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GENEVA, IL 60134
630-232-0104

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Test Report

SPONSOR: **ezoBord**
Mississauga, ON, Canada

Sound Absorption
RAL™-A20-491

CONDUCTED: 2020-11-24

ON: Baffles, 12 mm material (6 objects, 12 in. apart)

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 Baffles, 12 mm material (6 objects, 12 in. apart). 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

Material:	Polyethylene terephthalate felt
Manufacturer:	ezoBord

SPECIMEN MEASUREMENTS & TEST CONDITIONS

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

Test Specimen

Material:	Semirigid felt paneling
Construction:	Panels folded and adhered to form hollow rectangular prisms, open at one long perimeter face Support pieces spanning full depth, visible from open face
Dimensions:	6 @ 2137 mm (84.125 in.) long x 79.4 mm (3.125 in.) wide Panel thickness @ 12 mm (0.472 in.) Support members (3) spaced 755 mm (29.724 in.) on center, outermost members spaced 305 mm (12 in.) from ends
Overall Depth:	292 mm (11.5 in.)
Overall Weight:	19.05 kg (42 lbs)

Physical Measurements (per object)

Dimensions:	0.29 m (11.5 in) wide by 2.14 m (84.125 in) long
Thickness:	0.08 m (3.125 in)
Weight:	3.18 kg (7.0 lbs)

Test Environment

Room Volume:	291.98 m³
Temperature:	22.1 °C ± 0.1 °C (Requirement: ≥ 10 °C and ≤ 5 °C change)
Relative Humidity:	58.15 % ± 1.9 % (Requirement: ≥ 40 % and ≤ 5 % change)
Barometric Pressure:	98.9 kPa (Requirement not defined)

Each sound absorbing object had an absorptive area (all exposed surfaces) of 2.85 m^2 (30.66 ft^2). The total absorptive area (all exposed surfaces) of all sound-absorbing objects was 17.09 m^2 (183.97 ft^2). The array of objects covered 4.26 m^2 (45.86 ft^2) of the horizontal test surface (total treated area).

MOUNTING METHOD

Type J Mounting: The specimen is an array of 6 spaced sound absorbing objects suspended from cables such that the closest face is located approximately 1194 mm (47 in.) from the horizontal test surface. This approximates the mounting method of a typical ceiling baffle installation. The objects were evenly distributed in a single row, spaced 305 mm (12 in.) apart.

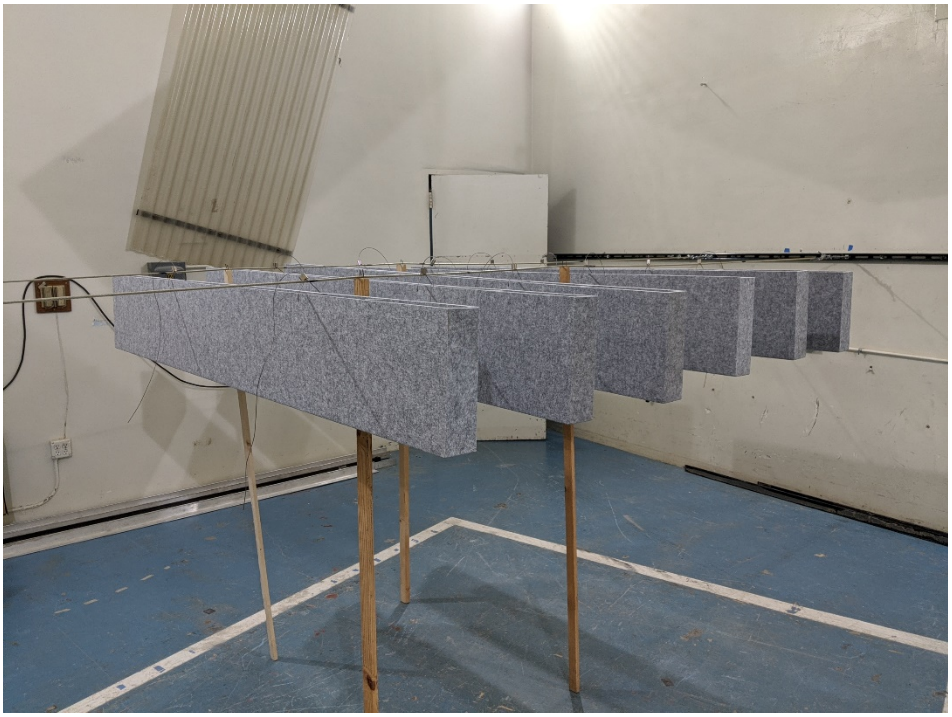

Figure 1 – Specimen mounted in test chamber

Figure 2 – Underside of specimen

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Figure 3 – Individual specimen object prior to mounting, hollow interior and support members

