T E S T R E P O R T

ASTM E 90-09: 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 27, 2010
Test Number: OL10-1034

RESULT SUMMARY

STC=64

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

PREPARED BY
David M. Berg
Orfield Laboratories, Inc.
2709 East 25th Street
Minneapolis MN 55406
Voice (612) 721-2455
FAX (612) 721-2457

Prepared by:

ELECTRONICALLY REPRODUCED SIGNATURE

David M. Berg
Laboratory Manager

Reviewed By:

ELECTRONICALLY REPRODUCED SIGNATURE

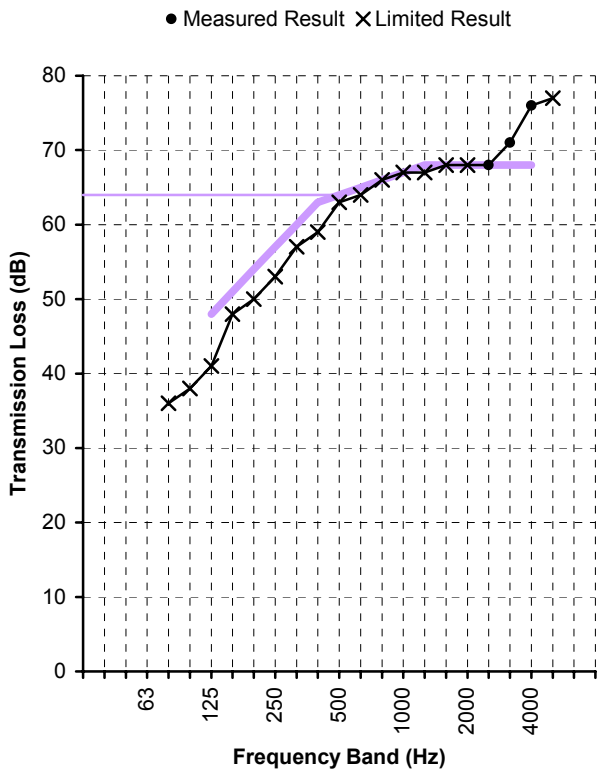
Michael R. Role

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

Test Date October 27, 2010
Specimen Wall Assembly

Method ASTM Standard E90
Technician D. Berg

Single Number Rating
STC = 64



Freq. (Hz)	TL (dB)	Def. (dB)
80	36*	
100	38*	
125	41*	7
160	48*	3
200	50*	4
250	53*	4
315	57*	3
400	59*	4
500	63*	1
630	64*	1
800	66*	-
1000	67*	-
1250	67*	1
1600	68*	-
2000	68*	-
2500	68	-
3150	71	-
4000	76	-
5000	77*	
Total Deficiencies		28

* Estimate of lower limit

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

0.625" (5/8") type X gypsum board (v); 1.625" type W screws @ 12" O.C.
Green Glue @ 2 Tubes / sheet - total 116 oz
(5/8") type X gypsum board (v)
25 gauge hat channel @ 24" O.C.
GG Noiseproofing Clips RC (20)
3-5/8" 25 gauge steel studs @ 24" O.C.
3.5" kraft-faced insulation batts
0.625" (5/8") type X gypsum board (h
Green Glue @ 2 Tubes / sheet - total 116 oz
0.625" (5/8") type X gypsum board (h); 1.625" type W screws @ 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 steel stud frame was originally constructed on October 27, 2010. The framing and insulation were retained for subsequent tests in the series. Independent contractors fabricated the test specimen and sealed it in the specimen opening. Qualified representatives of Orfield Laboratories observed the installation progress, and visually inspected the specimen prior to testing.

TEST METHODS

The methods followed these published standards:

ASTM E90-09*: *Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements*

ASTM E413-10: *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	70°F [21.1°C]
Relative Humidity	55%

Specimen Area	
Specimen Area	64.5 ft² [5.99 m²]

Chamber Volume - Airborne Transmission	
Source Room Volume	3284 ft³ [93.0 m³]
Receiving Room Volume	8079 ft³ [228.8 m³]

INSTRUMENTATION

Description	Brand	Model	S/N
Calibrator	Brüel & Kjær	Type 4230	584761
Microphone	Brüel & Kjær	Type 4134	558007
Preamplifier	Brüel & Kjær	Type 2639	1202479
Rotating Boom	Brüel & Kjær	Type 3923	2036583
Microphone	Brüel & Kjær	Type 4134	1478843
Preamplifier	Brüel & Kjær	Type 2639	1312147
Rotating Boom	Brüel & Kjær	Type 3923	890569
Power Supply	Brüel & Kjær	Type WB1057	n/a
Analyzer	Norsonic	Type 121	31185

APPENDIX B: CALCULATION RESULTS

Freq. Band (Hz)	Specimen T.L. (dB)	95% Conf. (dB)	Flanking Limit (dB)	STC Defic. (dB)
25				
31.5	**24.9**		40	
40	**16.7**		47	
50	**16.9**		43	
63	**24.9**		43	
80	**35.7** §	±1.63	42	
100	**37.6** §	±1.15	45	
125	**41.4** §	±0.95	46	7
160	**47.8** §	±1.27	52	3
200	**50.2** §	±1.24	53	4
250	**53.2** §	±0.65	56	4
315	**57.1** §	±0.65	60	3
400	**59.4** §	±0.62	61	4
500	**62.9** §	±0.40	65	1
630	**63.8** §	±0.50	66	1
800	**66.1** §	±0.40	69	-
1000	**67.3** §	±0.25	70	-
1250	**67.2** §	±0.25	72	1
1600	**67.8** §	±0.32	72	-
2000	**67.9** §	±0.44	74	-
2500	**68.3**	±0.35	79	-
3150	**70.9**	±0.31	83	-
4000	**75.5**	±0.49		-
5000	**76.6** *	±0.35		
6300	**75.2** *			
8000	**74.3** *			
10000	**69.0** *			
Total deficiencies below STC contour (dB)				28
STC contour [ASTM E413]				**64**

* 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 from room qualification data. Flanking Limit from chamber flanking measurements. Data available upon request. Extended frequency results below 80Hz and above 5000Hz for reference only.

APPENDIX C: SPECIMEN ASSEMBLY DESCRIPTION

The following table shows the description of the wall assembly.

Overall Mass = 627.2 lb [284.5 kg]
Overall Surface Density = 9.72 PSF [47.48 kg/m²]

Element	Mass lb [kg]	Surf. Dens. PSF [kg/m²]
0.625" (5/8") type X gypsum board (v); 1.625" type W screws @ 12" O.C.	291.8 [132.3]	4.52 [22.08]
Green Glue @ 2 Tubes / sheet - total 116 oz		
(5/8") type X gypsum board (v)		
25 gauge hat channel @ 24" O.C.	8.3 [3.7]	0.13 [0.62]
GG Noiseproofing Clips RC (20)	0.8 [0.4]	0.01 [0.06]
3-5/8" 25 gauge steel studs @ 24" O.C.	20.2 [9.1]	0.31 [1.53]
3.5" kraft-faced insulation batts	14.0 [6.4]	0.22 [1.06]
0.625" (5/8") type X gypsum board (h		
Green Glue @ 2 Tubes / sheet - total 116 oz		
0.625" (5/8") type X gypsum board (h); 1.625" type W screws @ 12" O.C.	292.3 [132.6]	4.53 [22.12]

Green Glue Company Noiseproofing Clips 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 3-5/8", 25 gauge steel frame was constructed in the perimeter of the laboratory test specimen opening. The frame consisted of 3-5/8" x 1-1/4" track plates at the top and bottom, and five, 3-5/8" x 1-1/4" studs installed 24" on center. The track plates and studs were made of 25 gauge galvanized steel. The track plates and studs were fastened together with two type S pan head screws at each intersection. The perimeter of the frame was sealed to the specimen opening with Green Glue Noiseproofing Sealant.

INSULATION

3-1/2" thick kraft-faced fiberglass insulation bats were installed in the stud cavities. The insulation batts were 24" wide. The faced fiberglass batts were friction fit into each of the stud cavities with the paper facing the source room.

CLIPS AND HAT CHANNEL

Twenty (20) Green Glue Noiseproofing Clips were attached to the vertical studs on the source room side using type S pan head screws. Five 8'-0" lengths of 25 gauge, 7/8" hat-channel were then attached to the Green Glue® Noiseproofing Clips at 24" nominal spacing.

SHEETING

The gypsum board sandwich panels with Green Glue adhesive were pre-laminated into sandwiches at the laboratory by independent contractors. Green Glue was applied from two 29 oz. adhesive cartridges in a random pattern over a whole 4' x 8' gypsum board panel. A second sheet of gypsum board was applied to the first side. The sandwich was thoroughly compressed by methodically walking over the entire face.

The assemblies were spaced out and stacked to dry with forced air ventilation. The adhesive aged from the assembly date, October 12, 2010 to the test date, October 27, 2010. This is greater than the 14 days period stated in ASTM Standard E90 for water-based adhesives.

Sandwiches on the source-room side were installed in a vertical orientation, so the seam between sandwiches ran parallel to the studs, and perpendicular to the hat channel. Sandwiches were fastened to the hat channel with 1-5/8" drywall screws, spaced 12" apart. The seam between source-room panels was sealed with Green Glue Noiseproofing Sealant and 1-7/8" wide 2 mil foil tape. Panels were shimmed at installation so equal gaps were at the top and bottom. Gaps were less than 1/2" in all cases. Shims were removed after sheeting was fastened and the perimeter was sealed on the source room side with Green Glue Noiseproofing Sealant and 1-7/8" wide 2 mil foil tape.

Sandwiches on the receiver-room side were installed in a horizontal orientation, so the seam between sandwiches ran perpendicular to the studs. Sandwiches were fastened to the studs with 1-5/8" drywall screws, spaced 12" apart. The seam between receiver-room panels was sealed Green Glue Noiseproofing Sealant. Panels were shimmed at installation so equal gaps were at the top and bottom. Gaps were less than 1/2" in all cases. Shims were removed after sheeting was fastened and the perimeter was sealed on the receiver room side with Green Glue Noiseproofing Sealant, 1-7/8" wide 2 mil foil tape and 7/8" dense putty tape.

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	**16.9**						
63	**24.9**						
80	**35.7**						
100	**37.6**	44	6.4	-29.0	-66.6	-20.0	-57.6
125	**41.4**	47	5.6	-26.0	-67.4	-20.0	-61.4
160	**47.8**	50	2.2	-23.0	-70.8	-18.0	-65.8
200	**50.2**	53	2.8	-21.0	-71.2	-18.0	-68.2
250	**53.2**	56	2.8	-19.0	-72.2	-15.0	-68.2
315	**57.1**	59	1.9	-17.0	-74.1	-14.0	-71.1
400	**59.4**	62	2.6	-15.0	-74.4	-13.0	-72.4
500	**62.9**	63	0.1	-13.0	-75.9	-12.0	-74.9
630	**63.8**	64	0.2	-12.0	-75.8	-11.0	-74.8
800	**66.1**	65	-	-11.0	-77.1	-9.0	-75.1
1000	**67.3**	66	-	-10.0	-77.3	-8.0	-75.3
1250	**67.2**	67	-	-9.0	-76.2	-9.0	-76.2
1600	**67.8**	67	-	-9.0	-76.8	-10.0	-77.8
2000	**67.9**	67	-	-9.0	-76.9	-11.0	-78.9
2500	**68.3**	67	-	-9.0	-77.3	-13.0	-81.3
3150	**70.9**	67	-	-9.0	-79.9	-15.0	-85.9
4000	**75.5**						
5000	**76.6**						
		Sum =	24.6	$R_{A,1}$ =	60.6	$R_{A,2}$ =	54.7
		R_W =	**63**	**C =**	**-2**	**C_{tr} =**	**-8**

$Rw\ (C\ ;\ Ctr) = 63\ (-2\ ;\ -8)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,50\text{-}3150\ ;\ Ctr,50\text{-}3150) = 63\ (-2\ ;\ -8\ ;\ -9\ ;\ -22)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,100\text{-}5000\ ;\ Ctr,100\text{-}5000) = 63\ (-2\ ;\ -8\ ;\ -2\ ;\ -8)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,50\text{-}5000\ ;\ Ctr,50\text{-}5000) = 63\ (-2\ ;\ -8\ ;\ -8\ ;\ -22)$

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

T E S T R E P O R T

ASTM E 90-09: 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 28, 2010
Test Number: OL10-1036

RESULT SUMMARY

STC=53

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

PREPARED BY
David M. Berg
Orfield Laboratories, Inc.
2709 East 25th Street
Minneapolis MN 55406
Voice (612) 721-2455
FAX (612) 721-2457

Prepared by:

ELECTRONICALLY REPRODUCED SIGNATURE

David M. Berg
Laboratory Manager

Reviewed By:

ELECTRONICALLY REPRODUCED SIGNATURE

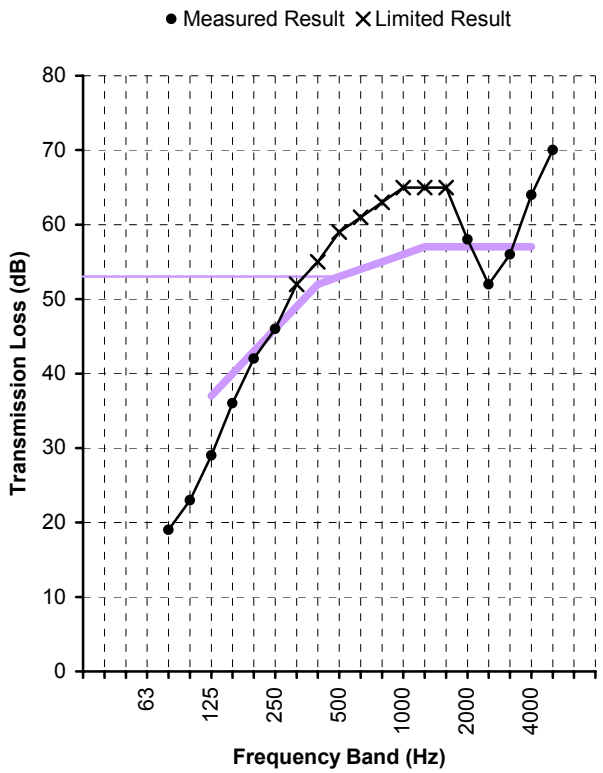
Michael R. Role

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

Test Date October 28, 2010
Specimen Wall Assembly

Method ASTM Standard E90
Technician D. Berg

Single Number Rating
STC = 53



Freq. (Hz)	TL (dB)	Def. (dB)
80	19	
100	23	
125	29	8
160	36	4
200	42	1
250	46	-
315	52*	-
400	55*	-
500	59*	-
630	61*	-
800	63*	-
1000	65*	-
1250	65*	-
1600	65*	-
2000	58	-
2500	52	5
3150	56	1
4000	64	-
5000	70	
Total Deficiencies		19

* Estimate of lower limit

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

0.625" Type X gypsum board (v); 1.25" type W screws @ 12" O.C.
25 gauge hat channel @ 24" O.C.
GG Noiseproofing Clips RC (20)
3-5/8" 25 gauge steel studs @ 24" O.C.
3.5" kraft-faced insulation batts
0.625" Type X gypsum board (v); 1.25" type W screws @ 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 steel stud frame was originally constructed on October 27, 2010. The framing and insulation were retained for subsequent tests in the series. Independent contractors fabricated the test specimen and sealed it in the specimen opening. Qualified representatives of Orfield Laboratories observed the installation progress, and visually inspected the specimen prior to testing.

