NORTH ORBIT
ACOUSTIC LABORATORIES
P.O. Box 6948, Minneapolis MN 55406-0948

Test Report ASTM E90

Prepared For: NOAL
13191 Cross Road Parkway, Suite 325 City of Industry, CA 9174

ACCREDITED
Certificate #4240.01

Test Number: NOAL 19-0117
Test Date: 1/30/19
Report Date: 3/5/19

ASTM E90-09 (2016): Laboratory Measurement of Airborne Sound Transmission of Building Partitions and Elements

Result Summary: STC 50

Specimen: Wall Assembly

Method: ASTM E90-09 (2016)

Test Site: North Orbit Acoustic Laboratory Facility
512 5th Street NW
Dyersville, IA 52040

Technician: D. Berg

Prepared by: David M. Berg
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P.O. Box 6948
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ELECTRONICALLY REPRODUCED SIGNATURE

David M. Berg
Laboratory Manager

ELECTRONICALLY REPRODUCED SIGNATURE

Heide Gross
Laboratory Quality Manager

Two signatures are required for an official laboratory test report.
Copies without signatures are considered to be for reference only.

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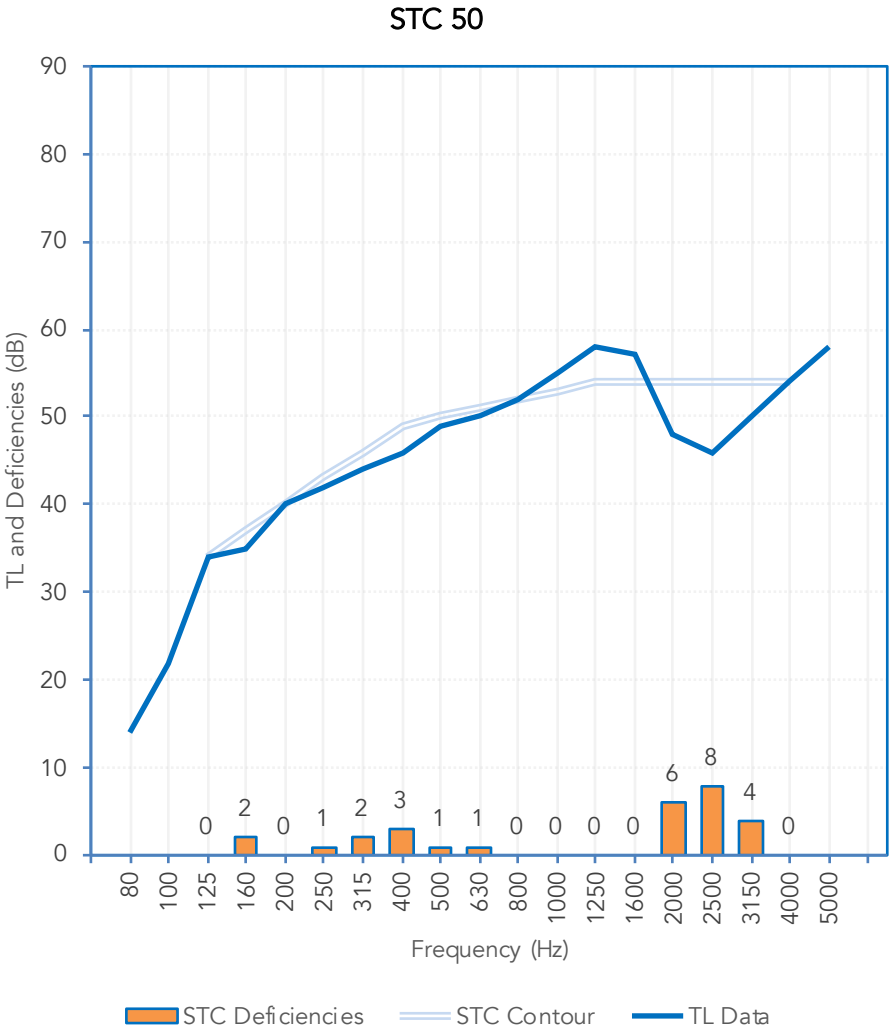
Frequency (Hz)	TL (dB)	Deficiencies (dB)
80	14	
100	22	
125	34	
160	35	2
200	40	
250	42	1
315	44	2
400	46	3
500	49	1
630	50	1
800	52	
1000	55	
1250	58	
1600	57	
2000	48	6
2500	46	8
3150	50	4
4000	54	
5000	58	
Total Deficiencies		28



