SPONSOR: **Mayne Inc.**
Langley, British Columbia, Canada

Sound Absorption
RAL™-A19-487

CONDUCTED: 2019-12-02

ON: Linear Metal Ceilings: Link & Lock Beams (6 in. Link & Lock Beams) with fiberglass backer

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 C423-17: "Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method." The specimen mounting was performed according to ASTM E795-16: "Standard Practices for Mounting Test Specimens During Sound Absorption Tests." A description of the measurement procedure and room specifications are available upon request. 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 Linear Metal Ceilings: Link & Lock Beams (6 in. Link & Lock Beams) with fiberglass backer. 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.

Product Under Test

Trade Name:	Linear Metal Ceilings: Link & Lock Beams
Depth:	152.4 mm (6 in.)
Backer Density:	48.1 kg/m^3 (3 lbs/ft^3)
Manufacturer:	Longboard Products

SPECIMEN MEASUREMENTS & TEST CONDITIONS

Through a full external visual inspection performed on the test specimen, Riverbank personnel verified the following information:

Test Specimen

Materials:	Hollow metal beams over rigid fiberglass backer
Dimensions:	Beams, 18 @ 2438.4 mm (96 in.) long x 152.4 mm (6 in.) wide x 41 mm (1.614 in.) thick Fiberglass backer @ 2743.2 mm (108 in.) x 2438.4 mm (96 in.)
Thickness:	Beam wall @ 1.8 mm (0.071 in.) Fiberglass backer @ 25.4 mm (1 in.)

Test Specimen (continued)

Overall Weight:	Beams @ 102.85 kg (226.75 lbs)
	Fiberglass backer @ 7.94 kg (17.5 lbs)
Density:	Fiberglass backer 46.7 kg/m^3 @ (2.92 lbs/ft^3)

Physical Measurements (per beam)

Dimensions:	0.15 m (6.0 in) wide by 2.44 m (96.0 in) long
Thickness:	41 mm (1.614 in.)
Weight:	5.72 kg (12.6 lbs)

Test Environment

Room Volume:	291.98 m^3
Temperature:	21.4 °C ± 0.2 °C (Requirement: ≥ 10 °C and ≤ 5 °C change)
Relative Humidity:	54.4 % ± 1.2 % (Requirement: ≥ 40 % and ≤ 5 % change)
Barometric Pressure:	98.9 kPa (Requirement not defined)

Each sound absorbing unit had an absorptive area (all exposed surfaces) of 0.94 m^2 (10.13 ft^2). The total absorptive area (all exposed surfaces) of all sound-absorbing units was 16.93 m^2 (182.25 ft^2). The array of units covered 6.51 m^2 (70.08 ft^2) of the horizontal test surface (total treated area).

MOUNTING METHOD

Type J Mounting: The specimen is an array of 18 spaced rectangular baffles laid on the horizontal test surface over the fiberglass backer, such that their width is oriented vertically. The baffles were spaced 152.4 mm (6 in.) on center.