TEST METHODS

The methods followed these published standards:

ASTM E90-09*: *Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements*

ASTM E413-10: *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	70°F [21.1°C]
Relative Humidity	55%

Specimen Area	
Specimen Area	64.5 ft² [5.99 m²]

Chamber Volume - Airborne Transmission	
Source Room Volume	3284 ft³ [93.0 m³]
Receiving Room Volume	8079 ft³ [228.8 m³]

INSTRUMENTATION

Description	Brand	Model	S/N
Calibrator	Brüel & Kjær	Type 4230	584761
Microphone	Brüel & Kjær	Type 4134	558007
Preamplifier	Brüel & Kjær	Type 2639	1202479
Rotating Boom	Brüel & Kjær	Type 3923	2036583
Microphone	Brüel & Kjær	Type 4134	1478843
Preamplifier	Brüel & Kjær	Type 2639	1312147
Rotating Boom	Brüel & Kjær	Type 3923	890569
Power Supply	Brüel & Kjær	Type WB1057	n/a
Analyzer	Norsonic	Type 121	31185

APPENDIX B: CALCULATION RESULTS

Freq. Band (Hz)	Specimen T.L. (dB)	95% Conf. (dB)	Flanking Limit (dB)	STC Defic. (dB)
25				
31.5	**21.3**		40	
40	**16.8**		47	
50	**12.5**		43	
63	**11.7**		43	
80	**18.6**	±1.63	42	
100	**23.1**	±1.15	45	
125	**28.7**	±0.95	46	8
160	**36.0**	±1.27	52	4
200	**41.7**	±1.24	53	1
250	**45.5**	±0.65	56	-
315	**52.0** §	±0.65	60	-
400	**55.5** §	±0.62	61	-
500	**59.3** §	±0.40	65	-
630	**60.9** §	±0.50	66	-
800	**63.1** §	±0.40	69	-
1000	**64.8** §	±0.25	70	-
1250	**65.2** §	±0.25	72	-
1600	**65.1** §	±0.32	72	-
2000	**57.9**	±0.44	74	-
2500	**51.8**	±0.35	79	5
3150	**56.3**	±0.31	83	1
4000	**63.7**	±0.49		-
5000	**69.9**	±0.35		
6300	**73.1** *			
8000	**72.7** *			
10000	**69.1** *			
Total deficiencies below STC contour (dB)				19
STC contour [ASTM E413]				**53**

* 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 from room qualification data. Flanking Limit from chamber flanking measurements. Data available upon request. Extended frequency results below 80Hz and above 5000Hz for reference only.

APPENDIX C: SPECIMEN ASSEMBLY DESCRIPTION

The following table shows the description of the wall assembly.

Overall Mass = 330.0 lb [149.7 kg]
Overall Surface Density = 5.12 PSF [24.98 kg/m²]

Element	Mass lb [kg]	Surf. Dens. PSF [kg/m²]
0.625" Type X gypsum board (v); 1.25" type W screws @ 12" O.C.	143.8 [65.2]	2.23 [10.88]
25 gauge hat channel @ 24" O.C.	8.3 [3.7]	0.13 [0.62]
GG Noiseproofing Clips RC (20)	0.8 [0.4]	0.01 [0.06]
3-5/8" 25 gauge steel studs @ 24" O.C.	20.2 [9.1]	0.31 [1.53]
3.5" kraft-faced insulation batts	14.0 [6.4]	0.22 [1.06]
0.625" Type X gypsum board (v); 1.25" type W screws @ 12" O.C.	143.0 [64.9]	2.22 [10.82]

Green Glue Company Noiseproofing Clips 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 3-5/8", 25 gauge steel frame was constructed in the perimeter of the laboratory test specimen opening. The frame consisted of 3-5/8" x 1-1/4" track plates at the top and bottom, and five, 3-5/8" x 1-1/4" studs installed 24" on center. The track plates and studs were made of 25 gauge galvanized steel. The track plates and studs were fastened together with two type S pan head screws at each intersection. The perimeter of the frame was sealed to the specimen opening with Green Glue Noiseproofing Sealant.

INSULATION

3-1/2" thick kraft-faced fiberglass insulation bats were installed in the stud cavities. The insulation batts were 24" wide. The faced fiberglass batts were friction fit into each of the stud cavities with the paper facing the source room.

CLIPS AND HAT CHANNEL

Twenty (20) Green Glue Noiseproofing Clips were attached to the vertical studs on the source room side using type S pan head screws. Five 8'-0" lengths of 25 gauge, 7/8" hat-channel were then attached to the Green Glue® Noiseproofing Clips at 24" nominal spacing.

SHEETING

On the source side, type X gypsum board panels were installed in a vertical orientation, so the seam between panels ran parallel to the studs, and perpendicular to the hat channel. Panels were fastened to the hat channel with 1-1/4" drywall screws, spaced 12" apart. The seam between source-room panels was sealed Green Glue Noiseproofing Sealant and 1-7/8" wide 2 mil foil tape. Panels were shimmed at installation so equal gaps were at the top and bottom. Gaps were less than 1/2" in all cases. Shims were removed after sheeting was fastened and the perimeter was sealed on the source room side with Green Glue Noiseproofing Sealant and 1-7/8" wide 2 mil foil tape.

On the receiver side, type X gypsum board panels were installed in a vertical orientation, so the seam between panels ran parallel to the studs. Panels were fastened to the studs with 1-1/4” drywall screws, spaced 12” apart. The seam between receiver-room panels was sealed Green Glue Noiseproofing Sealant. Panels were shimmed at installation so equal gaps were at the top and bottom. Gaps were less than 1/2” in all cases. Shims were removed after sheeting was fastened and the perimeter was sealed on the receiver room sides with Green Glue Noiseproofing Sealant, 1-7/8” wide 2 mil foil tape and 7/8” dense putty tape.

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	**12.5**						
63	**11.7**						
80	**18.6**						
100	**23.1**	34	10.9	-29.0	-52.1	-20.0	-43.1
125	**28.7**	37	8.3	-26.0	-54.7	-20.0	-48.7
160	**36.0**	40	4.0	-23.0	-59.0	-18.0	-54.0
200	**41.7**	43	1.3	-21.0	-62.7	-18.0	-59.7
250	**45.5**	46	0.5	-19.0	-64.5	-15.0	-60.5
315	**52.0**	49	-	-17.0	-69.0	-14.0	-66.0
400	**55.5**	52	-	-15.0	-70.5	-13.0	-68.5
500	**59.3**	53	-	-13.0	-72.3	-12.0	-71.3
630	**60.9**	54	-	-12.0	-72.9	-11.0	-71.9
800	**63.1**	55	-	-11.0	-74.1	-9.0	-72.1
1000	**64.8**	56	-	-10.0	-74.8	-8.0	-72.8
1250	**65.2**	57	-	-9.0	-74.2	-9.0	-74.2
1600	**65.1**	57	-	-9.0	-74.1	-10.0	-75.1
2000	**57.9**	57	-	-9.0	-66.9	-11.0	-68.9
2500	**51.8**	57	5.2	-9.0	-60.8	-13.0	-64.8
3150	**56.3**	57	0.7	-9.0	-65.3	-15.0	-71.3
4000	**63.7**						
5000	**69.9**						
		Sum =	30.9	$R_{A,1}$ =	48.7	$R_{A,2}$ =	41.6
		R_W =	**53**	**C =**	**-4**	**C_{tr} =**	**-11**

$Rw\ (C\ ;\ Ctr) = 53\ (-4\ ;\ -11)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,50\text{-}3150\ ;\ Ctr,50\text{-}3150) = 53\ (-4\ ;\ -11\ ;\ -9\ ;\ -21)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,100\text{-}5000\ ;\ Ctr,100\text{-}5000) = 53\ (-4\ ;\ -11\ ;\ -3\ ;\ -11)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,50\text{-}5000\ ;\ Ctr,50\text{-}5000) = 53\ (-4\ ;\ -11\ ;\ -8\ ;\ -21)$

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

T E S T R E P O R T

ASTM E 90-09: 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 28, 2010
Test Number: OL10-1037

RESULT SUMMARY

STC=59

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

PREPARED BY
David M. Berg
Orfield Laboratories, Inc.
2709 East 25th Street
Minneapolis MN 55406
Voice (612) 721-2455
FAX (612) 721-2457

Prepared by:

ELECTRONICALLY REPRODUCED SIGNATURE

David M. Berg
Laboratory Manager

Reviewed By:

ELECTRONICALLY REPRODUCED SIGNATURE

Michael R. Role

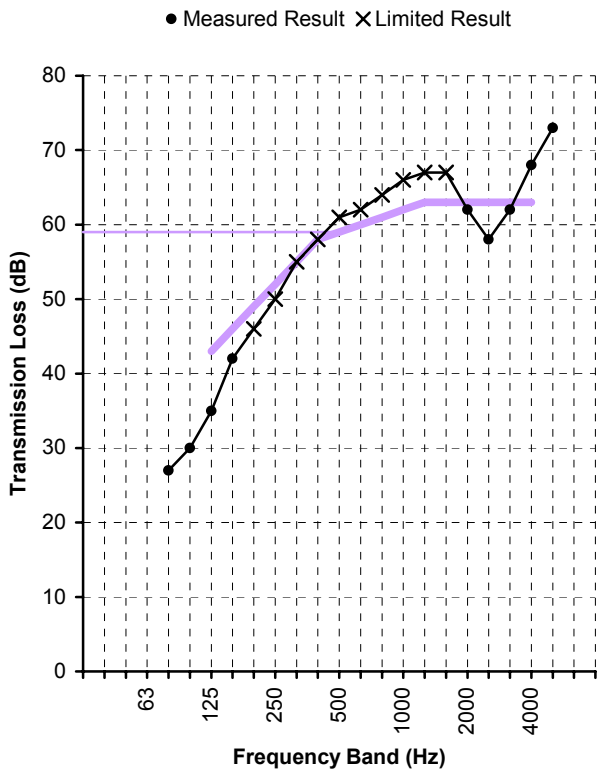
Signatures are required on this document for an official laboratory test report. Copies of this document without signatures are for reference only.

Orfield Laboratories Inc

Test Date October 28, 2010
Specimen Wall Assembly

Method ASTM Standard E90
Technician D. Berg

Single Number Rating
STC = 59



Freq. (Hz)	TL (dB)	Def. (dB)
80	27	
100	30	
125	35	8
160	42	4
200	46*	3
250	50*	2
315	55*	-
400	58*	-
500	61*	-
630	62*	-
800	64*	-
1000	66*	-
1250	67*	-
1600	67*	-
2000	62	1
2500	58	5
3150	62	1
4000	68	-
5000	73	
Total Deficiencies		24

* Estimate of lower limit

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

0.625" Type X gypsum board (h); 1.625" type W screws @ 12" O.C.
0.625" Type X gypsum board (v); 1.25" type W screws @ 12" O.C.
25 gauge hat channel @ 24" O.C.
GG Noiseproofing Clips RC (20)
3-5/8" 25 gauge steel studs @ 24" O.C.
3.5" kraft-faced insulation batts
0.625" Type X gypsum board (v); 1.25" type W screws @ 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 steel stud frame was originally constructed on October 27, 2010. The framing and insulation were retained for subsequent tests in the series. Independent contractors fabricated the test specimen and sealed it in the specimen opening. Qualified representatives of Orfield Laboratories observed the installation progress, and visually inspected the specimen prior to testing.

TEST METHODS

The methods followed these published standards:

ASTM E90-09*: *Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements*

ASTM E413-10: *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	70°F [21.1°C]
Relative Humidity	55%

Specimen Area	
Specimen Area	64.5 ft² [5.99 m²]

Chamber Volume - Airborne Transmission	
Source Room Volume	3284 ft³ [93.0 m³]
Receiving Room Volume	8079 ft³ [228.8 m³]

INSTRUMENTATION

Description	Brand	Model	S/N
Calibrator	Brüel & Kjær	Type 4230	584761
Microphone	Brüel & Kjær	Type 4134	558007
Preamplifier	Brüel & Kjær	Type 2639	1202479
Rotating Boom	Brüel & Kjær	Type 3923	2036583
Microphone	Brüel & Kjær	Type 4134	1478843
Preamplifier	Brüel & Kjær	Type 2639	1312147
Rotating Boom	Brüel & Kjær	Type 3923	890569
Power Supply	Brüel & Kjær	Type WB1057	n/a
Analyzer	Norsonic	Type 121	31185

APPENDIX B: CALCULATION RESULTS

Freq. Band (Hz)	Specimen T.L. (dB)	95% Conf. (dB)	Flanking Limit (dB)	STC Defic. (dB)
25				
31.5	**23.6**		40	
40	**18.0**		47	
50	**14.1**		43	
63	**18.0**		43	
80	**26.6**	±1.63	42	
100	**29.7**	±1.15	45	
125	**34.7**	±0.95	46	8
160	**41.9**	±1.27	52	4
200	**46.1** §	±1.24	53	3
250	**49.7** §	±0.65	56	2
315	**54.9** §	±0.65	60	-
400	**57.8** §	±0.62	61	-
500	**61.1** §	±0.40	65	-
630	**62.1** §	±0.50	66	-
800	**64.4** §	±0.40	69	-
1000	**65.7** §	±0.25	70	-
1250	**66.6** §	±0.25	72	-
1600	**67.1** §	±0.32	72	-
2000	**62.5**	±0.44	74	1
2500	**57.8**	±0.35	79	5
3150	**62.1**	±0.31	83	1
4000	**67.9**	±0.49		-
5000	**73.3**	±0.35		
6300	**74.7** *			
8000	**74.1** *			
10000	**69.4** *			
Total deficiencies below STC contour (dB)				24
STC contour [ASTM E413]				**59**

* 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 from room qualification data. Flanking Limit from chamber flanking measurements. Data available upon request. Extended frequency results below 80Hz and above 5000Hz for reference only.

APPENDIX C: SPECIMEN ASSEMBLY DESCRIPTION

The following table shows the description of the wall assembly.

Overall Mass = 473.2 lb [214.6 kg]
Overall Surface Density = 7.34 PSF [35.82 kg/m²]

Element	Mass lb [kg]	Surf. Dens. PSF [kg/m²]
0.625" Type X gypsum board (h); 1.625" type W screws @ 12" O.C.	143.3 [65.0]	2.22 [10.84]
0.625" Type X gypsum board (v); 1.25" type W screws @ 12" O.C.	143.8 [65.2]	2.23 [10.88]
25 gauge hat channel @ 24" O.C.	8.3 [3.7]	0.13 [0.62]
GG Noiseproofing Clips RC (20)	0.8 [0.4]	0.01 [0.06]
3-5/8" 25 gauge steel studs @ 24" O.C.	20.2 [9.1]	0.31 [1.53]
3.5" kraft-faced insulation batts	14.0 [6.4]	0.22 [1.06]
0.625" Type X gypsum board (v); 1.25" type W screws @ 12" O.C.	143.0 [64.9]	2.22 [10.82]

Green Glue Company Noiseproofing Clips 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 3-5/8", 25 gauge steel frame was constructed in the perimeter of the laboratory test specimen opening. The frame consisted of 3-5/8" x 1-1/4" track plates at the top and bottom, and five, 3-5/8" x 1-1/4" studs installed 24" on center. The track plates and studs were made of 25 gauge galvanized steel. The track plates and studs were fastened together with two type S pan head screws at each intersection. The perimeter of the frame was sealed to the specimen opening with Green Glue Noiseproofing Sealant.

