

Test Report

SPONSOR: **TURF Design**
Elgin, IL

Sound Absorption
RAL™-A20-134

CONDUCTED: 2020-03-17

Page 1 of 10

ON: Fractal (12 triangular fixtures in single continuous cloud)

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 Fractal (12 triangular fixtures in single continuous cloud). 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: Fractal
Exposed Surface Area: 0.84 m² (9.038 ft²) per tile
Manufacturer: TURF Design

SPECIMEN MEASUREMENTS & TEST CONDITIONS

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

Test Specimen

Material: Notched and folded semirigid felt paneling
Dimensions: Regular triangular pyramids, 8
Side length @ 911.22 mm (35.875 in.)
Height @ 187.32 mm (7.375 in.)
Overall Weight: 24.15 kg (53.25 lbs)

Test Report

TURF Design
2020-03-17

RAL™-A20-134
Page 2 of 10

Physical Measurements (per unit)

Dimensions: 1.59 m (62.75 in) wide by 3.19 m (125.5 in) long
Thickness: 0.19 m (7.375 in)
Weight: 24.15 kg (53.25 lbs)

Test Environment

Room Volume: 291.98 m³
Temperature: 21.5 °C ± 0.1 °C (Requirement: ≥ 10 °C and ≤ 5 °C change)
Relative Humidity: 67.35 % ± 0.1 % (Requirement: ≥ 40 % and ≤ 5 % change)
Barometric Pressure: 99.7 kPa (Requirement not defined)

From sponsor-provided area calculations, the total absorptive area (all exposed surfaces) of all sound-absorbing tiles was 10.08 m² (108.45 ft²). The array of tiles covered 5.08 m² (54.69 ft²) of the horizontal test surface (total treated area).

MOUNTING METHOD

Type J Mounting: The specimen is an array of 12 sound absorbing fixtures suspended over an array of cables such that the closest face of the fixtures is located approximately 1473.2 mm (58 in.) from the horizontal test surface. This approximates the mounting method of a typical ceiling baffle installation. The tiles were arranged in a single cloud, with no spacing between the edges of adjacent tiles.

Test Report

TURF Design
2020-03-17

RAL™-A20-134
Page 3 of 10



Figure 1 – Specimen mounted in test chamber



Figure 2 – Specimen mounted in test chamber

Test Report

TURF Design
2020-03-17

RAL™-A20-134
Page 4 of 10



Figure 3 – Top face of individual fixture

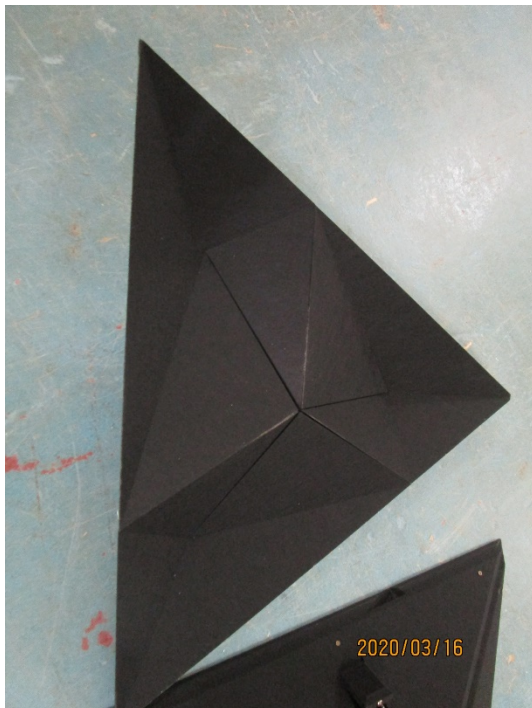


Figure 4 – Underside of individual fixture

Test Report


TURF Design
2020-03-17

RAL™-A20-134
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.). Note that, for the purposes of this test report, the entire specimen is treated as a single unit.

