

SPONSOR: **Kirei**
San Diego, CA

Sound Absorption
RAL™-A24-064

CONDUCTED: 2024-02-02

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ON: Breeze Cloud (four units, two rows of two units each, rows spaced 12" apart, units in each row spaced 12" 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 C423-23: "Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method." The specimen mounting was performed according to ASTM E795-23: "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 Breeze Cloud (four units, two rows of two units each, rows spaced 12" apart, units in each row spaced 12" 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

Product Name: Breeze Cloud
Manufacturer: Kirei

SPECIMEN MEASUREMENTS & TEST CONDITIONS

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

Test Specimen

Product Type: Baffles constructed with fins and channels of PET felt
Two parallel channels per baffle, fins attached to channels
Fourteen fins per baffle, fins perpendicular to channels
Baffle Dimensions: 4 baffles @ 673 mm (26.5 in.) by 1327 mm (52.25 in.)
Baffle Depth: 184 mm (7.25 in.)
Felt Thickness: 11.66 mm (0.459 in.)
Overall Weight: 14.51 kg (32 lbs)

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Physical Measurements (per object)

Dimensions: 0.67 m (26.5 in) wide by 1.33 m (52.25 in) long
Thickness: 0.18 m (7.25 in)
Weight: 3.63 kg (8 lbs)

Test Environment

Room Volume: 291.98 m³
Temperature: 21.5 °C ± 0.2 °C (Requirement: ≥ 10 °C and ≤ 5 °C change)
Relative Humidity: 57.0 % ± 2.4 % (Requirement: ≥ 40 % and ≤ 5 % change)
Barometric Pressure: 99.2 kPa (Requirement not defined)

MOUNTING METHOD

Type JH-MOD Mounting: The specimen is an array of 4 spaced sound absorbing baffles suspended from cables such that the closest face is located approximately 1410 mm (55.5 in.) from the horizontal test surface. This approximates the mounting method of a typical ceiling baffle installation. The baffles were distributed in two rows, with two baffles per row, with rows spaced 305 mm (12 in.) apart, and baffles in each row spaced 305 mm (12 in.) apart. The width of the installed object array was 1645 mm (64.75 in.) and the length of the installed object array was 2959 mm (116.5 in.). The area of extended continuous surface attributed to the object array was 6.36 m² (68.5 ft²).

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Figure 1 – Specimen mounted in test chamber

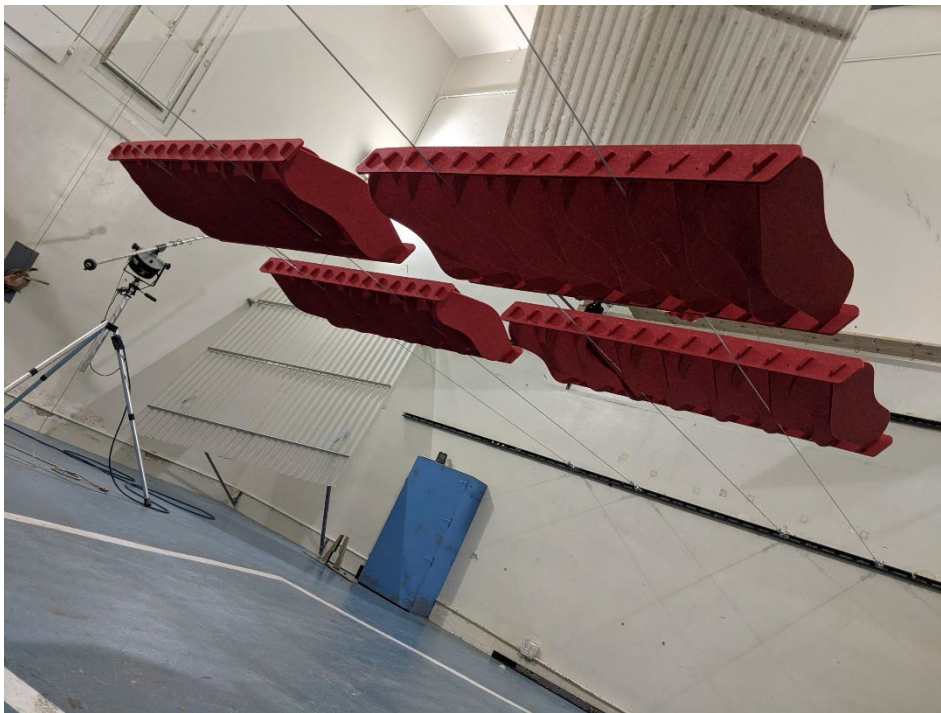


Figure 2 – Specimen mounted in test chamber

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Figure 3 – Specimen fin and pair of channels prior to assembly into baffle



Figure 4 – Detail of assembled baffle in test chamber

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TEST RESULTS

The preferred presentation of sound absorption test results for arrays of spaced objects is sound absorption (m^2) per object and total sound absorption (m^2) at each one-third-octave band

