

Test Report

FOR: **Turf Design**
Elgin, IL

Sound Absorption
RAL-A18-428

CONDUCTED: 2018-12-06

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ON: Boomstick baffles, spaced 12 in. on center

TEST METHOD

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 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 measuring procedure and room qualifications is available upon request.

DESCRIPTION OF THE SPECIMEN

The test specimen was designated by the manufacturer as Boomstick baffles, spaced 12 in. on center. A full internal inspection performed on the test specimen by Riverbank personnel verified the manufacturer's description.

Test Specimen

Trade Name:	Boomstick
Material:	Polyethylene terephthalate felt
Overall Dimensions:	10 @ 2413 mm (95 in.) long x 193.68 mm (7.625 in.) wide x 98.42 mm (3.875 in.) high
Key Geometry:	9 mm (0.354 in.) thick felt folded to create triangular tube, secured by embedded magnetic fasteners Air space @ 165 mm (6.496 in.) base width x 90 mm (3.543 in.) high 45° chamfers at both ends
Overall Weight:	24.38 kg (53.75 lbs)

Physical Measures (per unit)

Dimensions:	0.19 m (7.625 in) wide by 2.41 m (95.0 in) long
Thickness:	0.1 m (3.875 in)
Weight:	2.45 kg (5.4 lbs)



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Test Environment

Room Volume: 291.98 m³
Temperature: 20.3 °C ± 0.1 °C
Relative Humidity: 61.85 % ± 0.5 %
Barometric Pressure: 99.6 kPa

Each sound absorbing unit had an absorptive area (all exposed surfaces) of 1.08 m² (11.66 ft²). The total absorptive area (all exposed surfaces) of all sound-absorbing units was 10.84 m² (116.63 ft²). The array of units covered 7.16 m² (77.02 ft²) of chamber floor surface (total treated area).

MOUNTING METHOD

Type J Mounting: The specimen is an array of ten (10) spaced sound absorbing baffles laid atop an array of cables mounted 1.52 m (60.0 in.) above the horizontal test surface. This approximates the mounting method of a typical ceiling baffle installation. The baffles were evenly distributed in a single row, spaced 304.8 mm (12 in.) on center.

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Figure 1 - Specimen mounted in test chamber

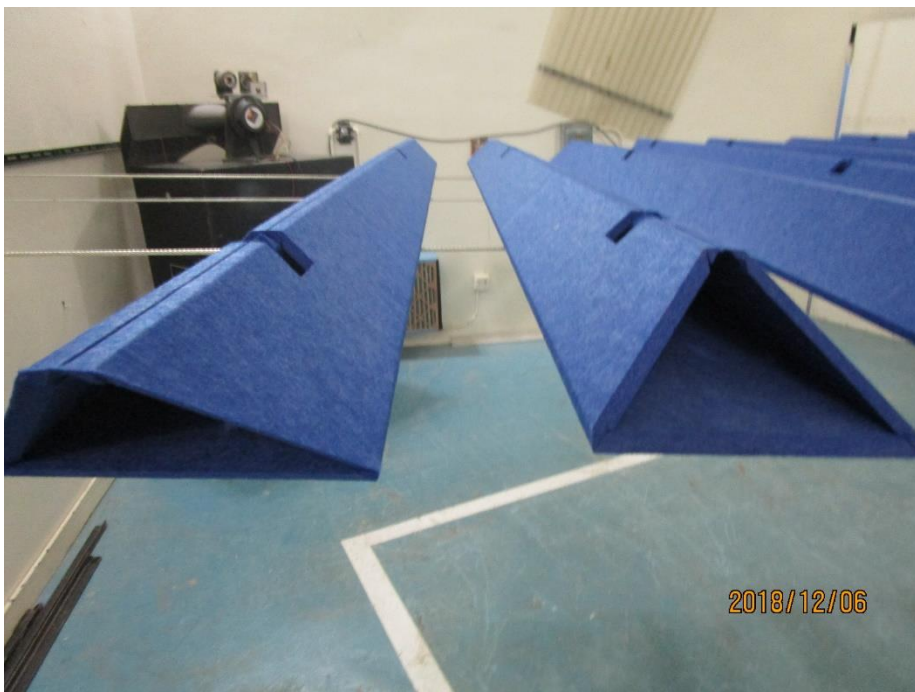


Figure 2 - Detail of individual baffles

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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.).