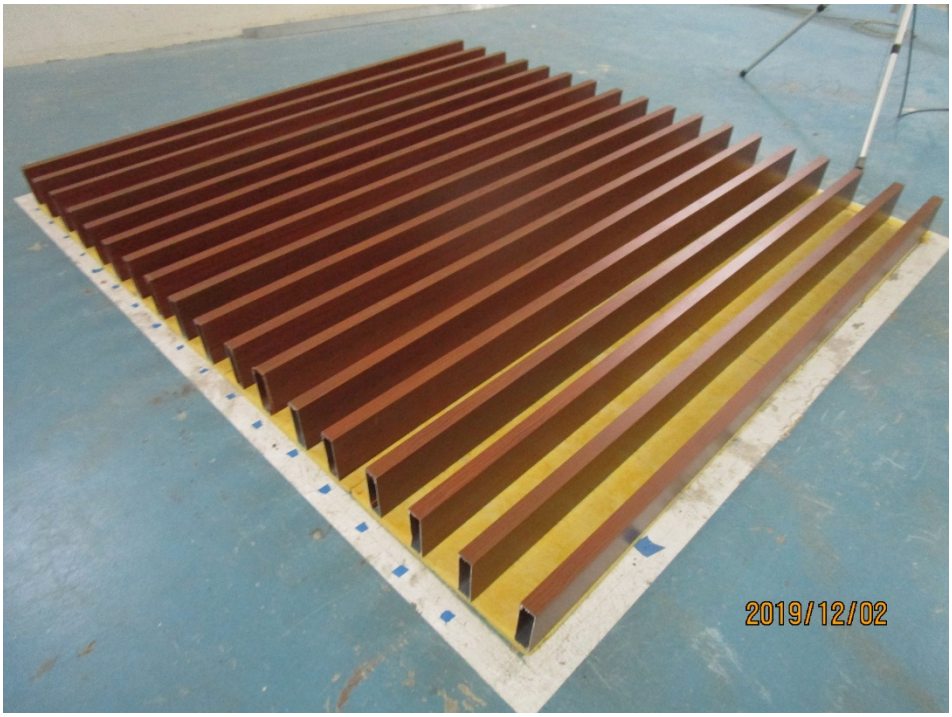


Figure 1 – Specimen mounted in test chamber

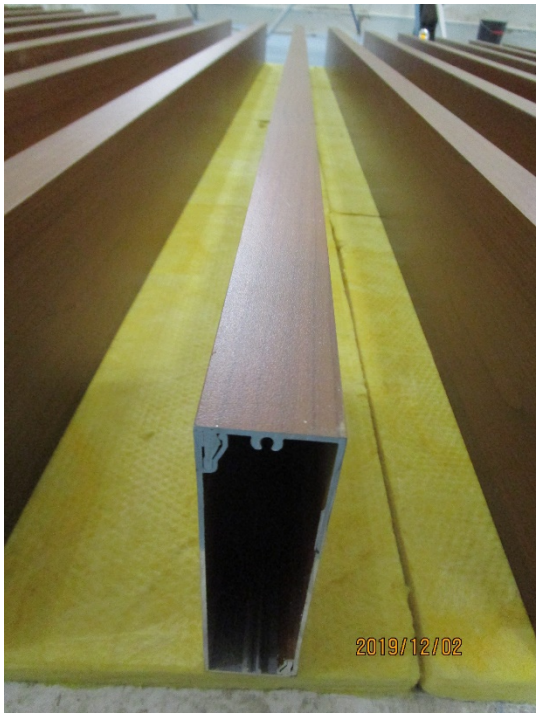


Figure 2 – Cross section of individual beam

TEST RESULTS

Note: There is currently no standardized method for calculating Absorption Coefficients from spaced object absorbers. The sound absorption performance of spaced object absorbers should not be compared directly with specimens tested as a single rectangular area (e.g. mounting types A, E, etc.).
For the purposes of this report, a single "unit" consists of a single beam and the portion of the fiberglass backer beneath that beam.

1/3 Octave Center Frequency	**Total Absorption**		**Absorption per Unit**	
(Hz)	(m^2)	(Sabins)	(m^2 / Unit)	(Sabins / Unit)
100	0.83	8.92	0.05	0.50
** 125	2.13	22.90	0.12	1.27
160	1.32	14.17	0.07	0.79
200	2.37	25.55	0.13	1.42
** 250	3.31	35.66	0.18	1.98
315	4.67	50.22	0.26	2.79
400	5.69	61.22	0.32	3.40
** 500	6.00	64.56	0.33	3.59
630	5.68	61.16	0.32	3.40
800	5.63	60.61	0.31	3.37
** 1000	6.16	66.34	0.34	3.69
1250	7.00	75.39	0.39	4.19
1600	6.49	69.91	0.36	3.88
** 2000	6.69	72.06	0.37	4.00
2500	6.53	70.27	0.36	3.90
3150	6.10	65.64	0.34	3.65
** 4000	6.23	67.06	0.35	3.73
5000	5.91	63.56	0.33	3.53

