

1512 S BATAVIA AVENUE
GENEVA, IL 60134
630-232-0104

An ALION Technical Center

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WALLACE CLEMENT SABINE

Test Report

SPONSOR: **ClarkDietrich**
West Chester, OH

Sound Transmission Loss
RAL™-TL21-027

CONDUCTED: 2021-01-25

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ON: 8-Inch Concrete Slab with insulated dual-layer gypsum board ceiling on ClarkDietrich Sound Clips™ (CDSC)

TEST METHODOLOGY

Riverbank Acoustical Laboratories™ is accredited by the U.S. Department of Commerce, National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP) as an ISO 17025:2017 Laboratory (NVLAP Lab Code: 100227-0) and for this test procedure. The test reported in this document conformed explicitly with ASTM E90-09 (2016): "Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements." The single number rating of the specimen was calculated according to ASTM E413-16: "Classification for Rating Sound Insulation." A description of the measurement procedure and room specifications is available upon request. The transmission loss values are for a single direction of measurement. The results presented in this report apply to the sample as received from the test sponsor.

INFORMATION PROVIDED BY SPONSOR

The test specimen was designated by the sponsor as 8-Inch Concrete Slab with insulated dual-layer gypsum board ceiling on ClarkDietrich Sound Clips™ (CDSC). The following nominal product information was provided by the sponsor prior to testing. The accuracy of such sponsor-provided information can affect the validity of the test results.

Products Under Test

Isolating Clips

Trade Name: ClarkDietrich Sound Clips™ (CDSC)
Manufacturer: ClarkDietrich

Furring Channel

Trade Name: 087F125-18 (33ksi, G40EQ)
Material: 7/8 in. Furring/Hat Channel – 25 ga (18 mils)
Manufacturer: ClarkDietrich



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SPECIMEN MEASUREMENTS & TEST CONDITIONS

The building contractor (Seth Priser) and RAL staff compiled a detailed construction specification as follows, in order of installation:

Concrete Slab

Material: Wire-reinforced concrete
Dimensions: 4 @ 610 mm (24 in.) x 4267 mm (168 in.)
Thickness: 203 mm (8 in.)
Overall Weight: 5023.08 kg (11074 lbs)
Mass per Unit Area: 482.75 kg/m² (98.875 lbs/ft²)
Installation: Laid in test opening over 152.4 mm (6 in.) wide knee walls constructed from isolated wood framing
Joint undersides sealed with acoustical caulk and tape
Top of joints filled with general purpose sand, sealed with premixed masonry joint compound

Ceiling Assembly

Isolating Clips

Material: Metal, rubber (see Products Under Test)
Dimensions: 76 mm (3 in.) long by 35 mm (1.375 in.) wide
Thickness: 32 mm (1.25 in.)
Installation: Fastened through center to anchor holes in underside of concrete slabs
Staggered array, spaced 1219 mm (48 in.) on center, 16 pieces total
Overall Weight: 1.02 kg (2.25 lbs)

Furring Channel

Material: Steel furring channel (see Products Under Test)
Dimensions: 7 @ 2463.8 mm (97 in.) long by 69 mm (2.72 in.) wide
Formed Depth: 22.2 mm (0.875 in.)
Steel Thickness: 0.49 mm (0.019 in.)
Installation: Clipped in to isolating clips, oriented perpendicular to concrete slab
Overall Weight: 6.58 kg (14.5 lbs)
Mass per Unit Length: 0.38 kg/m (0.26 lbs/ft)

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Ceiling Assembly (continued)

Insulation

Material: R-6.7 unfaced fiberglass insulation
Dimensions: 406 mm (16 in.) wide by 1219 mm (48 in.) long pieces
Thickness: 51 mm (2 in.)
Installation: Draped over furring channel
Orientation: Length of pieces perpendicular to furring channel
Overall Weight: 4.31 kg (9.5 lbs)
Density: 8.78 kg/m³ (0.55 lbs/ft³)

Gypsum Layer 1

Material: Type X gypsum board
Manufacturer: USG
Brand name: Sheetrock® brand, Firecode® core (type X)
Dimensions: 1219 mm (48 in.) wide by 2616 mm (103 in.) long
1219 mm (48 in.) wide by 2584.5 mm (101.75 in.) long
1219 mm (48 in.) wide by 1384 mm (54.5 in.) long
1219 mm (48 in.) wide by 1346 mm (53 in.) long
Thickness: 15.9 mm (0.625 in.)
Installation: Fastened to furring channel at center flange
Fasteners: Type S bugle head drywall screws @ 31.8 mm (1.25 in.)
Fastener Spacing: 610 mm (24 in.) on center
Overall Weight: 105.23 kg (232 lbs)
Mass per Unit Area: 10.88 kg/m² (2.23 lbs/ft²)

