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GENEVA, IL 60134
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WALLACE CLEMENT SABINE

Test Report

FOR: **ezoBord**
Elgin, IL

Sound Absorption
RAL-A18-334

CONDUCTED: 2018-10-04

Page 1 of 10

ON: Geocloud - Hexagon 3/8 in. (9 mm) w/open back

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 Geocloud - Hexagon 3/8 in. (9 mm) w/open back. A full internal inspection performed on the test specimen by Riverbank personnel verified the manufacturer's description.

Test Specimen

Material: Polyethylene terephthalate, metal
Dimensions: 6 large hexagons @ 520.7 mm (20.5 in.) per side
1 small hexagon @ 457.2 mm (18 in.) per side
Composition: Overall thickness @ 50.8 mm (2 in.)
Approximately 32 mm (1.26 in.) thick air space
2 pieces metal channel adhered to each unit within air space
Wall thickness @ 8.89 mm (0.35 in.)
Overall Weight: Large units @ 17.01 kg (37.5 lbs)
Small unit @ 2.04 kg (4.5 lbs)

Test Report**ezoBord**
2018-10-04**RAL-A18-334**
Page 2 of 10**Physical Measures**

Array Dimensions: 1.89 m (74.5 in) wide by 3.77 m (148.5 in) long
Thickness: 0.05 m (2.0 in)
Weight: 19.05 kg (42.0 lbs)

Test Environment

Room Volume: 291.98 m³
Temperature: 20.6 °C ± 0.0 °C
Relative Humidity: 57.05 % ± 1.1 %
Barometric Pressure: 99.4 kPa

The total absorptive area (all exposed surfaces) of all sound-absorbing units was 14.72 m² (158.39 ft²).
The array of units covered 7.14 m² (76.83 ft²) of chamber floor surface (total treated area).

MOUNTING METHOD

Type J Mounting: The specimen is an array of seven (7) spaced sound absorbing units suspended from cables such that the bottom surface of the units is located approximately 1422.4 mm (56 in.) above the horizontal test surface. This approximates the mounting method of a typical ceiling absorption product installation. The seven hexagonal units were arranged in two rows containing three and four units respectively. The units were arranged in a honeycomb pattern, with parallel edges spaced 88.9 mm (3.5 in.) apart. The small unit was located on the end of the row of four, furthest from the sound source.

Test Report

ezoBord
2018-10-04

RAL-A18-334
Page 3 of 10



Figure 1 - Specimen mounted in test chamber

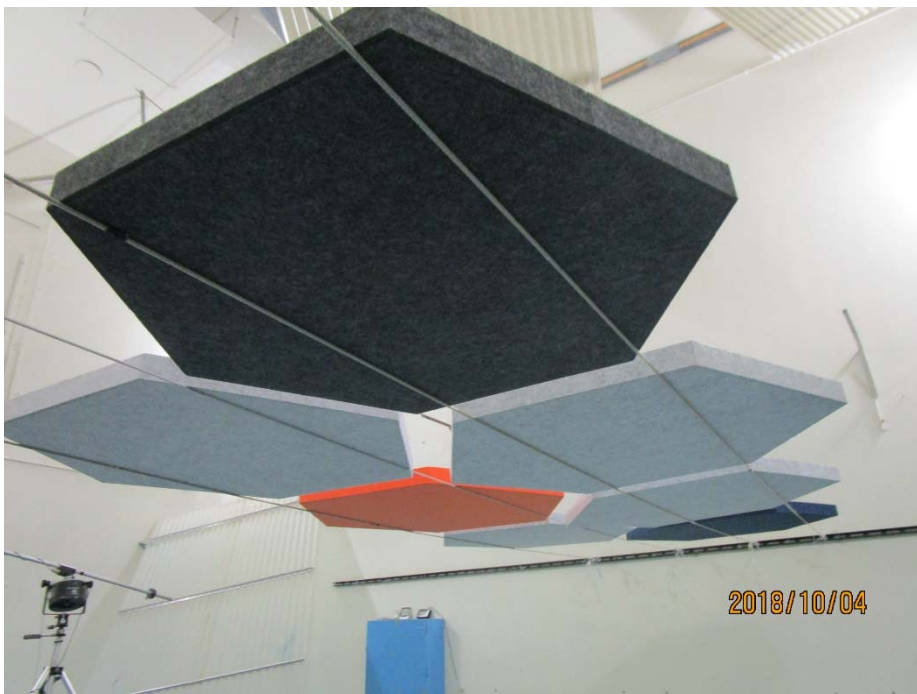


Figure 2 - Underside of mounted specimen

Test Report

ezoBord
2018-10-04

RAL-A18-334
Page 4 of 10



Figure 3 – Detail of specimen material, air space

Test Report

ezoBord
2018-10-04

RAL-A18-334
Page 5 of 10

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.).