INSULATION

3-1/2" thick kraft-faced fiberglass insulation bats were installed in the stud cavities. The insulation batts were 24" wide. The faced fiberglass batts were friction fit into each of the stud cavities with the paper facing the source room.

CLIPS AND HAT CHANNEL

Twenty (20) Green Glue Noiseproofing Clips were attached to the vertical studs on the source room side using type S pan head screws. Five 8'-0" lengths of 25 gauge, 7/8" hat-channel were then attached to the Green Glue® Noiseproofing Clips at 24" nominal spacing.

SHEETING

Two layers of 5/8” gypsum board were installed on the source room side. The base (inner) layer of type X gypsum board panels were fastened to the hat channel, so the seam between panels ran parallel to the studs, and perpendicular to the hat channel. The base layer was fastened with 1-1/4” type S screws spaced at 12” OC. The outer layer of type X gypsum board was fastened to the hat channel, driven through the first layer, with the seam between the panels running perpendicular to the studs and parallel to the hat channel. The outer (surface) layer of 5/8” type X panels were fastened to the hat channel with 1-5/8” type S drywall screws, spaced 12” apart. The seams between outer (face) layer source-room panels was sealed Green Glue Noiseproofing Sealant and 1-7/8” wide 2 mil foil tape. Panels were shimmed at installation so equal gaps were at the top and bottom. Gaps were less than 1/2” in all cases. Shims were removed after sheeting was fastened and the perimeter was sealed on the source room side with Green Glue Noiseproofing Sealant and 1-7/8” wide 2 mil foil tape.

On the receiver side, type X gypsum board panels were installed in a vertical orientation, so the seam between panels ran parallel to the studs. Panels were fastened to the studs with 1-1/4” drywall screws, spaced 12” apart. The seam between receiver-room panels was sealed with Green Glue Noiseproofing Sealant. Panels were shimmed at installation so equal gaps were at the top and bottom. Gaps were less than 1/2” in all cases. Shims were removed after sheeting was fastened and the perimeter was sealed on the receiver room sides with Green Glue Noiseproofing Sealant, 1-7/8” wide 2 mil foil tape and 7/8” dense putty tape.

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	**14.1**						
63	**18.0**						
80	**26.6**						
100	**29.7**	39	9.3	-29.0	-58.7	-20.0	-49.7
125	**34.7**	42	7.3	-26.0	-60.7	-20.0	-54.7
160	**41.9**	45	3.1	-23.0	-64.9	-18.0	-59.9
200	**46.1**	48	1.9	-21.0	-67.1	-18.0	-64.1
250	**49.7**	51	1.3	-19.0	-68.7	-15.0	-64.7
315	**54.9**	54	-	-17.0	-71.9	-14.0	-68.9
400	**57.8**	57	-	-15.0	-72.8	-13.0	-70.8
500	**61.1**	58	-	-13.0	-74.1	-12.0	-73.1
630	**62.1**	59	-	-12.0	-74.1	-11.0	-73.1
800	**64.4**	60	-	-11.0	-75.4	-9.0	-73.4
1000	**65.7**	61	-	-10.0	-75.7	-8.0	-73.7
1250	**66.6**	62	-	-9.0	-75.6	-9.0	-75.6
1600	**67.1**	62	-	-9.0	-76.1	-10.0	-77.1
2000	**62.5**	62	-	-9.0	-71.5	-11.0	-73.5
2500	**57.8**	62	4.2	-9.0	-66.8	-13.0	-70.8
3150	**62.1**	62	-	-9.0	-71.1	-15.0	-77.1
4000	**67.9**						
5000	**73.3**						
		Sum =	27.1	$R_{A,1}$ =	54.5	$R_{A,2}$ =	47.8
		R_W =	**58**	**C =**	**-4**	**C_{tr} =**	**-10**

$Rw\ (C\ ;\ Ctr) = 58\ (-4\ ;\ -10)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,50\text{-}3150\ ;\ Ctr,\,50\text{-}3150) = 58\ (-4\ ;\ -10\ ;\ -9\ ;\ -22)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,100\text{-}5000\ ;\ Ctr,100\text{-}5000) = 58\ (-4\ ;\ -10\ ;\ -3\ ;\ -10)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,50\text{-}5000\ ;\ Ctr,\,50\text{-}5000) = 58\ (-4\ ;\ -10\ ;\ -8\ ;\ -22)$

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

T E S T R E P O R T

ASTM E 90-09: 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 28, 2010
Test Number: OL10-1038

RESULT SUMMARY

STC=62

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

PREPARED BY
David M. Berg
Orfield Laboratories, Inc.
2709 East 25th Street
Minneapolis MN 55406
Voice (612) 721-2455
FAX (612) 721-2457

Prepared by:

ELECTRONICALLY REPRODUCED SIGNATURE

David M. Berg
Laboratory Manager

Reviewed By:

ELECTRONICALLY REPRODUCED SIGNATURE

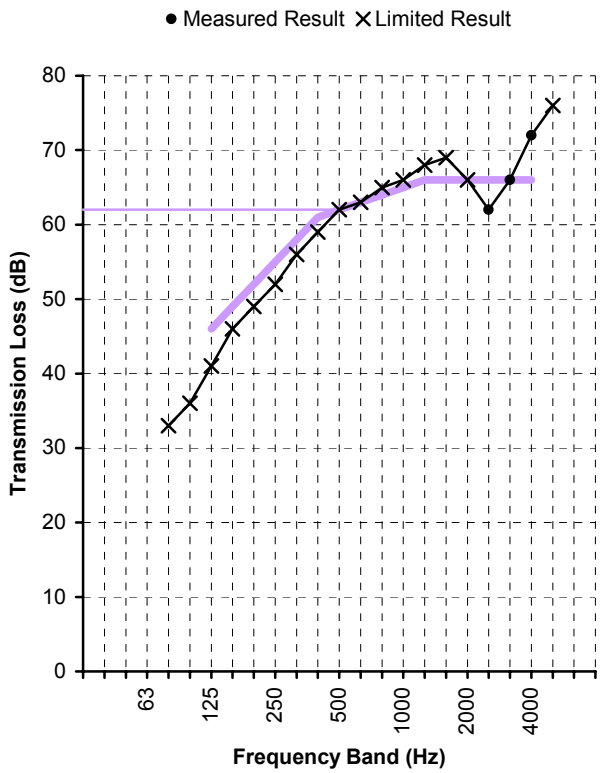
Michael R. Role

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

Test Date October 28, 2010
Specimen Wall Assembly

Method ASTM Standard E90
Technician D. Berg

Single Number Rating
STC = 62



Freq. (Hz)	TL (dB)	Def. (dB)
80	33*	
100	36*	
125	41*	5
160	46*	3
200	49*	3
250	52*	3
315	56*	2
400	59*	2
500	62*	-
630	63*	-
800	65*	-
1000	66*	-
1250	68*	-
1600	69*	-
2000	66*	-
2500	62	4
3150	66	-
4000	72	-
5000	76*	
Total Deficiencies		22

* Estimate of lower limit

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

0.625" Type X gypsum board (h); 1.625" type W screws @ 12" O.C.
0.625" Type X gypsum board (v); 1.25" type W screws @ 12" O.C.
25 gauge hat channel @ 24" O.C.
GG Noiseproofing Clips RC (20)
3-5/8" 25 gauge steel studs @ 24" O.C.
3.5" kraft-faced insulation batts
0.625" Type X gypsum board (v); 1.25" type W screws @ 12" O.C.
0.625" Type X gypsum board (h); 1.625" type W screws @ 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 steel stud frame was originally constructed on October 27, 2010. The framing and insulation were retained for subsequent tests in the series. Independent contractors fabricated the test specimen and sealed it in the specimen opening. Qualified representatives of Orfield Laboratories observed the installation progress, and visually inspected the specimen prior to testing.

TEST METHODS

The methods followed these published standards:

ASTM E90-09*: *Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements*

ASTM E413-10: *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	70°F [21.1°C]
Relative Humidity	55%

Specimen Area	
Specimen Area	64.5 ft² [5.99 m²]

Chamber Volume - Airborne Transmission	
Source Room Volume	3284 ft³ [93.0 m³]
Receiving Room Volume	8079 ft³ [228.8 m³]

INSTRUMENTATION

Description	Brand	Model	S/N
Calibrator	Brüel & Kjær	Type 4230	584761
Microphone	Brüel & Kjær	Type 4134	558007
Preamplifier	Brüel & Kjær	Type 2639	1202479
Rotating Boom	Brüel & Kjær	Type 3923	2036583
Microphone	Brüel & Kjær	Type 4134	1478843
Preamplifier	Brüel & Kjær	Type 2639	1312147
Rotating Boom	Brüel & Kjær	Type 3923	890569
Power Supply	Brüel & Kjær	Type WB1057	n/a
Analyzer	Norsonic	Type 121	31185

APPENDIX B: CALCULATION RESULTS

Freq. Band (Hz)	Specimen T.L. (dB)	95% Conf. (dB)	Flanking Limit (dB)	STC Defic. (dB)
25				
31.5	**24.6**		40	
40	**17.9**		47	
50	**21.7**		43	
63	**26.9**		43	
80	**32.6** §	±1.63	42	
100	**35.5** §	±1.15	45	
125	**40.6** §	±0.95	46	5
160	**46.3** §	±1.27	52	3
200	**49.2** §	±1.24	53	3
250	**52.5** §	±0.65	56	3
315	**56.2** §	±0.65	60	2
400	**58.9** §	±0.62	61	2
500	**62.4** §	±0.40	65	-
630	**63.4** §	±0.50	66	-
800	**65.4** §	±0.40	69	-
1000	**66.3** §	±0.25	70	-
1250	**67.7** §	±0.25	72	-
1600	**69.1** §	±0.32	72	-
2000	**65.8** §	±0.44	74	-
2500	**61.9**	±0.35	79	4
3150	**66.2**	±0.31	83	-
4000	**72.0**	±0.49		-
5000	**75.9** *	±0.35		
6300	**75.2** *			
8000	**74.5** *			
10000	**69.4** *			
Total deficiencies below STC contour (dB)				22
STC contour [ASTM E413]				**62**

* 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 from room qualification data. Flanking Limit from chamber flanking measurements. Data available upon request. Extended frequency results below 80Hz and above 5000Hz for reference only.

APPENDIX C: SPECIMEN ASSEMBLY DESCRIPTION

The following table shows the description of the wall assembly.

Overall Mass = 616.2 lb [279.5 kg]
Overall Surface Density = 9.55 PSF [46.64 kg/m²]

Element	Mass lb [kg]	Surf. Dens. PSF [kg/m²]
0.625" Type X gypsum board (h); 1.625" type W screws @ 12" O.C.	143.3 [65.0]	2.22 [10.84]
0.625" Type X gypsum board (v); 1.25" type W screws @ 12" O.C.	143.8 [65.2]	2.23 [10.88]
25 gauge hat channel @ 24" O.C.	8.3 [3.7]	0.13 [0.62]
GG Noiseproofing Clips RC (20)	0.8 [0.4]	0.01 [0.06]
3-5/8" 25 gauge steel studs @ 24" O.C.	20.2 [9.1]	0.31 [1.53]
3.5" kraft-faced insulation batts	14.0 [6.4]	0.22 [1.06]
0.625" Type X gypsum board (v); 1.25" type W screws @ 12" O.C.	143.0 [64.9]	2.22 [10.82]
0.625" Type X gypsum board (h); 1.625" type W screws @ 12" O.C.	143.0 [64.9]	2.22 [10.82]

Green Glue Company Noiseproofing Clips 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 3-5/8", 25 gauge steel frame was constructed in the perimeter of the laboratory test specimen opening. The frame consisted of 3-5/8" x 1-1/4" track plates at the top and bottom, and five, 3-5/8" x 1-1/4" studs installed 24" on center. The track plates and studs were made of 25 gauge galvanized steel. The track plates and studs were fastened together with two type S pan head screws at each intersection. The perimeter of the frame was sealed to the specimen opening with Green Glue Noiseproofing Sealant.

INSULATION

3-1/2" thick kraft-faced fiberglass insulation bats were installed in the stud cavities. The insulation batts were 24" wide. The faced fiberglass batts were friction fit into each of the stud cavities with the paper facing the source room.

CLIPS AND HAT CHANNEL

Twenty (20) Green Glue Noiseproofing Clips were attached to the vertical studs on the source room side using type S pan head screws. Five 8'-0" lengths of 25 gauge, 7/8" hat-channel were then attached to the Green Glue® Noiseproofing Clips at 24" nominal spacing.

SHEETING

Two layers of 5/8” gypsum board were installed on the source room side. The base (inner) layer of type X gypsum board panels were fastened to the hat channel, so the seam between panels ran parallel to the studs, and perpendicular to the hat channel. The base layer was fastened with 1-1/4” type S screws spaced at 12” OC. The outer layer of type X gypsum board was fastened to the hat channel, driven through the first layer, with the seam between the panels running perpendicular to the studs and parallel to the hat channel. The outer (surface) layer of 5/8” type X panels were fastened to the hat channel with 1-5/8” type S drywall screws, spaced 12” apart. The seams between outer (face) layer source-room panels was sealed Green Glue Noiseproofing Sealant and 1-7/8” wide 2 mil foil tape. Panels were shimmed at installation so equal gaps were at the top and bottom. Gaps were less than 1/2” in all cases. Shims were removed after sheeting was fastened and the perimeter was sealed on the source room side with Green Glue Noiseproofing Sealant and 1-7/8” wide 2 mil foil tape.

Two layers of 5/8” gypsum board were installed on the receiver room side. The base (inner) layer of type X gypsum board panels were fastened to the studs so the seam between panels ran parallel to the studs. The base layer was fastened with 1-1/4” type S screws spaced at 12” OC. The outer layer of type X gypsum board was fastened to the studs, driven through the first layer, with the seam between the panels running perpendicular to the studs. The outer (surface) layer of 5/8” type X panels were fastened to the studs with 1-5/8” type S drywall screws, spaced 12” apart. The seams between outer (face) layer source-room panels was sealed Green Glue Noiseproofing Sealant and 1-7/8” wide 2 mil foil tape. Panels were shimmed at installation so equal gaps were at the top and bottom. Gaps were less than 1/2” in all cases. Shims were removed after sheeting was fastened and the perimeter was sealed on the receiver room side with Green Glue Noiseproofing Sealant, 1-7/8” wide 2 mil foil tape and 7/8” dense putty tape.