Tested by: Marc Sciaky, *Senior Experimentalist*

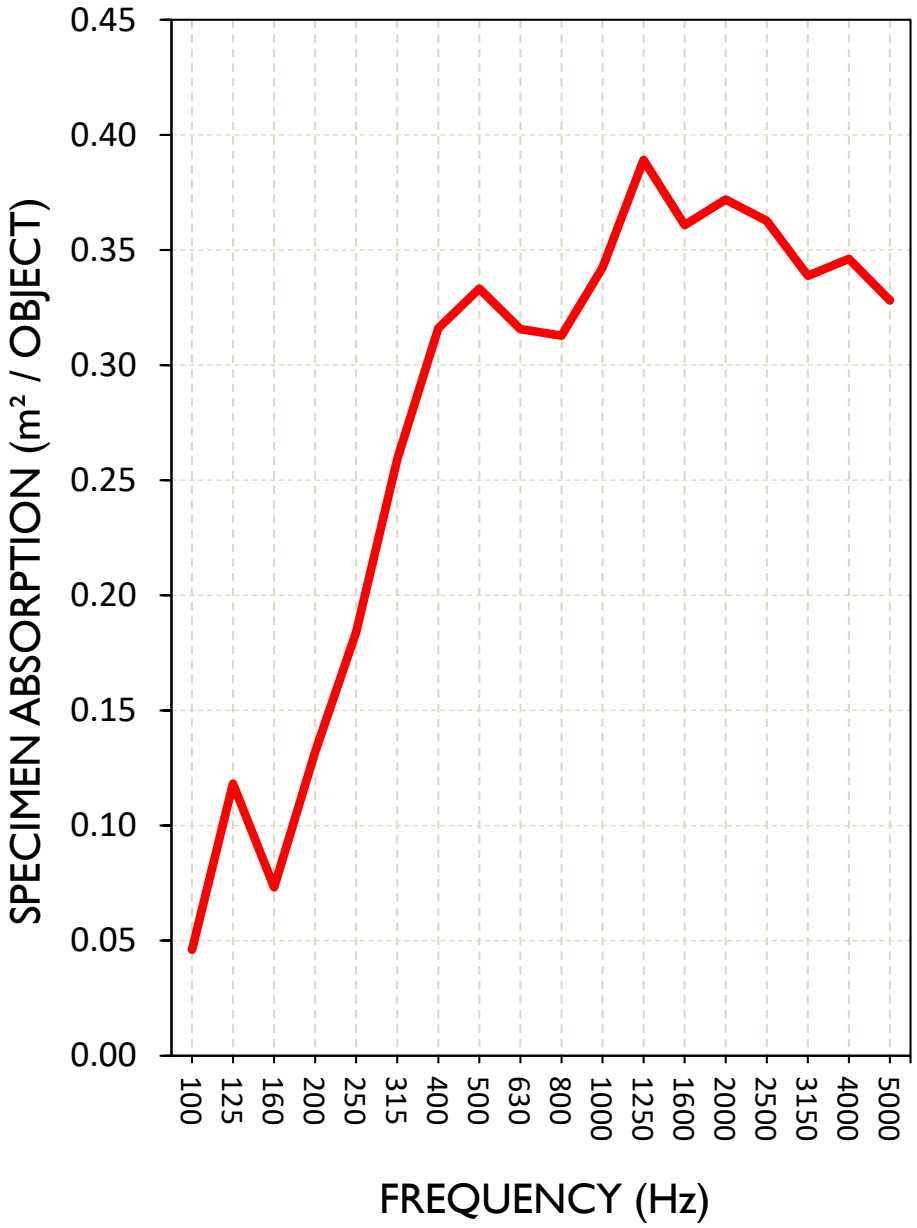
Report by: Malcolm Kelly, *Test Engineer, Acoustician*

Approved by: Eric P. Wolfram, *Laboratory Manager*

Digitally signed by Eric P Wolfram
Location: Geneva, IL
Date: 2019.12.17 13:12:07 -06'00'

SOUND ABSORPTION REPORT

Linear Metal Ceilings: Link & Lock Beams (6 in. Link & Lock Beams) with fiberglass backer



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APPENDIX A: Extended Frequency Range Data

Specimen: Linear Metal Ceilings: Link & Lock Beams (6 in. Link & Lock Beams) with fiberglass backer (See Full Report)

The following non-accredited data were obtained in accordance with ASTM C423-17, 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.

1/3 Octave Band Center Frequency (Hz)	Total Absorption (m^2)	Total Absorption (Sabins)	Absorption per Unit (m^2 / Unit)	Absorption per Unit (Sabins / Unit)
31.5	-1.49	-15.99	-0.08	-0.89
40	-0.84	-9.02	-0.05	-0.50
50	-1.10	-11.86	-0.06	-0.66
63	0.38	4.09	0.02	0.23
80	0.85	9.11	0.05	0.51
100	0.83	8.92	0.05	0.50
125	2.13	22.90	0.12	1.27
160	1.32	14.17	0.07	0.79
200	2.37	25.55	0.13	1.42
250	3.31	35.66	0.18	1.98
315	4.67	50.22	0.26	2.79
400	5.69	61.22	0.32	3.40
500	6.00	64.56	0.33	3.59
630	5.68	61.16	0.32	3.40
800	5.63	60.61	0.31	3.37
1000	6.16	66.34	0.34	3.69
1250	7.00	75.39	0.39	4.19
1600	6.49	69.91	0.36	3.88
2000	6.69	72.06	0.37	4.00
2500	6.53	70.27	0.36	3.90
3150	6.10	65.64	0.34	3.65
4000	6.23	67.06	0.35	3.73
5000	5.91	63.56	0.33	3.53
6300	5.75	61.93	0.32	3.44
8000	6.05	65.16	0.34	3.62
10000	6.23	67.09	0.35	3.73
12500	6.90	74.31	0.38	4.13