ASTM C423-23 Appendix X2 allows calculation of sound absorption per m^2 (SA/m^2) based on the projected horizontal surface area attributable to an array of objects. The extended continuous surface area used in this calculation is to be determined using the following procedure:

$S_{array} = (w + w_1) \times (l + l_1)$ If the set of objects consists of a rectangular array of equal sized objects with equal space between each object in a row and equal space between rows. (ASTM E423-23 X.2.3.1)

Where:

S_{array} = area of extended continuous surface attributed to the test specimen, m^2

w = the measured width of the installed object array, in meters

w_1 = the space between objects in the array along the width, in meters

l = the measured length of the installed object array, in meters

l_1 = the space between objects in the array along the length, in meters

The sound absorption per m^2 (SA/m^2) is calculated based on the following formula:

$$\alpha_{array} = (A_2 - A_1)/S_{array}$$

Where:

α_{array} = sound absorption per m^2 (SA/m^2) of extended continuous surface, no units,

A_1 = absorption of the empty reverberation room, m^2 and

A_2 = absorption of the room after the specimen has been installed, m^2 .

S_{array} = area of extended continuous surface attributed to the test specimen, m^2

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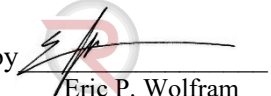
TEST RESULTS (continued)

1/3 Octave Center Frequency (Hz)	Total Absorption		Absorption per Object		α_{array} (Sabins/ft ²) (SA/m ²)
	(m ²)	(Sabins)	(m ² / Object)	(Sabins / Object)	
100	0.46	5.00	0.12	1.25	0.07
** 125	-0.05	-0.59	-0.01	-0.15	-0.01
160	0.15	1.58	0.04	0.39	0.02
200	0.17	1.86	0.04	0.47	0.03
** 250	0.45	4.84	0.11	1.21	0.07
315	1.24	13.39	0.31	3.35	0.20
400	1.61	17.32	0.40	4.33	0.25
** 500	2.39	25.75	0.60	6.44	0.38
630	3.02	32.52	0.76	8.13	0.47
800	3.55	38.18	0.89	9.54	0.56
** 1000	4.35	46.84	1.09	11.71	0.68
1250	4.83	51.99	1.21	13.00	0.76
1600	5.49	59.09	1.37	14.77	0.86
** 2000	5.98	64.32	1.49	16.08	0.94
2500	6.43	69.17	1.61	17.29	1.01
3150	6.83	73.52	1.71	18.38	1.07
** 4000	7.20	77.51	1.80	19.38	1.13
5000	7.18	77.23	1.79	19.31	1.13

Array-NRC 0.50 over 6.36 m² of extended continuous surface area
Array-SAA 0.52 over 6.36 m² of extended continuous surface area

Tested by 
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Report by 
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Test Engineer

Approved by 
Eric P. Wolfram
Laboratory Manager

Note: Sound absorption per m² (SA/m²), and therefore the reported Single Number Ratings, are highly dependent on the exact sample shape, size, spacing, and extended continuous surface area present in the test and subsequent calculations. Changes to any of these parameters will change the resulting values. These presented results are valid only for the specific configuration present in this test.

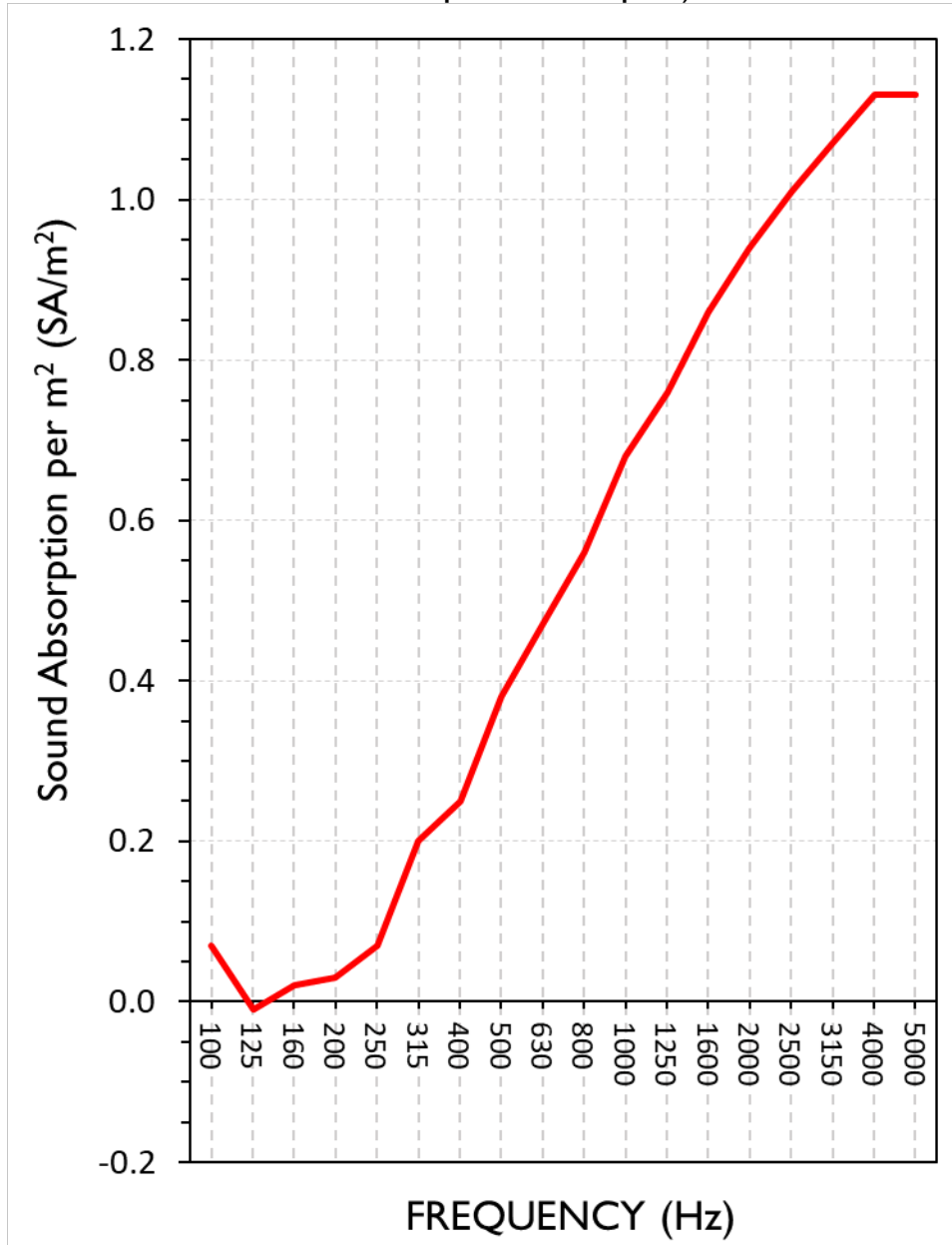
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SOUND ABSORPTION REPORT

