

Test Report

SPONSOR: **EUREKA**
Montréal, QC, Canada

Sound Absorption
RAL™-A20-419

CONDUCTED: 2020-09-30

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ON: 4821-24 HEX AREA (4x2 array, 45 in. on center, nonstandard mounting)

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." 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 4821-24 HEX AREA (4x2 array, 45 in. on center, nonstandard mounting). 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: HEX AREA
Product ID: 4821-24
Manufacturer: EUREKA

SPECIMEN MEASUREMENTS & TEST CONDITIONS

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

Test Specimen

Materials: Enclosed aluminum fixtures with semirigid felt panel on one face
Geometry: Regular hexagonal prisms (8)
Side length @ 298.45 mm (11.75 in.)
Depth @ 95.25 mm (3.75 in.)
Overall Weight: 40.82 kg (90 lbs)

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Physical Measurements (per object)

Dimensions: 0.52 m (20.312 in) wide by 0.59 m (23.375 in) long
Thickness: 0.1 m (3.75 in)
Weight: 5.1 kg (11.25 lbs)

Test Environment

Room Volume: 291.98 m³
Temperature: 22.4 °C ± 0.0 °C (Requirement: ≥ 10 °C and ≤ 5 °C change)
Relative Humidity: 56.65 % ± 0.5 % (Requirement: ≥ 40 % and ≤ 5 % change)
Barometric Pressure: 97.4 kPa (Requirement not defined)

Each sound absorbing object had an absorptive area (all exposed surfaces) of 0.63 m² (6.82 ft²). The total absorptive area (all exposed surfaces) of all sound-absorbing objects was 5.07 m² (54.54 ft²). The array of objects covered 6.84 m² (73.64 ft²) of the horizontal test surface (total treated area).

MOUNTING METHOD

Nonstandard Mounting: The specimen is an array of 8 spaced sound absorbing objects suspended from cables such that the closest face is located approximately 0.91 m (36 in.) from the horizontal test surface. This approximates the mounting method of a typical ceiling baffle installation. The objects were evenly distributed in a 2x4 square array, spaced 1143 mm (45 in.) on center.

Note: This mounting method is similar to the Type J mounting specified in ASTM E795-16, though the absorptive area of the specimen (5.07 m²) is less than the minimum absorptive area of 10 m² specified in Section 15.4 of the Standard. The specimen was installed with the intent of maximizing absorptive area while preserving the object spacing of interest and maintaining adequate distance from test chamber surfaces.

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Figure 1 – Specimen mounted in test chamber



Figure 2 – Underside of individual fixture, semirigid felt panel

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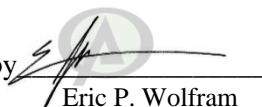
TEST RESULTS

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 Object	
	(m ²)	(Sabins)	(m ² / Object)	(Sabins / Object)
100	0.43	4.58	0.05	0.57
** 125	0.58	6.24	0.07	0.78
160	0.46	4.99	0.06	0.62
200	0.58	6.19	0.07	0.77
** 250	0.94	10.12	0.12	1.27
315	1.37	14.73	0.17	1.84
400	1.63	17.58	0.20	2.20
** 500	1.94	20.84	0.24	2.61
630	2.07	22.24	0.26	2.78
800	1.91	20.51	0.24	2.56
** 1000	1.91	20.53	0.24	2.57
1250	1.94	20.93	0.24	2.62
1600	1.89	20.39	0.24	2.55
** 2000	1.88	20.29	0.24	2.54
2500	1.84	19.77	0.23	2.47
3150	1.66	17.86	0.21	2.23
** 4000	1.63	17.49	0.20	2.19
5000	1.57	16.92	0.20	2.11

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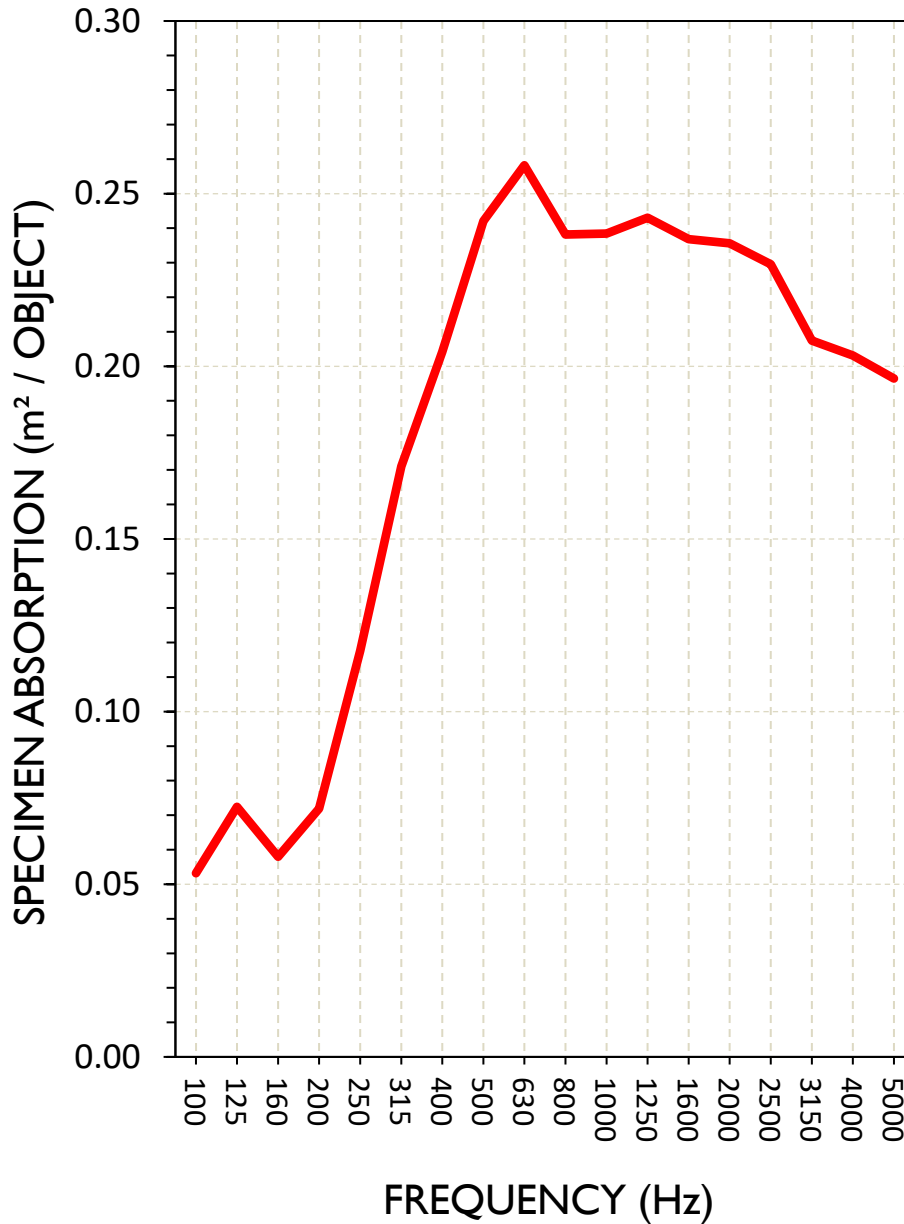
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SOUND ABSORPTION REPORT