Gypsum Layer 2

Material: Type X gypsum board
Manufacturer: USG
Brand name: Sheetrock® brand, Firecode® core (type X)
Dimensions: 1 @ 1219 mm (48 in.) wide by 2019 mm (79.5 in.) long
1 @ 1219 mm (48 in.) wide by 1962 mm (77.25 in.) long
1 @ 610 mm (24 in.) wide by 2616 mm (103 in.) long
1 @ 610 mm (24 in.) wide by 2572 mm (101.25 in.) long
1 @ 610 mm (24 in.) wide by 1365 mm (53.75 in.) long
1 @ 610 mm (24 in.) wide by 1403 mm (55.25 in.) long
Thickness: 15.9 mm (0.625 in.)
Installation: Fastened through Gypsum Layer 1 to center flange of furring channel
Fasteners: Type S bugle head drywall screws @ 41.3 mm (1.625 in.)
Fastener Spacing: 610 mm (24 in.) on center
Overall Weight: 103.87 kg (229 lbs)

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Ceiling Assembly (continued)

Gypsum Layer 2

Mass per Unit Area: 10.70 kg/m² (2.19 lbs/ft²)

Note: Joints and screw heads on the exposed face of the gypsum board in the receive room were treated with a thin bead of acoustical sealant and metal tape (0.23 kg (0.5 lbs) total).

Overall Specimen Measurements

Dimensions: 2.44 m (96.0 in) wide by 4.27 m (168 in.) long
Thickness: 286 mm (11.25 in)
Weight: 5244.32 kg (11561.75 lbs)
Overall Area: 10.405 m² (112 ft²)
Mass per Unit Area: 504.01 kg/m² (103.23 lbs/ft²)

Test Aperture

Opening Size: 4.27 m (14.0 ft) x 6.10 m (20.0 ft)
Filler Wall: Yes
Aperture Size: 2.44 m (96.0 in) wide by 3.86 m (152.0 in) long
Transmission Area: 9.414 m² (101.33 ft²)
Sealed: Entire periphery (both sides) with dense mastic

Test Environment

Source Room

Volume: 130.84 m³
Temperature: 22.2 °C ± 0.0 °C
Relative Humidity: 49.0 % ± 0.0 %

Receive Room

Volume: 81.9 m³
Temperature: 22.8 °C ± 0.0 °C
Relative Humidity: 47.0 % ± 0.0 %

Requirements

Temperature: 22° C +/- 2° C, not more than 3° C change over all tests.
Relative Humidity: ≥ 30%, not more than +/- 3% change over all tests.



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Figure 1 – Specimen mounted in test opening, as viewed from source room



Figure 2 – Specimen mounted in test opening, as viewed from receive room

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Figure 3 – Detail of isolating clip



Figure 4 – Detail of isolating clip

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Figure 5 – Isolating clips installed to bottom of concrete slabs



Figure 6 – Furring channel being installed to isolating clips

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Figure 7 – Furring channel and insulation installed below slabs



Figure 8 – First layer of gypsum board partially installed to furring channel

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TEST RESULTS


Sound transmission loss values are tabulated at the eighteen standard frequency bands. A graphic presentation of the data and additional information appear on the following pages. The precision of the transmission loss test data is within the limits set by the ASTM Standard E90-09 (2016). See Appendix A for identification of corrections applied to the reported data.

<u>FREQ.</u>	<u>TL</u>	<u>ΔTL</u>	<u>DEF.</u>	<u>FREQ.</u>	<u>TL</u>	<u>ΔTL</u>	<u>DEF.</u>
100	37	0.51	0	800	68	0.18	0
125	45	0.71	2	1000	72	0.16	0
160	45	0.32	5	1250	76	0.11	0
200	47	0.55	6	1600	80	0.12	0
250	49	0.31	7	2000	83	0.11	0
315	55	0.23	4	2500	88	0.13	0
400	58	0.30	4	3150	93	0.13	0
500	62	0.20	1	4000	93	0.13	0
630	65	0.18	0	5000	89	0.11	0

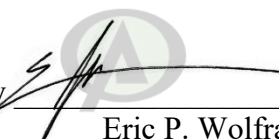
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ABBREVIATION INDEX

- FREQ. = 1/3 OCTAVE BAND CENTER FREQUENCY, Hz
- TL = TRANSMISSION LOSS, dB
- ΔTL = 95% CONFIDENCE INTERVAL FOR TL MEASUREMENTS, dB
- DEF. = DEFICIENCIES, dB BELOW SHIFTED STC CONTOUR (SUM OF DEF = 29)
- STC = SOUND TRANSMISSION CLASS

