



Test Number: NOAL 19-1041

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

Result Summary: STC 50

Test Date: October 29, 2019

Specimen: Wall Assembly

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

Report Date: December 19, 2019

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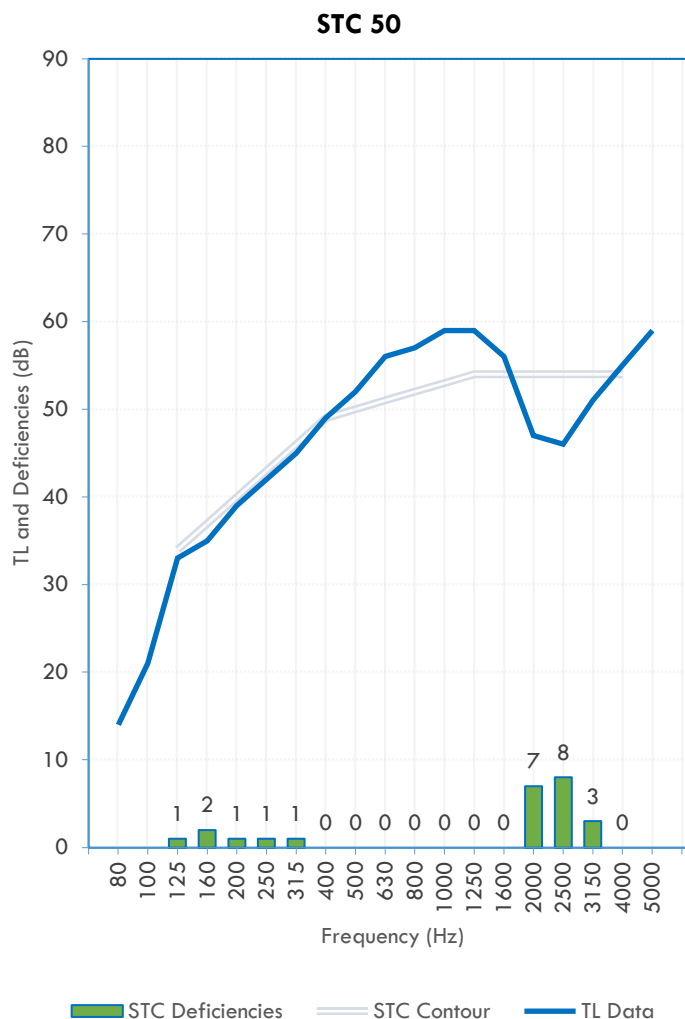
David M Berg
Laboratory Manager

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Heide Gross
Laboratory Quality Manager

Frequency (Hz)	TL (dB)	Deficiencies (dB)
80	14	
100	21	
125	33	1
160	35	2
200	39	1
250	42	1
315	45	1
400	49	0
500	52	0
630	56	0
800	57	0
1000	59	0
1250	59	0
1600	56	0
2000	47	7
2500	46	8
3150	51	3
4000	55	0
5000	59	

Total Deficiencies 24



ASSEMBLY ELEMENTS:

(From Source Room Side to Receive Room Side)

Sheathing	5/8" Type X gypsum wallboard (vs); 1.625" #6 type S screws spaced 8" OC at perimeter except top and 12" OC in field
Sheathing	5/8" Type X gypsum wallboard (v); 1" #6 type S screws spaced 8" OC at perimeter except top and 12" OC in field
Framing	3-5/8" CEMCO Viper-X 18 mil (20 EQ) studs spaced 24" OC
Insulation	3 1/2" fiberglass insulation batts
Sheathing	5/8" Type X gypsum wallboard (v); 1" #6 type S screws spaced 8" OC at perimeter except top and 12" OC in field

CEMCO HOTROD XL fire-rated wall mount deflection bead at sample top on both source and receiver side
No other seals/sealant used at sample top.

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



SPECIMEN DESCRIPTION

The specimen is a wall assembly and its 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 October 29, 2019 at the Dyersville acoustic laboratory location.

Qualified 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 approximately 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 resilient 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 accommodate 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.