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	**21.7**						
63	**26.9**						
80	**32.6**						
100	**35.5**	43	7.5	-29.0	-64.5	-20.0	-55.5
125	**40.6**	46	5.4	-26.0	-66.6	-20.0	-60.6
160	**46.3**	49	2.7	-23.0	-69.3	-18.0	-64.3
200	**49.2**	52	2.8	-21.0	-70.2	-18.0	-67.2
250	**52.5**	55	2.5	-19.0	-71.5	-15.0	-67.5
315	**56.2**	58	1.8	-17.0	-73.2	-14.0	-70.2
400	**58.9**	61	2.1	-15.0	-73.9	-13.0	-71.9
500	**62.4**	62	-	-13.0	-75.4	-12.0	-74.4
630	**63.4**	63	-	-12.0	-75.4	-11.0	-74.4
800	**65.4**	64	-	-11.0	-76.4	-9.0	-74.4
1000	**66.3**	65	-	-10.0	-76.3	-8.0	-74.3
1250	**67.7**	66	-	-9.0	-76.7	-9.0	-76.7
1600	**69.1**	66	-	-9.0	-78.1	-10.0	-79.1
2000	**65.8**	66	0.2	-9.0	-74.8	-11.0	-76.8
2500	**61.9**	66	4.1	-9.0	-70.9	-13.0	-74.9
3150	**66.2**	66	-	-9.0	-75.2	-15.0	-81.2
4000	**72.0**						
5000	**75.9**						
		Sum =	29.1	$R_{A,1}$ =	59.1	$R_{A,2}$ =	53.2
		R_W =	**62**	**C =**	**-3**	**C_{tr} =**	**-9**

$Rw\ (C\ ;\ Ctr) = 62\ (-3\ ;\ -9)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,50\text{-}3150\ ;\ Ctr,50\text{-}3150) = 62\ (-3\ ;\ -9\ ;\ -6\ ;\ -18)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,100\text{-}5000\ ;\ Ctr,100\text{-}5000) = 62\ (-3\ ;\ -9\ ;\ -2\ ;\ -9)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,50\text{-}5000\ ;\ Ctr,50\text{-}5000) = 62\ (-3\ ;\ -9\ ;\ -5\ ;\ -18)$

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

T E S T R E P O R T

ASTM E 90-09: 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: December 20, 2010
Test Number: OL10-1217

RESULT SUMMARY

STC=58

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

PREPARED BY
David M. Berg
Orfield Laboratories, Inc.
2709 East 25th Street
Minneapolis MN 55406
Voice (612) 721-2455
FAX (612) 721-2457

Prepared by:

ELECTRONICALLY REPRODUCED SIGNATURE

David M. Berg
Laboratory Manager

Reviewed By:

ELECTRONICALLY REPRODUCED SIGNATURE

Michael R. Role

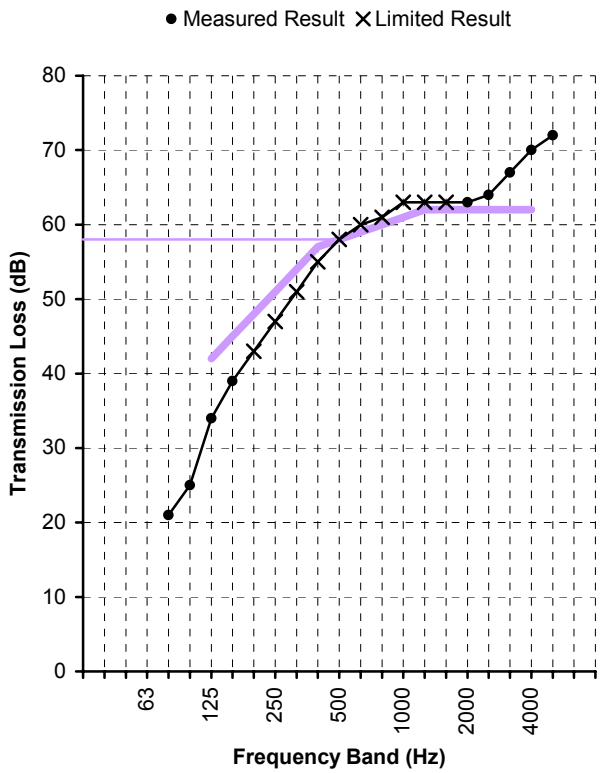
Signatures are required on this document for an official laboratory test report. Copies of this document without signatures are for reference only.

Orfield Laboratories Inc

Test Date December 20, 2010
Specimen Wall Assembly

Method ASTM Standard E90
Technician D. Berg

Single Number Rating
STC = 58



Freq. (Hz)	TL (dB)	Def. (dB)
80	21	
100	25	
125	34	8
160	39	6
200	43*	5
250	47*	4
315	51*	3
400	55*	2
500	58*	-
630	60*	-
800	61*	-
1000	63*	-
1250	63*	-
1600	63*	-
2000	63	-
2500	64	-
3150	67	-
4000	70	-
5000	72	
Total Deficiencies		28

* Estimate of lower limit

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

0.625" (16mm) type X gypsum board (v); 2" type S screw @ 12" O.C.
Green Glue @ 2 Tubes / sheet - total 116 oz / 3.43 L
0.625" (16mm) type X gypsum board (v)
2-3/4" (70mm) C-shaped steel studs @ 24" O.C.
2" (50mm) fiberglass batts
0.625" (16mm) type X gypsum board (h)
Green Glue @ 2 Tubes / sheet - total 116 oz (3.43 L)
0.625" (16mm) type X gypsum board (h); 2" type S 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 steel stud frame was originally constructed on December 20, 2010 The framing and insulation were retained for subsequent tests in the series. Independent contractors fabricated the test specimen and sealed it in the specimen opening. Qualified representatives of Orfield Laboratories observed the installation progress, and visually inspected the specimen prior to testing.

TEST METHODS

The methods followed these published standards:

ASTM E90-09*: *Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements*

ASTM E413-10: *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	70°F [21.1°C]
Relative Humidity	50%

Specimen Area	
Specimen Area	64.5 ft² [5.99 m²]

Chamber Volume - Airborne Transmission	
Source Room Volume	3284 ft³ [93.0 m³]
Receiving Room Volume	8281 ft³ [234.5 m³]

INSTRUMENTATION

Description	Brand	Model	S/N
Calibrator	Brüel & Kjær	Type 4230	584761
Microphone	Brüel & Kjær	Type 4134	558007
Preamplifier	Brüel & Kjær	Type 2639	1202479
Rotating Boom	Brüel & Kjær	Type 3923	2036583
Microphone	Brüel & Kjær	Type 4134	1478843
Preamplifier	Brüel & Kjær	Type 2639	1312147
Rotating Boom	Brüel & Kjær	Type 3923	890569
Power Supply	Brüel & Kjær	Type WB1057	n/a
Analyzer	Norsonic	Type 121	31185

APPENDIX B: CALCULATION RESULTS

Freq. Band (Hz)	Specimen T.L. (dB)	95% Conf. (dB)	Flanking Limit (dB)	STC Defic. (dB)
25				
31.5	**25.2**		40	
40	**18.6**		47	
50	**19.8**		43	
63	**17.4**		43	
80	**20.6**	±1.63	42	
100	**25.4**	±1.15	45	
125	**34.0**	±0.95	46	8
160	**39.2**	±1.27	52	6
200	**43.2** §	±1.24	53	5
250	**47.5** §	±0.65	56	4
315	**51.1** §	±0.65	60	3
400	**55.2** §	±0.62	61	2
500	**58.2** §	±0.40	65	-
630	**59.9** §	±0.50	66	-
800	**61.4** §	±0.40	69	-
1000	**63.4** §	±0.25	70	-
1250	**63.1** §	±0.25	72	-
1600	**63.4** §	±0.32	72	-
2000	**62.5**	±0.44	74	-
2500	**64.3**	±0.35	79	-
3150	**66.9**	±0.31	83	-
4000	**69.9**	±0.49		-
5000	**71.7**	±0.35		
6300	**72.9** *			
8000	**72.3** *			
10000	**67.9** *			
Total deficiencies below STC contour (dB)				28
STC contour [ASTM E413]				**58**

* 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 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 = 608.9 lb [276.2 kg]
Overall Surface Density = 9.44 PSF [46.09 kg/m²]

Element	Mass lb [kg]	Surf. Dens. PSF [kg/m²]
0.625" (16mm) type X gypsum board (v); 2" type S screw @ 12" O.C.	290.2 [131.6]	4.50 [21.97]
Green Glue @ 2 Tubes / sheet - total 116 oz / 3.43 L		
0.625" (16mm) type X gypsum board (v)		
2-5/8" (68.5mm) C-shaped steel studs @ 24" O.C.	19.4 [8.8]	0.30 [1.47]
2" (50mm) fiberglass batts	8.8 [4.0]	0.14 [0.67]
0.625" (16mm) type X gypsum board (h)		
Green Glue @ 2 Tubes / sheet - total 116 oz (3.43 L)		
0.625" (16mm) type X gypsum board (h); 2" type S screw @ 12" O.C.	290.5 [131.8]	4.50 [21.99]

Steel studs and insulation was 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 2-3/4" (68.5 mm) deep, 25 gauge (0.59mm) steel frame was constructed in the perimeter of the laboratory test specimen opening. The frame consisted of a 25 gauge steel, 2-3/4" (68.5 mm) x 1-5/8" (41mm) track plate at the top and bottom, and five, 2-3/4" x 1-1/4", 25 gauge steel studs installed, 24" (610mm) on center. The track plates and studs were fastened together with #8, 1/2" type S pan head screws at each intersection. The perimeter of the frame was sealed to the specimen opening with Green Glue Noiseproofing Sealant. Figure 1 is a photograph of the insulated steel stud frame.

Figure 1: Insulated steel stud frame viewed from source room side

INSULATION

2” (50mm) fiberglass insulation bats were installed in the stud cavities. The insulation was 24” (610mm) wide and 2” (50mm) thick. The un-faced fiberglass batts were friction fit into each of the 6 stud cavities.

SHEETING

The gypsum board sandwich panels with Green Glue adhesive were pre-laminated into sandwiches at the laboratory by independent contractors. Green Glue was applied from two 29 oz. adhesive cartridges in a random pattern over a whole 4’ x 8’ gypsum board panel. A second sheet of gypsum board was applied to the first side. The sandwich was thoroughly compressed by methodically walking over the entire face.

The assemblies were spaced out and stacked to dry with forced air ventilation. The adhesive aged from the assembly date, December 3, 2010 to the test date, December 20, 2010. This is greater than the 14 days period stated in ASTM Standard E90 for water-based adhesives.

Sandwiches on the source-room side were installed in a vertical orientation, so the seam between sandwiches ran parallel to the studs. Sandwiches were fastened to the studs with 2” drywall screws, spaced 12” apart. The seam between source-room panels was sealed Green Glue Noiseproofing Sealant. Panels were shimmed at installation so equal gaps were at the top and bottom. Gaps were less than 1/2” in all cases. Shims were removed after sheeting was fastened and the perimeter was sealed on the source and receiver room sides with Green Glue Noiseproofing Sealiant and 1-7/8” wide 2 mil foil tape.

Figure 2: Photograph of sealed source room sheeting layer

Sandwiches on the receiver-room side were installed in a horizontal orientation, so the seam between sandwiches ran perpendicular to the studs. Sandwiches were fastened to the studs with 2” drywall screws, spaced 12” apart. The seam between source-room panels was sealed Green Glue Noiseproofing Sealant. Panels were shimmed at installation so equal gaps were at the top and bottom. Gaps were less than 1/2” in all cases. Shims were removed after sheeting was fastened and the perimeter was sealed on the source and receiver room sides with Green Glue Noiseproofing Sealant and 1-7/8” wide 2 mil foil tape.

Figure 3: Photograph of receiver room sheeting layer

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	**19.8**						
63	**17.4**						
80	**20.6**						
100	**25.4**	37	11.6	-29.0	-54.4	-20.0	-45.4
125	**34.0**	40	6.0	-26.0	-60.0	-20.0	-54.0
160	**39.2**	43	3.8	-23.0	-62.2	-18.0	-57.2
200	**43.2**	46	2.8	-21.0	-64.2	-18.0	-61.2
250	**47.5**	49	1.5	-19.0	-66.5	-15.0	-62.5
315	**51.1**	52	0.9	-17.0	-68.1	-14.0	-65.1
400	**55.2**	55	-	-15.0	-70.2	-13.0	-68.2
500	**58.2**	56	-	-13.0	-71.2	-12.0	-70.2
630	**59.9**	57	-	-12.0	-71.9	-11.0	-70.9
800	**61.4**	58	-	-11.0	-72.4	-9.0	-70.4
1000	**63.4**	59	-	-10.0	-73.4	-8.0	-71.4
1250	**63.1**	60	-	-9.0	-72.1	-9.0	-72.1
1600	**63.4**	60	-	-9.0	-72.4	-10.0	-73.4
2000	**62.5**	60	-	-9.0	-71.5	-11.0	-73.5
2500	**64.3**	60	-	-9.0	-73.3	-13.0	-77.3
3150	**66.9**	60	-	-9.0	-75.9	-15.0	-81.9
4000	**69.9**						
5000	**71.7**						
		Sum =	26.6	$R_{A,1}$ =	51.8	$R_{A,2}$ =	44.3
		R_W =	**56**	**C =**	**-4**	**C_{tr} =**	**-12**

$Rw\ (C\ ;\ Ctr) = 56\ (-4\ ;\ -12)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,50\text{-}3150\ ;\ Ctr,50\text{-}3150) = 56\ (-4\ ;\ -12\ ;\ -8\ ;\ -20)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,100\text{-}5000\ ;\ Ctr,100\text{-}5000) = 56\ (-4\ ;\ -12\ ;\ -3\ ;\ -12)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,50\text{-}5000\ ;\ Ctr,50\text{-}5000) = 56\ (-4\ ;\ -12\ ;\ -7\ ;\ -20)$

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

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

PREPARED BY
David M. Berg
Orfield Laboratories, Inc.
2709 East 25th Street
Minneapolis MN 55406
Voice (612) 721-2455
FAX (612) 721-2457

Prepared by:

ELECTRONICALLY REPRODUCED SIGNATURE

David M. Berg
Laboratory Manager

Reviewed By:

ELECTRONICALLY REPRODUCED SIGNATURE

Michael R. Role

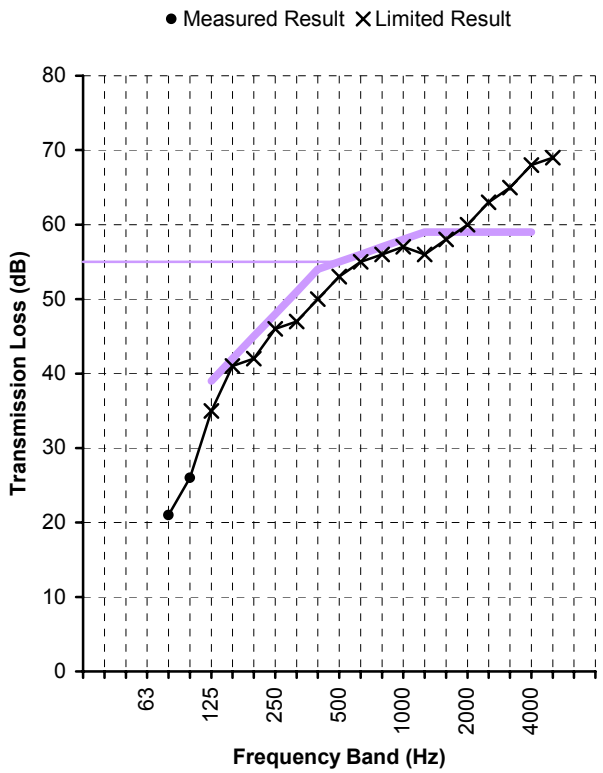
Signatures are required on this document for an official laboratory test report. Copies of this document without signatures are for reference only.