1/3 Octave Center Frequency (Hz)	Total Absorption		Absorption per Unit	
	(m ²)	(Sabins)	(m ² / Unit)	(Sabins / Unit)
100	0.47	5.04	0.05	0.50
** 125	0.66	7.11	0.07	0.71
160	1.17	12.60	0.12	1.26
200	1.63	17.57	0.16	1.76
** 250	2.06	22.21	0.21	2.22
315	3.27	35.16	0.33	3.52
400	3.89	41.88	0.39	4.19
** 500	5.34	57.51	0.53	5.75
630	6.46	69.58	0.65	6.96
800	7.44	80.13	0.74	8.01
** 1000	8.02	86.29	0.80	8.63
1250	8.62	92.80	0.86	9.28
1600	9.02	97.10	0.90	9.71
** 2000	9.39	101.09	0.94	10.11
2500	10.06	108.32	1.01	10.83
3150	10.24	110.23	1.02	11.02
** 4000	10.57	113.79	1.06	11.38
5000	10.81	116.36	1.08	11.64

Tested by Marc Sciaky Report by Malcolm Kelly Approved by Eric P. Wolfram
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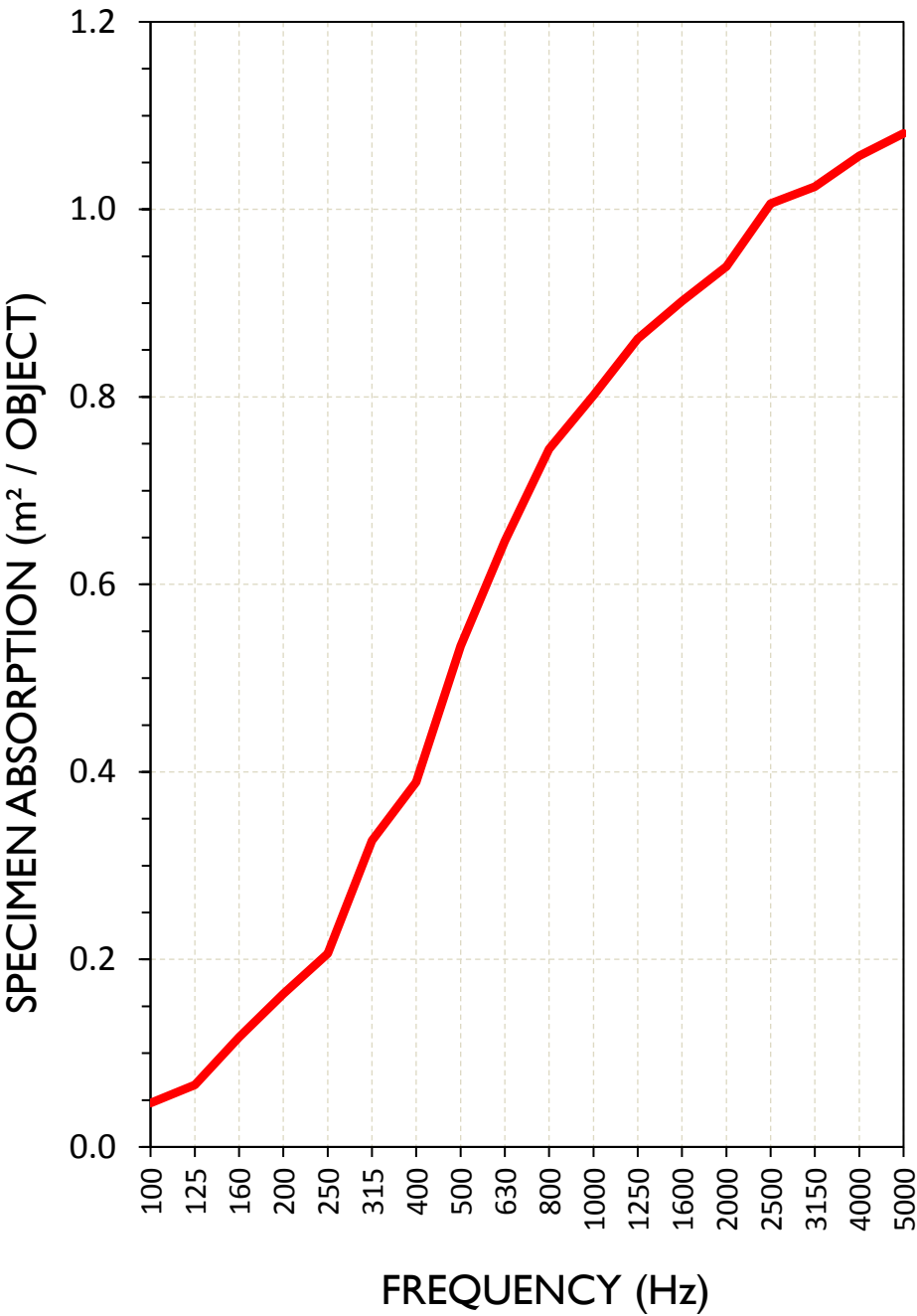
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SOUND ABSORPTION REPORT
Boomstick baffles, spaced 12 in. on center