Because one of the seven units is smaller than the others, Absorption per Unit data will be skewed slightly lower than expected from an array of uniformly-sized units.

1/3 Octave Center Frequency (Hz)	Total Absorption		Absorption per Unit	
	(m ²)	(Sabins)	(m ² / Unit)	(Sabins / Unit)
100	1.07	11.50	0.15	1.64
** 125	2.31	24.89	0.33	3.56
160	1.59	17.15	0.23	2.45
200	2.94	31.65	0.42	4.52
** 250	2.56	27.60	0.37	3.94
315	3.53	38.03	0.50	5.43
400	3.90	41.97	0.56	6.00
** 500	4.38	47.16	0.63	6.74
630	4.99	53.69	0.71	7.67
800	5.52	59.40	0.79	8.49
** 1000	6.14	66.12	0.88	9.45
1250	6.83	73.52	0.98	10.50
1600	7.33	78.92	1.05	11.27
** 2000	7.66	82.41	1.09	11.77
2500	7.70	82.93	1.10	11.85
3150	7.84	84.41	1.12	12.06
** 4000	8.03	86.41	1.15	12.34
5000	8.25	88.81	1.18	12.69

Tested by  **Dean Victor**
Senior Experimentalist

Report by  **Malcolm Kelly**
Acoustical Test Engineer

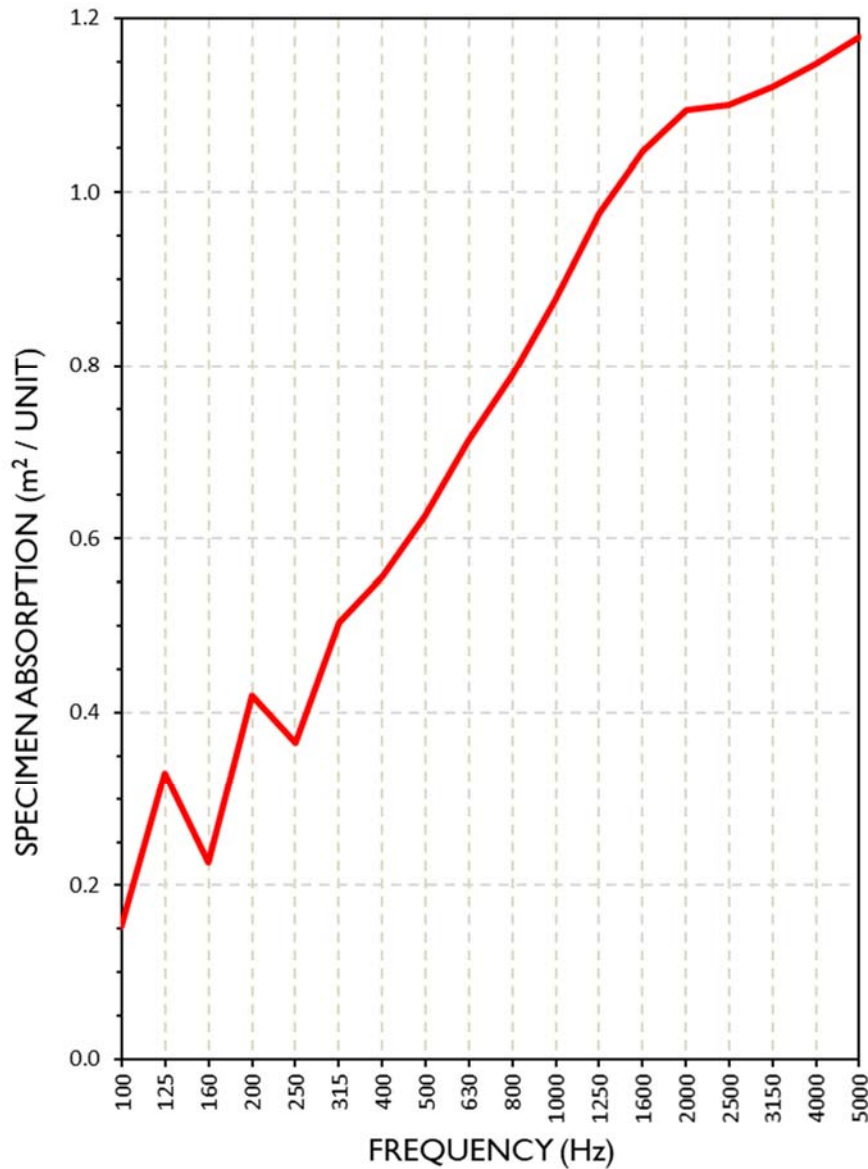
Approved by  **Eric P. Wolfram**
Laboratory Manager