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

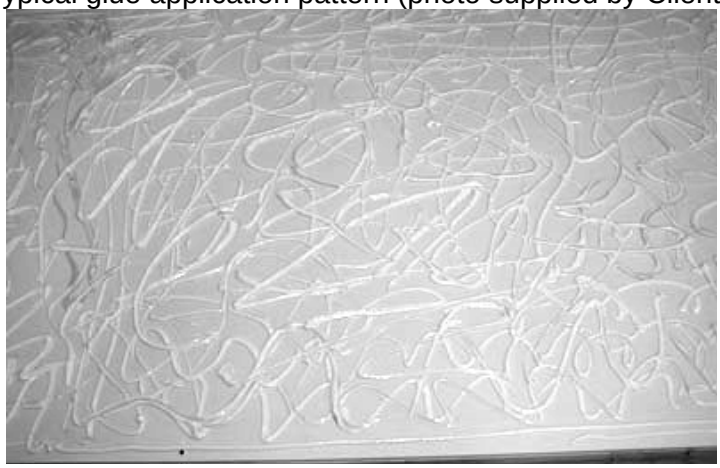
INSULATION

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

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: February 2, 2007
Test Number: OL07-0211

RESULT SUMMARY

STC=52

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

PREPARED BY
David M. Berg
Orfield Laboratories, Inc.
2709 East 25th Street
Minneapolis MN 55406
Voice (612) 721-2455
FAX (612) 721-2457

Prepared by:

ELECTRONICALLY REPRODUCED SIGNATURE

David M. Berg
Laboratory Manager

Reviewed By:

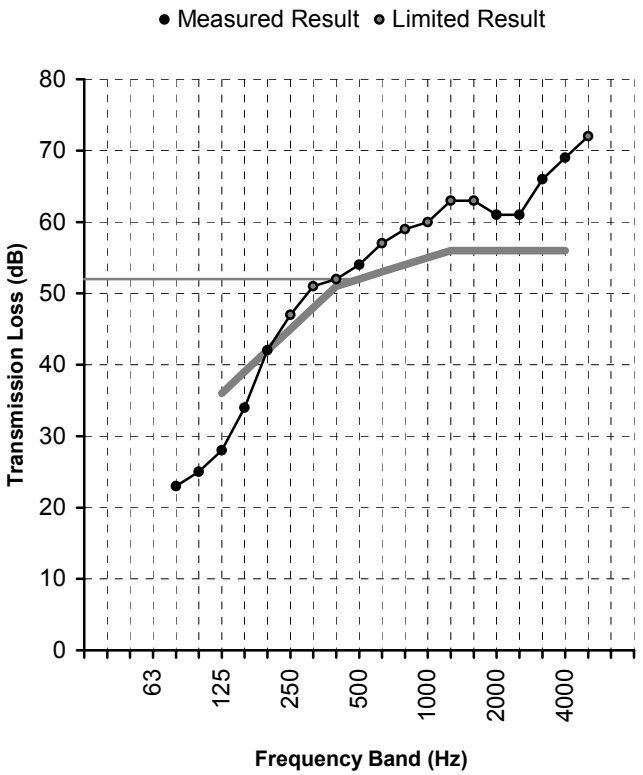
ELECTRONICALLY REPRODUCED SIGNATURE

Michael R. Role

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

Test Date February 2, 2007 **Method** ASTM Standard E90
Specimen Interior Wall Assembly

Single Number Rating
STC = 52



Freq. (Hz)	TL (dB)	Def. (dB)
80	23	
100	25	
125	28	8
160	34	5
200	42	-
250	47*	-
315	51*	-
400	52*	-
500	54	-
630	57*	-
800	59*	-
1000	60*	-
1250	63*	-
1600	63*	-
2000	61	-
2500	61	-
3150	66	-
4000	69	-
5000	72*	
Total Deficiencies		13

* Estimate of lower limit

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

0.625" (5/8") type X gypsum board; 2" screw @ 12" O.C.
Green Glue @ 2 Tubes (58 oz) / sheet - total 116 oz
0.625" Type X gypsum board
Resilient Channel @ 24" O.C.; 1.63" screw @ 16" O.C.
2x6" wood studs @ 16" O.C.
3.5" (R11) glass fiber insulation
0.625" (5/8") type X gypsum board; 1.63" screw @ 16" 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

Some parts of the assembly were used in previous tests in the series and were retained for subsequent tests in the series. Independent contractors installed the specimen wall assembly. A qualified representative of Orfield Laboratories observed the installation and visually inspected the specimen.

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	69°F [20.6°C]
Relative Humidity	48%

Specimen Area	
Specimen Area	64.5 ft² [5.99 m²]

Chamber Volume - Airborne Transmission	
Source Room Volume	3284 ft³ [93.0 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	**25.4**		40	
40	**18.7**		47	
50	**19.2**		43	
63	**18.4**		43	
80	**22.7**	±1.63	42	
100	**24.9**	±1.15	45	
125	**27.7**	±0.95	46	8
160	**34.0**	±1.27	52	5
200	**42.1**	±1.24	53	-
250	**46.6** §	±0.65	56	-
315	**51.1** §	±0.65	60	-
400	**52.2** §	±0.62	61	-
500	**54.5**	±0.40	65	-
630	**56.7** §	±0.50	66	-
800	**59.0** §	±0.40	69	-
1000	**60.5** §	±0.25	70	-
1250	**62.8** §	±0.25	72	-
1600	**62.6** §	±0.32	72	-
2000	**60.6**	±0.44	74	-
2500	**61.4**	±0.35	79	-
3150	**65.5**	±0.31	83	-
4000	**69.3**	±0.49		-
5000	**71.8** *	±0.35		
6300	**71.4** *			
8000	**71.6** *			
10000	**66.9** *			
Total deficiencies below STC contour (dB)				13
STC contour [ASTM E413]				**52**

* 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 from room qualification data. Flanking Limit from chamber flanking measurements. Data available upon request. Extended frequency results below 80Hz and above 5000Hz for reference only.

APPENDIX C: SPECIMEN ASSEMBLY DESCRIPTION

The following table shows the description of the wall assembly.

Overall Mass = 603.0 lb [273.5 kg]
Overall Surface Density = 9.35 PSF [45.65 kg/m²]

Element	Mass lb [kg]	Surf. Dens. PSF [kg/m²]
0.625" (5/8") type X gypsum board; 2" screw @ 12" O.C.	319.0 [144.7]	4.95 [24.15]
Green Glue @ 2 Tubes (58 oz) / sheet - total 116 oz		
0.625" Type X gypsum board		
Resilient Channel @ 24" O.C.; 1.63" screw @ 16" O.C.	8.0 [3.6]	0.12 [0.61]
2x6" wood studs @ 16" O.C.	117.5 [53.3]	1.82 [8.89]
3.5" (R11) glass fiber insulation	10.5 [4.8]	0.16 [0.79]
0.625" (5/8") type X gypsum board; 1.63" screw @ 16" O.C.	148.0 [67.1]	2.29 [11.20]

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 wood 2x6 sill plate was laid on the floor and a wood 2x6 top plate was bolted to the top frame in the specimen opening. Wood 2x6 studs were fastened to the sill and top plates, spaced 16” apart, on-centers. The outermost wood 2x6 studs were also bolted to each side of the specimen opening frame. Actual lumber dimensions were 1.5” x 5.5”.

INSULATION

Fiberglass insulation batts were installed in the stud cavities. The insulation batts were 15” wide, 3.5” thick, and were friction fit into each of the 6 stud cavities. The insulation was labeled with an R-value of R-11.

RESILIENT CHANNELS

Resilient channels were oriented horizontally, perpendicular to the studs, and spaced 24” on-centers. Channel was fastened to the studs with 1-5/8” drywall screws.

SHEETING

For the source side sheeting, the gypsum board panels and the Green Glue adhesive were pre-laminated into sandwiches. Each sandwich was assembled by the client off-site. According to the client, Green Glue was applied from two 29 oz. adhesive cartridges in a random pattern over a whole gypsum board panel. A second sheet of gypsum board was applied to the first side. The sandwich was thoroughly compressed by methodically walking over the entire face.

The assemblies were spaced out and stacked to dry with forced air ventilation. The adhesive aged from the assembly date, January 14, 2007 to the test date, February 2, 2007 according to the client. This is greater than the 14 day period stated in ASTM Standard E90 for water-based adhesives. Sandwiches on the source-room side were installed in a vertical orientation, so the seam between sandwiches ran along the center stud.

Sandwiches on the source-room side were installed in a vertical orientation, so the seam between sandwiches ran perpendicular to the resilient channel and parallel to the studs. Sandwiches were fastened to the resilient channel with 2" drywall screws, spaced 12" apart and taking care to avoid short-circuits. The seam between source-room panels was sealed with 1/8" strips of rope-caulk Panels were shimmed at installation so equal gaps were at the top and bottom. Gaps were less than 1/2" in all cases. Shims were removed after sheeting was fastened and the perimeter was sealed on the source and receiver room sides with 7/8" Mortite-brand rope-caulk.

Type X gypsum board panels were fastened to the studs on the receiver-room side with 1-5/8" drywall screws, spaced 16" apart, driven through to the studs. The seam between receiver-room panels was sealed with acoustical sealant.

Figure 1: Typical glue application pattern (photo supplied by Client)

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	**19.2**						
63	**18.4**						
80	**22.7**						
100	**24.9**	35	10.1	-29.0	-53.9	-20.0	-44.9
125	**27.7**	38	10.3	-26.0	-53.7	-20.0	-47.7
160	**34.0**	41	7.0	-23.0	-57.0	-18.0	-52.0
200	**42.1**	44	1.9	-21.0	-63.1	-18.0	-60.1
250	**46.6**	47	0.4	-19.0	-65.6	-15.0	-61.6
315	**51.1**	50	-	-17.0	-68.1	-14.0	-65.1
400	**52.2**	53	0.8	-15.0	-67.2	-13.0	-65.2
500	**54.5**	54	-	-13.0	-67.5	-12.0	-66.5
630	**56.7**	55	-	-12.0	-68.7	-11.0	-67.7
800	**59.0**	56	-	-11.0	-70.0	-9.0	-68.0
1000	**60.5**	57	-	-10.0	-70.5	-8.0	-68.5
1250	**62.8**	58	-	-9.0	-71.8	-9.0	-71.8
1600	**62.6**	58	-	-9.0	-71.6	-10.0	-72.6
2000	**60.6**	58	-	-9.0	-69.6	-11.0	-71.6
2500	**61.4**	58	-	-9.0	-70.4	-13.0	-74.4
3150	**65.5**	58	-	-9.0	-74.5	-15.0	-80.5
4000	**69.3**						
5000	**71.8**						
		Sum =	30.5	$R_{A,1}$ =	49.1	$R_{A,2}$ =	42.3
		R_W =	**54**	**C =**	**-5**	**C_{tr} =**	**-12**

$Rw\ (C\ ;\ Ctr) = 54\ (-5\ ;\ -12)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,50\text{-}3150\ ;\ Ctr,\,50\text{-}3150) = 54\ (-5\ ;\ -12\ ;\ -7\ ;\ -17)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,100\text{-}5000\ ;\ Ctr,100\text{-}5000) = 54\ (-5\ ;\ -12\ ;\ -4\ ;\ -12)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,50\text{-}5000\ ;\ Ctr,\,50\text{-}5000) = 54\ (-5\ ;\ -12\ ;\ -6\ ;\ -17)$

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

T E S T R E P O R T

ASTM E 90: Laboratory Measurement of Airborne Sound Transmission of Building Partitions and Elements
ASTM E 492: Laboratory Measurement of Impact Sound Transmission through Floor-Ceiling Assemblies Using the Tapping Machine

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: July 9, 2009
Test Number: OL09-0709

RESULT SUMMARY

STC=62
IIC=55

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

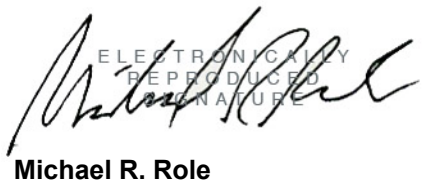
ACCREDITATION
NVLAP
For the scope of accreditation under NVLAP code 200248-0

PREPARED BY
David M. Berg
Orfield Laboratories, Inc.
2709 East 25th Street
Minneapolis MN 55406
Voice (612) 721-2455
FAX (612) 721-2457

Prepared by:

David M. Berg
Laboratory Manager

Reviewed By:



Michael R. Role

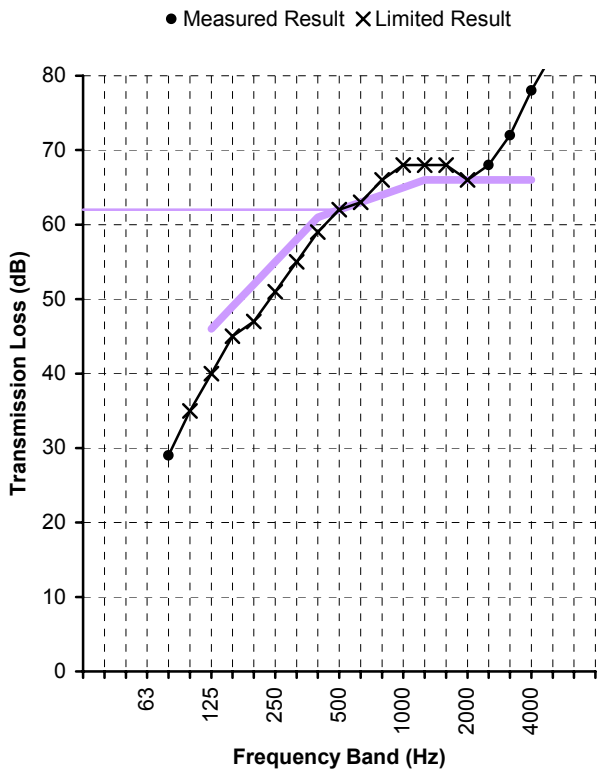
Signatures are required on this document for an official laboratory test report. Copies of this document without signatures are for reference only.

Orfield Laboratories Inc

Test Date July 9, 2009
Specimen Floor / Ceiling

Method ASTM Standard E90
Technician D. Berg

Single Number Rating
STC = 62



Freq. (Hz)	TL (dB)	Def. (dB)
80	29	
100	35*	
125	40*	6
160	45*	4
200	47*	5
250	51*	4
315	55*	3
400	59*	2
500	62*	-
630	63*	-
800	66*	-
1000	68*	-
1250	68*	-
1600	68*	-
2000	66*	-
2500	68	-
3150	72	-
4000	78	-
5000	83*	
Total Deficiencies		24

* Estimate of lower limit

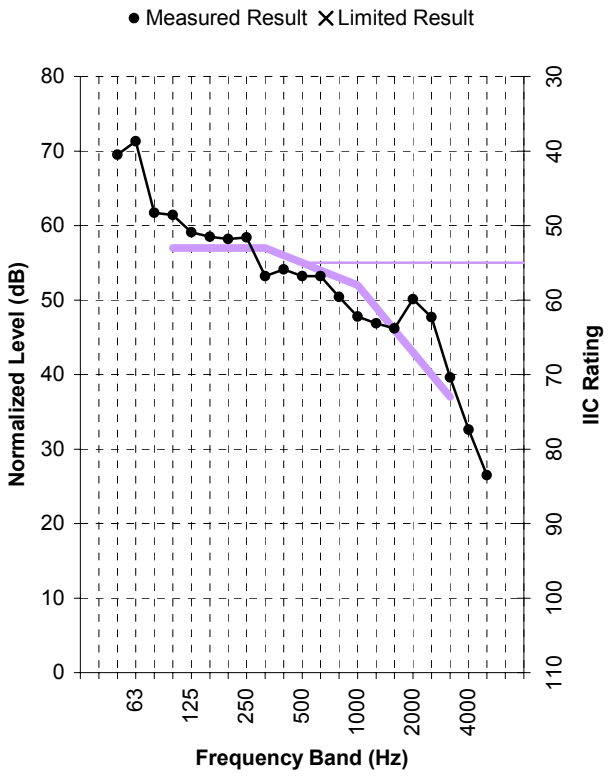
Assembly Elements (listed in order from source room side to receiver room side)

2"x2" ceramic tile raft (187.5 ft.)
with acryllic tile adhesive and sanded grout
0.5" Engineered tile backer-board (187.5 ft.); floating
1.5" (2 x 3/4") OSB GG Sandwich; 2" #9 Screw @ 12" O.C.
2 x 10 wood joists @ 16" O.C.
6.25" R19 kraft-faced CertainTeed glass fiber batt insulation
Deitrich RC Deluxe @ 24" O.C.; 1.25" drywall screw @ 24" O.C.
0.625" Type X gypsum board; 1.625" drywall screw @ 12" O.C.