4821-24 HEX AREA (4x2 array, 45 in. on center, nonstandard mounting)



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APPENDIX A: Extended Frequency Range Data

Specimen: 4821-24 HEX AREA (4x2 array, 45 in. on center, nonstandard mounting) (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 Object	
	(m ²)	(Sabins)	(m ² / Object)	(Sabins / Object)
31.5	0.22	2.34	0.03	0.29
40	0.24	2.57	0.03	0.32
50	-1.32	-14.20	-0.16	-1.78
63	0.03	0.37	0.00	0.05
80	-0.33	-3.54	-0.04	-0.44
100	0.43	4.58	0.05	0.57
125	0.58	6.24	0.07	0.78
160	0.46	4.99	0.06	0.62
200	0.58	6.19	0.07	0.77
250	0.94	10.12	0.12	1.27
315	1.37	14.73	0.17	1.84
400	1.63	17.58	0.20	2.20
500	1.94	20.84	0.24	2.61
630	2.07	22.24	0.26	2.78
800	1.91	20.51	0.24	2.56
1000	1.91	20.53	0.24	2.57
1250	1.94	20.93	0.24	2.62
1600	1.89	20.39	0.24	2.55
2000	1.88	20.29	0.24	2.54
2500	1.84	19.77	0.23	2.47
3150	1.66	17.86	0.21	2.23
4000	1.63	17.49	0.20	2.19
5000	1.57	16.92	0.20	2.11
6300	1.71	18.39	0.21	2.30
8000	1.62	17.47	0.20	2.18
10000	1.72	18.51	0.21	2.31
12500	1.43	15.35	0.18	1.92

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APPENDIX B: Instruments of Traceability

Specimen: 4821-24 HEX AREA (4x2 array, 45 in. on center, nonstandard mounting) (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-042	3160-106968	2020-06-26	2021-06-26
Bruel & Kjaer Mic And Preamp E	Type 4943-B-001	2311441	2020-04-07	2021-04-07
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: 4821-24 HEX AREA (4x2 array, 45 in. on center, nonstandard mounting) (See Full Report)

<u>Date</u>	<u>Revision</u>
2020-10-05	Original report issued

END

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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. 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 objects, including intermediate spaces. The object rigging covered 6.84 m² (73.64 ft²) of horizontal test surface area. With an extra 549.28 mm (21.625 in.) of length and width to account for the space between the tested array and what would be the next objects in a larger array, the surface area comes to 10.26 m² (110.47 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 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 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 exposed specimen faces (0.63 m² (6.82 ft²) per object x 8 objects = 5.07 m² (54.54 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).

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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
Freq. (Hz)	Sabins	Sabins / Object	Apparent Abs. Coefficient From Total Coverage Area	Apparent Abs. Coefficient From Total Exposed Surface Area
31.5	2.34	0.29	0.02	0.04
40	2.57	0.32	0.02	0.05
50	-14.20	-1.78	-0.13	-0.26
63	0.37	0.05	0.00	0.01
80	-3.54	-0.44	-0.03	-0.06
100	4.58	0.57	0.04	0.08
125	6.24	0.78	0.06	0.11
160	4.99	0.62	0.05	0.09
200	6.19	0.77	0.06	0.11
250	10.12	1.27	0.09	0.19
315	14.73	1.84	0.13	0.27
400	17.58	2.20	0.16	0.32
500	20.84	2.61	0.19	0.38
630	22.24	2.78	0.20	0.41
800	20.51	2.56	0.19	0.38
1,000	20.53	2.57	0.19	0.38
1,250	20.93	2.62	0.19	0.38
1,600	20.39	2.55	0.18	0.37
2,000	20.29	2.54	0.18	0.37
2,500	19.77	2.47	0.18	0.36
3,150	17.86	2.23	0.16	0.33
4,000	17.49	2.19	0.16	0.32
5,000	16.92	2.11	0.15	0.31
6,300	18.39	2.30	0.17	0.34
8,000	17.47	2.18	0.16	0.32
10,000	18.51	2.31	0.17	0.34
12,500	15.35	1.92	0.14	0.28
Apparent NRC:			0.15	0.35
Apparent SAA:			0.16	0.33

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