T E S T R E P O R T

ASTM E 90-04: Laboratory Measurement of Airborne Sound Transmission of Building Partitions and Elements

Orfield Laboratories Inc

Design Research Testing
Acoustics / Vibration / Vision / Lighting / Architecture / Market Research

TEST
Client: **Saint-Gobain Performance Plastics**
Report Date: February 14, 2014
Test Date: October 14, 2005
Test Number: OL05-1030

RESULT SUMMARY

STC=55

CLIENT ADDRESS
Saint-Gobain Performance Plastics
Green Glue Division
One Sealants Park
Granville, NY 12832
Phone (800) 724-0883
www.greengluecompany.com

ACCREDITATION
NVLAP
For the scope of accreditation under NVLAP code 200248-0

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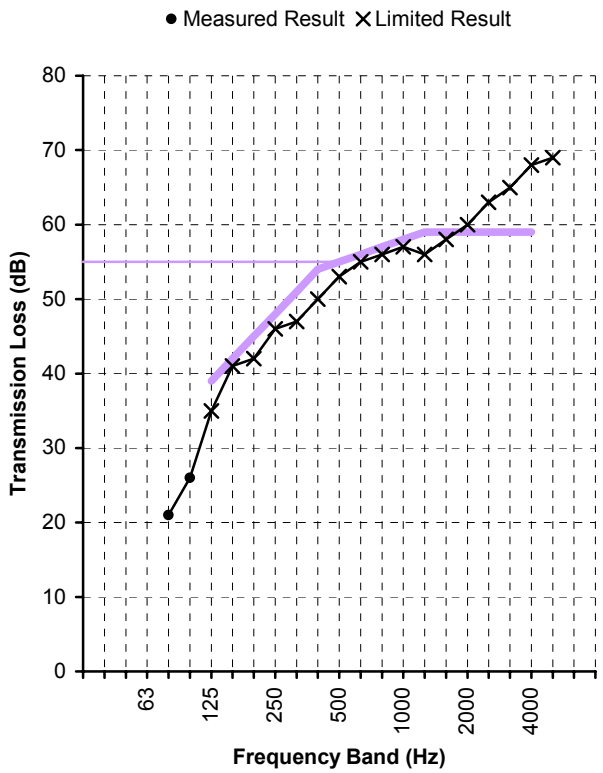
Signatures are required on this document for an official laboratory test report. Copies of this document without signatures are for reference only.

Orfield Laboratories Inc

Test Date October 14, 2005
Specimen Wall Assembly

Method ASTM Standard E90
Technician D. Berg

Single Number Rating
STC = 55



Freq. (Hz)	TL (dB)	Def. (dB)
80	21	
100	26	
125	35*	4
160	41*	1
200	42*	3
250	46*	2
315	47*	4
400	50*	4
500	53*	2
630	55*	1
800	56*	1
1000	57*	1
1250	56*	3
1600	58*	1
2000	60*	-
2500	63*	-
3150	65*	-
4000	68*	-
5000	69*	
Total Deficiencies		27

* Estimate of lower limit

Assembly Elements (listed in order from source room side to receiver room side)

0.5" gypsum board; 2.5" type W screw @ 12" O.C.
116 oz. Green Glue
0.5" gypsum board; 1.625" type W screw @ 24" O.C.
2"x4" wood studs @ 24" O.C.
3.5" R13 fiberglass insulation batts (R13)
0.5" gypsum board; 1.625" type W screw @ 24" O.C.
116 oz. Green Glue
0.5" gypsum board; 2.5" type W screw @ 12" O.C.

SPECIMEN DESCRIPTION

The specimen under test was a wall assembly. The elements in the assembly are described briefly below the results table and chart on page 2. Detailed information regarding the specimen may be found in Appendix C.

Test results pertain to this specimen only.

INSTALLATION AND DISPOSITION

The 2x4 wood stud frame was originally constructed on October 10, 2005. The framing and insulation were used in previous tests in the series and were retained for subsequent tests in the series. Representatives of the client constructed and installed the specimen wall assembly. A qualified representative of Orfield Laboratories observed the installation and visually inspected the specimen. The specimen was disposed of after testing.