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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	**Total Absorption**		**Absorption per Object**	
(Hz)	(m^2)	(Sabins)	(m^2 / Object)	(Sabins / Object)
100	0.87	9.38	0.15	1.56
** 125	0.78	8.37	0.13	1.40
160	0.38	4.11	0.06	0.69
200	1.50	16.12	0.25	2.69
** 250	2.58	27.81	0.43	4.64
315	3.18	34.25	0.53	5.71
400	3.56	38.28	0.59	6.38
** 500	3.98	42.84	0.66	7.14
630	4.48	48.23	0.75	8.04
800	5.53	59.51	0.92	9.92
** 1000	6.34	68.28	1.06	11.38
1250	6.92	74.44	1.15	12.41
1600	7.46	80.29	1.24	13.38
** 2000	7.86	84.57	1.31	14.09
2500	8.11	87.24	1.35	14.54
3150	8.24	88.73	1.37	14.79
** 4000	8.39	90.30	1.40	15.05
5000	8.70	93.69	1.45	15.62

Tested by Marc Sciaky
Senior Experimentalist

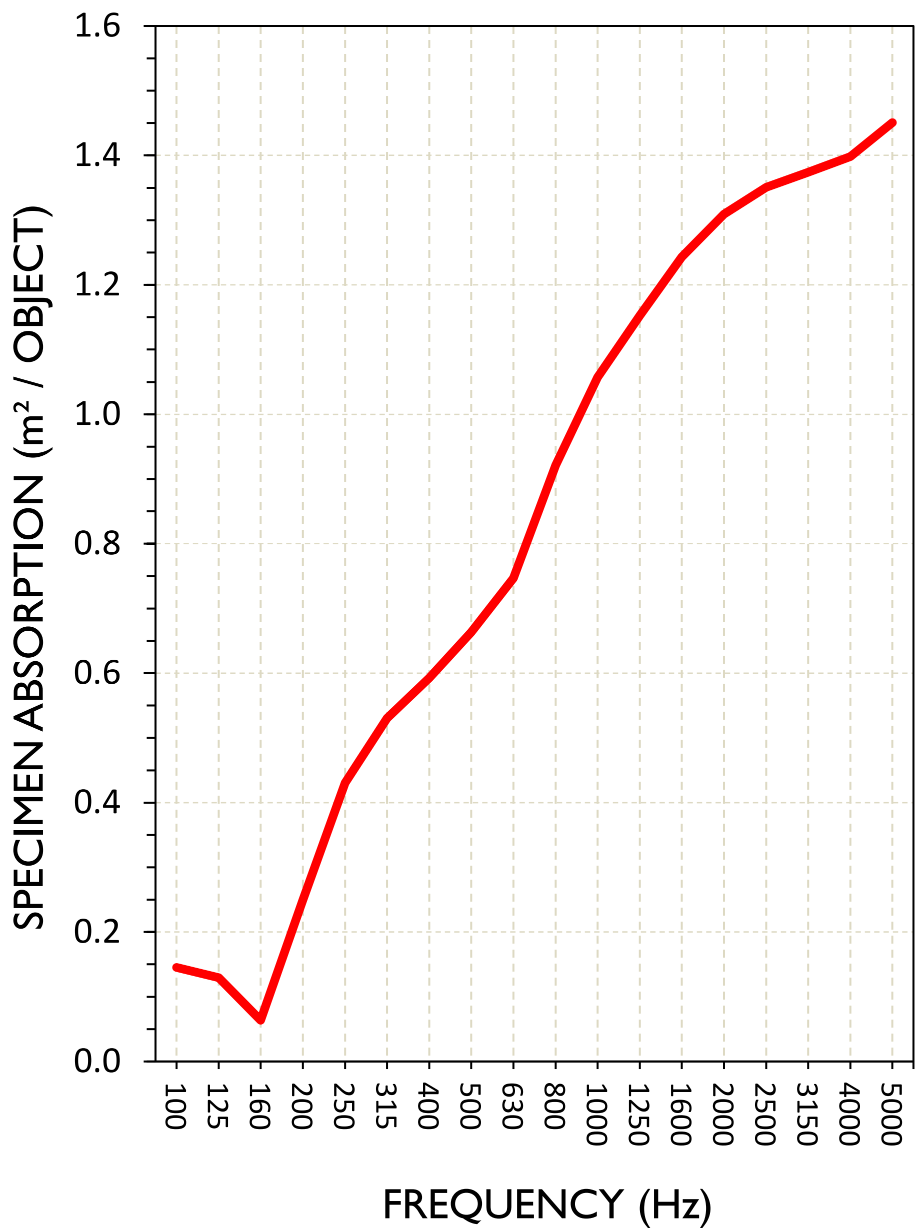
Report by Malcolm Kelly
Test Engineer, Acoustician

