SPONSOR: **TURF**
Elgin, IL

Sound Absorption
RAL™-A20-240

CONDUCTED: 2020-06-25

ON: BEAM / LIGHT BEAM - 8 units, spaced 6 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 BEAM / LIGHT BEAM - 8 units, spaced 6 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

Trade Name:	BEAM / LIGHT BEAM
Material:	Polyethylene terephthalate felt
Manufacturer:	TURF

SPECIMEN MEASUREMENTS & TEST CONDITIONS

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

Test Specimen

Materials:	Notched and folded semirigid felt paneling Coated metal light fixtures
Dimensions:	8 @ 2495.55 mm (98.25 in.) long x 203.2 mm (8 in.) deep x 76.2 mm (3 in.) wide
Key Geometry:	58 mm (2.283 in.) wide light fixtures embedded in 2 of 8 units Felt panel layers @ 9 mm (0.354 in.) thick each
Overall Weight:	Units without light fixtures, 6 @ 16.1 kg (35.5 lbs) Units with light fixtures, 2 @ 21.21 kg (46.75 lbs)

Physical Measurements (per unit)

Dimensions:	0.2 m (8.0 in) wide by 2.5 m (98.25 in) long
Thickness:	0.08 m (3.0 in)
Weight:	4.67 kg (10.3 lbs)

Test Environment

Room Volume:	291.98 m³
Temperature:	22.3 °C ± 0.0 °C (Requirement: ≥ 10 °C and ≤ 5 °C change)
Relative Humidity:	60.0 % ± 0.2 % (Requirement: ≥ 40 % and ≤ 5 % change)
Barometric Pressure:	98.7 kPa (Requirement not defined)

Each sound absorbing unit had an absorptive area (all exposed surfaces) of 1.43 m^2 (15.34 ft^2). The total absorptive area (all exposed surfaces) of all sound-absorbing units was 11.40 m^2 (122.75 ft^2). The array of units covered 4.25 m^2 (45.71 ft^2) of the horizontal test surface (total treated area).

MOUNTING METHOD

Type J Mounting: The specimen is an array of 8 spaced sound absorbing baffles suspended from cables such that the closest face of the baffles is located approximately 1295.4 mm (51 in.) from 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 152.4 mm (6 in.) apart.

The array was configured such that the baffles with light fixtures were each neighbored by two baffles without light fixtures on both sides.

