	0	7.5
100	42.2	4.6	97.0	69.9	41.3	22	2.41	0	10.1
125	41.2	4.6	101.2	81.4	47.3	15	2.83	8	23.5
160	46.7	4.5	103.5	71.4	49.5	27	0.86	0	13.2
200	46.8	5.1	107.0	74.5	52.9	27	0.95	2	16.8
250	44.8	5.1	106.1	73.3	56.1	27	1.05	5	19.8
315	43.8	5.4	102.2	65.5	57.7	31	0.77	4	17.7
400	43.3	5.8	101.3	62.7	62.8	32	0.35	6	21.2
500	42.5	5.6	102.2	57.7	67.1	38	0.28	1	19.5
630	37.7	5.6	106.5	60.2	71.0	40	0.49	0	21.6
800	38.7	5.7	106.6	58.9	73.1	42	0.23	0	22.2
1000	35.9	6.1	106.1	57.6	76.4	42	0.66	0	25.0
1250	35.6	6.4	106.7	57.0	78.3	43	0.20	0	26.1
1600	33.6	6.8	112.5	62.3	83.2	43	0.20	0	30.7
2000	24.0	7.3	104.0	53.1	84.2	44	0.24	0	31.2
2500	14.0	8.3	101.5	48.9	85.7	45	0.22	0	31.7
3150	12.8	10.0	102.2	46.7	86.3	47	0.26	0	30.1
4000	9.9	12.3	100.4	39.9	87.2	51	0.20	0	26.9
5000	8.2	15.9	96.9	33.2	85.6	53	0.46	0	23.3

**STC Rating = 39**      *(Sound Transmission Class)*  
**Deficiencies = 26**      *(Number of deficiencies versus contour curve)*  
**OITC Rating = 28**      *(Outdoor/Indoor Transmission Class)*

