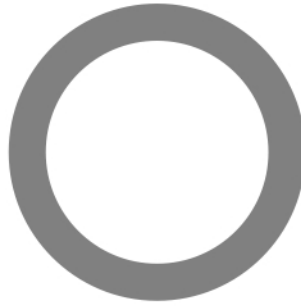


ASTM E 90-09: Laboratory Measurement of Airborne Sound Transmission of Building Partitions and Elements

Orfield Laboratories Inc



Design Research Testing

Acoustics / Vibration / Vision / Lighting / Architecture / Market Research

TEST

Client: Cemco
Report Date: January 29, 2015
Test Date: October 29, 2015
Test Number: OL15-1017

ACCREDITATION



For the scope of accreditation under NVLAP code 200248-0

RESULT SUMMARY

STC=54

CLIENT ADDRESS

Cemco
263 North Covina Lane
City of Industry, CA 91744
(800) 775-2362

PREPARED BY

David M. Berg
Orfield Laboratories, Inc.
2709 East 25th Street
Minneapolis MN 55406
Voice (612) 721-2455
FAX (612) 721-2457

Prepared by:

Handwritten signature of David M. Berg with 'ELECTRONICALLY REPRODUCED SIGNATURE' watermark.

David M. Berg
Laboratory Manager

Reviewed By:

Handwritten signature of Michael R. Role with 'ELECTRONICALLY REPRODUCED SIGNATURE' watermark.

Michael R. Role

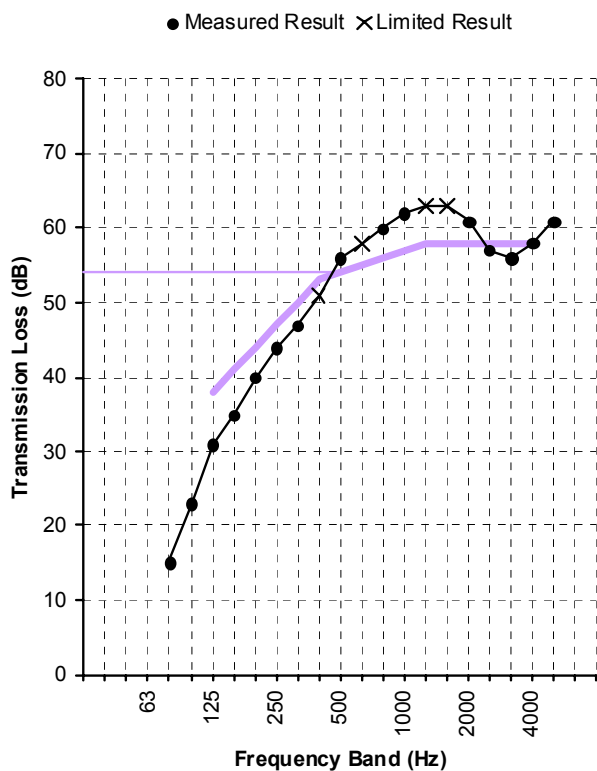
Signatures are required on this document for an official laboratory test report. Copies of this document without signatures are for reference only.





Test Date October 29, 2015
Specimen Wall Assembly

Single Number Rating
STC = 54



| Freq. (Hz) | TL (dB) | Def. (dB) |
|--------------------|---------|-----------|
| 80 | 15 | |
| 100 | 23 | |
| 125 | 31 | 7 |
| 160 | 35 | 6 |
| 200 | 40 | 4 |
| 250 | 44 | 3 |
| 315 | 47 | 3 |
| 400 | 51* | 2 |
| 500 | 56 | - |
| 630 | 58* | - |
| 800 | 60 | - |
| 1000 | 62 | - |
| 1250 | 63* | - |
| 1600 | 63* | - |
| 2000 | 61 | - |
| 2500 | 57 | 1 |
| 3150 | 56 | 2 |
| 4000 | 58 | - |
| 5000 | 61 | |
| Total Deficiencies | | 28 |

* Estimate of lower limit

Assembly Elements (listed in order from source room side to receiver room side)