1/3 Octave Center Frequency (Hz)	Total Absorption		Absorption per Unit	
	(m ²)	(Sabins)	(m ² / Unit)	(Sabins / Unit)
100	1.11	11.99	1.11	11.99
** 125	1.88	20.21	1.88	20.21
160	1.69	18.21	1.69	18.21
200	2.28	24.52	2.28	24.52
** 250	3.12	33.60	3.12	33.60
315	4.59	49.36	4.59	49.36
400	4.52	48.68	4.52	48.68
** 500	4.25	45.70	4.25	45.70
630	4.86	52.32	4.86	52.32
800	4.87	52.39	4.87	52.39
** 1000	5.23	56.33	5.23	56.33
1250	6.01	64.73	6.01	64.73
1600	6.78	72.96	6.78	72.96
** 2000	6.98	75.16	6.98	75.16
2500	7.69	82.74	7.69	82.74
3150	7.79	83.83	7.79	83.83
** 4000	8.16	87.79	8.16	87.79
5000	8.17	87.89	8.17	87.89

Tested by 
Marc Sciaky
Senior Experimentalist

Report by 
Malcolm Kelly
Test Engineer, Acoustician

Approved by 
Eric P. Wolfram
Laboratory Manager

1512 S BATAVIA AVENUE
GENEVA, IL 60134
630-232-0104

An  ALION Technical Center

RIVERBANK.ALIONSCIENCE.COM

FOUNDED 1918 BY
WALLACE CLEMENT SABINE

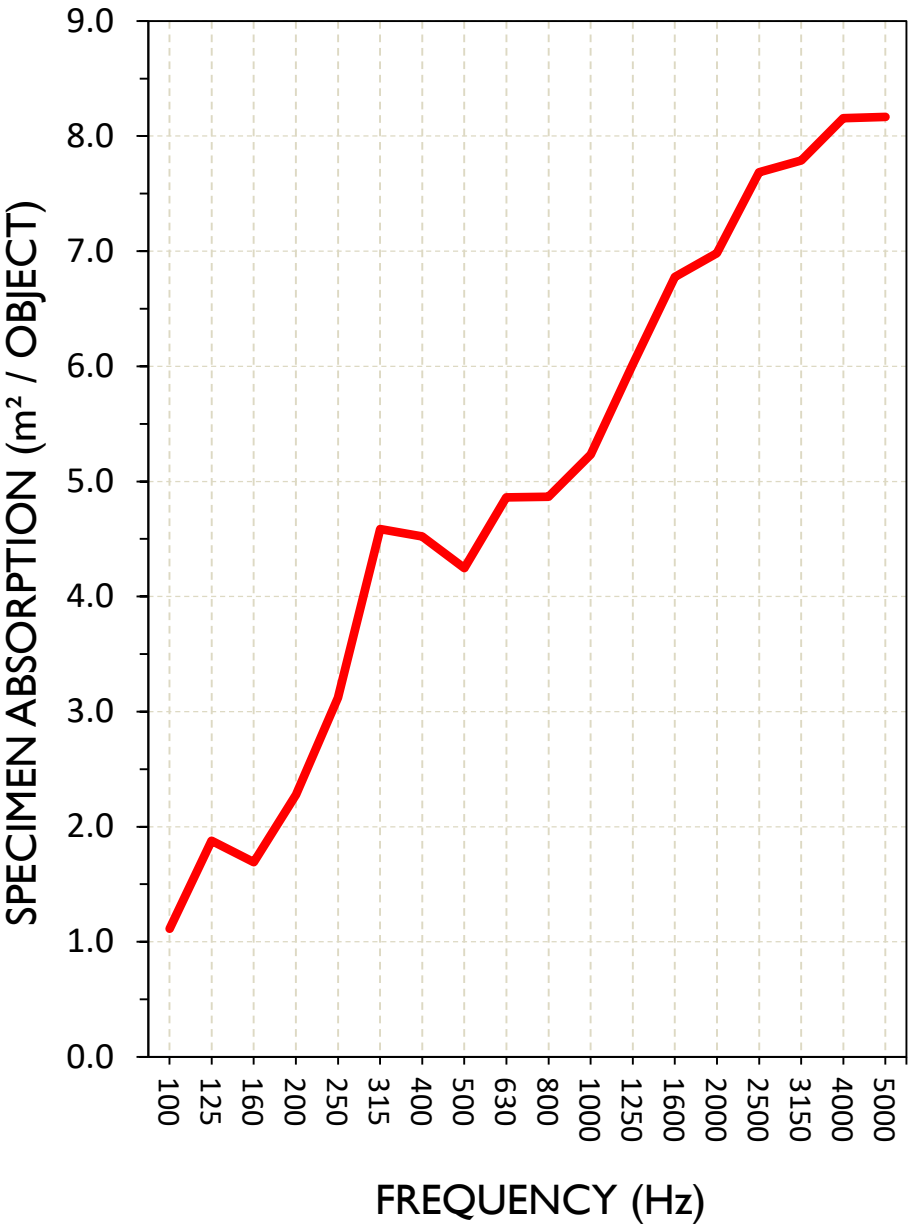
Test Report

TURF Design
2020-03-17

RAL™-A20-134
Page 6 of 10

SOUND ABSORPTION REPORT

Fractal (12 triangular fixtures in single continuous cloud)