**Notes:**

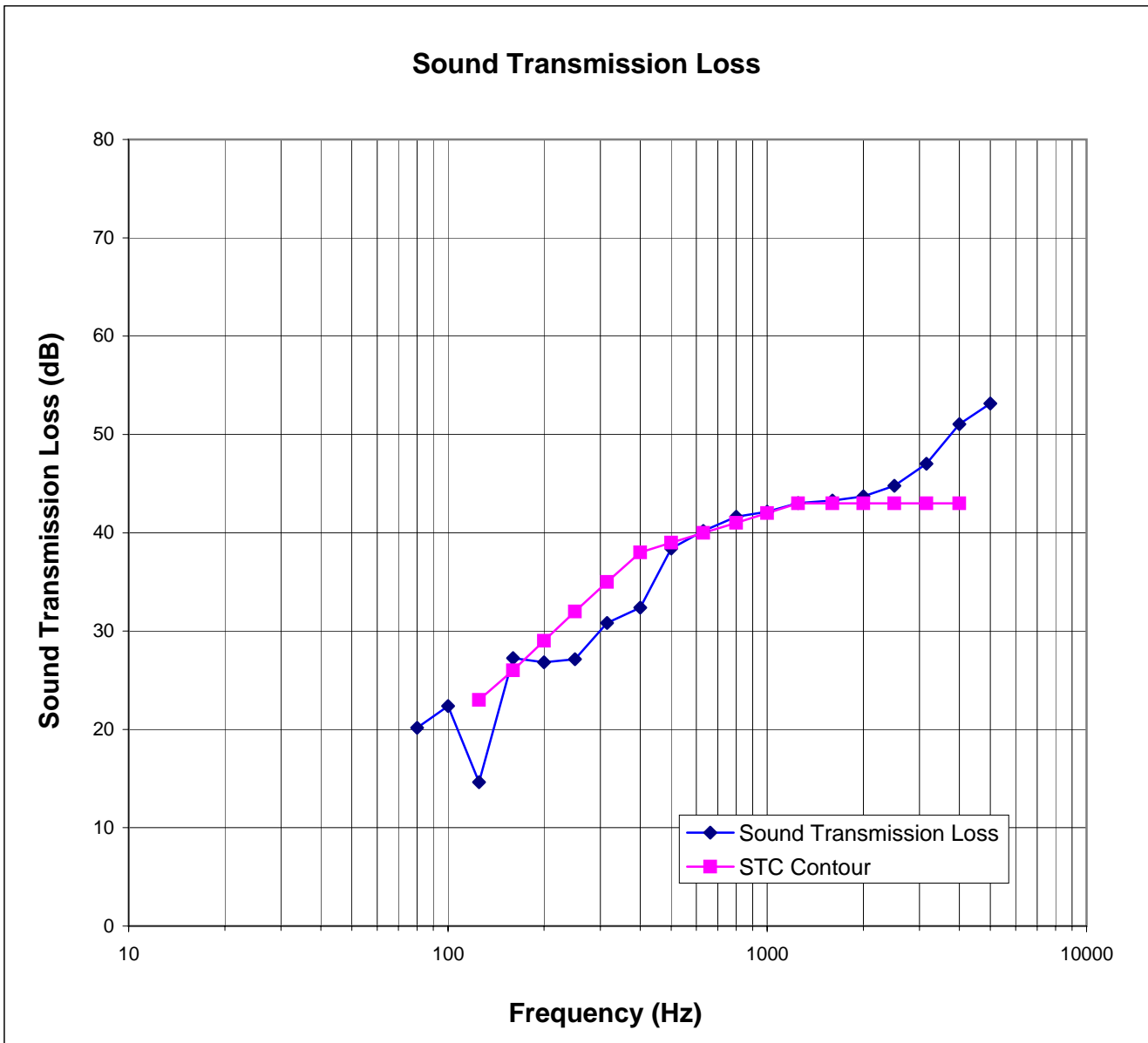
- 1) The acoustical chambers are qualified for measurements down to 80 hertz. Data reported below 80 hertz is for reference only.
- 2) Transmission loss coefficient differences less than 6 indicate the lower limit of the transmission loss for this specimen. These cells are highlighted red.
- 3) Transmission 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, Inc. is accredited by the International Accreditation Service, Inc. (IAS) under the specific test methods listed under lab code TL-144, in accordance with the recognized International Standard ISO/IEC 17025:2005. The laboratory's accreditation or test report in no way constitutes or implies product certification, approval, or endorsement by IAS. This test report applies only to the specimen that was tested.
-------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------



### Architectural Testing

ATI No. A1834.01A Date 06/14/10  
Client REHAU Construction LLC  
Specimen Series/Model: 4500, fixed window with 1-3/8" IG (1/4" laminated, 7/8" air space, 1/4" laminated), Glass temperature 75°F  
Specimen Area 1.39 Square Meters  
Filler Area 11.60 Square Meters  
Operator Kurt Golden



Architectural Testing, Inc. is accredited by the International Accreditation Service, Inc. (IAS) under the specific test methods listed under lab code TL-144, in accordance with the recognized International Standard ISO/IEC 17025:2005. The laboratory's accreditation or test report in no way constitutes or implies product certification, approval, or endorsement by IAS. This test report applies only to the specimen that was tested.



## SOUND TRANSMISSION LOSS

ASTM E 90

### Architectural Testing

<b>ATI No.</b>	A1834.01B	<b>Date</b>	06/14/10
<b>Client</b>	REHAU Construction LLC		
<b>Specimen</b>	Series/Model: 4500, fixed window with 1-5/16" IG (5/16" laminated exterior, 3/4" air space, 1/4" laminated interior), Glass temperature 75°F		
<b>Specimen Area</b>	1.39 Square Meters		
<b>Filler Area</b>	11.60 Square Meters		
<b>Operator</b>	Kurt Golden		


	Bkgrd	Absorp	Source	Receive	Filler	Specimen
<b>Temp C</b>	24.4	25.8	24.5	25.1	23.4	25.0
<b>RH %</b>	43.6	40.2	42.5	42.1	43.6	42.1