- 0.625" (5/8") type X gypsum (v); 1.25" type S screw @ 12" O.C.
- Cemco Tab Track 20 ga. eq.
- Cemco Viper 20 ga. eq. steel studs @ 24" O.C.
- (3.5") fiberglass insulations (R13)
- 0.625" (5/8") N.G.* SoundBreak (v); 1.25" type S screw @ 12" O.C.
- * National Gypsum

- (h) = horizontal installation
- (v) = vertical installation
- (vs) = vertical installation with staggered seams





SPECIMEN DESCRIPTION

The specimen under test was a wall assembly. The elements in the assembly are described briefly below the results table and chart on page 2. Detailed information regarding the specimen may be found in Appendix C.

Test results pertain to this specimen only.

INSTALLATION AND DISPOSITION

The 3-5/8" steel track and frame was constructed on October 28, 2015. The framing and insulation were retained for subsequent tests in the series. Independent contractors fabricated the test specimen and sealed it in the specimen opening as described in the detailed sample description in Appendix C. Qualified representatives of Orfield Laboratories observed the installation progress, and visually inspected the specimen prior to testing.

TEST METHODS

The methods followed these published standards:

ASTM E90-09*: *Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements*

ASTM E413-10: *Classification for Rating Sound Insulation*

The values presented in this report are from single-direction transmission loss measurements.

** Orfield Laboratories, Inc. has been accredited by the U.S. Department of Commerce, National Institute of Standards and Technology (NIST) under their National Voluntary Laboratory Accreditation Program (NVLAP) for this test procedure. This report shall not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the U.S. Government.*

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 [20.6°C] |
| Relative Humidity | 50% |

Specimen Area

| | |
|---------------|--------------------|
| Specimen Area | 64.5 ft² [5.99 m²] |
|---------------|--------------------|

Chamber Volume - Airborne Transmission

| | |
|-----------------------|---------------------|
| Source Room Volume | 3284 ft³ [93.0 m³] |
| Receiving Room Volume | 8281 ft³ [234.5 m³] |

Chamber Volume - Impact Transmission

| | |
|-----------------------|---------------------|
| Source Room Volume | 8281 ft³ [234.5 m³] |
| Receiving Room Volume | 2062 ft³ [58.4 m³] |

INSTRUMENTATION

| Description | Brand | Model | S/N |
|---------------|--------------|-------------|--|
| Analyzer | Norsonic | Type 121 | 31185 |
| Calibrator | Brüel & Kjær | Type 4230 | 372201 |
| Microphone | Brüel & Kjær | Type 4134 | 296819 |
| Microphone | Brüel & Kjær | Type 4134 | 1675265 |
| Preamplifier | G.R.A.S. | TMS126AF | 10038 |
| Preamplifier | Brüel & Kjær | Type 2639 | 1312147 |
| Rotating Boom | Brüel & Kjær | Type 3923 | 936491 |
| Rotating Boom | Brüel & Kjær | Type 3923 | 2036583 |
| Power Supply | Brüel & Kjær | Type WB1057 | n/a |
| Loudspeakers | JBL | EON15 | J149N-023374 J149N-024235 J149N-137360 |
| Subwoofer | JBL | JRX-118SP | P0370-018539 |