TEST METHODS

The methods followed these published standards:

> ASTM E90-04*: *Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements*
>
> ASTM E413-04: *Classification for Rating Sound Insulation*
>
> The values presented in this report are from single-direction transmission loss measurements.

** Orfield Laboratories, Inc. has been accredited by the U.S. Department of Commerce, National Institute of Standards and Technology (NIST) under their National Voluntary Laboratory Accreditation Program (NVLAP) for this test procedure. This report shall not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the U.S. Government.*

CONFIDENTIALITY

The client has full control over this information and any release of information will be only to the client. The specific testing results are deemed to be confidential exclusively for the client's use. Reproduction of this report, except in full, is prohibited.

APPENDIX A: MEASUREMENT SETUP

Environment	
Temperature	68°F [20.0°C]
Relative Humidity	50%

Specimen Area	
Specimen Area	64.5 ft² [5.99 m²]

Chamber Volume - Airborne Transmission	
Source Room Volume	4022 ft³ [113.9 m³]
Receiving Room Volume	8281 ft³ [234.5 m³]

INSTRUMENTATION

Description	Brand	Model	S/N
Microphone	Brüel & Kjær	Type 4134	1478843
Preamplifier	Brüel & Kjær	Type 2639	1202479
Microphone	Brüel & Kjær	Type 4134	558007
Preamplifier	Brüel & Kjær	Type 2639	1312237
Analyzer	Brüel & Kjær	Type 2133	1389369
Rotating Boom	Brüel & Kjær	Type 3923	2036583
Rotating Boom	Brüel & Kjær	Type 3923	890569

APPENDIX B: CALCULATION RESULTS

Freq. Band (Hz)	Specimen T.L. (dB)	95% Conf. (dB)	Flanking Limit (dB)	STC Defic. (dB)
25				
31.5	**27.1**		40	
40	**22.3**		47	
50	**23.4** §		33	
63	**17.8**		34	
80	**21.0**	±4.57	36	
100	**26.5**	±2.94	40	
125	**34.5** §	±2.31	42	4
160	**40.6** §	±2.52	45	1
200	**42.1** §	±1.85	48	3
250	**46.0** §	±1.06	49	2
315	**46.9** §	±0.85	52	4
400	**50.3** §	±0.46	54	4
500	**53.2** §	±0.76	57	2
630	**54.8** §	±0.44	59	1
800	**56.3** §	±0.63	62	1
1000	**57.2** §	±0.66	65	1
1250	**56.2** §	±0.61	66	3
1600	**58.5** §	±0.38	67	1
2000	**60.3** §	±0.39	69	-
2500	**62.5** §	±0.61	68	-
3150	**64.9** §	±0.31	69	-
4000	**68.2** §	±0.53	69	-
5000	**69.5** §		68	
6300	**69.4** *			
8000	**68.5** *			
10000	**62.9** *			
Total deficiencies below STC contour (dB)				27
STC contour [ASTM E413]				**55**

* Actual transmission loss of specimen may be higher than measured at this frequency band. Signal-to-noise in the receiving room less than 5 dB, therefore the result is "an estimate of the lower limit".

§ Actual transmission loss of specimen may be higher than measured at this frequency band. Result within 10 dB of flanking limit found in separate study, therefore the result may be "potentially limited by the laboratory" due to flanking around the specimen.

Note: 95% confidence intervals from room qualification data. Flanking Limit from chamber flanking study. Reference sample and repeatability data available upon request. Extended frequency results below 80Hz and above 5000Hz are for reference only.

APPENDIX C: SPECIMEN ASSEMBLY DESCRIPTION

The following table shows the description of the wall assembly.