Orfield Laboratories Inc

Test Date July 9, 2009 **Method** ASTM Standard E492
Specimen Floor / Ceiling

Single Number Rating
IIC = 55



Freq. (Hz)	L_n (dB)	Dev. (dB)
50	69	
63	71	
80	62	
100	61	4
125	59	2
160	59	2
200	58	1
250	58	1
315	53	-
400	54	-
500	53	-
630	53	-
800	50	-
1000	48	-
1250	47	-
1600	46	-
2000	50	7
2500	48	8
3150	40	3
4000	33	
5000	26	
Total Deviations		28

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

2"x2" ceramic tile raft (187.5 ft.)
with acryllic tile adhesive and sanded grout
0.5" Engineered tile backer-board (187.5 ft.); floating
1.5" (2 x 3/4") OSB GG Sandwich; 2" #9 Screw @ 12" O.C.
2 x 10 wood joists @ 16" O.C.
6.25" R19 kraft-faced CertainTeed glass fiber batt insulation
Deitrich RC Deluxe @ 24" O.C.; 1.25" drywall screw @ 24" O.C.
0.625" Type X gypsum board; 1.625" drywall screw @ 12" O.C.

SPECIMEN DESCRIPTION

The specimen under test was a floor / ceiling assembly. The elements in the assembly are described briefly below the results table and chart on pages 2 and 3. Detailed information regarding the specimen may be found in Appendix C.

Test results pertain to this specimen only.

INSTALLATION AND DISPOSITION

The wood joist floor was originally constructed in early June of 2010. The framing and insulation were retained from previous tests and used for subsequent tests in the series. Independent contractors fabricated the test specimen and sealed it in the specimen opening. Qualified representatives of Orfield Laboratories observed the installation progress, and visually inspected the specimen prior to 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*

ASTM E492-04*: *Standard Test Method for Laboratory Measurement of Impact Sound Transmission through Floor-Ceiling Assemblies Using the Tapping Machine*

ASTM E1332-90: *Standard Classification for Determination of ImpactInsulation Class (IIC)*

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	70°F [21.1°C]
Relative Humidity	55%

Specimen Area	
Specimen Area	176.8 ft² [16.43 m²]

Chamber Volume - Airborne Transmission	
Source Room Volume	2035 ft³ [57.6 m³]
Receiving Room Volume	8123 ft³ [230.0 m³]

Chamber Volume - Impact Transmission	
Source Room Volume	8123 ft³ [230.0 m³]
Receiving Room Volume	2035 ft³ [57.6 m³]

INSTRUMENTATION

Description	Brand	Model	S/N
Calibrator	Brüel & Kjær	Type 4230	584761
Microphone	Brüel & Kjær	Type 4134	558007
Preamplifier	Brüel & Kjær	Type 2639	1202479
Rotating Boom	Brüel & Kjær	Type 3923	2036583
Microphone	Brüel & Kjær	Type 4134	1478843
Preamplifier	Brüel & Kjær	Type 2639	1312237
Rotating Boom	Brüel & Kjær	Type 3923	890569
Analyzer	Brüel & Kjær	Type 2133	1389369

APPENDIX B: CALCULATION RESULTS

Freq. Band (Hz)	Specimen T.L. (dB)	95% Conf. (dB)	Flanking Limit (dB)	STC Defic. (dB)
25				
31.5	**34.4** §		40	
40	**21.4**		47	
50	**22.2**		43	
63	**32.7**		43	
80	**29.2**	±1.63	42	
100	**35.0** §	±1.15	45	
125	**40.4** §	±0.95	46	6
160	**44.9** §	±1.27	52	4
200	**47.2** §	±1.24	53	5
250	**50.9** §	±0.65	56	4
315	**54.9** §	±0.65	60	3
400	**59.3** §	±0.62	61	2
500	**62.0** §	±0.40	65	-
630	**63.2** §	±0.50	66	-
800	**66.2** §	±0.40	69	-
1000	**67.7** §	±0.25	70	-
1250	**68.0** §	±0.25	72	-
1600	**68.5** §	±0.32	72	-
2000	**66.1** §	±0.44	74	-
2500	**67.6**	±0.35	79	-
3150	**72.1**	±0.31	83	-
4000	**78.4**	±0.49		-
5000	**82.5** *	±0.35		
6300	**80.7** *			
8000	**77.2** *			
10000	**70.4** *			
Total deficiencies below STC contour (dB)				24
STC contour [ASTM E413]				**62**

* 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 from room qualification data. Flanking Limit from chamber flanking measurements. Data available upon request. Extended frequency results below 80Hz and above 5000Hz for reference only.

Freq. Band (Hz)	Normalized Level (L_n) (dB)	95% Confidence (dB)	IIC Deviations (dB)
25			
31.5	**59.9**		
40	**61.9**		
50	**69.5**	±0.5	
63	**71.3**	±0.6	
80	**61.7**	±0.7	
100	**61.4**	±0.4	4
125	**59.1**	±0.2	2
160	**58.5**	±0.8	2
200	**58.2**	±1.1	1
250	**58.4**	±0.5	1
315	**53.2**	±0.5	-
400	**54.1**	±0.4	-
500	**53.2**	±0.3	-
630	**53.2**	±0.2	-
800	**50.4**	±0.1	-
1000	**47.8**	±0.2	-
1250	**46.9**	±0.2	-
1600	**46.2**	±0.1	-
2000	**50.1**	±0.1	7
2500	**47.7**	±0.1	8
3150	**39.6**	±0.2	3
4000	**32.6**	±0.2	
5000	**26.5**	±0.3	
6300	**22.1** *		
8000	**20.3** *		
10000	**20.0** *		
Total deviations above IIC contour			28
IIC contour (ASTM E989)			**55**

* Actual impact isolation of specimen may be higher than measured at this frequency band. Signal-to-noise in the receiving room less than 5 dB, therefore the "background noise level was too high".

Note: 95% Confidence from room qualification data. Data available upon request. Extended frequency results below 50Hz and above 5000Hz for reference only.

APPENDIX C: SPECIMEN ASSEMBLY DESCRIPTION

The following table shows the description of the floor / ceiling assembly.

Overall Mass = 2684.8 lb [1217.8 kg]
Overall Surface Density = 15.18 PSF [74.14 kg/m²]

Element	Mass lb [kg]	Surf. Dens. PSF [kg/m²]
2"x2" ceramic tile raft (187.5 ft.)	901.0 [408.7]	5.10 [24.88]
with acryllic tile adhesive and sanded grout		
0.5" Engineered tile backer-board (187.5 ft.); floating	313.6 [142.2]	1.77 [8.66]
1.5" (2 x 3/4") OSB GG Sandwich; 2" #9 Screw @ 12" O.C.	813.3 [368.9]	4.60 [22.46]
2 x 10 wood joists @ 16" O.C.	183.0 [83.0]	1.04 [5.05]
6.25" R19 kraft-faced CertainTeed glass fiber batt insulation	52.5 [23.8]	0.30 [1.45]
Deitrich RC Deluxe @ 24" O.C.; 1.25" drywall screw @ 24" O.C.	20.0 [9.1]	0.11 [0.55]
0.625" Type X gypsum board; 1.625" drywall screw @ 12" O.C.	401.4 [182.1]	2.27 [11.08]

TILE RAFTS

2”x2” ceramic tiles were attached to 36” x 60” pieces of ½” thick engineered tile-backer board. The tiles were attached to the backer-board with acrylic tile adhesive. The tiles were then grouted with sanded tile grout. The pre-prepared and pre-dried tile rafts were floated (no fasteners) on top of the sub-floor assembly. The seams between the tile rafts were not treated.

FRAMING AND SUB-FLOOR

The laminated Green Glue sub-floor panels were supplied by the client. All other construction materials were acquired by the construction contractors through construction material suppliers. The framing and sub-floor were constructed for previous tests in this series for this client, and portions of this specimen assembly were used in subsequent tests in the series. In order to maximize the volume of the lower reverberation room (impact receiver room, airborne source room), the 2 x10 framing was constructed above the floor test opening and rested on its perimeter. The 2x10 joists were spaced at 16” O.C. The exposed vertical perimeter of the rim joists was covered by several additional layers of materials to prevent airborne flanking through the sides of the test sample. The additional layers consisted of a second 2x10 joist screwed in place and damped with Green Glue damping adhesive. Over that a 1” sandwich (2 x .5”) of Green Glue-damped cement board was attached with screws. All gaps and seams were filled with Green Glue Noiseproofing Sealant.

The sub-flooring was 2 layers of tongue-and-groove OSB laminated with Green Glue. The OSB sandwiches were fastened directly to the joists with 2”, #9 screws spaced 12”. The seams of the sub-floor were sealed with Green Glue Noiseproofing Sealant. The OSB sandwiches were laminated with Green Glue at approximately 1.8 oz per square foot. The panels were pre-assembled and dried longer than the period required by ASTM E90.

INSULATION

6-1/4” Kraft-faced glass fiber insulation batts were friction fit in each joist cavity. The insulation batts had an R-value of R19.

RESILIENT CHANNELS

Resilient Channels were installed perpendicular to the joists at 24” on center. The channels were attached to the joist bottoms with 1-1/4” type W screws. The channel was Dietrich RC Deluxe and was purchased through retail channels.

CEILING

The finished ceiling was Type X gypsum board, fastened to the resilient channel with 1-5/8” screws, spaced 12” on-center. The gypsum board seams were sealed with Green Glue Noiseproofing Sealant. The perimeter of the ceiling was sealed with Green Glue Noiseproofing Sealant and 7/8” dense putty tape.

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	**22.2**						
63	**32.7**						
80	**29.2**						
100	**35.0**	43	8.0	-29.0	-64.0	-20.0	-55.0
125	**40.4**	46	5.6	-26.0	-66.4	-20.0	-60.4
160	**44.9**	49	4.1	-23.0	-67.9	-18.0	-62.9
200	**47.2**	52	4.8	-21.0	-68.2	-18.0	-65.2
250	**50.9**	55	4.1	-19.0	-69.9	-15.0	-65.9
315	**54.9**	58	3.1	-17.0	-71.9	-14.0	-68.9
400	**59.3**	61	1.7	-15.0	-74.3	-13.0	-72.3
500	**62.0**	62	-	-13.0	-75.0	-12.0	-74.0
630	**63.2**	63	-	-12.0	-75.2	-11.0	-74.2
800	**66.2**	64	-	-11.0	-77.2	-9.0	-75.2
1000	**67.7**	65	-	-10.0	-77.7	-8.0	-75.7
1250	**68.0**	66	-	-9.0	-77.0	-9.0	-77.0
1600	**68.5**	66	-	-9.0	-77.5	-10.0	-78.5
2000	**66.1**	66	-	-9.0	-75.1	-11.0	-77.1
2500	**67.6**	66	-	-9.0	-76.6	-13.0	-80.6
3150	**72.1**	66	-	-9.0	-81.1	-15.0	-87.1
4000	**78.4**						
5000	**82.5**						
		Sum =	31.4	$R_{A,1}$ =	58.7	$R_{A,2}$ =	52.6
		R_W =	**62**	**C =**	**-3**	**C_{tr} =**	**-9**

$Rw\ (C\ ;\ Ctr) = 62\ (-3\ ;\ -9)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,50\text{-}3150\ ;\ Ctr,\,50\text{-}3150) = 62\ (-3\ ;\ -9\ ;\ -6\ ;\ -18)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,100\text{-}5000\ ;\ Ctr,100\text{-}5000) = 62\ (-3\ ;\ -9\ ;\ -2\ ;\ -9)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,50\text{-}5000\ ;\ Ctr,\,50\text{-}5000) = 62\ (-3\ ;\ -9\ ;\ -5\ ;\ -18)$

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

T E S T R E P O R T

ASTM E 90: Laboratory Measurement of Airborne Sound Transmission of Building Partitions and Elements
ASTM E 492: Laboratory Measurement of Impact Sound Transmission through Floor-Ceiling Assemblies Using the Tapping Machine

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: August 18, 2009
Test Number: OL09-0812

RESULT SUMMARY

STC=66
IIC=57

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

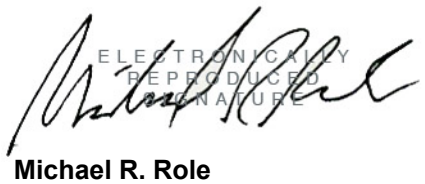
ACCREDITATION
NVLAP
For the scope of accreditation under NVLAP code 200248-0

PREPARED BY
David M. Berg
Orfield Laboratories, Inc.
2709 East 25th Street
Minneapolis MN 55406
Voice (612) 721-2455
FAX (612) 721-2457

Prepared by:

David M. Berg
Laboratory Manager

Reviewed By:



Michael R. Role

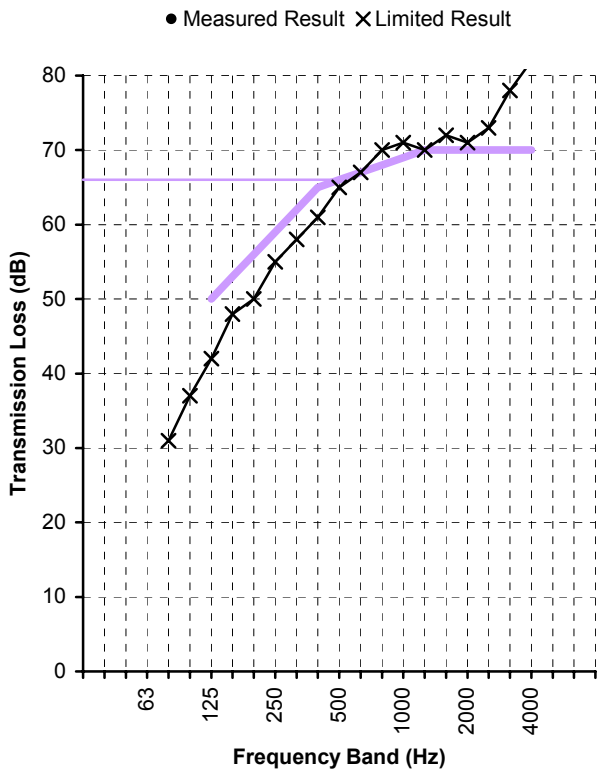
Signatures are required on this document for an official laboratory test report. Copies of this document without signatures are for reference only.