APPENDIX B: CALCULATION RESULTS

| Freq. Band (Hz) | Specimen T.L. (dB) | 95% Conf. (dB) | Flanking Limit (dB) | STC Defic. (dB) |
|---|--------------------|----------------|---------------------|-----------------|
| 25 | | | | |
| 31.5 | 27.4 | | 40 | |
| 40 | 15.7 | | 47 | |
| 50 | 15.7 | | 43 | |
| 63 | 13.7 | | 43 | |
| 80 | 14.8 | ±5.02 | 41 | |
| 100 | 22.6 | ±3.05 | 46 | |
| 125 | 31.3 | ±2.35 | 51 | 7 |
| 160 | 35.2 | ±2.38 | 55 | 6 |
| 200 | 39.8 | ±1.55 | 57 | 4 |
| 250 | 44.1 | ±1.09 | 60 | 3 |
| 315 | 47.4 | ±0.89 | 60 | 3 |
| 400 | 51.2 § | ±0.74 | 61 | 2 |
| 500 | 55.9 | ±0.98 | 66 | - |
| 630 | 58.4 § | ±0.93 | 68 | - |
| 800 | 59.7 | ±0.52 | 72 | - |
| 1000 | 62.3 | ±0.67 | 75 | - |
| 1250 | 62.7 § | ±0.85 | 72 | - |
| 1600 | 63.4 § | ±0.49 | 73 | - |
| 2000 | 60.7 | ±0.38 | 77 | - |
| 2500 | 56.7 | ±0.57 | 81 | 1 |
| 3150 | 56.3 | ±0.70 | 84 | 2 |
| 4000 | 57.7 | ±0.50 | 78 | - |
| 5000 | 61.0 | | | |
| 6300 | 64.9 | | | |
| 8000 | 66.8 * | | | |
| 10000 | 62.4 * | | | |
| Total deficiencies below STC contour (dB) | | | | 28 |
| STC contour [ASTM E413] | | | | 54 |

* 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.

Note: 95% confidence intervals for T.L. measurements from room qualification data. ASTM 1289 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 from chamber flanking study. Extended frequency results below 80Hz and above 5000Hz are for reference only.





APPENDIX C: SPECIMEN ASSEMBLY DESCRIPTION

The following table shows the description of the wall assembly.

Overall Mass = 370.7 lb [168.1 kg]
 Overall Surface Density = 5.75 PSF [28.06 kg/m²]

| Element | Mass lb [kg] | Surf. Dens. PSF [kg/m ²] |
|--|---------------------------|---|
| 0.625" (5/8") type X gypsum (v); 1.25" type S screw @ 12" O.C. Cemco Tab Track 20 ga. eq. | 148.0 [67.1] | 2.29 [11.20] |
| Cemco Viper 20 ga. eq. steel studs @ 24" O.C. (3.5") fiberglass insulations (R13) | 26.3 [11.9] 19.2 [8.7] | 0.41 [1.99] 0.30 [1.45] |
| 0.625" (5/8") N.G.* SoundBreak (v); 1.25" type S screw @ 12" O.C. * National Gypsum | 177.2 [80.4] | 2.75 [13.41] |

(h) = horizontal installation
 (v) = vertical installation
 (vs) = vertical installation with staggered seams

Cemco Tab Track and Cemco ViperStuds and were supplied by the Client. The type X gypsum board sheeting was also provided by the client and was shipped directly from a third party supplier. All other materials were purchased through local retail channels. All materials were weighed prior to installation. Weights of fasteners and sealant are not represented in the above totals.

FRAMING

A steel frame was constructed in the laboratory test opening. The framing consisted of a Cemco 20 gauge equivalent (.0205" thick) Tab Track steel head track, a Cemco 3-5/8" x 1-1/4", 20 gauge equivalent (.0205" thick) steel bottom track, and 5 Cemco ViperStud, 3-5/8" x 1-1/4", 20 gauge equivalent (0.0205") steel studs installed 24" on center. The Cemco Tab Track was fastened to the top of the test opening with screws and concrete anchors.

INSULATION

Fiberglass insulation batts were installed in the stud cavities. The insulation batts were 24" wide, 3.5" thick R13, and were friction fit into each of the 4 stud cavities.

SHEETING

The source room side sheeting consisted of one 5/8" thick gypsum board sheeting layer. The source room side sheeting consisted of two sheets of 5/8" thick type X gypsum board fastened parallel to the steel studs with 1-1/4" long, type S drywall screws spaced at 12" O.C. in the field and spaced at 8" at the sheet edges.

The source room side gypsum board was cut short at the head to intentionally leave a gap of approximately 1/2" across the top and was filled with backer rod, tape and joint compound. Also, the sheeting was not attached to the header on this side.