Overall Mass = 533.6 lb [242.0 kg]
Overall Surface Density = 8.27 PSF [40.39 kg/m²]

Element	Mass lb [kg]	Surf. Dens. PSF [kg/m²]
0.5" gypsum board; 2.5" type W screw @ 12" O.C.	228.0 [103.4]	3.53 [17.26]
116 oz. Green Glue		
0.5" gypsum board; 1.625" type W screw @ 24" O.C.		
2"x4" wood studs @ 24" O.C.	59.8 [27.1]	0.93 [4.53]
3.5" R13 fiberglass insulation batts (R13)	13.8 [6.3]	0.21 [1.04]
0.5" gypsum board; 1.625" type W screw @ 24" O.C.		
116 oz. Green Glue		
0.5" gypsum board; 2.5" type W screw @ 12" O.C.	232.0 [105.2]	3.60 [17.56]

All pre-constructed sandwich sheeting panels were supplied by the client. All other materials were purchased through retail channels. All materials were weighed prior to installation. Weights of fasteners are not represented in the above totals.

FRAMING

A 2 x 4 wood (actual lumber dimensions 1.5” x 3.5”) wood frame was constructed in the laboratory test opening. A wood 2x4 sill plate was laid on the floor and a wood 2x4 top plate installed at top frame in the specimen opening. Wood 2x4 studs were spaced 24” on center and fastened to the sill and top plates using four (4), 2-1/2” drywall screws per stud; two at each the sill and top plate. Figure 1 is a photograph of the wood stud frame mounted in the test opening.

Figure 1: Wood stud frame mounted in test opeing

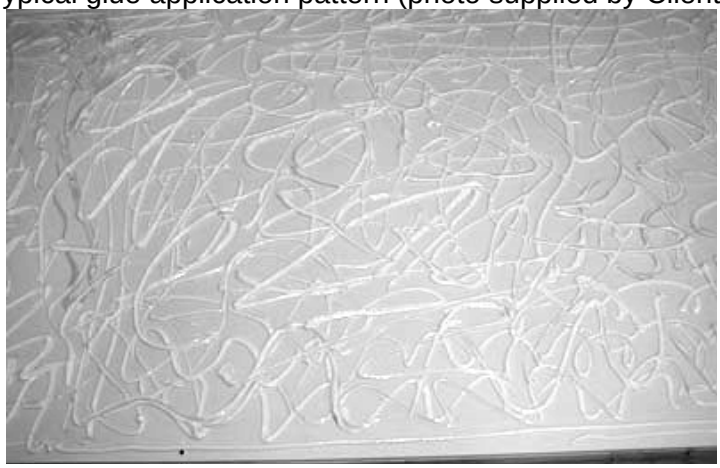
INSULATION

Fiberglass insulation batts were installed in the stud cavities. The insulation batts were 24” wide, 3.5” thick, and were friction fit into each of the 4 stud cavities. The insulation was labeled with an R-value of R-13.

SHEETING

The gypsum board panels were laminated together with Green Glue damping adhesive. The client reported that the Green Glue was applied from adhesive cartridges in 3/16" beads in a random pattern over the whole panel. The aging period was over 40 days, greater than the 14 days period stated in ASTM Standard E90 for water-base adhesives. The assemblies were dried on 4' x 8' wood-stud frames, spaced out and with forced air ventilation according to the client. Figure 2 is a photograph of a typical glue application pattern.

Figure 2: Typical glue application pattern (photo supplied by Client)



The specimen arrived at the laboratory still mounted on temporary wood stud drying frames. Fastener heads on the base layer panel were accessible via pre-drilled holes through the face layer, approximately 1/2" in diameter. The dried panels were demounted from the drying frames, and then remounted on the frame in the test opening.

The source room side sheeting layer consisted of a two pre-laminated sheeting layers. The inner sheeting layer was 1/2” gypsum wall board attached parallel to the joists with 1-5/8” type W drywall screws spaced at 24” on center. The screws were accessed through pre-drilled holes through the face layer. The face layer was 1/2” gypsum wall board installed parallel to the joists with 2-1/2” type W drywall screws spaced at 12” on center.

Seams were sealed with caulk. The perimeter of each face was sealed with 7/8" wide strips of putty rope-caulk. Screw holes in the face were filled with putty.