Test Report

TURF Design
2020-03-17

RAL™-A20-134
Page 7 of 10

APPENDIX A: Extended Frequency Range Data

Specimen: Fractal (12 triangular fixtures in single continuous cloud) (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	-0.19	-2.02	-0.19	-2.02
40	-0.58	-6.24	-0.58	-6.24
50	-0.68	-7.32	-0.68	-7.32
63	0.27	2.94	0.27	2.94
80	0.85	9.11	0.85	9.11
100	1.11	11.99	1.11	11.99
125	1.88	20.21	1.88	20.21
160	1.69	18.21	1.69	18.21
200	2.28	24.52	2.28	24.52
250	3.12	33.60	3.12	33.60
315	4.59	49.36	4.59	49.36
400	4.52	48.68	4.52	48.68
500	4.25	45.70	4.25	45.70
630	4.86	52.32	4.86	52.32
800	4.87	52.39	4.87	52.39
1000	5.23	56.33	5.23	56.33
1250	6.01	64.73	6.01	64.73
1600	6.78	72.96	6.78	72.96
2000	6.98	75.16	6.98	75.16
2500	7.69	82.74	7.69	82.74
3150	7.79	83.83	7.79	83.83
4000	8.16	87.79	8.16	87.79
5000	8.17	87.89	8.17	87.89
6300	8.25	88.83	8.25	88.83
8000	8.24	88.73	8.24	88.73
10000	7.59	81.68	7.59	81.68
12500	6.91	74.37	6.91	74.37

Test Report**TURF Design**
2020-03-17**RAL™-A20-134**
Page 8 of 10**APPENDIX B: Instruments of Traceability**

Specimen: Fractal (12 triangular fixtures in single continuous cloud) (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	2019-06-25	2020-06-25
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: Fractal (12 triangular fixtures in single continuous cloud) (See Full Report)

<u>Date</u>	<u>Revision</u>
2020-03-18	Original report issued

END

SPONSOR: **TURF Design**
Elgin, IL

Report Referenced: **RAL™-A20-134**
Page 1 of 2

CONDUCTED: 2020-03-17

ON: Fractal (12 triangular fixtures in single continuous cloud) (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 an array of units, including intermediate spaces. The resulting calculations for Apparent Noise Reduction Coefficient and Apparent Sound Absorption Average provide a means to compare the absorption performance of arrays with a variety of spacings. In tests of a single continuous unit, no array spacing can be inferred, thus rendering this method unusable.

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 determined from sponsor-provided area calculations (10.08 m² (108.45 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).

Method 3) Apparent Sound Absorption Coefficient calculated from one face per fixture

The total sound absorption yielded by the specimen is divided by the surface area of one side of one large of the specimen (4.31 m² (46.44 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 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.

SPONSOR: **TURF Design**
CONDUCTED: 2020-03-17

Report Referenced: **RAL™-A20-134**

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	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	-2.02	-2.02		-0.02	-0.04
40	-6.24	-6.24		-0.06	-0.13
50	-7.32	-7.32		-0.07	-0.16
63	2.94	2.94		0.03	0.06
80	9.11	9.11		0.08	0.20
100	11.99	11.99		0.11	0.26
125	20.21	20.21		0.19	0.44
160	18.21	18.21		0.17	0.39
200	24.52	24.52		0.23	0.53
250	33.60	33.60		0.31	0.72
315	49.36	49.36		0.46	1.06
400	48.68	48.68		0.45	1.05
500	45.70	45.70		0.42	0.98
630	52.32	52.32		0.48	1.13
800	52.39	52.39		0.48	1.13
1,000	56.33	56.33		0.52	1.21
1,250	64.73	64.73		0.60	1.39
1,600	72.96	72.96		0.67	1.57
2,000	75.16	75.16		0.69	1.62
2,500	82.74	82.74		0.76	1.78
3,150	83.83	83.83		0.77	1.81
4,000	87.79	87.79		0.81	1.89
5,000	87.89	87.89		0.81	1.89
6,300	88.83	88.83		0.82	1.91
8,000	88.73	88.73		0.82	1.91
10,000	81.68	81.68		0.75	1.76
12,500	74.37	74.37		0.69	1.60
Apparent NRC:			N/A	0.50	1.15
Apparent SAA:			N/A	0.51	1.18

Prepared by 
Malcolm Kelly
Test Engineer, Acoustician