ASSEMBLY ELEMENTS: (From Source Room Side to Receive Room Side)

Sheathing	5/8" Type X gypsum wallboard; 1.625" #6 type S screws spaced 24" OC
Sheathing	5/8" Type X gypsum wallboard; 1" #6 type S screws spaced 8" OC perimeter and 12" OC field
Framing	3-5/8" CEMCO Viper-X (VXS) 19 mil (20 EQ) studs spaced 24" OC
Insulation	3-1/2" fiberglass insulation batts
Sheathing	5/8" Type X gypsum wallboard; 1" #6 type S screws spaced 8" OC perimeter and 12" OC field

CEMCO HOTROD XL fire rated deflection bead and flat vinyl profile seal @ top source and receiver (acoustic sealant and putty at bottom and sides)

See Appendix C on pages 6 and 7 for a full description of Assembly Elements

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SPECIMEN DESCRIPTION

The specimen is a wall assembly and it's elements are described below with results on page 2. Detailed information regarding the specimen is found in Appendix C on pages 6 and 7.

INSTALLATION AND DISPOSITION

The wall assembly was originally constructed on January 30, 2019 at the Dyersville acoustic laboratory location.

Qualfied representatives from North Orbit Acoustic Laboratories observed the installation process and inspected all major building elements when completed and prior to testing.

FILLER WALL

A high transmission loss double stud filler wall was constructed in the entire 20' x 12' test opening. The filler wall consisted of two 1.5" x 7.5" x 12' wood bottom and top plates separated by approixmately 3" of air space. 1.5" x 3.5" wood studs were placed at 24" OC in each frame. The resulting cavity was filled entirely with fiberglass batt insulation. Four layers of Type C gypsum wall board (GWB) were attached to the outside of the frames on both sides. The GWB on the north side of the filler is mounted on reslient clips and 7/8" hat channel at 16" OC. The GWB on the south side is directly attached to the frame. The filler wall assembly was tested and the results retained for use in composite wall corrections. The filler wall was then modified to provide a 12' x 8' decoupled opening to accomodate tests in this series.

TEST METHODS

Methods follow the published standards listed below. All values derived from single-direction transmission loss measurements.

ASTM E90-09 (2016): *Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements*

ASTM E413-16: *Classification for Rating Sound Insulation*

All results reported herein were derived from tests performed in full accordance with test method ASTM E90-09 (2016). The laboratory and measurement systems fully meet all requirements of the test standard and the requirements of ASTM E90-09 (2016) Annex *A2: Qualification of room sound fields and microphone systems used for sampling.*

North Orbit Acoustic Laboratory (NOAL) is accredited through A2LA certificate number 4240.01 for this test procedure. This test report relates only to the item(s) tested. This report shall not be used to claim product certification, approval, or endorsement by North Orbit Acoustic Laboratories or A2LA.

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.

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APPENDIX A: MEASUREMENT SETUP

ENVIRONMENT

Temperature:	68 °F	20 °C
Relative Humidity:	50 %	

SPECIMEN

Specimen Area:	96.0 ft²	8.92 m²

CHAMBER VOLUME - AIRBORNE TRANSMISSION

Source Room	7074.0 ft³	200.3 m³
Receiver Room	7833.8 ft³	221.8 m³

INSTRUMENTATION

Description	Brand	Model	Serial Number
Analyzer	Sinus	Apollo	7510
Software	Sinus	Samurai	ver. 2.8.3
Microphone	Brüel & Kjær	4166	1620281
Microphone	Brüel & Kjær	4166	1620312
Preamplifier	Brüel & Kjær	2669	2025373
Preamplifier	Brüel & Kjær	2669	2083679
Rotating Boom	Brüel & Kjær	3923	1263440
Rotating Boom	Brüel & Kjær	3923	2705113
Calibrator	Brüel & Kjær	4231	2162880
Loudspeaker	Mackie	SA1501	PP14915
Loudspeaker	Mackie	SA1501	PP14940

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APPENDIX B: CALCULATION RESULTS