The receiving room side sheeting layer consisted of a two pre-laminated sheeting layers. The inner sheeting layer was 1/2” gypsum wall board attached parallel to the joists with 1-5/8” type W drywall screws spaced at 24” on center. The screws were accessed through pre-drilled holes through the face layer. The face layer was 1/2” gypsum wall board installed parallel to the joists with 2-1/2” type W drywall screws spaced at 12” on center.

Seams were sealed with caulk. The perimeter of each face was sealed with 7/8" wide strips of putty rope-caulk. Screw holes in the face were filled with putty.

APPENDIX D: SINGLE-NUMBER CALCULATION TO ISO 717-1

Freq. Band (Hz)	R_i ($R_i \equiv$ TL) (dB)	Ref Curve (dB)	Unfav. Deviat. (dB)	L_{i1} Spectrum (dB)	$L_{i1} - R_i$ Level (dB)	L_{i2} Spectrum (dB)	$L_{i2} - R_i$ Level (dB)
50	**23.4**						
63	**17.8**						
80	**21.0**						
100	**26.5**	35	8.5	-29.0	-55.5	-20.0	-46.5
125	**34.5**	38	3.5	-26.0	-60.5	-20.0	-54.5
160	**40.6**	41	0.4	-23.0	-63.6	-18.0	-58.6
200	**42.1**	44	1.9	-21.0	-63.1	-18.0	-60.1
250	**46.0**	47	1.0	-19.0	-65.0	-15.0	-61.0
315	**46.9**	50	3.1	-17.0	-63.9	-14.0	-60.9
400	**50.3**	53	2.7	-15.0	-65.3	-13.0	-63.3
500	**53.2**	54	0.8	-13.0	-66.2	-12.0	-65.2
630	**54.8**	55	0.2	-12.0	-66.8	-11.0	-65.8
800	**56.3**	56	-	-11.0	-67.3	-9.0	-65.3
1000	**57.2**	57	-	-10.0	-67.2	-8.0	-65.2
1250	**56.2**	58	1.8	-9.0	-65.2	-9.0	-65.2
1600	**58.5**	58	-	-9.0	-67.5	-10.0	-68.5
2000	**60.3**	58	-	-9.0	-69.3	-11.0	-71.3
2500	**62.5**	58	-	-9.0	-71.5	-13.0	-75.5
3150	**64.9**	58	-	-9.0	-73.9	-15.0	-79.9
4000	**68.2**						
5000	**69.5**						
		Sum =	23.9	$R_{A,1}$ =	51.4	$R_{A,2}$ =	44.9
		R_W =	**54**	**C =**	**-3**	**C_{tr} =**	**-9**

$Rw\ (C\ ;\ Ctr) = 54\ (-3\ ;\ -9)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,50\text{-}3150\ ;\ Ctr,50\text{-}3150) = 54\ (-3\ ;\ -9\ ;\ -6\ ;\ -17)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,100\text{-}5000\ ;\ Ctr,100\text{-}5000) = 54\ (-3\ ;\ -9\ ;\ -2\ ;\ -9)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,50\text{-}5000\ ;\ Ctr,50\text{-}5000) = 54\ (-3\ ;\ -9\ ;\ -5\ ;\ -17)$

Note: The calculations in ISO 717-1 are performed based on assumed equivalency of the ASTM and the corresponding ISO test methods. The test herein is performed according to the ASTM standards. Orfield Laboratories *does not* hold accreditation for ISO 140 or ISO 717 under their NVLAP scope of accreditation.

The spectrum adaptation terms C and C_{tr} characterize performance against two specific sound sources, A-weighted pink noise and A-weighted traffic noise respectively. The standard ISO 717-1 includes a discussion of “Use of Spectrum Adaptation Terms” in Annex A (informative).

Each spectrum adaptation term may additionally be reported with extended frequency bands included. A calculation for the primary frequency range is shown above, but all available extended-frequency calculations were performed to compare against corresponding ratings of other specimens