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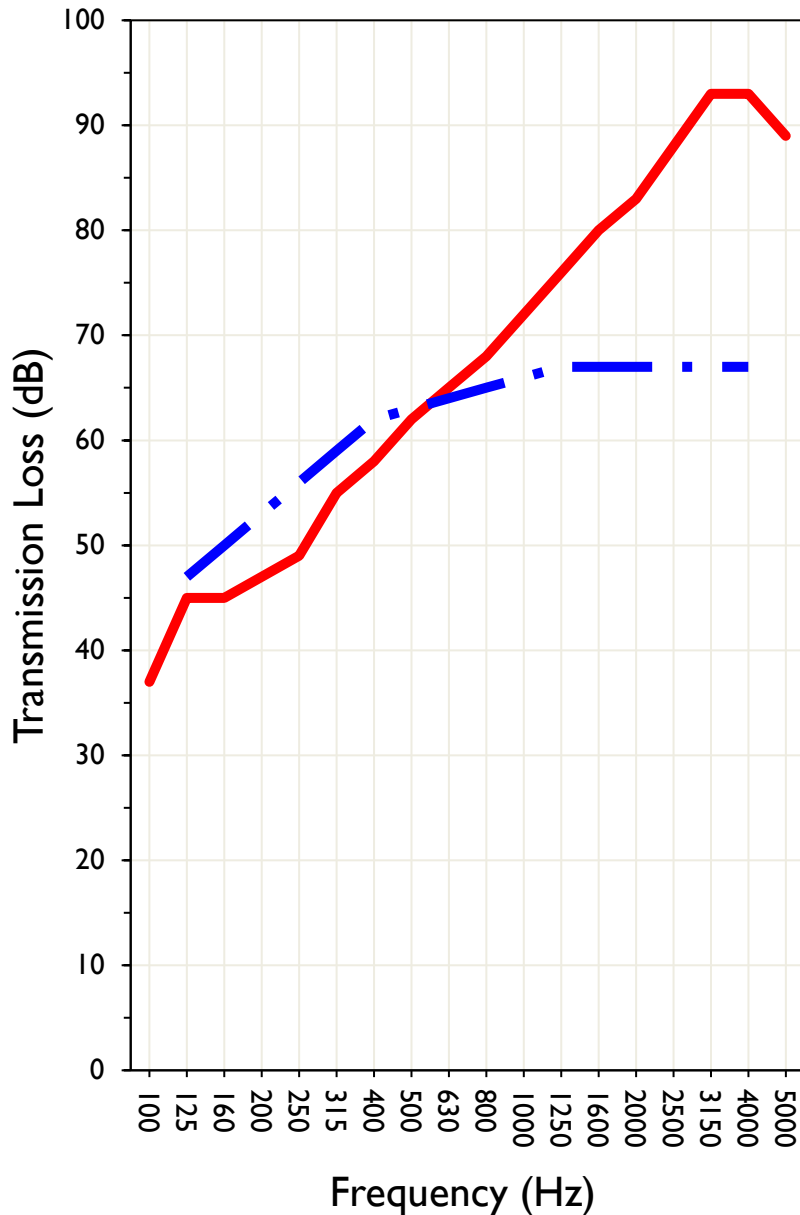
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SOUND TRANSMISSION REPORT

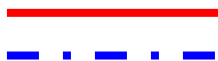
8-Inch Concrete Slab with insulated dual-layer gypsum board ceiling on ClarkDietrich
 Sound Clips™ (CDSC)



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TRANSMISSION LOSS

SOUND TRANSMISSION CLASS CONTOUR



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APPENDIX A: Extended Frequency Range Data

Specimen: 8-Inch Concrete Slab with insulated dual-layer gypsum board ceiling on ClarkDietrich Sound Clips™ (CDSC) (See Full Report)

The following non-accredited data were obtained in accordance with ASTM E90-09 (2016), but extend beyond the defined frequency range of 100Hz to 5,000Hz. These unofficial results are representative of the RAL test environment only and intended for research & comparison purposes. Sampling precision observed during this procedure is reported below. Corrections are detailed in Appendix B.