APPENDIX A: MEASUREMENT SETUP

ENVIRONMENT

Temperature: 67.1 °F [19.5 °C]

Relative Humidity: 58.2%

SPECIMEN AREA

Specimen Area: 96.0 ft² [8.9 m²]

CHAMBER VOLUME - AIRBORNE TRANSMISSION

Source Room 7,080.0 ft³ [200.5 m³]

Receiver Room 7,828.8 ft³ [221.7 m³]

INSTRUMENTATION

Description	Brand	Model	Serial
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	2736620
Rotating Boom	Brüel & Kjær	3923	2705113
Calibrator	Brüel & Kjær	4231	2416109
Loudspeaker	Mackie	SA1501	PP14915
Loudspeaker	Mackie	SA1501	PP14940
Thermohygrometer	Digi-Sense	20250-21	181013163

APPENDIX B: CALCULATION RESULTS

Freq. Band (Hz)	Spec TL (dB)	Data Flags (see below)	95% C.I. (dB)	Flanking Limit (dB)	STC Deficiencies (dB)
25 32 40					
50 63 80	15.1 15.3 13.7		± 4.87 ± 4.55 ± 3.62	40 45 46	
100 125 160	20.6 33.3 34.6		± 2.98 ± 2.82 ± 2.62	49 55 58	1 2
200 250 315	38.8 42.3 44.5		± 1.31 ± 1.33 ± 0.98	62 65 68	1 1 1
400 500 630	49.4 51.8 55.6		± 0.52 ± 0.98 ± 0.78	71 74 76	0 0 0
800 1000 1250	57.3 59.3 59.5		± 0.57 ± 0.56 ± 0.64	79 81 84	0 0 0
1600 2000 2500	56.0 47.1 45.6		± 0.59 ± 0.62 ± 0.57	83 82 86	0 7 8
3150 4000 5000	50.9 54.8 59.0		± 0.55 ± 0.79 ± 1.22	90 89 86	3 0
6300 8000 10000					
Total deficiencies below STC contour (dB)					24
STC contour [ASTM E413]					50

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.

APPENDIX C: SPECIMEN ASSEMBLY DESCRIPTION

Overall Mass 705.4 lb [320.0 kg]

Surface Weight 7.3 PSF [35.9 kg/m²]

Building Element	Mass lb [kg]	Surface Weight PSF [kg/m ²]
5/8" Type X gypsum wallboard (vs); 1.625" #6 type S screws spaced 8" OC at perimeter except top and 12" OC in field	214.4 [97.3]	2.23 [10.90]
5/8" Type X gypsum wallboard (v); 1" #6 type S screws spaced 8" OC at perimeter except top and 12" OC in field	214.0 [97.1]	2.23 [10.88]
3-5/8" CEMCO Viper-X 18 mil (20 EQ) studs spaced 24" OC	41.2 [18.7]	0.43 [2.10]
3 1/2" fiberglass insulation batts	22.6 [10.3]	0.24 [1.15]
5/8" Type X gypsum wallboard (v); 1" #6 type S screws spaced 8" OC at perimeter except top and 12" OC in field	213.2 [96.7]	2.22 [10.84]

CEMCO HOTROD XL fire-rated wall mount deflection bead at sample top on both source and receiver side
No other seals/sealant used at sample top.

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)

CEMCO steel tracks, steel studs, HOTROD XL and gypsum wallboard panels were supplied by the Client. All other materials were purchased through regional retail or wholesale channels.

FRAMING

Framing was constructed on 10-29-19 and was retained from previous tests in the series.

A steel stud frame was constructed within the perimeter of the laboratory test specimen opening. The frame consisted of CEMCO Viper-X (VXT), 18 mil designated thickness (20 EQ) 3-5/8" x 1-1/4" bottom track, CEMCO 33 mil designated thickness 3-5/8" (width) x 2-1/2" (leg) top track and seven CEMCO Viper-X (VXS) 18 mil designated thickness (20 EQ) 3-5/8" x 1-7/16" studs installed 24" on center (OC). The bottom track and studs were fastened together with two 7/16" #7 type screws at bottom, outside corner intersections. The perimeter of the outer sides and bottom of the frame was sealed at the specimen opening with non-hardening acoustic sealant.

CEMCO bottom tracks: 362VXT125-18 G40 33 ksi

CEMCO top tracks: 362TAB250-33 G40 33 ksi

CEMCO Viper-X Studs: 362VXS144-18 G40 57 ksi

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 panels were applied to the source room side of the framing.