Test Report

ezoBord
2018-10-04

RAL-A18-334
Page 6 of 10

SOUND ABSORPTION REPORT
Geocloud - Hexagon 3/8 in. (9 mm) w/open back



Test Report

ezoBord
2018-10-04

RAL-A18-334
Page 7 of 10

APPENDIX A: Extended Frequency Range Data

Specimen: Geocloud - Hexagon 3/8 in. (9 mm) w/open back (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	-0.06	-0.65	-0.01	-0.09
40	0.30	3.20	0.04	0.46
50	1.24	13.34	0.18	1.91
63	0.45	4.84	0.06	0.69
80	0.72	7.75	0.10	1.11
100	1.07	11.50	0.15	1.64
125	2.31	24.89	0.33	3.56
160	1.59	17.15	0.23	2.45
200	2.94	31.65	0.42	4.52
250	2.56	27.60	0.37	3.94
315	3.53	38.03	0.50	5.43
400	3.90	41.97	0.56	6.00
500	4.38	47.16	0.63	6.74
630	4.99	53.69	0.71	7.67
800	5.52	59.40	0.79	8.49
1000	6.14	66.12	0.88	9.45
1250	6.83	73.52	0.98	10.50
1600	7.33	78.92	1.05	11.27
2000	7.66	82.41	1.09	11.77
2500	7.70	82.93	1.10	11.85
3150	7.84	84.41	1.12	12.06
4000	8.03	86.41	1.15	12.34
5000	8.25	88.81	1.18	12.69
6300	8.73	93.94	1.25	13.42
8000	8.70	93.69	1.24	13.38
10000	8.89	95.67	1.27	13.67
12500	8.75	94.22	1.25	13.46

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Test Report

ezoBord
2018-10-04

RAL-A18-334
Page 8 of 10

APPENDIX B: Instruments of Traceability

Specimen: Geocloud - Hexagon 3/8 in. (9 mm) w/open back (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 C	Type 4943-B-001	2311439	2018-03-27	2019-03-27
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

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Page 1 of 2

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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 units, including intermediate spaces. The unit rigging covered 7.14 m² (76.83 ft²) of horizontal test 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 may be the most accurate method for comparing unit 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 in acoustical modeling software for approximation of unit array performance (assuming unit spacing is similar to that tested).

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 drawings (14.72 m² (158.39 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 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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Page 2 of 2

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
Freq. (Hz)	Sabins	Sabins / Unit	Apparent Abs. Coefficient From Total Coverage Area	Apparent Abs. Coefficient From Total Exposed Surface Area
31.5	-0.65	-0.09	-0.01	0.00
40	3.20	0.46	0.04	0.02
50	13.34	1.91	0.17	0.08
63	4.84	0.69	0.06	0.03
80	7.75	1.11	0.10	0.05
100	11.50	1.64	0.15	0.07
125	24.89	3.56	0.32	0.16
160	17.15	2.45	0.22	0.11
200	31.65	4.52	0.41	0.20
250	27.60	3.94	0.36	0.17
315	38.03	5.43	0.49	0.24
400	41.97	6.00	0.55	0.27
500	47.16	6.74	0.61	0.30
630	53.69	7.67	0.70	0.34
800	59.40	8.49	0.77	0.38
1,000	66.12	9.45	0.86	0.42
1,250	73.52	10.50	0.96	0.46
1,600	78.92	11.27	1.03	0.50
2,000	82.41	11.77	1.07	0.52
2,500	82.93	11.85	1.08	0.52
3,150	84.41	12.06	1.10	0.53
4,000	86.41	12.34	1.12	0.55
5,000	88.81	12.69	1.16	0.56
6,300	93.94	13.42	1.22	0.59
8,000	93.69	13.38	1.22	0.59
10,000	95.67	13.67	1.25	0.60
12,500	94.22	13.46	1.23	0.59
Apparent NRC:			0.75	0.35
Apparent SAA:			0.74	0.36

Prepared by 
Malcolm Kelly
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