Orfield Laboratories Inc

Test Date August 18, 2009
Specimen Floor / Ceiling

Method ASTM Standard E90
Technician D. Berg

Single Number Rating
STC = 66



Freq. (Hz)	TL (dB)	Def. (dB)
80	31*	
100	37*	
125	42*	8
160	48*	5
200	50*	6
250	55*	4
315	58*	4
400	61*	4
500	65*	1
630	67*	-
800	70*	-
1000	71*	-
1250	70*	-
1600	72*	-
2000	71*	-
2500	73*	-
3150	78*	-
4000	82*	-
5000	82*	
Total Deficiencies		32

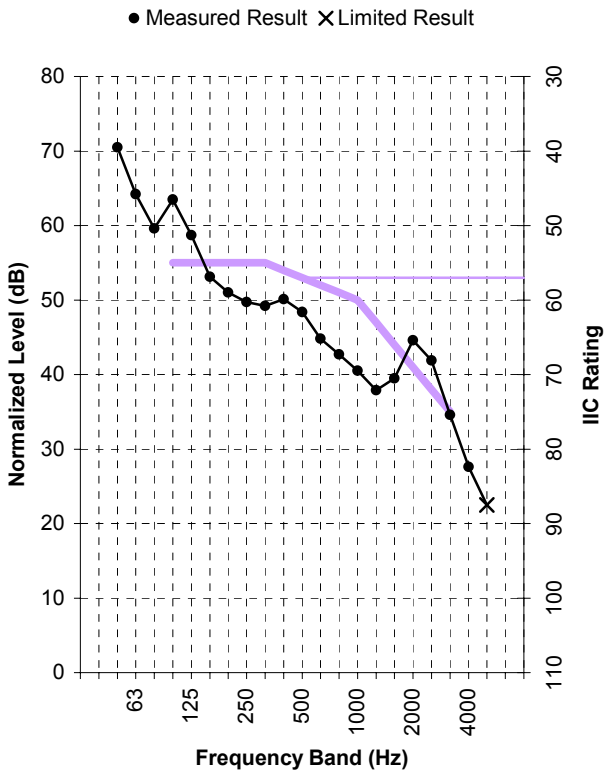
* Estimate of lower limit

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

0.1875" 2"x2" ceramic tile raft (187.5 ft.)
with acryllic tile adhesive and sanded grout
0.5" Engineered tile backer board (187.5 ft.); floating
1.5" (2 x 3/4") OSB GG Sandwich; 2" #9 Screw @ 12" O.C.
2 x 10 wood joists @ 16" O.C.
(6.25") R19 kraft-faced CertainTeed glass fiber batt insulation
GGC Soundproofing Clips RC @ 48" O.C.; 1.625" drywall screw @ 48" O.C
(7/8") Hat Channel
0.625" (5/8") Type X gypsum board; 1.625" drywall screw @ 12" O.C.

Test Date August 18, 2009 **Method** ASTM Standard E492
Specimen Floor / Ceiling

Single Number Rating
IIC = 57



Freq. (Hz)	L_n (dB)	Dev. (dB)
50	71	
63	64	
80	60	
100	63	8
125	59	4
160	53	-
200	51	-
250	50	-
315	49	-
400	50	-
500	48	-
630	45	-
800	43	-
1000	41	-
1250	38	-
1600	40	-
2000	45	4
2500	42	4
3150	35	-
4000	28	
5000	22*	
Total Deviations		20

* Limited by noise

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

0.1875" 2"x2" ceramic tile raft (187.5 ft.)
with acryllic tile adhesive and sanded grout
0.5" Engineered tile backer board (187.5 ft.); floating
1.5" (2 x 3/4") OSB GG Sandwich; 2" #9 Screw @ 12" O.C.
2 x 10 wood joists @ 16" O.C.
(6.25") R19 kraft-faced CertainTeed glass fiber batt insulation
GGC Soundproofing Clips RC @ 48" O.C.; 1.625" drywall screw @ 48" O.C
(7/8") Hat Channel
0.625" (5/8") Type X gypsum board; 1.625" drywall screw @ 12" O.C.

SPECIMEN DESCRIPTION

The specimen under test was a floor / ceiling assembly. The elements in the assembly are described briefly below the results table and chart on pages 2 and 3. Detailed information regarding the specimen may be found in Appendix C.

Test results pertain to this specimen only.

INSTALLATION AND DISPOSITION

The wood joist floor was originally constructed in early June of 2010. The framing and insulation were retained from previous tests and used for subsequent tests in the series. Independent contractors fabricated the test specimen and sealed it in the specimen opening. Qualified representatives of Orfield Laboratories observed the installation progress, and visually inspected the specimen prior to 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*

ASTM E492-04*: *Standard Test Method for Laboratory Measurement of Impact Sound Transmission through Floor-Ceiling Assemblies Using the Tapping Machine*

ASTM E1332-90: *Standard Classification for Determination of ImpactInsulation Class (IIC)*

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	70°F [21.1°C]
Relative Humidity	55%

Specimen Area	
Specimen Area	187.5 ft² [17.42 m²]

Chamber Volume - Airborne Transmission	
Source Room Volume	2019 ft³ [57.2 m³]
Receiving Room Volume	8079 ft³ [228.8 m³]

Chamber Volume - Impact Transmission	
Source Room Volume	8079 ft³ [228.8 m³]
Receiving Room Volume	2019 ft³ [57.2 m³]

INSTRUMENTATION

Description	Brand	Model	S/N
Calibrator	Brüel & Kjær	Type 4230	584761
Microphone	Brüel & Kjær	Type 4134	558007
Preamplifier	Brüel & Kjær	Type 2639	1202479
Rotating Boom	Brüel & Kjær	Type 3923	2036583
Microphone	Brüel & Kjær	Type 4134	1478843
Preamplifier	Brüel & Kjær	Type 2639	1312237
Rotating Boom	Brüel & Kjær	Type 3923	890569
Analyzer	Brüel & Kjær	Type 2133	1389369

APPENDIX B: CALCULATION RESULTS

Freq. Band (Hz)	Specimen T.L. (dB)	95% Conf. (dB)	Flanking Limit (dB)	STC Defic. (dB)
25				
31.5	**32.3** §		35	
40	**23.3** §		33	
50	**24.5**		35	
63	**33.1** §		42	
80	**31.0** §	±1.63	40	
100	**36.9** §	±1.15	44	
125	**41.7** §	±0.95	48	8
160	**47.6** §	±1.27	47	5
200	**50.2** §	±1.24	48	6
250	**54.9** §	±0.65	54	4
315	**57.5** §	±0.65	58	4
400	**60.7** §	±0.62	62	4
500	**64.6** §	±0.40	67	1
630	**67.0** §	±0.50	69	-
800	**69.8** §	±0.40	72	-
1000	**70.7** §	±0.25	73	-
1250	**69.9** §	±0.25	72	-
1600	**71.5** §	±0.32	74	-
2000	**70.7** §	±0.44	78	-
2500	**73.2** §	±0.35	81	-
3150	**78.4** §	±0.31	81	-
4000	**81.8** *§	±0.49	78	-
5000	**82.3** *§	±0.35	77	
6300	**78.8** *§		73	
8000	**75.1** *§		69	
10000	**68.4** *§		61	
Total deficiencies below STC contour (dB)				32
STC contour [ASTM E413]				**66**

* 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 from room qualification data. Flanking Limit from chamber flanking measurements. Data available upon request. Extended frequency results below 80Hz and above 5000Hz for reference only.

Freq. Band (Hz)	Normalized Level (L_n) (dB)	95% Confidence (dB)	IIC Deviations (dB)
25			
31.5	**59.0**		
40	**62.8**		
50	**70.5**	±0.5	
63	**64.2**	±0.6	
80	**59.6**	±0.7	
100	**63.5**	±0.4	8
125	**58.7**	±0.2	4
160	**53.1**	±0.8	-
200	**51.0**	±1.1	-
250	**49.7**	±0.5	-
315	**49.2**	±0.5	-
400	**50.1**	±0.4	-
500	**48.4**	±0.3	-
630	**44.8**	±0.2	-
800	**42.7**	±0.1	-
1000	**40.5**	±0.2	-
1250	**37.9**	±0.2	-
1600	**39.5**	±0.1	-
2000	**44.6**	±0.1	4
2500	**41.9**	±0.1	4
3150	**34.6**	±0.2	-
4000	**27.6**	±0.2	
5000	**22.5** *	±0.3	
6300	**21.4** *		
8000	**21.4** *		
10000	**20.8** *		
Total deviations above IIC contour			20
IIC contour (ASTM E989)			**57**

* Actual impact isolation of specimen may be higher than measured at this frequency band. Signal-to-noise in the receiving room less than 5 dB, therefore the "background noise level was too high".

Note: 95% Confidence from room qualification data. Data available upon request. Extended frequency results below 50Hz and above 5000Hz for reference only.

APPENDIX C: SPECIMEN ASSEMBLY DESCRIPTION

The following table shows the description of the floor / ceiling assembly.

Overall Mass = 2342.4 lb [1062.5 kg]
Overall Surface Density = 12.49 PSF [61.00 kg/m²]

Element	Mass lb [kg]	Surf. Dens. PSF [kg/m²]
0.1875" 2"x2" ceramic tile raft (187.5 ft.)	901.0 [408.7]	4.81 [23.46]
with acryllic tile adhesive and sanded grout		
0.5" Engineered tile backer board (187.5 ft.); floating		
1.5" (2 x 3/4") OSB GG Sandwich; 2" #9 Screw @ 12" O.C.	813.3 [368.9]	4.34 [21.18]
2 x 10 wood joists @ 16" O.C.	183.0 [83.0]	0.98 [4.77]
(6.25") R19 kraft-faced CertainTeed glass fiber batt insulation	52.5 [23.8]	0.28 [1.37]
GGC Soundproofing Clips RC @ 48" O.C.; 1.625" drywall screw @ 48" O.C.	1.2 [0.5]	0.01 [0.03]
(7/8") Hat Channel	20.4 [9.3]	0.11 [0.53]
0.625" (5/8") Type X gypsum board; 1.625" drywall screw @ 12" O.C.	371.0 [168.3]	1.98 [9.66]

TILE RAFTS

2”x2” ceramic tiles were attached to 36” x 60” pieces of ½” thick engineered tile-backer board. The tiles were attached to the backer-board with acrylic tile adhesive. The tiles were then grouted with sanded tile grout. The pre-prepared and pre-dried tile rafts were floated (no fasteners) on top of the sub-floor assembly. The seams between the tile rafts were not treated.

FRAMING AND SUB-FLOOR

The laminated Green Glue sub-floor panels were supplied by the client. All other construction materials were acquired by the construction contractors through construction material suppliers. The framing and sub-floor were constructed for previous tests in this series for this client, and portions of this specimen assembly were used in subsequent tests in the series. In order to maximize the volume of the lower reverberation room (impact receiver room, airborne source room), the 2 x10 framing was constructed above the floor test opening and rested on its perimeter. The 2x10 joists were spaced at 16” O.C. The exposed vertical perimeter of the rim joists was covered by several additional layers of materials to prevent airborne flanking through the sides of the test sample. The additional layers consisted of a second 2x10 joist screwed in place and damped with Green Glue damping adhesive. Over that a 1” sandwich (2 x .5”) of Green Glue-damped cement board was attached with screws. All gaps and seams were filled with Green Glue Noiseproofing Sealant.

The sub-flooring was 2 layers of tongue-and-groove OSB laminated with Green Glue. The OSB sandwiches were fastened directly to the joists with 2”, #9 screws spaced 12”. The seams of the sub-floor were sealed with Green Glue Noiseproofing Sealant. The OSB sandwiches were laminated with Green Glue at approximately 1.8 oz per square foot. The panels were pre-assembled and dried longer than the period required by ASTM E90.

INSULATION

6-1/4” Kraft-faced glass fiber insulation batts were friction fit in each joist cavity. The insulation batts had an R-value of R19.

CLIPS AND HAT CHANNEL

Green Glue Soundproofing Clips RC were attached to the bottoms of the joists at 48” on center spacing with 1/5/8” type W screws. 25 gauge, 7/8” hat channels were affixed to the clips perpendicular to the joists. The channels were installed 24” on center.

CEILING

The finished ceiling was Type X gypsum board, fastened to the 7/8” hat channel with 1-5/8” screws, spaced 12” on-center. The gypsum board seams were sealed with Green Glue Noiseproofing Sealant. The perimeter of the ceiling was sealed with Green Glue Noiseproofing Sealant and 7/8” dense putty tape.

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	**24.5**						
63	**33.1**						
80	**31.0**						
100	**36.9**	45	8.1	-29.0	-65.9	-20.0	-56.9
125	**41.7**	48	6.3	-26.0	-67.7	-20.0	-61.7
160	**47.6**	51	3.4	-23.0	-70.6	-18.0	-65.6
200	**50.2**	54	3.8	-21.0	-71.2	-18.0	-68.2
250	**54.9**	57	2.1	-19.0	-73.9	-15.0	-69.9
315	**57.5**	60	2.5	-17.0	-74.5	-14.0	-71.5
400	**60.7**	63	2.3	-15.0	-75.7	-13.0	-73.7
500	**64.6**	64	-	-13.0	-77.6	-12.0	-76.6
630	**67.0**	65	-	-12.0	-79.0	-11.0	-78.0
800	**69.8**	66	-	-11.0	-80.8	-9.0	-78.8
1000	**70.7**	67	-	-10.0	-80.7	-8.0	-78.7
1250	**69.9**	68	-	-9.0	-78.9	-9.0	-78.9
1600	**71.5**	68	-	-9.0	-80.5	-10.0	-81.5
2000	**70.7**	68	-	-9.0	-79.7	-11.0	-81.7
2500	**73.2**	68	-	-9.0	-82.2	-13.0	-86.2
3150	**78.4**	68	-	-9.0	-87.4	-15.0	-93.4
4000	**81.8**						
5000	**82.3**						
		Sum =	28.5	$R_{A,1}$ =	61.1	$R_{A,2}$ =	54.6
		R_W =	**64**	**C =**	**-3**	**C_{tr} =**	**-9**

$Rw\ (C\ ;\ Ctr) = 64\ (-3\ ;\ -9)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,50\text{-}3150\ ;\ Ctr,50\text{-}3150) = 64\ (-3\ ;\ -9\ ;\ -6\ ;\ -18)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,100\text{-}5000\ ;\ Ctr,100\text{-}5000) = 64\ (-3\ ;\ -9\ ;\ -2\ ;\ -9)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,50\text{-}5000\ ;\ Ctr,50\text{-}5000) = 64\ (-3\ ;\ -9\ ;\ -5\ ;\ -18)$

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

T E S T R E P O R T

ASTM E 90: Laboratory Measurement of Airborne Sound Transmission of Building Partitions and Elements
ASTM E 492: Laboratory Measurement of Impact Sound Transmission through Floor-Ceiling Assemblies Using the Tapping Machine

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: January 15, 2010
Test Number: OL10-0108

RESULT SUMMARY

STC=60
IIC=58

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

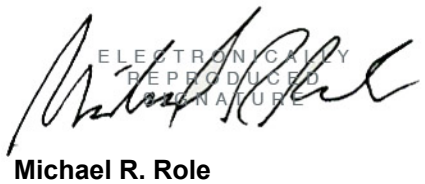
ACCREDITATION
NVLAP
For the scope of accreditation under NVLAP code 200248-0

PREPARED BY
David M. Berg
Orfield Laboratories, Inc.
2709 East 25th Street
Minneapolis MN 55406
Voice (612) 721-2455
FAX (612) 721-2457

Prepared by:

David M. Berg
Laboratory Manager

Reviewed By:



Michael R. Role

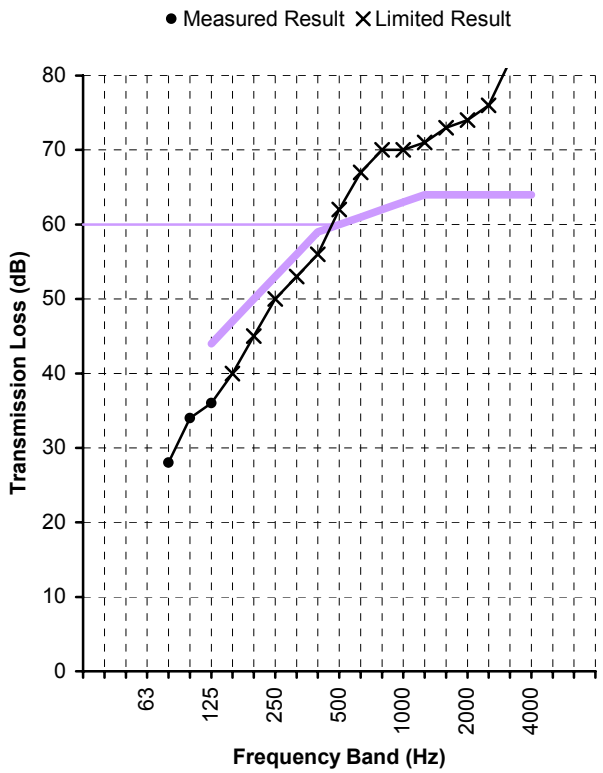
Signatures are required on this document for an official laboratory test report. Copies of this document without signatures are for reference only.