Figure 1 – Specimen mounted in test chamber

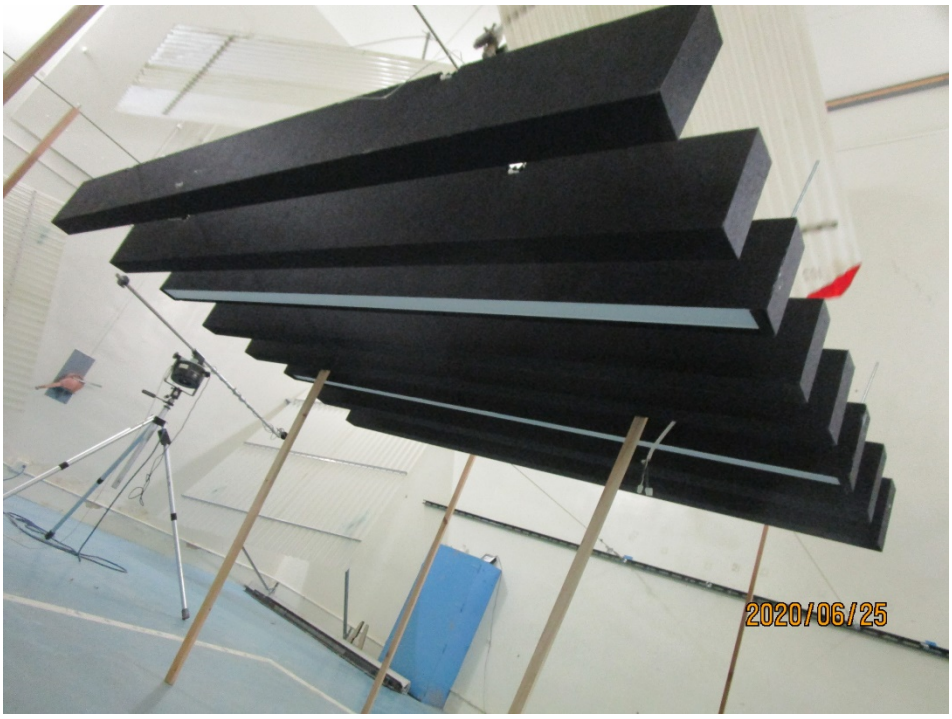


Figure 2 – Underside of specimen, position of baffles with light fixtures

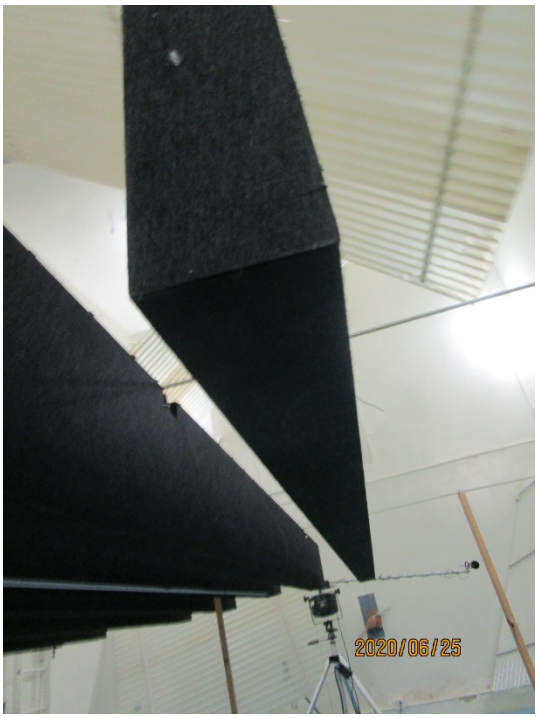


Figure 3 – Detail of materials, baffle without light fixture

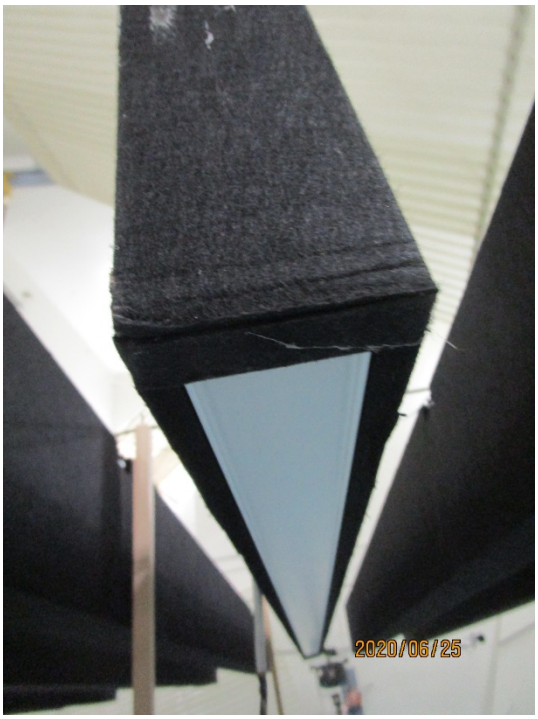


Figure 4 – Detail of materials, baffle with light fixture

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 the objects under test are not identical, the test results are to be treated as an average value across all object types. These results are only applicable to product installations featuring a distribution of object types similar to that of the test specimen.

1/3 Octave Center Frequency	**Total Absorption**		**Absorption per Unit**	
(Hz)	(m^2)	(Sabins)	(m^2 / Unit)	(Sabins / Unit)
100	0.46	4.96	0.06	0.62
** 125	0.82	8.86	0.10	1.11
160	1.20	12.89	0.15	1.61
200	1.68	18.04	0.21	2.26
** 250	2.27	24.48	0.28	3.06
315	3.11	33.50	0.39	4.19
400	3.73	40.16	0.47	5.02
** 500	4.40	47.39	0.55	5.92
630	4.91	52.84	0.61	6.60
800	5.64	60.74	0.71	7.59
** 1000	6.33	68.08	0.79	8.51
1250	7.06	75.99	0.88	9.50
1600	7.50	80.70	0.94	10.09
** 2000	7.75	83.39	0.97	10.42
2500	8.51	91.65	1.06	11.46
3150	8.66	93.19	1.08	11.65
** 4000	8.76	94.24	1.09	11.78
5000	8.72	93.89	1.09	11.74

