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Prepared For: CEMCO
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Test Number: NOAL 19-0116
Test Date: 1/29/19
Report Date: 3/4/19

Page 1 of 8

**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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A handwritten signature in black ink is written over the text "ELECTRONICALLY REPRODUCED SIGNATURE". The signature appears to be "D. Berg".

David M. Berg
Laboratory Manager

A handwritten signature in black ink is written over the text "ELECTRONICALLY REPRODUCED SIGNATURE". The signature appears to be "Heide Gross".

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.

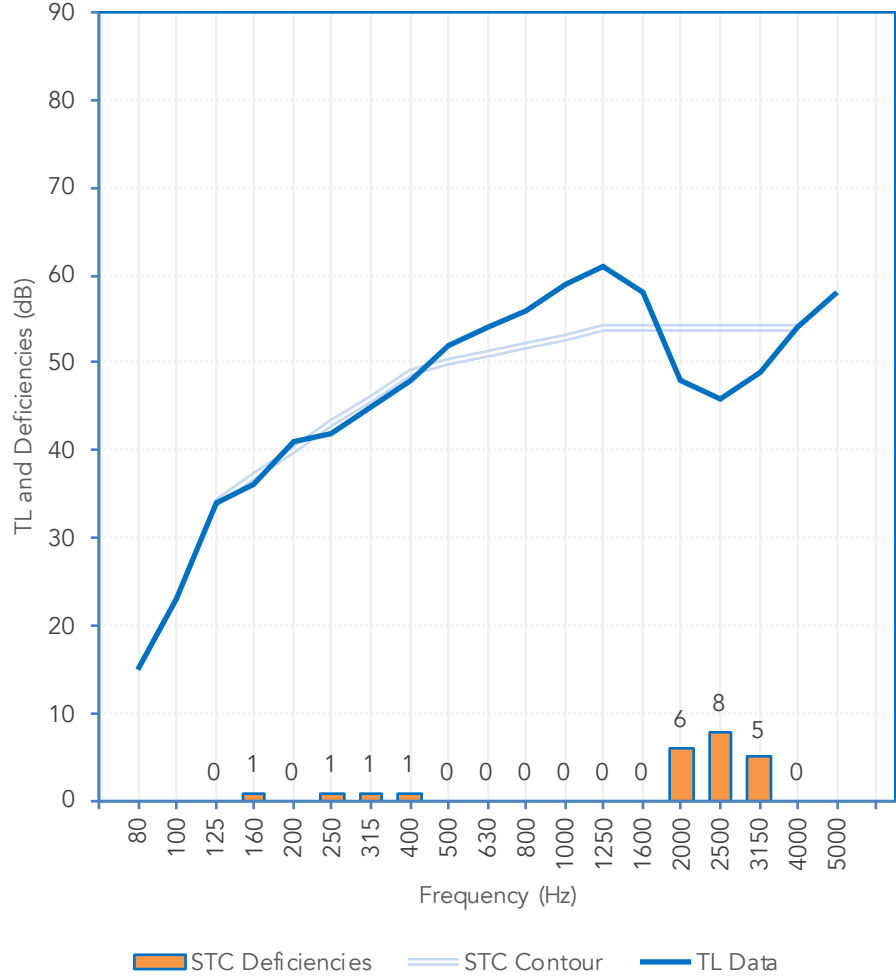


Test Number: NOAL 19-0116
 Test Date: 1/29/19
 Report Date: 3/4/19
 Page 2 of 8

STC 50

Frequency (Hz)	TL (dB)	Deficiencies (dB)
80	15	
100	23	
125	34	
160	36	1
200	41	
250	42	1
315	45	1
400	48	1
500	52	
630	54	
800	56	
1000	59	
1250	61	
1600	58	
2000	48	6
2500	46	8
3150	49	5
4000	54	
5000	58	

Total Deficiencies 23



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 FIRE BEAD fire rated deflection bead seal @ sample top
 (sealant + putty @ sides and bottom)

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



Test Number: NOAL 19-0116
Test Date: 1/29/19
Report Date: 3/4/19
Page 3 of 8

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 January 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.