Approved by Eric P. Wolfram
Laboratory Manager

Digitally signed by Eric P Wolfram
Location: Geneva, IL
Date: 2020.12.08 16:13:58 -06'00'

SOUND ABSORPTION REPORT

Baffles, 12 mm material (6 objects, 12 in. apart)



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APPENDIX A: Extended Frequency Range Data

Specimen: Baffles, 12 mm material (6 objects, 12 in. apart) (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	**Total Absorption**		**Absorption per Object**	
(Hz)	(m^2)	(Sabins)	(m^2 / Object)	(Sabins / Object)
31.5	0.98	10.57	0.16	1.76
40	1.67	17.99	0.28	3.00
50	-0.62	-6.68	-0.10	-1.11
63	-1.11	-11.94	-0.18	-1.99
80	1.40	15.02	0.23	2.50
100	0.87	9.38	0.15	1.56
125	0.78	8.37	0.13	1.40
160	0.38	4.11	0.06	0.69
200	1.50	16.12	0.25	2.69
250	2.58	27.81	0.43	4.64
315	3.18	34.25	0.53	5.71
400	3.56	38.28	0.59	6.38
500	3.98	42.84	0.66	7.14
630	4.48	48.23	0.75	8.04
800	5.53	59.51	0.92	9.92
1000	6.34	68.28	1.06	11.38
1250	6.92	74.44	1.15	12.41
1600	7.46	80.29	1.24	13.38
2000	7.86	84.57	1.31	14.09
2500	8.11	87.24	1.35	14.54
3150	8.24	88.73	1.37	14.79
4000	8.39	90.30	1.40	15.05
5000	8.70	93.69	1.45	15.62
6300	9.06	97.49	1.51	16.25
8000	9.50	102.22	1.58	17.04
10000	10.42	112.16	1.74	18.69
12500	11.49	123.63	1.91	20.60

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APPENDIX B: Instruments of Traceability

Specimen: Baffles, 12 mm material (6 objects, 12 in. apart) (See Full Report)

Description	**Model**	**Serial Number**	**Date of Certification**	**Calibration Due**
System 1	Type 3160-A-042	3160-106968	2020-06-26	2021-06-26
Bruel & Kjaer Mic And Preamp A	Type 4943-B-001	2311428	2020-09-30	2021-09-30
Bruel & Kjaer Pistonphone	Type 4228	2781248	2020-08-12	2021-08-12
Omega Digital Temp., Humid. And Pressure Recorder	OM-CP-PRHTemp2000	P97844	2020-02-18	2021-02-18

APPENDIX C: Revisions to Original Test Report

Specimen: Baffles, 12 mm material (6 objects, 12 in. apart) (See Full Report)

Date	**Revision**
2020-11-30	Original report issued

END

Riverbank Acoustical Laboratories
1512 S. Batavia Ave.
Geneva, IL 60134-3302

Tel: 630-232-0104
Fax: 630-232-0138
Email: RAL@alionscience.com

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CONDUCTED: 2020-11-24

ON: Baffles, 12 mm material (6 objects, 12 in. apart) (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. Several alternate non-standard calculation methods are provided. Riverbank Acoustical Laboratories prefers method 1. Rating titles for these methods are prepended with the word “Apparent”. These rating names and their associated acronyms are provided by RAL and shall not be misconstrued as originating from any current standard.

Method 1) Apparent Sound Absorption Coefficient calculated from extended test specimen envelope

The total sound absorption yielded by the specimen is divided by the surface area of the test surface covered by the suspended objects, including intermediate spaces, with additional added area to allow theoretical extrapolation for larger arrays. The object rigging covered 4.26 m^2 (45.86 ft^2) of horizontal test surface area. With an extra 305 mm (12 in.) of width to account for the space between the tested array and what would be the next objects in a larger array, the total covered surface area comes to 4.91 m^2 (52.87 ft^2). Apparent sound absorption coefficients, and subsequently the Apparent Noise Reduction Coefficient (A*NRC) and Apparent Sound Absorption Average (A*SAA) ratings, are calculated using this surface area based on the methods described in ASTM C423-17. This may be the most accurate method for comparing object 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 object array performance. Such approximations rely on the assumptions that object spacing is similar to that of the tested array across the entire surface, that gaps are negligibly small between adjacent rows of objects if the test specimen consists of a single row, and that the installation occurs over a perfectly reflective surface material.

