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

Test Report ASTM E90

Prepared For: CEMCO
13191 Cross Road Parkway, Suite 325 City of Industry, CA 91746

ACCREDITED
Certificate # 4240.01

Test Number: NOAL 18-0766
Test Date: 7/24/18
Report Date: 8/27/18

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

Result Summary: STC 67

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
North Orbit Acoustic Laboratories
P.O. Box 6948
Minneapolis, MN 55406

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.

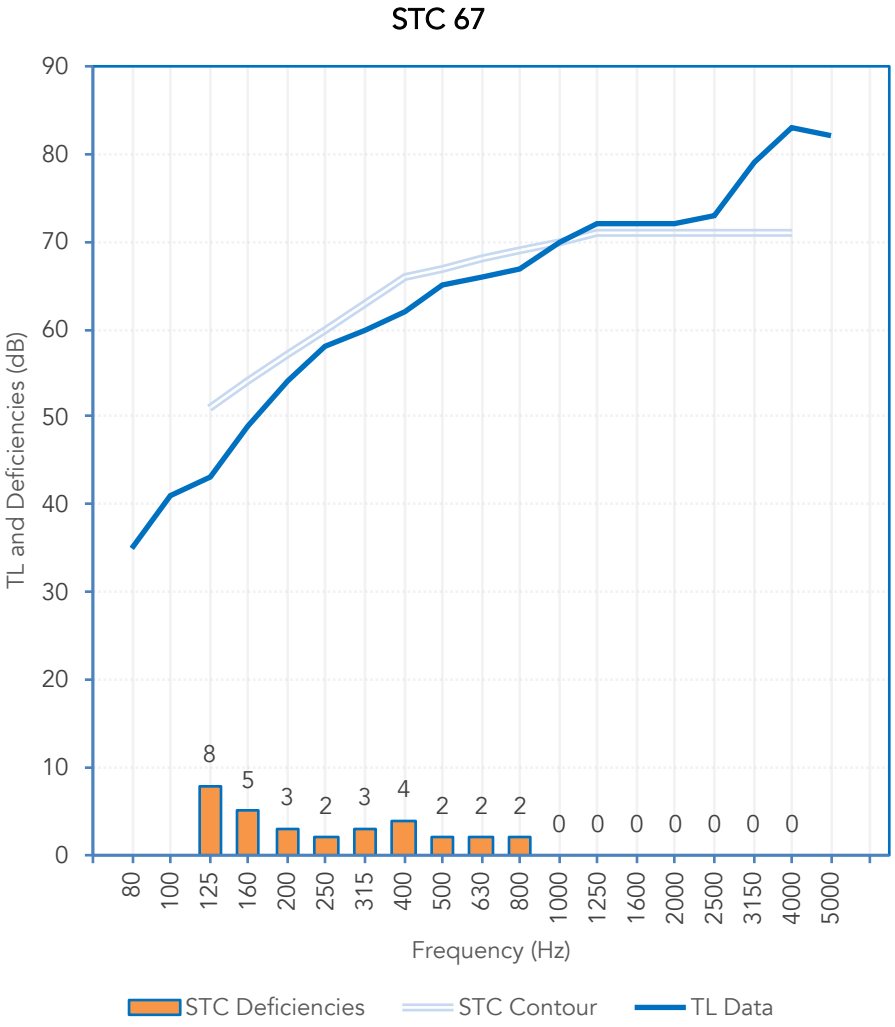
NORTH ORBIT
ACOUSTIC LABORATORIES
P.O. Box 6948, Minneapolis MN 55406-0948

Test Report ASTM E90

ACCREDITED Certificate #4240.01

Test Number: NOAL 18-0766
Test Date: 7/24/18
Report Date: 8/27/18

Frequency (Hz)	TL (dB)	Deficiencies (dB)
80	35	
100	41	
125	43	8
160	49	5
200	54	3
250	58	2
315	60	3
400	62	4
500	65	2
630	66	2
800	67	2
1000	70	
1250	72	
1600	72	
2000	72	
2500	73	
3150	79	
4000	83	
5000	82	
Total Deficiencies		31



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 perimeter and 16" OC field
Sheathing	5/8" Type X gypsum wallboard (v); 1" #6 type S screws spaced 12" OC perimeter and 16" OC field
Framing	Double row 2-1/2" CEMCO Viper-X (VXS) 19 mil (20 EQ) studs spaced 24" OC
Insulation	Double layer 3-1/2" fiberglass insulation batts (R13)
Sheathing	5/8" Type X gypsum wallboard (vs); 1" #6 type S screws spaced 12" OC perimeter and 16" OC field
Sheathing	5/8" Type X gypsum wallboard (v); 1" #6 type S screws spaced 12" OC perimeter and 16" OC field

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

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

ACCREDITED
Certificate #4240.01

Test Number: NOAL 18-0766
Test Date: 7/24/18
Report Date: 8/27/18

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 July 24, 2018 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.

