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

Test Report ASTM E90

ACCREDITED Certificate #4240.01

Test Number:	NOAL 19-1043
Test Method:	ASTM E90-09 (2016): Laboratory Measurement of Airborne Sound Transmission of Building Partitions and Elements
Result Summary:	STC 50
Test Date:	October 30, 2019
Specimen:	Wall Assembly
Test Site:	North Orbit Acoustic Laboratory Facility 512 5th Street NW Dyersville, IA 52040
Report Date:	December 19, 2019
Prepared For	CEMCO 13191 Cross Road Parkway, Suite 325 City of Industry, CA 91746
Technician:	D. Berg
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ELECTRONICALLY REPRODUCED SIGNATURE

David M Berg
Laboratory Manager

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Laboratory Quality Manager

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Prepared For: CEMCO

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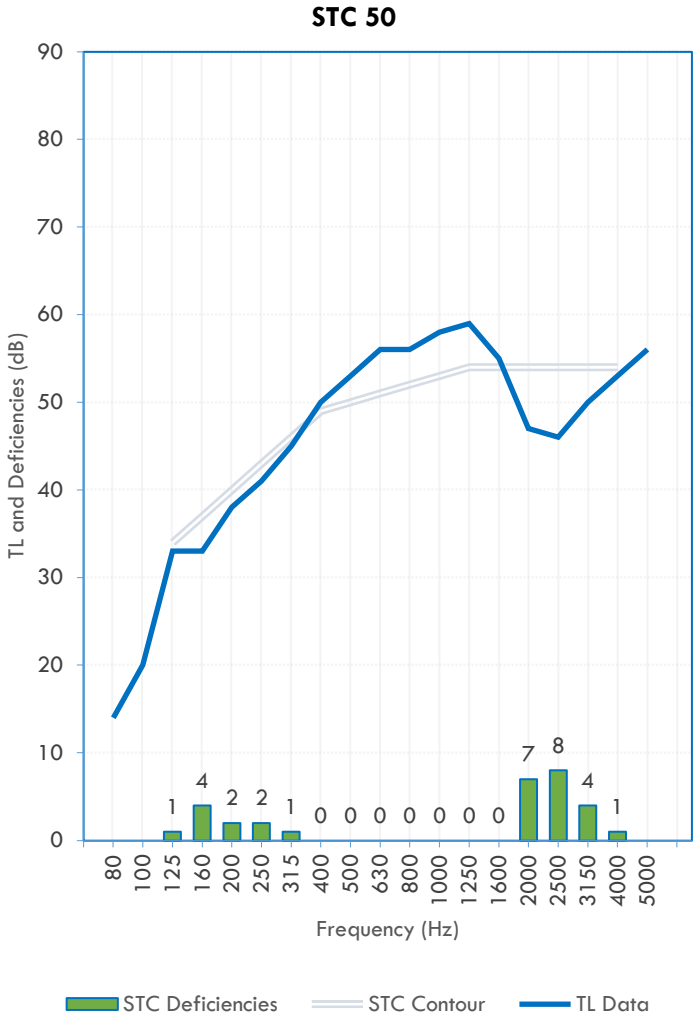
Frequency (Hz)	TL (dB)	Deficiencies (dB)
80	14	
100	20	
125	33	1
160	33	4
200	38	2
250	41	2
315	45	1
400	50	0
500	53	0
630	56	0
800	56	0
1000	58	0
1250	59	0
1600	55	0
2000	47	7
2500	46	8
3150	50	4
4000	53	1
5000	56	
Total Deficiencies		30



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 12" OC at perimeter except top and 16" 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 (R13)
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 Sound Gasket installed at sample perimeter on both source and receiver side.
No other seals/sealant used at sample perimeter.