Freq. Band (Hz)	Spec TL (dB)	Data Flags (see below)	0.95 Conf. Δ TL (dB)	Flanking Limit (dB)	STC Defic. (dB)	Rw Defic. (dB)
25						
32						
40						
50	15.1		4.87	40		
63	14.9		4.55	45		
80	14.5		3.62	46		
100	22.2		2.98	49		7.8
125	34.2		2.82	55	-	-
160	35.4		2.62	58	2	0.6
200	40.5		1.31	62	-	-
250	41.9		1.33	65	1	0.1
315	43.8		0.98	68	2	1.2
400	45.7		0.52	71	3	2.3
500	49.0		0.98	74	1	-
630	50.5		0.78	76	1	-
800	52.0		0.57	79	-	-
1000	55.3		0.56	81	-	-
1250	57.6		0.64	84	-	-
1600	57.0		0.59	83	-	-
2000	48.0		0.62	82	6	5.0
2500	45.6		0.57	86	8	7.4
3150	49.5		0.55	90	4	3.5
4000	54.1		0.79	89	-	
5000	58.4		1.22	86		
6300						
8000						
10000						
Total deficiencies below STC contour (dB)					28	
STC contour [ASTM E413]					50	
Total deficiencies below Rw contour (dB)						27.9
Rw contour [ISO 717/1]						49.0

Note: 95% confidence intervals for TL measurements from room qualification data. ASTM E1289 reference sample and repeatability data available upon request. The standard deviation of reproducibility is stated in ASTM E90 as <2 dB for frequencies from 125 Hz to 4 kHz. Flanking Limit derived from chamber flanking study. Extended frequency results below 80Hz and above 5000Hz are for reference only.

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APPENDIX C: SPECIMEN ASSEMBLY DESCRIPTION

Overall Mass 691.10 lb [313.48 kg]

Surface Weight 7.20 PSF [35.15 kg/m²]

Building Element	Mass lb (kg)	Surface Weight PSF (kg/m2)
5/8" Type X gypsum wallboard; 1.625" #6 type S screws spaced 24" OC	209.2 [94.9]	2.18 [10.64]
5/8" Type X gypsum wallboard; 1" #6 type S screws spaced 8" OC perimeter and 12" OC field	209.4 [95.0]	2.18 [10.65]
3-5/8" CEMCO Viper-X (VXS) 19 mil (20 EQ) studs spaced 24" OC	41.1 [18.6]	0.43 [2.09]
3-1/2" fiberglass insulation batts	22.6 [10.3]	0.24 [1.15]
5/8" Type X gypsum wallboard; 1" #6 type S screws spaced 8" OC perimeter and 12" OC field	208.8 [94.7]	2.18 [10.62]

CEMCO HOTROD XL fire rated deflection bead and flat vinyl profile seal @ top source and receiver
(acoustic sealant and putty at bottom and sides)

All materials were weighed prior to installation. Weights of fasteners, tape and sealant are not represented in the above totals.

APPENDIX C: SPECIMEN ASSEMBLY DESCRIPTION (CONTINUED)

FRAMING

Framing was constructed on 01-29-19 and was retained from previous tests in the series.

Steel studs and Fire Bead supplied by Client. All other materials were purchased through regional retail or wholesale channels.

A steel stud frame was constructed in the perimeter of the laboratory test specimen opening. The frame consisted of CEMCO Viper-X (VXT),19 mil designated thickness (20 EQ) 3-5/8" x 1-1/4" bottom tracks, CEMCO slotted (CST 250), 33 mil designated thickness 3-5/8" x 2-1/2" slotted top tracks and seven CEMCO Viper-X (VXS) 19 mil designated thickness (20 EQ) 3-5/8" x 1-7/16" studs installed 24" on center (OC). The tracks and outer two studs were fastened together with two 7/16" #7 type screws. The perimeter of the outer sides and bottom of the frame was sealed at the specimen opening with non-hardening acoustic sealant.

INSULATION

Fiberglass insulation batts were friction fit into the stud cavities. The batts were 24" wide and 3-1/2" thick with an R-Value of R-13.

