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

An ALION Technical Center

Test Report

RIVERBANK.ALIONSCIENCE.COM
FOUNDED 1918 BY
WALLACE CLEMENT SABINE

SPONSOR: **dB Sound Control**
Mt. Airy, NC

Impact Sound Transmission
RAL™-IN19-011

CONDUCTED: 2019-02-15

ON: Mortar and tile floor with dB Ceramic underlayment over 6 in. concrete slab, no ceiling

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 17025:2005 Laboratory (NVLAP Lab Code: 100227-0) and for this test procedure. The test reported in this document conformed explicitly with ASTM E492-09: "Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine." The single number rating of the specimen was calculated according to ASTM E989-18: "Standard Classification for Determination of Single-Number Metrics for Impact Noise." A description of the measurement procedure and room specifications is available upon request. The results presented in this report apply to the individual test specimen as described and assembled.

SPECIMEN MEASUREMENTS & TEST CONDITIONS

The test specimen was designated by the sponsor as Mortar and tile floor with dB Ceramic underlayment over 6 in. concrete slab, no ceiling. The building contractor and RAL staff compiled a detailed construction specification as follows, in order of installation.

Concrete Slab

Material:	Wire-reinforced concrete
Dimensions:	4 @ 609.6 mm (24 in.) x 4267.2 mm (168 in.)
Thickness:	152.4 mm (6 in.)
Overall Weight:	3474.74 kg (7660.5 lbs)
Mass per Unit Area:	333.94 kg/m^2 (68.40 lbs/ft^2)
Joints:	Underside sealed with acoustical caulk and tape
	Top filled with general purpose sand, sealed with ready mix compound

Note: A 0.08 mm (0.003 in.) thick polyethylene sheet was adhered with spray adhesive to the top face of the concrete slab in order to protect the slab surface.

Adhesive

Trade Name:	Roberts 2057
Material:	Vinyl composition tile adhesive
Application Tool:	1.59 mm (0.0625 in.) x 1.59 mm (0.0625 in.) x 0.79 mm (0.03125 in.) trowel
Wet Weight:	3.18 kg (7 lbs)
Installation:	Spread in a thin layer over polyethylene sheet

Underlayment

Trade Name:	dB Ceramic
Dimensions:	2438.4 mm (96 in.) x 4267.2 mm (168 in.) as installed
Overall Thickness:	3 mm (0.118 in.)
Overall Weight:	5.33 kg (11.75 lbs)
Mass per Unit Area:	0.51 kg/m^2 (0.10 lbs/ft^2)
Installation:	Laid over adhesive, rolled with 40.82 kg (90 lbs) flooring roller

Mortar

Trade Name:	Mapei Ultraflex™ 2
Material:	Polymer-modified thin-set mortar
Application Tool:	6.35 mm (0.25 in.) x 9.52 mm (0.375 in.) x 6.35 mm (0.25 in.) trowel
Thickness:	Approximately 6.35 mm (0.25 in.) as installed
Mix Ratio:	2.57 L water per 11.34 kg (25 lbs) dry mix
Wet Weight:	56.36 kg (124.25 lbs)
Installation:	Troweled over underlayment Trowel lines parallel to length of concrete slab

Tile

Trade Name:	Daltile LV02 12121HDIP6
Material:	Porcelain
Dimensions:	304.8 mm (12 in.) x 304.8 mm (12 in.)
Thickness:	7.94 mm (0.3125 in.)
Overall Weight:	164.65 kg (363 lbs)
Installation:	Laid over mortar, spaced 6.35 mm (0.25 in.) apart
Installation Date:	2019-02-12

Grout

Trade Name:	Mapei Flexcolor™ CQ
Wet Weight:	5.1 kg (11.25 lbs)
Installation:	Pressed into space between tiles
Installation Date:	2019-02-13

Overall Specimen Measurements

Size:	2.44 m (96.0 in) wide by 4.27 m (168.0 in) long
Thickness:	0.17 m (6.6 in)
Weight:	3709.37 kg (8177.75 lbs)
Transmission Area:	10.405 m² (112 ft²)
Mass per Unit Area:	356.49 kg/m² (73.02 lbs/ft²)

Test Aperture

Size:	4.27 m (14.0 ft.) by 2.44 m (8 ft.)
Filler Wall:	None
Sealed:	Entire periphery (both sides) with dense mastic

Test Environment

Source Room

Volume:	131.32 m³
Temperature:	22.2 °C ± 0.0 °C
Relative Humidity:	49.5 % ± 1.0 %

Receive Room

Volume:	82.64 m³
Temperature:	22.8 °C ± 0.0 °C
Relative Humidity:	49.5 % ± 1.0 %

Requirements

Temperature:	22º C +/- 5° C, not more than 3° C change over all tests.
Relative Humidity:	≥ 30% RH; not more than +/- 3% change over all tests.