Orfield Laboratories Inc

Test Date January 15, 2010
Specimen Floor / Ceiling

Method ASTM Standard E90
Technician D. Berg

Single Number Rating
STC = 60



Freq. (Hz)	TL (dB)	Def. (dB)
80	28	
100	34	
125	36	8
160	40*	7
200	45*	5
250	50*	3
315	53*	3
400	56*	3
500	62*	-
630	67*	-
800	70*	-
1000	70*	-
1250	71*	-
1600	73*	-
2000	74*	-
2500	76*	-
3150	82*	-
4000	83*	-
5000	83*	
Total Deficiencies		29

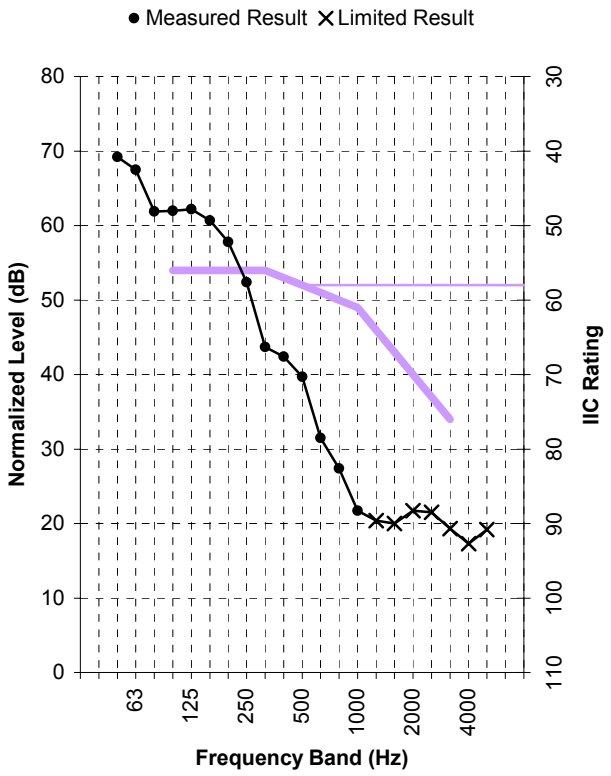
* Estimate of lower limit

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

0.281" (9/32") laminate flooring
1.5" (2 x 3/4") OSB GG Sandwich; 3" Screw @ 12" O.C.
2 x 10 wood joists @ 16" O.C.
(6.25") R19 kraft-faced CertainTeed glass fiber batt insulation
GGC Noiseproofing Clips RC @ 48" O.C.; 1.625" drywall screw @ 48" O.C.
(7/8") hat channel
0.625" (5/8") type X gypsum board; 1.625" drywall screw @ 12" O.C.

Test Date January 15, 2010 **Method** ASTM Standard E492
Specimen Floor / Ceiling

Single Number Rating
IIC = 58



Freq. (Hz)	L_n (dB)	Dev. (dB)
50	69	
63	67	
80	62	
100	62	8
125	62	8
160	61	7
200	58	4
250	52	-
315	44	-
400	42	-
500	40	-
630	31	-
800	27	-
1000	22	-
1250	20*	-
1600	20*	-
2000	22*	-
2500	21*	-
3150	19*	-
4000	17*	
5000	19*	
Total Deviations		27

* Limited by noise

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

0.281" (9/32") laminate flooring
1.5" (2 x 3/4") OSB GG Sandwich; 3" Screw @ 12" O.C.
2 x 10 wood joists @ 16" O.C.
(6.25") R19 kraft-faced CertainTeed glass fiber batt insulation
GGC Noiseproofing Clips RC @ 48" O.C.; 1.625" drywall screw @ 48" O.C.
(7/8") hat channel
0.625" (5/8") type X gypsum board; 1.625" drywall screw @ 12" O.C.

SPECIMEN DESCRIPTION

The specimen under test was a floor / ceiling assembly. The elements in the assembly are described briefly below the results table and chart on pages 2 and 3. Detailed information regarding the specimen may be found in Appendix C.

Test results pertain to this specimen only.

INSTALLATION AND DISPOSITION

The wood joist floor was originally constructed in early June of 2010. The framing and insulation were retained from previous tests and used for subsequent tests in the series. Independent contractors fabricated the test specimen and sealed it in the specimen opening. Qualified representatives of Orfield Laboratories observed the installation progress, and visually inspected the specimen prior to 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*

ASTM E492-04*: *Standard Test Method for Laboratory Measurement of Impact Sound Transmission through Floor-Ceiling Assemblies Using the Tapping Machine*

ASTM E1332-90: *Standard Classification for Determination of ImpactInsulation Class (IIC)*

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	55%

Specimen Area	
Specimen Area	187.5 ft² [17.42 m²]

Chamber Volume - Airborne Transmission	
Source Room Volume	2019 ft³ [57.2 m³]
Receiving Room Volume	8079 ft³ [228.8 m³]

Chamber Volume - Impact Transmission	
Source Room Volume	8079 ft³ [228.8 m³]
Receiving Room Volume	2019 ft³ [57.2 m³]

INSTRUMENTATION

Description	Brand	Model	S/N
Calibrator	Brüel & Kjær	Type 4230	584761
Microphone	Brüel & Kjær	Type 4134	558007
Preamplifier	Brüel & Kjær	Type 2639	1202479
Rotating Boom	Brüel & Kjær	Type 3923	2036583
Microphone	Brüel & Kjær	Type 4134	1478843
Preamplifier	Brüel & Kjær	Type 2639	1312237
Rotating Boom	Brüel & Kjær	Type 3923	890569
Analyzer	Brüel & Kjær	Type 2133	1389369

APPENDIX B: CALCULATION RESULTS

Freq. Band (Hz)	Specimen T.L. (dB)	95% Conf. (dB)	Flanking Limit (dB)	STC Defic. (dB)
25				
31.5	**28.8** §		35	
40	**21.7**		33	
50	**27.9** §		35	
63	**33.6** §		42	
80	**27.7**	±1.63	40	
100	**33.5**	±1.15	44	
125	**36.1**	±0.95	48	8
160	**39.7** §	±1.27	47	7
200	**45.1** §	±1.24	48	5
250	**49.8** §	±0.65	54	3
315	**52.7** §	±0.65	58	3
400	**56.0** §	±0.62	62	3
500	**62.1** §	±0.40	67	-
630	**66.5** §	±0.50	69	-
800	**69.5** §	±0.40	72	-
1000	**70.2** §	±0.25	73	-
1250	**70.8** §	±0.25	72	-
1600	**73.1** §	±0.32	74	-
2000	**74.4** §	±0.44	78	-
2500	**76.5** §	±0.35	81	-
3150	**81.8** §	±0.31	81	-
4000	**82.9** *§	±0.49	78	-
5000	**82.9** *§	±0.35	77	
6300	**79.8** *§		73	
8000	**76.7** *§		69	
10000	**71.3** *§		61	
Total deficiencies below STC contour (dB)				29
STC contour [ASTM E413]				**60**

* 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 from room qualification data. Flanking Limit from chamber flanking measurements. Data available upon request. Extended frequency results below 80Hz and above 5000Hz for reference only.

Freq. Band (Hz)	Normalized Level (L_n) (dB)	95% Confidence (dB)	IIC Deviations (dB)
25			
31.5	**74.7**		
40	**69.5**		
50	**69.2**	±0.5	
63	**67.5**	±0.6	
80	**61.9**	±0.7	
100	**62.0**	±0.4	8
125	**62.2**	±0.2	8
160	**60.7**	±0.8	7
200	**57.8**	±1.1	4
250	**52.4**	±0.5	-
315	**43.7**	±0.5	-
400	**42.4**	±0.4	-
500	**39.7**	±0.3	-
630	**31.5**	±0.2	-
800	**27.4**	±0.1	-
1000	**21.7**	±0.2	-
1250	**20.4** *	±0.2	-
1600	**20.0** *	±0.1	-
2000	**21.7** *	±0.1	-
2500	**21.5** *	±0.1	-
3150	**19.3** *	±0.2	-
4000	**17.3** *	±0.2	
5000	**19.2** *	±0.3	
6300	**20.1** *		
8000	**21.3** *		
10000	**20.9** *		
Total deviations above IIC contour			27
IIC contour (ASTM E989)			**58**

* Actual impact isolation of specimen may be higher than measured at this frequency band. Signal-to-noise in the receiving room less than 5 dB, therefore the "background noise level was too high".

Note: 95% Confidence from room qualification data. Data available upon request. Extended frequency results below 50Hz and above 5000Hz for reference only.

APPENDIX C: SPECIMEN ASSEMBLY DESCRIPTION

The following table shows the description of the floor / ceiling assembly.

Overall Mass = 1698.4 lb [770.4 kg]
Overall Surface Density = 9.06 PSF [44.23 kg/m²]

Element	Mass lb [kg]	Surf. Dens. PSF [kg/m²]
0.281" (9/32") laminate flooring	241.0 [109.3]	1.29 [6.28]
1.5" (2 x 3/4") OSB GG Sandwich; 3" Screw @ 12" O.C.	813.3 [368.9]	4.34 [21.18]
2 x 10 wood joists @ 16" O.C.	183.0 [83.0]	0.98 [4.77]
(6.25") R19 kraft-faced CertainTeed glass fiber batt insulation	52.5 [23.8]	0.28 [1.37]
GGC Noiseproofing Clips RC @ 48" O.C.; 1.625" drywall screw @ 48" O.C.	1.2 [0.5]	0.01 [0.03]
(7/8") hat channel	20.4 [9.3]	0.11 [0.53]
0.625" (5/8") type X gypsum board; 1.625" drywall screw @ 12" O.C.	387.0 [175.5]	2.06 [10.08]

FLOORING

Tongue and groove 9/32” laminated flooring was installed floating on the OSB sandwich sub-floor.

FRAMING AND SUB-FLOOR

The laminated Green Glue sub-floor panels were supplied by the client. All other construction materials were acquired by the construction contractors through construction material suppliers. The framing and sub-floor were constructed for previous tests in this series for this client, and portions of this specimen assembly were used in subsequent tests in the series. In order to maximize the volume of the lower reverberation room (impact receiver room, airborne source room), the 2 x10 framing was constructed above the floor test opening and rested on its perimeter. The 2x10 joists were spaced at 16” O.C. The exposed vertical perimeter of the rim joists was covered by several additional layers of materials to prevent airborne flanking through the sides of the test sample. The additional layers consisted of a second 2x10 joist screwed in place and damped with Green Glue damping adhesive. Over that a 1” sandwich (2 x .5”) of Green Glue-damped cement board was attached with screws. All gaps and seams were filled with Green Glue Noiseproofing Sealant.

The sub-flooring was 2 layers of tongue-and-groove OSB laminated with Green Glue. The OSB sandwiches were fastened directly to the joists with 2”, #9 screws spaced 12”. The seams of the sub-floor were sealed with Green Glue Noiseproofing Sealant. The OSB sandwiches were laminated with Green Glue at approximately 1.8 oz per square foot. The panels were pre-assembled and dried longer than the period required by ASTM E90.

INSULATION

6-1/4” Kraft-faced glass fiber insulation batts were friction fit in each joist cavity. The insulation batts had an R-value of R19.

CLIPS AND HAT CHANNEL

Green Glue Soundproofing Clips RC were attached to the bottoms of the joists at 48” on center spacing with 1/5/8” type W screws. 25 gauge, 7/8” hat channels were affixed to the clips perpendicular to the joists. The channels were installed 24” on center.

CEILING

The finished ceiling was Type X gypsum board, fastened to the 7/8” hat channel with 1-5/8” screws, spaced 12” on-center. The gypsum board seams were sealed with Green Glue Noiseproofing Sealant. The perimeter of the ceiling was sealed with Green Glue Noiseproofing Sealant and 7/8” dense putty tape.

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	**27.9**						
63	**33.6**						
80	**27.7**						
100	**33.5**	40	6.5	-29.0	-62.5	-20.0	-53.5
125	**36.1**	43	6.9	-26.0	-62.1	-20.0	-56.1
160	**39.7**	46	6.3	-23.0	-62.7	-18.0	-57.7
200	**45.1**	49	3.9	-21.0	-66.1	-18.0	-63.1
250	**49.8**	52	2.2	-19.0	-68.8	-15.0	-64.8
315	**52.7**	55	2.3	-17.0	-69.7	-14.0	-66.7
400	**56.0**	58	2.0	-15.0	-71.0	-13.0	-69.0
500	**62.1**	59	-	-13.0	-75.1	-12.0	-74.1
630	**66.5**	60	-	-12.0	-78.5	-11.0	-77.5
800	**69.5**	61	-	-11.0	-80.5	-9.0	-78.5
1000	**70.2**	62	-	-10.0	-80.2	-8.0	-78.2
1250	**70.8**	63	-	-9.0	-79.8	-9.0	-79.8
1600	**73.1**	63	-	-9.0	-82.1	-10.0	-83.1
2000	**74.4**	63	-	-9.0	-83.4	-11.0	-85.4
2500	**76.5**	63	-	-9.0	-85.5	-13.0	-89.5
3150	**81.8**	63	-	-9.0	-90.8	-15.0	-96.8
4000	**82.9**						
5000	**82.9**						
		Sum =	30.1	$R_{A,1}$ =	56.3	$R_{A,2}$ =	50.0
		R_W =	**59**	**C =**	**-3**	**C_{tr} =**	**-9**

$Rw\ (C\ ;\ Ctr) = 59\ (-3\ ;\ -9)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,50\text{-}3150\ ;\ Ctr,\,50\text{-}3150) = 59\ (-3\ ;\ -9\ ;\ -4\ ;\ -14)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,100\text{-}5000\ ;\ Ctr,100\text{-}5000) = 59\ (-3\ ;\ -9\ ;\ -2\ ;\ -9)$

$Rw\ (C\ ;\ Ctr\ ;\ C\,50\text{-}5000\ ;\ Ctr,\,50\text{-}5000) = 59\ (-3\ ;\ -9\ ;\ -3\ ;\ -14)$

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