APPENDIX B: Instruments of Traceability

Specimen: Linear Metal Ceilings: Link & Lock Beams (6 in. Link & Lock Beams) with fiberglass backer (See Full Report)

Description	Model	Serial Number	Date of Certification	Calibration Due
System 1	Type 3160-A-042	106968	2019-06-25	2020-06-25
Bruel & Kjaer Mic And Preamp A	Type 4943-B-001	2311428	2019-09-27	2020-09-27
Bruel & Kjaer Pistonphone	Type 4228	2781248	2019-08-09	2020-08-09
Omega Digital Temp., Humid. And Pressure Recorder	OM-CP-PRHTemp2000	P97844	2019-02-08	2020-02-08

APPENDIX C: Revisions to Original Test Report

Specimen: Linear Metal Ceilings: Link & Lock Beams (6 in. Link & Lock Beams) with fiberglass backer (See Full Report)

Date	Revision
2019-12-16	Original report issued

END

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Report Referenced: **RAL™-A19-487**

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ON: Linear Metal Ceilings: Link & Lock Beams (6 in. Link & Lock Beams) with fiberglass backer (See Full Test Report for Details)

Appendix D to ASTM C423 Sound Absorption Test
Non-standard calculation of equivalent NRC Rating and Absorption Coefficients from spaced absorbers

At this time ASTM C423 does not provide a standard method for determining absorption coefficients of spaced object absorbers. Tests of a set of sound absorbing objects spaced apart from each other will yield higher absorption rates than a specimen joined together as a single patch (A-Mount or E-Mount). For this reason it is unfair to provide NRC or absorption coefficient ratings for specimens that consist of a spaced set of absorbers. Despite this, the architectural industry has expressed great demand for a simple "single number" rating for these treatments. Likewise, acoustical consultants desire equivalent absorption coefficient data for use in acoustical modeling software. The following is an attempt to appease these demands until ASTM develops a standard method for calculation.

Apparent Sound Absorption Coefficient calculated from total test surface area covered
The total sound absorption yielded by the specimen is divided by the total surface area of the test surface covered by the suspended baffles, including intermediate spaces. The baffle rigging covered 6.51 m^2 (70.08 ft^2) of horizontal test surface area. With an extra 114.3 mm (4.5 in.) of width to account for the space between the tested array and what would be the next baffle in a larger array, the surface area comes to 6.79 m^2 (73.08 ft^2). Apparent Noise Reduction Coefficient (NRC) rating and Sound Absorption Average (SAA) figures are calculated from this data based on the methods described in ASTM C423-17. This may be the most accurate method for comparing baffle arrays to ceiling tile products. The apparent sound absorption coefficient data can be assigned to a single horizontal surface or plane in acoustical modeling software for approximation of baffle array performance. Such approximations rely on the assumptions that baffle spacing is similar to that of the tested array, that the spacing between adjacent rows of baffles is negligibly small, and that the installation occurs over a fiberglass backer similar to that used in the test specimen.

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Appendix D: Data Note: See full test report for details of mounting position, spacing, and configuration, as these parameters greatly affect sound absorption performance.

Specimen Absorption			Method 1
Freq. (Hz)	Sabins	Sabins / Unit	Apparent Abs. Coefficient From Total Coverage Area
31.5	-15.99	-0.89	-0.22
40	-9.02	-0.50	-0.12
50	-11.86	-0.66	-0.16
63	4.09	0.23	0.06
80	9.11	0.51	0.12
100	8.92	0.50	0.12
125	22.90	1.27	0.31
160	14.17	0.79	0.19
200	25.55	1.42	0.35
250	35.66	1.98	0.49
315	50.22	2.79	0.69
400	61.22	3.40	0.84
500	64.56	3.59	0.88
630	61.16	3.40	0.84
800	60.61	3.37	0.83
1,000	66.34	3.69	0.91
1,250	75.39	4.19	1.03
1,600	69.91	3.88	0.96
2,000	72.06	4.00	0.99
2,500	70.27	3.90	0.96
3,150	65.64	3.65	0.90
4,000	67.06	3.73	0.92
5,000	63.56	3.53	0.87
6,300	61.93	3.44	0.85
8,000	65.16	3.62	0.89
10,000	67.09	3.73	0.92
12,500	74.31	4.13	1.02
		Apparent NRC:	**0.80**
		Apparent SAA:	**0.81**

Prepared by
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Test Engineer, Acoustician