Figure 1 – Completed specimen mounted in test aperture, as viewed from source room.

Figure 2 – Completed specimen mounted in test aperture, as viewed from receive room.

Figure 3 – Adhesive installed on polyethylene sheet over concrete slab

Figure 4 – Underlayment installed, floor roller used in installation

Figure 5 – Detail of underlayment material

Figure 6 – Mortar and tile partially installed over underlayment

TEST RESULTS

The averaged sound pressure levels, normalized to a receive room reference absorption of 10 m^2, are tabulated at the sixteen standard frequencies. A graphic presentation of the data and additional information appear on the following pages. The 95% confidence interval for the sound pressure level in the receive room is below the limits specified in Section A1.4 of ASTM E492-09.

FREQ.	Ln	ΔLn	DEV	FREQ.	Ln	ΔLn	DEV
100	55	3.17	0	800	60	5.17	0
125	56	0.88	0	1000	53	2.52	0
160	60	0.71	0	1250	50	4.45	0
200	60	0.98	0	1600	49	5.33	0
250	66	3.81	2	2000	43	4.04	0
315	69	2.60	5	2500	40	3.14	0
400	71	2.74	8	3150	37	2.54	0
500	69	2.53	7				
630	64	4.51	3				

IIC=48

ABBREVIATION INDEX

FREQ. = FREQUENCY, HERTZ, (cps)
Ln = NORMALIZED SOUND PRESSURE LEVEL, dB
ΔLn = 95% UNCERTAINTY LIMIT FOR Ln, dB
DEV. = DEVIATION FROM SHIFTED IIC CONTOUR, dB (SUM OF DEV = 25)
IIC = IMPACT INSULATION CLASS
* = INDICATES A CORRECTION HAS BEEN APPLIED TO DATA DUE TO BACKGROUND NOISE LEVELS

Tested by _____
Marc Sciaky
Senior Experimentalist

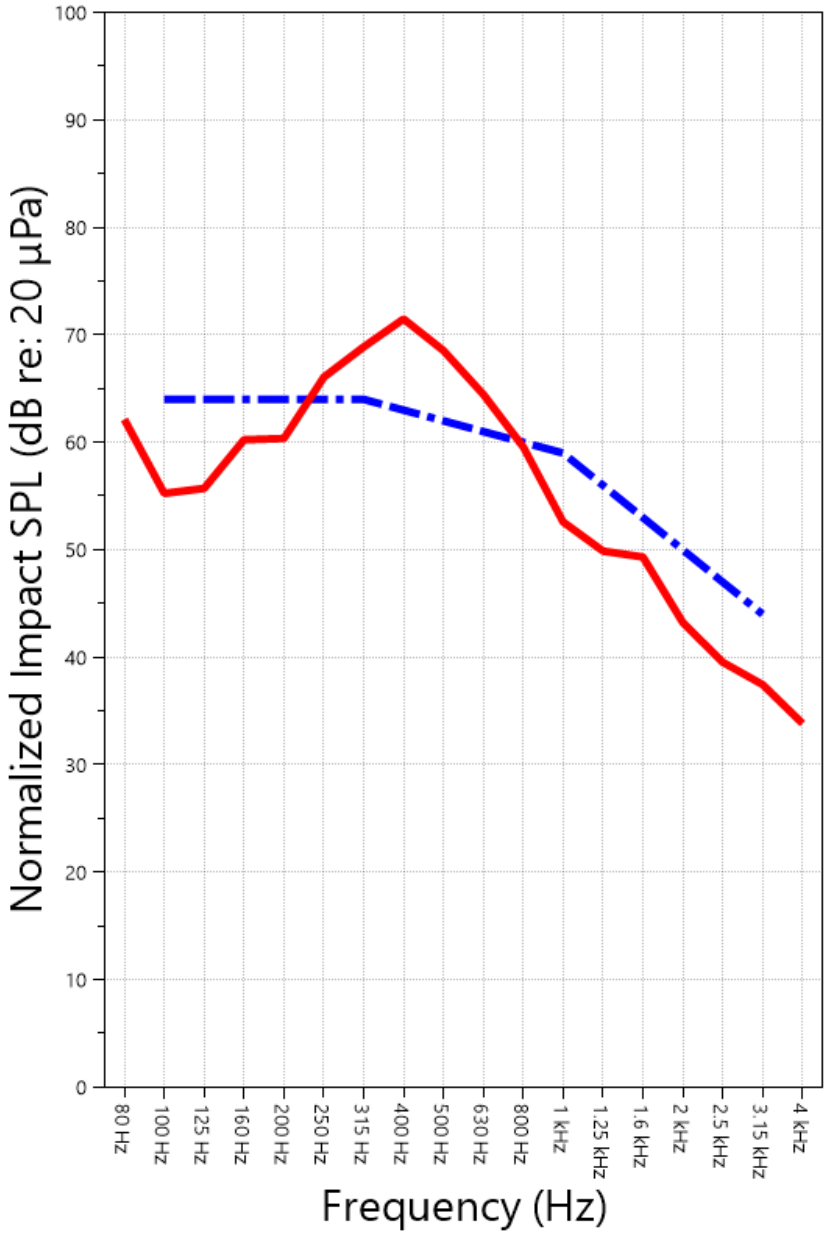
Report by _____
Malcolm Kelly
Test Engineer, Acoustician