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APPENDIX A: Extended Frequency Range Data

Specimen: Boomstick baffles, spaced 12 in. on center (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		Absorption per Unit	
	(m ²)	(Sabins)	(m ² / Unit)	(Sabins / Unit)
31.5	-0.47	-5.01	-0.05	-0.50
40	0.51	5.50	0.05	0.55
50	-0.13	-1.38	-0.01	-0.14
63	-0.09	-0.94	-0.01	-0.09
80	0.07	0.75	0.01	0.08
100	0.47	5.04	0.05	0.50
125	0.66	7.11	0.07	0.71
160	1.17	12.60	0.12	1.26
200	1.63	17.57	0.16	1.76
250	2.06	22.21	0.21	2.22
315	3.27	35.16	0.33	3.52
400	3.89	41.88	0.39	4.19
500	5.34	57.51	0.53	5.75
630	6.46	69.58	0.65	6.96
800	7.44	80.13	0.74	8.01
1000	8.02	86.29	0.80	8.63
1250	8.62	92.80	0.86	9.28
1600	9.02	97.10	0.90	9.71
2000	9.39	101.09	0.94	10.11
2500	10.06	108.32	1.01	10.83
3150	10.24	110.23	1.02	11.02
4000	10.57	113.79	1.06	11.38
5000	10.81	116.36	1.08	11.64
6300	10.63	114.41	1.06	11.44
8000	11.16	120.17	1.12	12.02
10000	11.00	118.37	1.10	11.84
12500	11.11	119.57	1.11	11.96

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APPENDIX B: Instruments of Traceability

Specimen: Boomstick baffles, spaced 12 in. on center (See Full Report)

<u>Description</u>	<u>Model</u>	<u>Serial Number</u>	<u>Date of Certification</u>	<u>Calibration Due</u>
System 1	Type 3160-A-4/2	System 1	2018-08-09	2019-08-09
Bruel & Kjaer Mic And Preamp A	Type 4943-B-001	2311428	2018-09-28	2019-09-28
Bruel & Kjaer Pistonphone	Type 4228	2781248	2018-08-06	2019-08-06
Omega Digital Temp., Humid. And Pressure Recorder	OM-CP- PRHTemp2000	P97844	2018-02-03	2019-02-03

END



NVLAP LAB CODE 100227-0

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Appendix C 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 programs. The following is an attempt to appease these demands until ASTM develops a standard method for calculation. Multiple alternate non-standard calculation methods are provided. Riverbank Acoustical Laboratories prefers method 1.