APPENDIX A: MEASUREMENT SETUP

ENVIRONMENT

Temperature:	69 °F	21 °C
Relative Humidity:	63 %	

SPECIMEN AREA

Specimen Area:	96.0 ft²	8.92 m²

CHAMBER VOLUME - AIRBORNE TRANSMISSION

Source Room	7106.0 ft³	201.2 m³
Receive Room	7775.8 ft³	220.2 m³

INSTRUMENTATION

Description	Brand	Model	Serial Number
Analyzer	Sinus	Apollo	7510
Software	Sinus	Samurai	ver. 2.8.1
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

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

Test Report ASTM E90

ACCREDITED Certificate #4240.01

Test Number: NOAL 18-0766
Test Date: 7/24/18
Report Date: 8/27/18

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	23.3	‡	3.78	40		
63	27.7		3.28	45		
80	35.3	‡	4.57	46		
100	41.3	§‡	2.47	49		5.7
125	43.4	‡	2.21	55	8	6.6
160	49.4	§‡	1.12	58	5	3.6
200	54.0	§‡	1.30	62	3	2.0
250	57.5	§‡	1.24	65	2	1.5
315	60.1	§‡	0.79	68	3	1.9
400	61.7	§‡	0.66	71	4	3.3
500	64.6	§‡	0.51	74	2	1.4
630	66.1	§‡	0.45	76	2	0.9
800	66.8	‡	0.44	79	2	1.2
1000	70.0	‡	0.38	81	-	-
1250	72.1	‡	0.48	84	-	-
1600	72.4	‡	0.27	83	-	-
2000	72.2	§‡	0.34	82	-	-
2500	73.2	‡	0.35	86	-	-
3150	78.7	‡	0.61	90	-	-
4000	83.2	*§†	0.57	89	-	
5000	82.0	*§†		86		
6300						
8000						
10000						
Total deficiencies below STC contour (dB)					31	
STC contour [ASTM E413]					67	
Total deficiencies below Rw contour (dB)						28.1
Rw contour [ISO 717/1]						66.0

* 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. ‡ Correction included in calculation due to a portion of the sound transmitted by way of the filler wall. Sound transmission through the filler wall is within correction limits established in ASTM E90. † Actual transmission loss of specimen may be higher than measured at this frequency band. Sound transmission through the filler wall exceeds correction limits established in ASTM E90; therefore the result is "an estimate of the lower limit". 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.

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

ACCREDITED
Certificate #4240.01

Test Number: NOAL 18-0766
Test Date: 7/24/18
Report Date: 8/27/18

APPENDIX C: SPECIMEN ASSEMBLY DESCRIPTION

Overall Mass 938.60 lb [425.74 kg]

Surface Weight 9.78 PSF [47.74 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 perimeter and 16" OC field	214.8 [97.4]	2.24 [10.92]
5/8" Type X gypsum wallboard (v); 1" #6 type S screws spaced 12" OC perimeter and 16" OC field	214.8 [97.4]	2.24 [10.92]
Double row 2-1/2" CEMCO Viper-X (VXS) 19 mil (20 EQ) studs spaced 24" OC	40.0 [18.1]	0.42 [2.03]
Double layer 3-1/2" fiberglass insulation batts (R13)	40.6 [18.4]	0.42 [2.06]
5/8" Type X gypsum wallboard (vs); 1" #6 type S screws spaced 12" OC perimeter and 16" OC field	214.2 [97.2]	2.23 [10.89]
5/8" Type X gypsum wallboard (v); 1" #6 type S screws spaced 12" OC perimeter and 16" OC field	214.2 [97.2]	2.23 [10.89]

APPENDIX C: SPECIMEN ASSEMBLY DESCRIPTION (CONTINUED)

FRAMING

Framing was constructed on 07-24-18 and was retained for subsequent tests in the series.

A double stud frame was constructed in the perimeter of the laboratory test specimen opening. The frame consisted of two rows of CEMCO Viper-X (VXS) 19 mil designated thickness (20EQ) 2-1/2" bottom track with 1-1/4" flange, two rows of CEMCO TAB Track (TAB 250), 33 mil designated thickness (20 ga.) 2-1/2" x 2-1/2" tabbed top tracks and two rows of seven 2-1/2" x 1-7/16" CEMCO Viper-X (VXS) 19 mil designated thickness (20EQ) studs installed 24" on center (OC). The two rows of studs were separated by a 1" air space. The bottom tracks and studs were fastened together with two 1/2" #7 type S screws at each intersection. The perimeter of the frame sides and bottom was sealed at the specimen opening with non-hardening acoustic sealant.