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 exterior specimen faces (1.63 m^2 (17.59 ft^2) per object x 6 objects = 9.80 m^2 (105.52 ft^2) total surface area). Apparent sound absorption coefficients, and subsequently the Apparent Noise Reduction Coefficient (A*NRC) and Apparent Sound Absorption Average (A*SAA) ratings, are calculated using this surface area 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).

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Geneva, IL 60134-3302

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Fax: 630-232-0138
Email: RAL@alionscience.com

Appendix D (continued)

Method 3) Apparent Sound Absorption Coefficient calculated from one face per object
The total sound absorption yielded by the specimen is divided by the surface area of one side of one large face for each object in the specimen (0.62 m^2 (6.72 ft^2) per object x 6 objects = 3.74 m^2 (40.31 ft^2) total surface area). Apparent sound absorption coefficients, and subsequently the Apparent Noise Reduction Coefficient (A*NRC) and Apparent Sound Absorption Average (A*SAA) ratings, are calculated using this surface area 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.

Method 4) Apparent Sound Absorption Coefficient calculated from specimen envelope without extension
The total sound absorption yielded by the specimen is divided by the rectangular test surface area covered by the suspended objects, including intermediate spaces. The object rigging covered 4.26 m^2 (45.86 ft^2) of horizontal test surface area. Apparent sound absorption coefficients, and subsequently the Apparent Noise Reduction Coefficient (A*NRC) and Apparent Sound Absorption Average (A*SAA) ratings, are calculated using this surface area based on the methods described in ASTM C423-17. While similar in concept to Method 1, attempting to model any array larger than the tested specimen using these results would imply instances of adjacent objects with zero spacing scattered throughout the extrapolated array. 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 (ft^2)			Method 1	Method 2	Method 3	Method 4
			Apparent Abs. Coefficient From Total Coverage Area (52.87 ft^2)	**Apparent** Abs. Coefficient From Total Exposed Surface Area (183.97 ft^2)	**Apparent** Abs. Coefficient From One Face per Object (40.31 ft^2)	**Apparent** Abs. Coefficient From Unextended Envelope Area (45.86 ft^2)
Freq. (Hz)	**Sabins**	**Sabins / Object**				
31.5	10.57	1.76	0.20	0.10	0.26	0.23
40	17.99	3.00	0.34	0.17	0.45	0.39
50	-6.68	-1.11	-0.13	-0.06	-0.17	-0.15
63	-11.94	-1.99	-0.23	-0.11	-0.30	-0.26
80	15.02	2.50	0.28	0.14	0.37	0.33
100	9.38	1.56	0.18	0.09	0.23	0.20
125	8.37	1.40	0.16	0.08	0.21	0.18
160	4.11	0.69	0.08	0.04	0.10	0.09
200	16.12	2.69	0.30	0.15	0.40	0.35
250	27.81	4.64	0.53	0.26	0.69	0.61
315	34.25	5.71	0.65	0.32	0.85	0.75
400	38.28	6.38	0.72	0.36	0.95	0.83
500	42.84	7.14	0.81	0.41	1.06	0.93
630	48.23	8.04	0.91	0.46	1.20	1.05
800	59.51	9.92	1.13	0.56	1.48	1.30
1,000	68.28	11.38	1.29	0.65	1.69	1.49
1,250	74.44	12.41	1.41	0.71	1.85	1.62
1,600	80.29	13.38	1.52	0.76	1.99	1.75
2,000	84.57	14.09	1.60	0.80	2.10	1.84
2,500	87.24	14.54	1.65	0.83	2.16	1.90
3,150	88.73	14.79	1.68	0.84	2.20	1.93
4,000	90.30	15.05	1.71	0.86	2.24	1.97
5,000	93.69	15.62	1.77	0.89	2.32	2.04
6,300	97.49	16.25	1.84	0.92	2.42	2.13
8,000	102.22	17.04	1.93	0.97	2.54	2.23
10,000	112.16	18.69	2.12	1.06	2.78	2.45
12,500	123.63	20.60	2.34	1.17	3.07	2.70
		Apparent NRC:	**1.05**	**0.55**	**1.40**	**1.20**
		Apparent SAA:	**1.04**	**0.52**	**1.37**	**1.20**

Prepared by [signature]
Malcolm Kelly
Test Engineer, Acoustician