1/3 Octave Band Center Frequency (Hz)	Sound Transmission Loss (dB)	Applicable Corrections	ΔTL (Eq. A2.5) (dB)	Repeatability (dB)
31.5	43	ZZ F	4.03	5.61
40	35	ZZ F	1.37	1.09
50	34	ZZ F	0.92	0.97
63	28	Z F	1.14	0.71
80	36	ZZ F	0.61	0.72
100	37	ZZ F	0.51	1.90
125	45	ZZ F	0.71	0.85
160	45	ZZ F	0.32	1.16
200	47	ZZ F	0.55	0.94
250	49	ZZ F	0.31	2.47
315	55	ZZ F	0.23	1.39
400	58	ZZ F	0.30	3.10
500	62	ZZ F	0.20	4.03
630	65	ZZ F	0.18	2.86
800	68	ZZ F	0.18	1.27
1000	72	ZZ F	0.16	1.18
1250	76	ZZ F	0.11	1.73
1600	80	ZZ F	0.12	0.86
2000	83	ZZ F	0.11	0.90
2500	88	ZZ F	0.13	0.96
3150	93	ZZ A F	0.13	1.74
4000	93	ZZ AA F	0.13	2.80
5000	89	ZZ AA F	0.11	2.43
6300	83	ZZ A F	0.14	1.96
8000	77	Z A F	0.13	1.98
10000	69	Z A F	0.37	1.56
12500	63	Z F	0.22	3.53

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APPENDIX B: Glossary of Standardized Corrections and Adjustments

Specimen: 8-Inch Concrete Slab with insulated dual-layer gypsum board ceiling on ClarkDietrich Sound Clips™ (CDSC) (See Full Report)

Mark Interpretation

- A* Measured sound pressure levels in the receive room are within 10 dB of the ambient noise level at the marked frequency band. Receive room levels used to calculate Transmission Loss are corrected according to ASTM E90 Section 10.3.
- AA* Measured sound pressure levels in the receive room are within 5 dB of the ambient noise level at the marked frequency band. Receive room levels used to calculate Transmission Loss are corrected according to ASTM E90 Section 10.3.1. Transmission Loss values calculated from levels corrected this way will be less than or equal to Transmission Loss values from a hypothetical test using the same specimen and a receive room with idealized ambient sound levels of $(-\infty)$ dB.
- F* The reported Transmission Loss is within 10 dB of the laboratory flanking limit at the marked frequency band. The measured performance of the specimen may be limited by the performance of the laboratory building structure at this frequency band.
- Z* The reported Transmission Loss at the marked frequency band has been corrected according to ASTM E90 Section A3.2.7 to account for possible sound transmission through the filler assembly.
- ZZ* The reported Transmission Loss at the marked frequency band has been corrected according to ASTM E90 Section A3.2.8 to account for possible sound transmission through the filler assembly. Transmission Loss values corrected this way will be less than or equal to Transmission Loss values from a hypothetical test using the same specimen and an idealized filler assembly with a Sound Transmission Class rating of (∞) .

APPENDIX C: Glossary of Variability Metrics

Specimen: 8-Inch Concrete Slab with insulated dual-layer gypsum board ceiling on ClarkDietrich Sound Clips™ (CDSC) (See Full Report)

Δ TL, the 95% confidence interval for reported transmission loss values, is calculated from the standard deviation of the sets of measurements for source room sound pressure level, receive room sound pressure level, and receive room sound absorption. This metric is calculated in an effort to quantify the combined influences of room geometry, microphone positioning, and other varying environmental conditions on reported results.

Repeatability, expressed as a 95% confidence interval, is calculated from the standard deviation of transmission loss as obtained from a set of six (6) consecutive tests conducted according to this test method by RAL on 2020-02-14. The tests were performed on a specimen composed of an insulated wood truss floor-ceiling, using the same test opening as used in this report. This metric provides an estimate of the variation in results that might be observed if the test were repeated with no change to the installed specimen. Note that repeatability will vary with the construction type.

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APPENDIX D: Instruments of Traceability

Specimen: 8-Inch Concrete Slab with insulated dual-layer gypsum board ceiling on ClarkDietrich Sound Clips™ (CDSC) (See Full Report)

<u>Description</u>	<u>Model</u>	<u>Serial Number</u>	<u>Date of Certification</u>	<u>Calibration Due</u>
System 2	Type 3160-A-042	3160-106974	2020-08-13	2021-08-13
Bruel & Kjaer Mic And Preamp C	Type 4943-B-001	2311439	2020-04-07	2021-04-07
Bruel & Kjaer Pistonphone	Type 4228	2781248	2020-08-12	2021-08-12
EXTECH Hygro 662	SD700	A083662	2020-12-18	2021-12-18
EXTECH Hygro 663	SD700	A083663	2020-12-18	2021-12-18

APPENDIX E: Revisions to Original Test Report

Specimen: 8-Inch Concrete Slab with insulated dual-layer gypsum board ceiling on ClarkDietrich Sound Clips™ (CDSC) (See Full Report)

<u>Date</u>	<u>Revision</u>
2021-02-12	Original report issued

END