Tested by Marc Sciaky
Senior Experimentalist

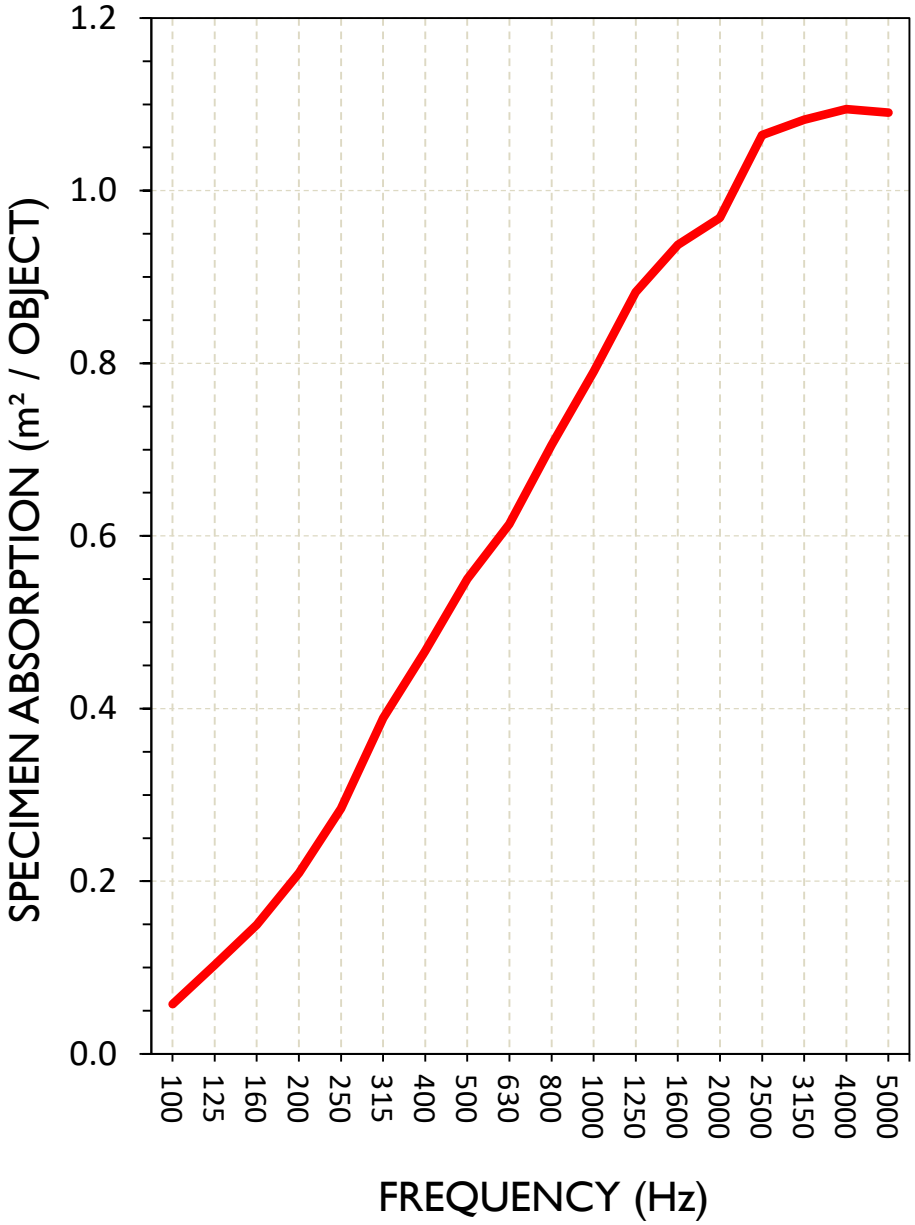
Report by Malcolm Kelly
Test Engineer, Acoustician

Approved by Eric P. Wolfram
Laboratory Manager

Digitally signed by Eric P Wolfram
Location: Geneva, IL
Date: 2020.07.01 13:27:01 -05'00'