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 Deficiencies	Trans Coef Diff
80	42.5	5.1	89.7	64.3	36.0	21	2.59	0	7.1
100	42.0	4.8	96.7	67.5	41.3	24	2.50	0	8.3
125	41.1	4.6	101.6	77.1	47.3	19	2.09	5	18.9
160	47.5	4.4	103.9	74.5	49.5	24	1.12	3	15.9
200	47.2	4.8	107.3	74.6	52.9	27	1.00	3	16.3
250	44.9	5.1	106.5	73.0	56.1	28	0.95	5	19.1
315	44.2	5.6	102.7	65.0	57.7	32	0.71	4	16.8
400	43.6	5.9	101.8	61.9	62.8	34	0.51	5	19.8
500	42.5	5.5	102.5	57.3	67.1	39	0.31	1	18.7
630	37.7	5.4	106.8	59.3	71.0	42	0.61	0	20.1
800	38.8	5.7	107.0	57.7	73.1	43	0.34	0	20.6
1000	36.1	6.0	106.4	56.4	76.4	44	0.67	0	23.5
1250	36.2	6.6	107.0	55.8	78.3	44	0.30	0	24.7
1600	34.6	6.6	112.7	61.2	83.2	45	0.31	0	29.2
2000	25.1	7.3	104.2	52.6	84.2	44	0.21	0	30.5
2500	15.6	8.4	101.7	49.1	85.7	45	0.22	0	31.7
3150	14.2	9.8	102.4	47.2	86.3	47	0.24	0	30.3
4000	11.3	12.2	100.7	40.5	87.2	51	0.18	0	27.2
5000	8.7	15.9	97.1	32.6	85.6	54	0.50	0	22.4

**STC Rating = 40**      *(Sound Transmission Class)*  
**Deficiencies = 26**      *(Number of deficiencies versus contour curve)*  
**OITC Rating = 31**      *(Outdoor/Indoor Transmission Class)*