INSULATION

Two layers of fiberglass batts were friction fit into the stud cavities. Each layer of batts was 24" wide and 3-1/2" thick with an R-Value of R-13.

SHEATHING

Source Side: The source room top frame edge was fitted wtih a CEMCO Fire Gasket. The Fire Gasket's 1-1/2" x 1/2" vinyl profile had a bubble gasket at the inner (frame side) top edge. The 1-1/2" leg was attached to the top track leg with #8 1/2" S-12 screws 36" OC. Two layers of gypsum wallboard panels were applied to the source room side of the framing. A 1/2" deflection gap was left at the top edge of both layers of gypsum wallboard. Base layer: 5/8" Type X gypsum wallboard panels were applied parallel to the studs. The panels were attached to the frame (except top track) with 1", #6 type S drywall screws at 12” OC at the perimeter and 16" OC in the field. Face layer: 5/8" Type X gypsum wallboard panels were applied parallel to the studs.The panels were attached to the frame with 1-5/8", #6 type S drywall screws at 12” OC at the perimeter and 16" OC field. Joints were staggered 24" as to offset on each layer. **Receiver Side:** The receiver room top frame edge was fitted wtih a CEMCO Fire Gasket. The Fire Gasket's 1-1/2" x 1/2" vinyl profile had a bubble gasket at the inner (frame side) top edge. The 1-1/2" leg was attached to the top track leg with #8 1/2" S-12 screws 36" OC. Two layers of 5/8" Type X gypsum wallboard panels were applied parallel to the studs. A 1/2" deflection gap was left at the top edge of both layers of gypsum wallboard. The installation details are were identical to those on the source side. The joints were staggered 24" as to offset on offosite sides of the frame and on each layer.

The panels were placed at installation so equal gaps were maintained. Gaps were less than 3/8”, except deflection gap which was 1/2" maximum. The seams were sealed on the source and receiving room sides with non-hardening acoustical sealant. In addition, the sides and bottom of both sides of the specimen was sealed with 2” wide, polypropylene tape and 7/8” dense putty tape.

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

Test Report ASTM E90

ACCREDITED Certificate #4240.01

Test Number: NOAL 18-0766
Test Date: 7/24/18
Report Date: 8/27/18

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	23.3						
63	27.7						
80	35.3						
100	41.3	47.0	5.7	-29.0	-70.3	-20.0	-61.3
125	43.4	50.0	6.6	-26.0	-69.4	-20.0	-63.4
160	49.4	53.0	3.6	-23.0	-72.4	-18.0	-67.4
200	54.0	56.0	2.0	-21.0	-75.0	-18.0	-72.0
250	57.5	59.0	1.5	-19.0	-76.5	-15.0	-72.5
315	60.1	62.0	1.9	-17.0	-77.1	-14.0	-74.1
400	61.7	65.0	3.3	-15.0	-76.7	-13.0	-74.7
500	64.6	66.0	1.4	-13.0	-77.6	-12.0	-76.6
630	66.1	67.0	0.9	-12.0	-78.1	-11.0	-77.1
800	66.8	68.0	1.2	-11.0	-77.8	-9.0	-75.8
1000	70.0	69.0	-	-10.0	-80.0	-8.0	-78.0
1250	72.1	70.0	-	-9.0	-81.1	-9.0	-81.1
1600	72.4	70.0	-	-9.0	-81.4	-10.0	-82.4
2000	72.2	70.0	-	-9.0	-81.2	-11.0	-83.2
2500	73.2	70.0	-	-9.0	-82.2	-13.0	-86.2
3150	78.7	70.0	-	-9.0	-87.7	-15.0	-93.7
4000	83.2						
5000	82.0						
		Sum = 28.1		RA,1 = 63.5		RA,2 = 57.8	
		RW = 66.0		C = -3		Ctr = -8.0	

Rw (C ; Ctr) = 66 (-3 ; -8)
Rw (C ; Ctr ; C50-3150 ; Ctr,50-3150) = 66 (-3 ; -8 ; -8 ; -20)
Rw (C ; Ctr ; C100-5000 ; Ctr,100-5000) = 66 (-3 ; -8 ; -2 ; -8)
Rw (C ; Ctr ; C50-5000 ; Ctr,50-5000) = 66 (-3 ; -8 ; -7 ; -20)

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.