SHEATHING

Source Side: Two layers of gypsum wallboard panels were applied to the source room side of the framing. Base layer: 5/8" Type X gypsum drywall panels were applied parallel to the studs and were attached to the frame (except the top track) with 1", #6 type S drywall screws at 8" OC at the perimeter and 12" OC in the field. A 5/8" (max) deflection gap was left between the specimen opening and the top edge of both layers of drywall. Face layer: 5/8" Type X gypsum wallboard applied parallel to the studs and were attached to the frame with 1-5/8", #6 type S drywall screws at 24" OC. Joints were staggered one stud cavity as to offset on each layer. The deflection gap between the specimen opening and the top edge of the drywall was fitted with CEMCO HOTROD XL wall mount fire rated deflection bead. The bead consisted of a foam and vinyl profile compressed to fit the deflection gap. The outer top edge was fitted with a flexible vinyl leg over compressible foam. Receiver Side: A 5/8" (max) deflection gap was left between the specimen opening and the top edge of the drywall. One layer of 5/8" Type X gypsum drywall panels was applied parallel to the studs and were attached to the frame (except the top track) with 1", #6 type S drywall screws at 8" OC at the perimeter and 12" OC in the field. The deflection gap between the specimen opening and the top edge of the drywall was fitted with CEMCO HOTROD XL wall mount fire-rated deflection bead. The bead consisted of a foam and vinyl profile compressed to fit the deflection gap. The outer top edge was fitted with a flexible vinyl leg over compressible foam. Joints were staggered 24" as to offset on opposite sides of the frame.

The panels were shimmed at installation so equal gaps were maintained at the top and bottom. Gaps were less than 3/8" in all cases. Shims were removed after the panels were fastened and the perimeter and seams were sealed on the source and receiving room sides with non-hardening acoustical sealant. In addition, the perimeter of both sides of the specimen was sealed with 2" wide polypropylene tape and 7/8" dense putty tape.

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

Freq. Band (Hz)	Ri (Ri ≡ TL) (dB)	Ref Curve (dB)	Unfav. Deviat. (dB)	Li1 Spectrum (dB)	Li1 - Ri Level (dB)	Li2 Spectrum (dB)	Li2 - Ri Level (dB)
50	15.1						
63	14.9						
80	14.5						
100	22.2	30.0	7.8	-29.0	-51.2	-20.0	-42.2
125	34.2	33.0	-	-26.0	-60.2	-20.0	-54.2
160	35.4	36.0	0.6	-23.0	-58.4	-18.0	-53.4
200	40.5	39.0	-	-21.0	-61.5	-18.0	-58.5
250	41.9	42.0	0.1	-19.0	-60.9	-15.0	-56.9
315	43.8	45.0	1.2	-17.0	-60.8	-14.0	-57.8
400	45.7	48.0	2.3	-15.0	-60.7	-13.0	-58.7
500	49.0	49.0	-	-13.0	-62.0	-12.0	-61.0
630	50.5	50.0	-	-12.0	-62.5	-11.0	-61.5
800	52.0	51.0	-	-11.0	-63.0	-9.0	-61.0
1000	55.3	52.0	-	-10.0	-65.3	-8.0	-63.3
1250	57.6	53.0	-	-9.0	-66.6	-9.0	-66.6
1600	57.0	53.0	-	-9.0	-66.0	-10.0	-67.0
2000	48.0	53.0	5.0	-9.0	-57.0	-11.0	-59.0
2500	45.6	53.0	7.4	-9.0	-54.6	-13.0	-58.6
3150	49.5	53.0	3.5	-9.0	-58.5	-15.0	-64.5
4000	54.1						
5000	58.4						
		Sum = 27.9		RA,1 = 46.5		RA,2 = 40.9	
		RW = 49.0		C = -3		Ctr = -8.0	

Rw (C ; Ctr) = 49 (-3 ; -8)
Rw (C ; Ctr ; C50-3150 ; Ctr,50-3150) = 49 (-3 ; -8 ; -6 ; -17)
Rw (C ; Ctr ; C100-5000 ; Ctr,100-5000) = 49 (-3 ; -8 ; -2 ; -8)
Rw (C ; Ctr ; C50-5000 ; Ctr,50-5000) = 49 (-3 ; -8 ; -5 ; -17)

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. NOAL *does not* hold accreditation for ISO 140 or ISO 717 under their scope of accreditation.

The spectrum adaptation terms C and Ctr 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.