The receiver room sheeting consisted of one 5/8" thick gypsum board sheeting layer. The receiver room side sheeting consisted of two sheets of 5/8" thick type X gypsum board fastened parallel to the steel studs with 1-1/4" long, type S drywall screws spaced at 12" O.C. in the field and spaced at 8" at the sheet edges.

The receiving room side gypsum board sheeting was cut short at the head to intentionally leave a gap of approximately 1/2" across the top and was filled with CEMCO HOTROD, tape and joint compound. Also, the sheeting was not attached to the header on this side.

Panels were shimmed at installation to leave a minimal gap at the bottom and the intentional 1/2" gap at the top. Shims were removed after sheeting was fastened and the perimeter at the sides and bottom edge was sealed on the source and receiving room sides with acoustic sealant, 1-7/8" wide, 2 mil aluminum foil tape and 7/8" dense putty tape. The seams were sealed with acoustic sealant and 2 mil aluminum foil tape.



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

| Freq. Band (Hz) | R_i (R_i ? TL) (dB) | 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 | 15.7 | | | | | | |
| 63 | 13.7 | | | | | | |
| 80 | 14.8 | | | | | | |
| 100 | 22.6 | 34 | 11.4 | -29.0 | -51.6 | -20.0 | -42.6 |
| 125 | 31.3 | 37 | 5.7 | -26.0 | -57.3 | -20.0 | -51.3 |
| 160 | 35.2 | 40 | 4.8 | -23.0 | -58.2 | -18.0 | -53.2 |
| 200 | 39.8 | 43 | 3.2 | -21.0 | -60.8 | -18.0 | -57.8 |
| 250 | 44.1 | 46 | 1.9 | -19.0 | -63.1 | -15.0 | -59.1 |
| 315 | 47.4 | 49 | 1.6 | -17.0 | -64.4 | -14.0 | -61.4 |
| 400 | 51.2 | 52 | 0.8 | -15.0 | -66.2 | -13.0 | -64.2 |
| 500 | 55.9 | 53 | - | -13.0 | -68.9 | -12.0 | -67.9 |
| 630 | 58.4 | 54 | - | -12.0 | -70.4 | -11.0 | -69.4 |
| 800 | 59.7 | 55 | - | -11.0 | -70.7 | -9.0 | -68.7 |
| 1000 | 62.3 | 56 | - | -10.0 | -72.3 | -8.0 | -70.3 |
| 1250 | 62.7 | 57 | - | -9.0 | -71.7 | -9.0 | -71.7 |
| 1600 | 63.4 | 57 | - | -9.0 | -72.4 | -10.0 | -73.4 |
| 2000 | 60.7 | 57 | - | -9.0 | -69.7 | -11.0 | -71.7 |
| 2500 | 56.7 | 57 | 0.3 | -9.0 | -65.7 | -13.0 | -69.7 |
| 3150 | 56.3 | 57 | 0.7 | -9.0 | -65.3 | -15.0 | -71.3 |
| 4000 | 57.7 | | | | | | |
| 5000 | 61.0 | | | | | | |
| Sum = | | | 30.4 | $R_{A,1} =$ | 48.7 | $R_{A,2} =$ | 41.4 |
| $R_w =$ | | | 53 | $C =$ | -4 | $C_{tr} =$ | -12 |

$$R_w (C ; C_{tr}) = 53 (-4 ; -12)$$

$$R_w (C ; C_{tr} ; C_{50-3150} ; C_{tr, 50-3150}) = 53 (-4 ; -12 ; -9 ; -21)$$

$$R_w (C ; C_{tr} ; C_{100-5000} ; C_{tr, 100-5000}) = 53 (-4 ; -12 ; -3 ; -12)$$

$$R_w (C ; C_{tr} ; C_{50-5000} ; C_{tr, 50-5000}) = 53 (-4 ; -12 ; -8 ; -21)$$

Note: The 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. Orfield Laboratories *does not* hold accreditation for ISO 140 or ISO 717 under their NVLAP scope of accreditation.

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. 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.