**Notes:**

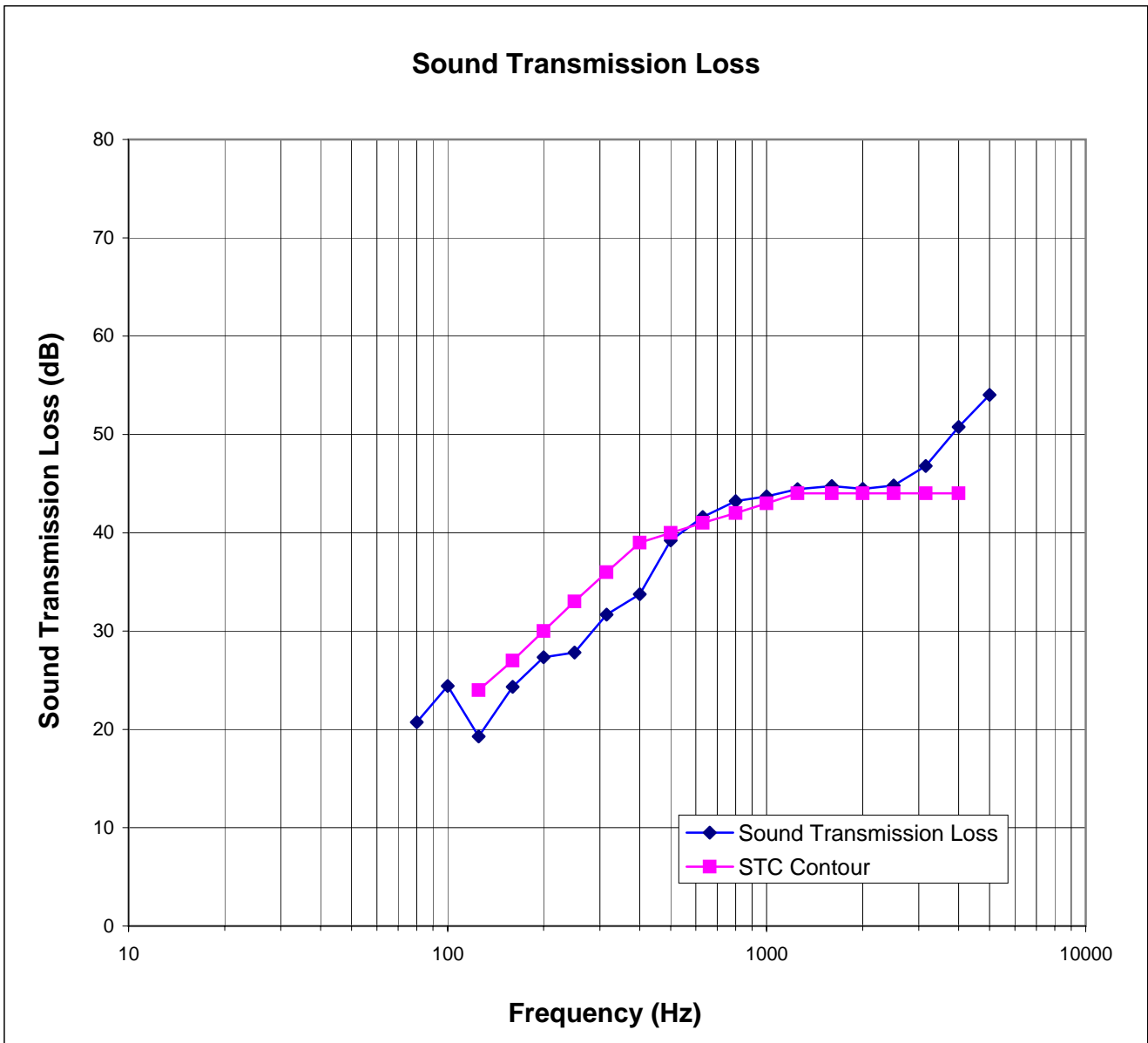
- 1) The acoustical chambers are qualified for measurements down to 80 hertz. Data reported below 80 hertz is for reference only.
- 2) Transmission loss coefficient differences less than 6 indicate the lower limit of the transmission loss for this specimen. These cells are highlighted red.
- 3) Transmission 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, Inc. is accredited by the International Accreditation Service, Inc. (IAS) under the specific test methods listed under lab code TL-144, in accordance with the recognized International Standard ISO/IEC 17025:2005. The laboratory's accreditation or test report in no way constitutes or implies product certification, approval, or endorsement by IAS. This test report applies only to the specimen that was tested.
-------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------



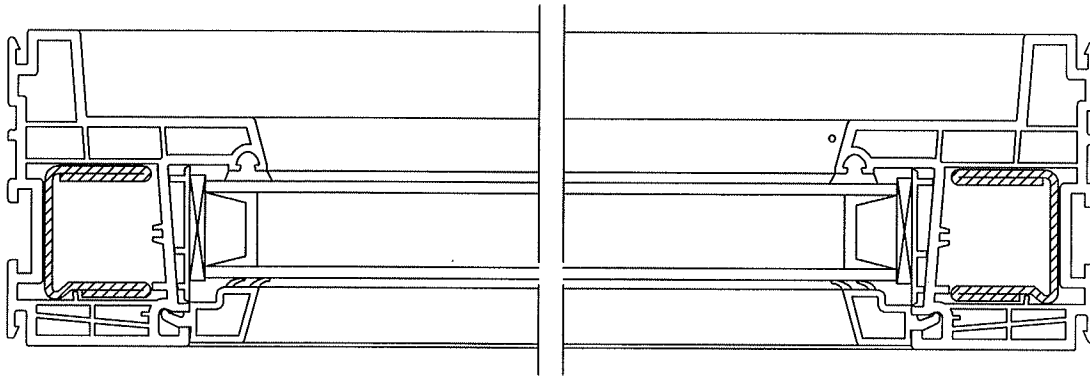
### Architectural Testing

ATI No. A1834.01B Date 06/14/10  
Client REHAU Construction LLC  
Specimen Series/Model: 4500, fixed window with 1-5/16" IG (5/16" laminated exterior, 3/4" air space, 1/4" laminated interior), Glass temperature 75°F  
Specimen Area 1.39 Square Meters  
Filler Area 11.60 Square Meters  
Operator Kurt Golden