Method 1) 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 7.16 m² (77.02 ft²) of horizontal test surface area. With an additional 304.8 mm (12 in.) of length 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 7.89 m² (84.94 ft²). 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. In acoustical modeling applications, the apparent sound absorption coefficient data can be assigned to a single horizontal surface or plane for approximation of baffle array performance. Such approximations rely on the assumptions that baffle spacing is similar to the tested specimen and that the installation occurs over a perfectly reflective ceiling surface.

Method 2) Apparent Sound Absorption Coefficient calculated from total exposed surface area of specimen.

The total sound absorption yielded by the specimen is divided by the total surface area of all exposed specimen faces, as obtained from client CAD models (1.08 m² (11.66 ft²) per baffle x 10 baffles = 10.84 m² (116.63 ft²) total surface area). 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 method shows the actual absorption occurring at the exposed surfaces, but does not provide a fair comparison with materials mounted as a uniform patch (in A-mount or E-mount).

Method 3) Apparent Sound Absorption Coefficient calculated from one face per baffle.

The total sound absorption yielded by the specimen is divided by the surface area of one side of one large face for each baffle in the specimen (0.46 m² (4.92 ft²) per baffle x 10 baffles = 4.57 m² (49.2 ft²) total surface area). 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 method is favored by some material manufacturers since it yields very high NRC figures, but does not provide a fair comparison with other ceiling tile or wall panel products. Riverbank Acoustical Laboratories recommends that results obtained from this method be used for research and comparison purposes only; such results should not be used for marketed claims of product performance.

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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	Method 2	Method 3
Freq. (Hz)	Sabins	Sabins / Unit	Apparent Abs. Coefficient From Total Coverage Area	Apparent Abs. Coefficient From Total Exposed Surface Area	Apparent Abs. Coefficient From One Face/Baffle
31.5	-5.01	-0.50	-0.06	-0.04	-0.10
40	5.50	0.55	0.06	0.05	0.11
50	-1.38	-0.14	-0.02	-0.01	-0.03
63	-0.94	-0.09	-0.01	-0.01	-0.02
80	0.75	0.08	0.01	0.01	0.02
100	5.04	0.50	0.06	0.04	0.10
125	7.11	0.71	0.08	0.06	0.14
160	12.60	1.26	0.15	0.11	0.26
200	17.57	1.76	0.21	0.15	0.36
250	22.21	2.22	0.26	0.19	0.45
315	35.16	3.52	0.41	0.30	0.71
400	41.88	4.19	0.49	0.36	0.85
500	57.51	5.75	0.68	0.49	1.17
630	69.58	6.96	0.82	0.60	1.41
800	80.13	8.01	0.94	0.69	1.63
1,000	86.29	8.63	1.02	0.74	1.75
1,250	92.80	9.28	1.09	0.80	1.89
1,600	97.10	9.71	1.14	0.83	1.97
2,000	101.09	10.11	1.19	0.87	2.05
2,500	108.32	10.83	1.28	0.93	2.20
3,150	110.23	11.02	1.30	0.95	2.24
4,000	113.79	11.38	1.34	0.98	2.31
5,000	116.36	11.64	1.37	1.00	2.36
6,300	114.41	11.44	1.35	0.98	2.33
8,000	120.17	12.02	1.41	1.03	2.44
10,000	118.37	11.84	1.39	1.01	2.41
12,500	119.57	11.96	1.41	1.03	2.43
Apparent NRC:			0.80	0.55	1.35
Apparent SAA:			0.79	0.58	1.37

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