SOUND ABSORPTION REPORT

BEAM / LIGHT BEAM - 8 units, spaced 6 in. apart



APPENDIX A: Extended Frequency Range Data

Specimen: BEAM / LIGHT BEAM - 8 units, spaced 6 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 (Hz)	Total Absorption (m^2)	Total Absorption (Sabins)	Absorption per Unit (m^2 / Unit)	Absorption per Unit (Sabins / Unit)
31.5	0.62	6.69	0.08	0.84
40	0.67	7.18	0.08	0.90
50	-0.90	-9.71	-0.11	-1.21
63	-0.46	-4.99	-0.06	-0.62
80	0.12	1.35	0.02	0.17
100	0.46	4.96	0.06	0.62
125	0.82	8.86	0.10	1.11
160	1.20	12.89	0.15	1.61
200	1.68	18.04	0.21	2.26
250	2.27	24.48	0.28	3.06
315	3.11	33.50	0.39	4.19
400	3.73	40.16	0.47	5.02
500	4.40	47.39	0.55	5.92
630	4.91	52.84	0.61	6.60
800	5.64	60.74	0.71	7.59
1000	6.33	68.08	0.79	8.51
1250	7.06	75.99	0.88	9.50
1600	7.50	80.70	0.94	10.09
2000	7.75	83.39	0.97	10.42
2500	8.51	91.65	1.06	11.46
3150	8.66	93.19	1.08	11.65
4000	8.76	94.24	1.09	11.78
5000	8.72	93.89	1.09	11.74
6300	8.73	93.94	1.09	11.74
8000	8.48	91.29	1.06	11.41
10000	8.21	88.42	1.03	11.05
12500	8.10	87.18	1.01	10.90

APPENDIX B: Instruments of Traceability

Specimen: BEAM / LIGHT BEAM - 8 units, spaced 6 in. apart (See Full Report)

Description	Model	Serial Number	Date of Certification	Calibration Due
System 2	Type 3160-A-042	3160-106974	2019-08-08	2020-08-08
Bruel & Kjaer Mic And Preamp A	Type 4943-B-001	2311428	2019-09-27	2020-09-27
Bruel & Kjaer Pistonphone	Type 4228	2781248	2019-08-09	2020-08-09
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: BEAM / LIGHT BEAM - 8 units, spaced 6 in. apart (See Full Report)

Date	Revision
2020-06-26	Original report issued

END

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Report Referenced: **RAL™-A20-240**

CONDUCTED: 2020-06-25

ON: BEAM / LIGHT BEAM - 8 units, spaced 6 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.

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 4.25 m^2 (45.71 ft^2) of horizontal test surface area. With an extra 152.4 mm (6 in.) of width 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 4.63 m^2 (49.81 ft^2) 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. The apparent sound absorption coefficient data can be assigned to a single horizontal surface or plane in acoustical modeling software for approximation of baffle array performance. Such approximations rely on the assumptions that baffle spacing is similar to that of the tested array across the entire surface, that the spacing is negligible between adjacent rows of baffles, 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 (1.43 m^2 (15.34 ft^2) per baffle x 8 baffles = 11.40 m^2 (122.75 ft^2) 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 (0.51 m^2 (5.46 ft^2) per baffle x 8 baffles = 4.06 m^2 (43.67 ft^2) 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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Report Referenced: **RAL™-A20-240**

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	6.69	0.84	0.13	0.05	0.15
40	7.18	0.90	0.14	0.06	0.16
50	-9.71	-1.21	-0.19	-0.08	-0.22
63	-4.99	-0.62	-0.10	-0.04	-0.11
80	1.35	0.17	0.03	0.01	0.03
100	4.96	0.62	0.10	0.04	0.11
125	8.86	1.11	0.18	0.07	0.20
160	12.89	1.61	0.26	0.11	0.30
200	18.04	2.26	0.36	0.15	0.41
250	24.48	3.06	0.49	0.20	0.56
315	33.50	4.19	0.67	0.27	0.77
400	40.16	5.02	0.81	0.33	0.92
500	47.39	5.92	0.95	0.39	1.09
630	52.84	6.60	1.06	0.43	1.21
800	60.74	7.59	1.22	0.49	1.39
1,000	68.08	8.51	1.37	0.55	1.56
1,250	75.99	9.50	1.53	0.62	1.74
1,600	80.70	10.09	1.62	0.66	1.85
2,000	83.39	10.42	1.67	0.68	1.91
2,500	91.65	11.46	1.84	0.75	2.10
3,150	93.19	11.65	1.87	0.76	2.13
4,000	94.24	11.78	1.89	0.77	2.16
5,000	93.89	11.74	1.88	0.76	2.15
6,300	93.94	11.74	1.89	0.77	2.15
8,000	91.29	11.41	1.83	0.74	2.09
10,000	88.42	11.05	1.78	0.72	2.02
12,500	87.18	10.90	1.75	0.71	2.00
		Apparent NRC:	**1.10**	**0.45**	**1.30**
		Apparent SAA:	**1.13**	**0.46**	**1.29**

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