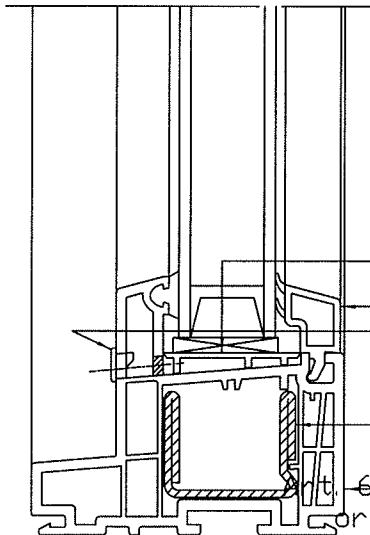
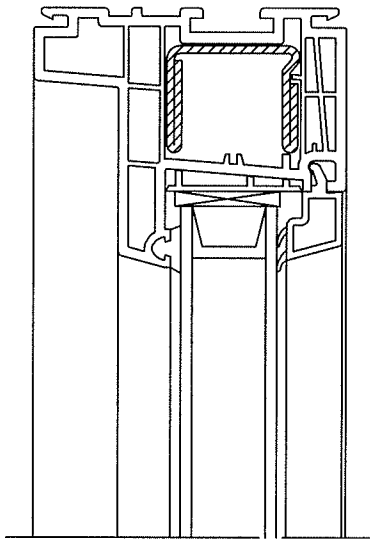


Architectural Testing, Inc. is accredited by the International Accreditation Service, Inc. (IAS) under the specific test methods listed under lab code TL-144, in accordance with the recognized International Standard ISO/IEC 17025:2005. The laboratory's accreditation or test report in no way constitutes or implies product certification, approval, or endorsement by IAS. This test report applies only to the specimen that was tested.

**Appendix C**  
**Design Drawing**



SECTION B-B



- Art. 541220
- Art. 560600
- Art. 600526
- Art. 244536
- Art. 601205 w/o nailing fin  
or Art. 601215 with nailing fin

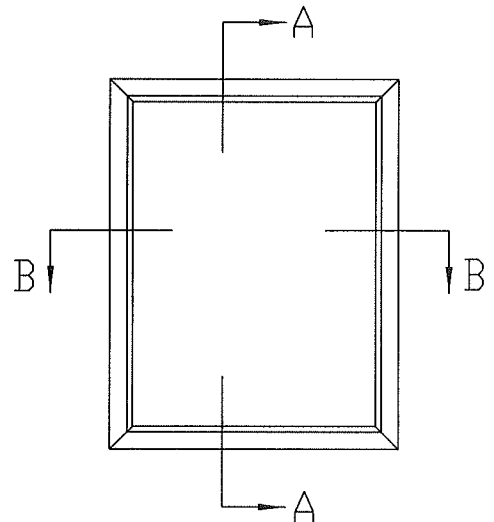
SECTION A-A



**Architectural Testing**

Test sample complies with these details.  
Deviations are noted.

Report# A/834.01-113-11  
Date 6/14/10 Tech K6



© COPYRIGHT 2009 REHAU INCORPORATED

THE DESIGN, CONCEPT AND INFORMATION CONTAINED  
IN THIS DRAWING IS PROPRIETARY TO REHAU  
AND MAY NOT BE REPRODUCED, USED OR DISCLOSED  
WITHOUT WRITTEN PERMISSION FROM SAID COMPANY.



Unlimited Polymer Solutions

System	4500
Title	Fixed/Picture Window using 3/8" & 1" Glazing
Drawn	5/23/10
Checked	5/23/10
Dwg. No.	S454103
Rev.	3

**Appendix D**

**Photographs**



**Receive Room View of Installed Specimen**



**Source Room View of Installed Specimen**