Base Layer: 5/8" Type X gypsum wallboard panels were applied parallel to the studs. A 3/4" high (max) deflection gap was left at the top of the wallboard. The panels were attached to the frame with 1", #6 type S drywall screws at 8" OC at the perimeter and 12" OC in the field, except at the top where the studs and frame were not fastened together.

Face Layer: 5/8" Type X gypsum wallboard panels were applied parallel to the studs. A 3/4" high (max) deflection gap was left at the top of the wallboard. The panels were attached to the frame with 1 5/8", #6 type S drywall screws at 8" OC at the perimeter and 12" OC in the field, except at the top where the studs and frame were not fastened together. 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 Hotrod XL fire-rated wall mount deflection bead. The Hotrod XL was stapled to the outer layer of wallboard and was covered (below the deflection gap) with 20-minute joint compound over the perforated mud leg.



Receiver Side:

5/8" Type X gypsum wallboard panels were applied parallel to the studs. A 3/4" high (max) deflection gap was left at the top of the wallboard. The panels were attached to the frame with 1", #6 type S drywall screws 8" OC at the perimeter and 12" OC in the field, except at the top where the studs and frame were not fastened together. Joints were staggered one cavity as to offset on opposite sides.

The deflection gap between the specimen opening and the top edge of the drywall was fitted with Hotrod XL fire-rated wall mount deflection bead. The Hotrod XL was stapled to the wallboard and was covered (below the deflection gap) with 20-minute joint compound over the perforated mud leg.

The panels were shimmed at installation so equal gaps were maintained at the sides and bottom. Gaps were less than 3/8" in all cases except the top where the 3/4" deflection gap was left. Shims were removed after the panels were fastened and the sides, bottom 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, except the top which was sealed on the source and receiver only with the HOTROD XL.

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

Freq. Band (Hz)	R _i (R _i ≡ TL) (dB)	Adj. 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	15.1						
63	15.3						
80	13.7						
100	20.6	30	9.4	-29.0	-50.6	-20.0	-40.6
125	33.3	33	0.0	-26.0	-60.3	-20.0	-53.3
160	34.6	36	1.4	-23.0	-58.6	-18.0	-52.6
200	38.8	39	0.2	-21.0	-60.8	-18.0	-56.8
250	42.3	42	0.0	-19.0	-62.3	-15.0	-57.3
315	44.5	45	0.5	-17.0	-62.5	-14.0	-58.5
400	49.4	48	0.0	-15.0	-65.4	-13.0	-62.4
500	51.8	49	0.0	-13.0	-65.8	-12.0	-63.8
630	55.6	50	0.0	-12.0	-68.6	-11.0	-66.6
800	57.3	51	0.0	-11.0	-69.3	-9.0	-66.3
1000	59.3	52	0.0	-10.0	-70.3	-8.0	-67.3
1250	59.5	53	0.0	-9.0	-69.5	-9.0	-68.5
1600	56.0	53	0.0	-9.0	-66.0	-10.0	-66.0
2000	47.1	53	5.9	-9.0	-57.1	-11.0	-58.1
2500	45.6	53	7.4	-9.0	-55.6	-13.0	-58.6
3150	50.9	53	2.1	-9.0	-60.9	-15.0	-65.9
4000	54.8						
5000	59.0						
Sum =			26.9	R _{A,1} =	46.0	R _{A,2} =	39.7
R _w =			49	C =	-3	C _{tr} =	-9

$$R_w (C ; C_{tr}) = 49 (-3 ; -9)$$

$$R_w (C ; C_{tr} ; C_{50-3150} ; C_{tr,50-3150}) = 49 (-3 ; -9 ; -7 ; -17)$$

$$R_w (C ; C_{tr} ; C_{100-5000} ; C_{tr,100-5000}) = 49 (-3 ; -9 ; -2 ; -9)$$

$$R_w (C ; C_{tr} ; C_{50-5000} ; C_{tr,50-5000}) = 49 (-3 ; -9 ; -6 ; -17)$$

Calculations according to the standard ISO 717-1 are based on an assumed equivalency of the ASTM and the corresponding ISO test methods. NOAL's scope of accreditation includes ASTM E90 and the test herein is performed according to this standard as described, but NOAL does not hold accreditation for the corresponding ISO standards.

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. The calculation above represents the primary frequency range. The results below the table show the calculated primary ratings as well all available extended-frequency ratings, so that this specimen may be compared against corresponding ratings of other specimens.