Approved by _____
Eric P. Wolfram
Laboratory Manager

Digitally signed by Eric P Wolfram
DN: cn=Eric P Wolfram, o=Alion Science & Technology, ou=Riverbank Acoustical Laboratories, email=ewolfram@alionscience.com, c=US
Date: 2019.03.01 14:59:47 -06'00'

IMPACT SOUND TRANSMISSION REPORT

Mortar and tile floor with dB Ceramic underlayment over 6 in. concrete slab, no ceiling



IIC=48

IMPACT SOUND PRESSURE LEVEL
IMPACT INSULATION CLASS CONTOUR

APPENDIX A: Extended Frequency Range Data

Specimen: Mortar and tile floor with dB Ceramic underlayment over 6 in. concrete slab, no ceiling (See Full Report)

The following non-accredited data were obtained in accordance with ASTM E989-06 (2012), but extend beyond the defined frequency range of 100 Hz to 3,150 Hz. These unofficial results are representative of the RAL test environment only and intended for research & comparison purposes.

1/3 Octave Band Center Frequency (Hz)	L_n (dB)	ΔL_n (dB)	Repeatability (dB)
31.5	51	14.36	4.45
40	56	5.09	3.47
50	58	1.02	2.55
63	60	2.45	5.07
80	62	6.33	2.23
100	55	3.31	3.47
125	56	1.43	2.85
160	60	1.36	2.46
200	60	1.07	1.93
250	66	3.84	0.73
315	69	2.63	0.79
400	71	2.76	2.17
500	69	2.53	1.93
630	64	4.53	0.21
800	60	5.17	1.41
1000	53	2.53	2.05
1250	50	4.45	1.49
1600	49	5.33	2.22
2000	43	4.04	2.51
2500	40	3.15	1.26
3150	37	2.58	1.51
4000	34	3.11	1.85
5000	30	2.12	1.82
6300	27	3.04	1.90
8000	25	3.40	0.88
10000	24	2.97	4.02
12500	22	4.93	5.26

APPENDIX B: Glossary of Variability Metrics

Specimen: Mortar and tile floor with dB Ceramic underlayment over 6 in. concrete slab, no ceiling (See Full Report)

ΔL_n, the 95% confidence interval for the reported normalized sound pressure level, is calculated from the standard deviation of the set of sound pressure levels measured during this individual test. This metric is calculated in an effort to quantify the variability in measured levels due to the combined influences of measured levels at different microphone positions and the specimen's response to different tapping machine locations.

Repeatability, expressed as a 95% confidence interval, is calculated from the standard deviation in normalized sound pressure level as obtained from a total of six tests conducted according to this test method by RAL. The six consecutive tests were conducted from 2019-02-07 to 2019-02-12 on a bare 152.4 mm (6 in.) thick concrete slab specimen, which was left installed and unaltered between tests. The repeatability standard deviation is comparable to reference values for concrete slabs provided in Table 1 of ASTM E492-09 (2016). 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 or the measurement apparatus. Note that repeatability may vary depending on the construction type.

APPENDIX C: Instruments of Traceability

Specimen: Mortar and tile floor with dB Ceramic underlayment over 6 in. concrete slab, no ceiling (See Full Report)

Description	Model	Serial Number	Date of Certification	Calibration Due
System 2	Type 3160-A-042	3160-106974	2018-08-09	2019-08-09
Bruel & Kjaer Mic And Preamp D	Type 4943-B-001	2311440	2018-09-28	2019-09-28
Wood Case Tapping Machine	Type 3204	226940	2018-08-23	2019-08-23
Bruel & Kjaer Pistonphone	Type 4228	2781248	2018-08-06	2019-08-06
EXTECH Hygro 330	SD700	A083330	2018-09-07	2019-09-07
EXTECH Hygro 322	SD700	A083322	2018-09-07	2019-09-07

APPENDIX D: Revisions to Original Test Report

Specimen: Mortar and tile floor with dB Ceramic underlayment over 6 in. concrete slab, no ceiling (See Full Report)

Date	Revision
2019-02-20	Original report issued

END