

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 91746Test Number: NOAL 18-0765
Test Date: 7/24/18
Report Date: 8/27/18
Page 1 of 8**ASTM E90-09 (2016): Laboratory Measurement of Airborne Sound Transmission of
Building Partitions and Elements**

Result Summary: STC 63

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



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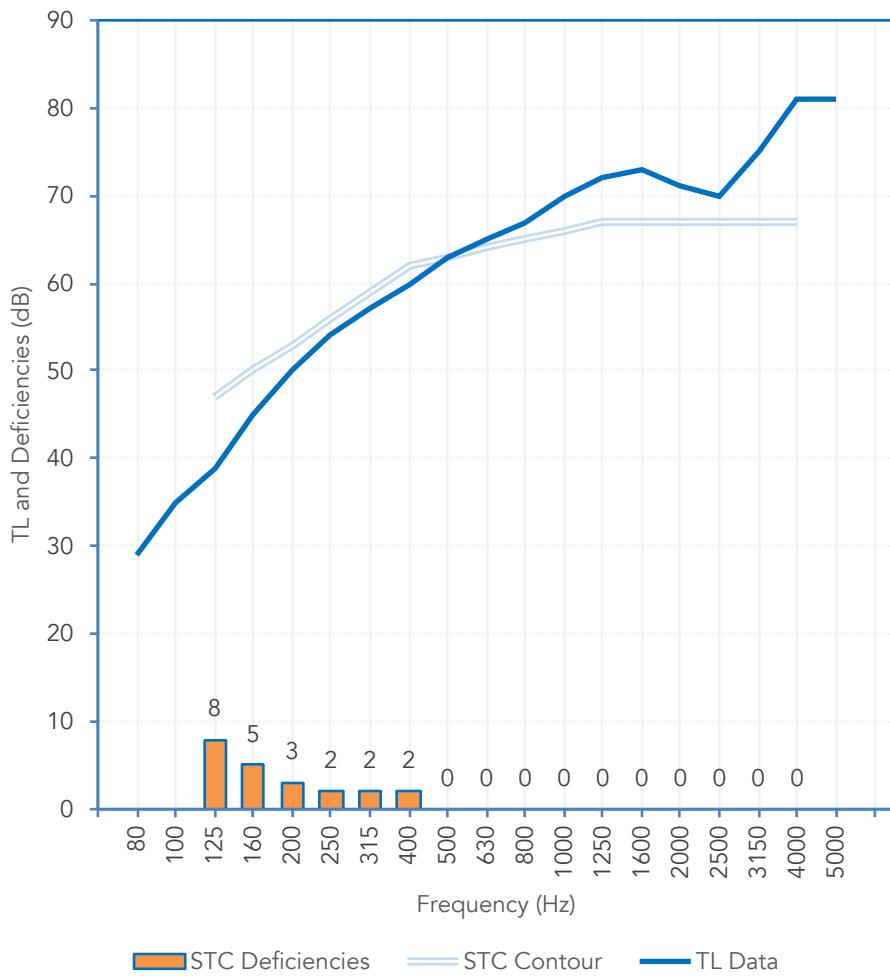
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STC 63

| Frequency (Hz) | TL (dB) | Deficiencies (dB) |
|----------------|---------|-------------------|
| 80 | 29 | |
| 100 | 35 | |
| 125 | 39 | 8 |
| 160 | 45 | 5 |
| 200 | 50 | 3 |
| 250 | 54 | 2 |
| 315 | 57 | 2 |
| 400 | 60 | 2 |
| 500 | 63 | |
| 630 | 65 | |
| 800 | 67 | |
| 1000 | 70 | |
| 1250 | 72 | |
| 1600 | 73 | |
| 2000 | 71 | |
| 2500 | 70 | |
| 3150 | 75 | |
| 4000 | 81 | |
| 5000 | 81 | |



Total Deficiencies

22

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 8" OC perimeter and 12" OC field |

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 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 July 24, 2018 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.



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APPENDIX A: MEASUREMENT SETUP

ENVIRONMENT

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

SPECIMEN AREA

| | | |
|----------------|----------------------|---------------------|
| Specimen Area: | 96.0 ft ² | 8.92 m ² |
|----------------|----------------------|---------------------|

CHAMBER VOLUME - AIRBORNE TRANSMISSION

| | | |
|--------------|------------------------|----------------------|
| Source Room | 7106.0 ft ³ | 201.2 m ³ |
| Receive Room | 7780.8 ft ³ | 220.3 m ³ |