Breeze Cloud (four units, two rows of two units each, rows spaced 12” apart, units in each row spaced 12” apart)



Array-NRC 0.50 over 6.36 m² of extended continuous surface area

Array-SAA 0.52 over 6.36 m² of extended continuous surface area



NVLAP LAB CODE 100227-0

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APPENDIX A: Extended Frequency Range Data

Specimen: Breeze Cloud (four units, two rows of two units each, rows spaced 12” apart, units in each row spaced 12” apart) (See Full Report)

The following non-accredited data were obtained in accordance with ASTM C423-23, 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		α_{array} (Sabins/ft ²)
	(m ²)	(Sabins)	(m ² / Object)	(Sabins / Object)	(SA/m ²)
31.5	-0.41	-4.36	-0.10	-1.09	-0.06
40	-0.12	-1.25	-0.03	-0.31	-0.02
50	-1.11	-11.90	-0.28	-2.97	-0.17
63	0.08	0.84	0.02	0.21	0.01
80	0.11	1.14	0.03	0.28	0.02
100	0.46	5.00	0.12	1.25	0.07
125	-0.05	-0.59	-0.01	-0.15	-0.01
160	0.15	1.58	0.04	0.39	0.02
200	0.17	1.86	0.04	0.47	0.03
250	0.45	4.84	0.11	1.21	0.07
315	1.24	13.39	0.31	3.35	0.20
400	1.61	17.32	0.40	4.33	0.25
500	2.39	25.75	0.60	6.44	0.38
630	3.02	32.52	0.76	8.13	0.47
800	3.55	38.18	0.89	9.54	0.56
1000	4.35	46.84	1.09	11.71	0.68
1250	4.83	51.99	1.21	13.00	0.76
1600	5.49	59.09	1.37	14.77	0.86
2000	5.98	64.32	1.49	16.08	0.94
2500	6.43	69.17	1.61	17.29	1.01
3150	6.83	73.52	1.71	18.38	1.07
4000	7.20	77.51	1.80	19.38	1.13
5000	7.18	77.23	1.79	19.31	1.13
6300	6.96	74.91	1.74	18.73	1.09
8000	6.31	67.88	1.58	16.97	0.99
10000	5.60	60.30	1.40	15.08	0.88
12500	4.34	46.70	1.08	11.67	0.68



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APPENDIX B: Instruments of Traceability

Specimen: Breeze Cloud (four units, two rows of two units each, rows spaced 12” apart, units in each row spaced 12” apart) (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	2023-07-17	2024-07-17
Bruel & Kjaer Mic And Preamp G	Type 4943-B-001	2525858	2023-05-03	2024-05-03
Bruel & Kjaer Pistonphone	Type 4228	2781248	2023-07-12	2024-07-12
EXTECH Hygro 6015	SD700	A.116015	2023-05-31	2024-05-31

APPENDIX C: Revisions to Original Test Report

Specimen: Breeze Cloud (four units, two rows of two units each, rows spaced 12” apart, units in each row spaced 12” apart) (See Full Report)

<u>Date</u>	<u>Revision</u>
2024-02-09	Original report issued

END