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 30, 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:	53.2%

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	14.9		±4.87	40	
63	15.3		±4.55	45	
80	13.7		±3.62	46	
100	19.7		±2.98	49	
125	32.7		±2.82	55	1
160	33.3		±2.62	58	4
200	37.9		±1.31	62	2
250	41.4		±1.33	65	2
315	45.4		±0.98	68	1
400	50.5		±0.52	71	0
500	53.5		±0.98	74	0
630	55.7		±0.78	76	0
800	56.3		±0.57	79	0
1000	58.4		±0.56	81	0
1250	58.7		±0.64	84	0
1600	54.8		±0.59	83	0
2000	46.7		±0.62	82	7
2500	45.7		±0.57	86	8
3150	49.6		±0.55	90	4
4000	53.1		±0.79	89	1
5000	56.5		±1.22	86	
6300					
8000					
10000					
Total deficiencies below STC contour (dB)					30
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 491.0 lb [222.7 kg]

Surface Weight 5.1 PSF [25.0 kg/m²]

Building Element	Mass lb [kg]	Surface Weight PSF [kg/m²]
5/8" Type X gypsum wallboard (vs); 1.625" #6 type S screws spaced 12" OC at perimeter except top and 16" OC in field		
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 (R13)	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 Sound Gasket installed at sample perimeter on both source and receiver side
No other seals/sealant used at sample perimeter.

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, outer 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 1/2” (max) gap was left at the perimeter of the sample. 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 1/2” (max) gap was left at the perimeter of the sample. 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 cavity as to offset on each layer.

Prior to installing the gypsum panels, CEMCO Sound Gasket was applied to the perimeter of the frame to provide the seal the perimeter of the sample. The Sound Gasket was attached to the tracks and outer studs with a self-adhesive strip. No other caulking or sealing was used at the sample perimeter.

Receiver Side:

5/8" Type X gypsum wallboard panels were applied parallel to the studs. A 1/2” (max) gap was left at the perimeter of the sample. 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. Joints were staggered one cavity as to offset on opposite sides.

Prior to installing the gypsum panels, CEMCO Sound Gasket was applied to the perimeter of the frame to provide the seal between the frame and specimen opening. The Sound Gasket was attached to the tracks and outer studs with a self-adhesive strip. No other caulking or sealing was used at the sample perimeter.

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

Freq. Band (Hz)	R_i ($R_i \equiv TL$) (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	14.9						
63	15.3						
80	13.7						
100	19.7	30	10.3	-29.0	-49.7	-20.0	-39.7
125	32.7	33	0.3	-26.0	-59.7	-20.0	-52.7
160	33.3	36	2.7	-23.0	-57.3	-18.0	-51.3
200	37.9	39	1.1	-21.0	-59.9	-18.0	-55.9
250	41.4	42	0.6	-19.0	-61.4	-15.0	-56.4
315	45.4	45	0.0	-17.0	-63.4	-14.0	-59.4
400	50.5	48	0.0	-15.0	-66.5	-13.0	-63.5
500	53.5	49	0.0	-13.0	-67.5	-12.0	-65.5
630	55.7	50	0.0	-12.0	-68.7	-11.0	-66.7
800	56.3	51	0.0	-11.0	-68.3	-9.0	-65.3
1000	58.4	52	0.0	-10.0	-69.4	-8.0	-66.4
1250	58.7	53	0.0	-9.0	-68.7	-9.0	-67.7
1600	54.8	53	0.0	-9.0	-64.8	-10.0	-64.8
2000	46.7	53	6.3	-9.0	-56.7	-11.0	-57.7
2500	45.7	53	7.3	-9.0	-55.7	-13.0	-58.7
3150	49.6	53	3.4	-9.0	-59.6	-15.0	-64.6
4000	53.1						
5000	56.5						
		Sum =	32.0	$R_{A,1}$ =	45.4	$R_{A,2}$ =	38.8
		R_w =	49	C =	-4	C_{tr} =	-10

$$R_w (C ; C_{tr}) = 49 (-4 ; -10)$$

$$R_w (C ; C_{tr} , C_{50\text{-}3150} ; C_{tr,50\text{-}3150}) = 49 (-4 ; -10 ; -7 ; -18)$$

$$R_w (C ; C_{tr} ; C_{100\text{-}5000} ; C_{tr,100\text{-}5000}) = 49 (-4 ; -10 ; -3 ; -10)$$

$$R_w (C ; C_{tr} ; C_{50\text{-}5000} ; C_{tr,50\text{-}5000}) = 49 (-4 ; -10 ; -6 ; -18)$$

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 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. 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.