Test Number: NOAL 19-0116
 Test Date: 1/29/19
 Report Date: 3/4/19

APPENDIX A: MEASUREMENT SETUP

ENVIRONMENT

Temperature: 68 °F 20 °C
 Relative Humidity: 54 %

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



Test Number: NOAL 19-0116
 Test Date: 1/29/19
 Report Date: 3/4/19

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	14.5		4.87	40		
63	14.5		4.55	45		
80	14.7		3.62	46		
100	23.0		2.98	49		8.0
125	34.4		2.82	55	-	-
160	36.0		2.62	58	1	1.0
200	40.6		1.31	62	-	-
250	42.4		1.33	65	1	0.6
315	45.2		0.98	68	1	0.8
400	48.4		0.52	71	1	0.6
500	51.8		0.98	74	-	-
630	54.0		0.78	76	-	-
800	56.4		0.57	79	-	-
1000	58.9		0.56	81	-	-
1250	61.0		0.64	84	-	-
1600	57.9		0.59	83	-	-
2000	48.0		0.62	82	6	6.0
2500	45.7		0.57	86	8	8.3
3150	49.5		0.55	90	5	4.5
4000	53.9		0.79	89	-	
5000	58.0		1.22	86		
6300						
8000						
10000						
Total deficiencies below STC contour (dB)					23	
STC contour [ASTM E413]					50	
Total deficiencies below Rw contour (dB)						29.8
Rw contour [ISO 717/1]						50.0

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.



Test Number: NOAL 19-0116
 Test Date: 1/29/19
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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	Surface Weight
	lb (kg)	PSF (kg/m ²)
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 FIRE BEAD fire rated deflection bead seal @ sample top

(sealant + putty @ sides and bottom)

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



Test Number: NOAL 19-0116
Test Date: 1/29/19
Report Date: 3/4/19
Page 7 of 8

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. A 5/8" (max) deflection gap was left between the specimen opening and the top edge of the wallboard on both layers. Base layer: 5/8" Type X gypsum wallboard 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. Face layer: 5/8" Type X gypsum wallboard panels applied parallel to the studs and were attached to the frame with 1-5/8", #6 type S drywall screws at 24" OC. The top edge was fitted with a CEMCO FIRE BEAD 3/4" x 1-1/8" fire-rated deflection bead. The short leg of the FIRE BEAD was friction fit between the top track and specimen opening, was pressed up against the specimen opening and stapled to the wallboard surface providing the top seal. Joints were staggered one stud cavity as to offset on each layer. **Receiver Side:** A 5/8" (max) deflection gap was left between the specimen opening and the top edge of the wallboard. Type X gypsum wallboard 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. The top edge was fitted with a CEMCO FIRE BEAD 3/4" x 1-1/8" fire-rated deflection bead. The short leg of the FIRE BEAD was friction fit between the top track and specimen opening and provides the top seal. Joints were staggered one stud cavity as to offset on opposite sides of the frame.

The panels were shimmed at installation. Side and bottom gaps were less than 3/8" in all cases. Shims were removed after the panels were fastened and the specimen sides, bottom and joints were sealed with non-hardening acoustical sealant. In addition, the sides and bottom of the specimen were sealed with 2" wide polypropylene tape and 7/8" dense putty tape. The top edges of the specimen were sealed with the CEMCO Fire Bead fire-rated deflection bead.



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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	14.5						
63	14.5						
80	14.7						
100	23.0	31.0	8.0	-29.0	-52.0	-20.0	-43.0
125	34.4	34.0	-	-26.0	-60.4	-20.0	-54.4
160	36.0	37.0	1.0	-23.0	-59.0	-18.0	-54.0
200	40.6	40.0	-	-21.0	-61.6	-18.0	-58.6
250	42.4	43.0	0.6	-19.0	-61.4	-15.0	-57.4
315	45.2	46.0	0.8	-17.0	-62.2	-14.0	-59.2
400	48.4	49.0	0.6	-15.0	-63.4	-13.0	-61.4
500	51.8	50.0	-	-13.0	-64.8	-12.0	-63.8
630	54.0	51.0	-	-12.0	-66.0	-11.0	-65.0
800	56.4	52.0	-	-11.0	-67.4	-9.0	-65.4
1000	58.9	53.0	-	-10.0	-68.9	-8.0	-66.9
1250	61.0	54.0	-	-9.0	-70.0	-9.0	-70.0
1600	57.9	54.0	-	-9.0	-66.9	-10.0	-67.9
2000	48.0	54.0	6.0	-9.0	-57.0	-11.0	-59.0
2500	45.7	54.0	8.3	-9.0	-54.7	-13.0	-58.7
3150	49.5	54.0	4.5	-9.0	-58.5	-15.0	-64.5
4000	53.9						
5000	58.0						

Sum = 29.8 RA,1 = 47.2 RA,2 = 41.7
 RW = 50.0 C = -3 Ctr = -8.0

Rw (C ; Ctr) = 50 (-3 ; -8)
 Rw (C ; Ctr ; C50-3150 ; Ctr,50-3150) = 50 (-3 ; -8 ; -7 ; -18)
 Rw (C ; Ctr ; C100-5000 ; Ctr,100-5000) = 50 (-3 ; -8 ; -2 ; -8)
 Rw (C ; Ctr ; C50-5000 ; Ctr,50-5000) = 50 (-3 ; -8 ; -6 ; -18)

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.