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 |

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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 | 15.2 | | 3.78 | 40 | | |
| 63 | 18.5 | | 3.28 | 45 | | |
| 80 | 28.9 | | 4.57 | 46 | | |
| 100 | 35.1 | ‡ | 2.47 | 49 | | 8.9 |
| 125 | 38.7 | ‡ | 2.21 | 55 | 8 | 8.3 |
| 160 | 44.6 | ‡ | 1.12 | 58 | 5 | 5.4 |
| 200 | 50.0 | ‡ | 1.30 | 62 | 3 | 3.0 |
| 250 | 54.1 | ‡ | 1.24 | 65 | 2 | 1.9 |
| 315 | 57.4 | ‡ | 0.79 | 68 | 2 | 1.6 |
| 400 | 60.0 | ‡ | 0.66 | 71 | 2 | 2.0 |
| 500 | 63.3 | ‡ | 0.51 | 74 | - | - |
| 630 | 65.1 | ‡ | 0.45 | 76 | - | - |
| 800 | 66.6 | ‡ | 0.44 | 79 | - | - |
| 1000 | 69.6 | ‡ | 0.38 | 81 | - | - |
| 1250 | 72.2 | ‡ | 0.48 | 84 | - | - |
| 1600 | 73.1 | §‡ | 0.27 | 83 | - | - |
| 2000 | 70.9 | ‡ | 0.34 | 82 | - | - |
| 2500 | 70.3 | ‡ | 0.35 | 86 | - | - |
| 3150 | 75.0 | ‡ | 0.61 | 90 | - | - |
| 4000 | 81.3 | *§‡ | 0.57 | 89 | - | |
| 5000 | 81.2 | *§† | | 86 | | |
| 6300 | | | | | | |
| 8000 | | | | | | |
| 10000 | | | | | | |
| Total deficiencies below STC contour (dB) | | | | 22 | | |
| STC contour [ASTM E413] | | | | 63 | | |
| Total deficiencies below Rw contour (dB) | | | | | 31.1 | |
| Rw contour [ISO 717/1] | | | | | 63.0 | |

* 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.



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APPENDIX C: SPECIMEN ASSEMBLY DESCRIPTION

Overall Mass 724.40 lb [328.58 kg]

Surface Weight 7.55 PSF [36.84 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 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 8" OC perimeter and 12" OC field | 214.2 [97.2] | 2.23 [10.89] |



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APPENDIX C: SPECIMEN ASSEMBLY DESCRIPTION (CONTINUED)

FRAMING

Framing was constructed on 07-24-18 and was retained from previous 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 with 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 with 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. One layer 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 the gypsum wallboard. The panels were attached to the frame (except top track) with 1", #6 type S drywall screws at 8" OC at the perimeter and 12" OC in the field. The joints were staggered 24" as to offset on opposite sides of the frame.

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.

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

| Freq. Band (Hz) | Ri (Ri \equiv TL) (dB) | Ref Curve (dB) | Unfav. Deviat. (dB) | Li1 Spectrum (dB) | Li1 - Ri Level (dB) | Li2 Spectrum (dB) | Li2 - Ri Level (dB) |
|-----------------------|--------------------------------|----------------------|---------------------------|-------------------------|---------------------------|-------------------------|---------------------------|
| 50 | 15.2 | | | | | | |
| 63 | 18.5 | | | | | | |
| 80 | 28.9 | | | | | | |
| 100 | 35.1 | 44.0 | 8.9 | -29.0 | -64.1 | -20.0 | -55.1 |
| 125 | 38.7 | 47.0 | 8.3 | -26.0 | -64.7 | -20.0 | -58.7 |
| 160 | 44.6 | 50.0 | 5.4 | -23.0 | -67.6 | -18.0 | -62.6 |
| 200 | 50.0 | 53.0 | 3.0 | -21.0 | -71.0 | -18.0 | -68.0 |
| 250 | 54.1 | 56.0 | 1.9 | -19.0 | -73.1 | -15.0 | -69.1 |
| 315 | 57.4 | 59.0 | 1.6 | -17.0 | -74.4 | -14.0 | -71.4 |
| 400 | 60.0 | 62.0 | 2.0 | -15.0 | -75.0 | -13.0 | -73.0 |
| 500 | 63.3 | 63.0 | - | -13.0 | -76.3 | -12.0 | -75.3 |
| 630 | 65.1 | 64.0 | - | -12.0 | -77.1 | -11.0 | -76.1 |
| 800 | 66.6 | 65.0 | - | -11.0 | -77.6 | -9.0 | -75.6 |
| 1000 | 69.6 | 66.0 | - | -10.0 | -79.6 | -8.0 | -77.6 |
| 1250 | 72.2 | 67.0 | - | -9.0 | -81.2 | -9.0 | -81.2 |
| 1600 | 73.1 | 67.0 | - | -9.0 | -82.1 | -10.0 | -83.1 |
| 2000 | 70.9 | 67.0 | - | -9.0 | -79.9 | -11.0 | -81.9 |
| 2500 | 70.3 | 67.0 | - | -9.0 | -79.3 | -13.0 | -83.3 |
| 3150 | 75.0 | 67.0 | - | -9.0 | -84.0 | -15.0 | -90.0 |
| 4000 | 81.3 | | | | | | |
| 5000 | 81.2 | | | | | | |

Sum = 31.1

RW = 63.0

RA,1 = 59.2

C = -4

RA,2 = 52.6

Ctr = -10.0

$$Rw (C ; Ctr) = 63 (-4 ; -10)$$

$$Rw (C ; Ctr ; C50-3150 ; Ctr,50-3150) = 63 (-4 ; -10 ; -12 ; -26)$$

$$Rw (C ; Ctr ; C100-5000 ; Ctr,100-5000) = 63 (-4 ; -10 ; -3 ; -10)$$

$$Rw (C ; Ctr ; C50-5000 ; Ctr,50-5000) = 63 (-4 ; -10 ; -11 ; -26)$$

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.