RIVERBANK ACOUSTICAL LABORATORIES

1512 S. BATAVIA AVENUE
GENEVA, ILLINOIS 60134

Alion Science and Technology

630/232-0104
FOUNDED 1918 BY
WALLACE CLEMENT SABINE

TEST REPORT

FOR: **Auralex Acoustics, Inc.**
Indianapolis, IN.

Sound Absorption
RAL™-A14-257

CONDUCTED: 2014-11-18

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ON: Deep 6 Bass Trap Panel

TEST METHOD

The test method conformed explicitly with the requirements of the ASTM Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method: ASTM C423-09a and E795-05. Riverbank Acoustical Laboratories has been accredited by the U.S. Department of Commerce, National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP) for this test procedure (NVLAP Lab Code: 100227-0). A description of the measuring procedure and room qualifications is available separately.

DESCRIPTION OF THE SPECIMEN

The test specimen was designated by the manufacturer as Deep 6 Bass Trap Panel. A visual inspection verified the manufacturer's description. The specimen consisted of eight panels measured as 1.23 m (48.25 in.) long by 609.60 m (24.0 in.) wide. From top to bottom, the specimen was composed of the following: 50.80 mm (2.0 in.) thick, rigid fiberglass with beveled and chemically hardened edges, all wrapped with 0.76 mm (0.03 in.) fabric; 52.83 mm (2.08 in.) thick, semi-rigid mineral wool insulation; 52.32 mm (2.06 in.) thick, semi-rigid mineral wool insulation with foil backing. The specimen was encased by a metal frame measured as 144.27 mm (5.68 in.) deep and 0.76 mm (0.03 in.) thick.

The overall dimensions of each unit was measured as 1.23 m (48.25 in.) wide by 609.60 mm (24.00 in.) long and 152.65 mm (6.01 in.) tall. Each sound absorbing unit had an absorptive area (all exposed surfaces) of 2.05 m^2 (22.11 ft^2).The total absorptive area (all exposed surfaces) of all sound-absorbing units is 16.44 m^2 (176.88 ft^2). Each unit covered approximinatly 1.07 m^2 (11.49 ft^2) of chamber surface. The average weight of each unit as measured was 14.57 kg (32.13 lbs).

The specimen was tested in the laboratory's 292.0 m^3 (10,311.0 ft^3) test chamber. The room temperature at the time of the test was 20.3±0.0℃ (68.6±0.0℉) and 63.8±0.1% relative humidity. The atmospheric pressure was 99.0 kPa.

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Figure 1 - Specimen mounted in the test chamber.

Figure 2 - Detail of the test specimen.

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<u>MOUNTING J</u>

The specimen is a set of sound absorbing units installed with one edge in direct contact with the test surface and another in direct contact of the side wall of reverberation chamber. This approximates the corner mounting method typical of the actual product installation. The units were spaced 304.80 mm (12.0 in.) apart (3 on North wall, 2 on South wall, 3 on West wall).

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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.).

TEST RESULTS

1/3 Octave Center Frequency (Hz)	Sabins per Unit	Total Absorption In Sabins
100	14.28	114.27
** 125	18.50	148.02
160	14.99	119.91
200	11.93	95.45
** 250	12.86	102.92
315	10.70	85.60
400	10.86	86.86
** 500	10.83	86.64
630	11.21	89.68
800	10.61	84.92
** 1000	10.47	83.79
1250	10.73	85.86
1600	10.25	82.01
** 2000	10.04	80.31
2500	10.02	80.14
3150	9.85	78.83
** 4000	9.65	77.18
5000	9.48	75.81

Tested by _____ Report by _____ Approved by _____
Dean Victor   Chris Nottoli   Eric P. Wolfram
Senior Experimentalist   *Acoustician*   *Laboratory Manager*

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TEST REPORT

SOUND ABSORPTION REPORT
Deep 6 Bass Trap Panel

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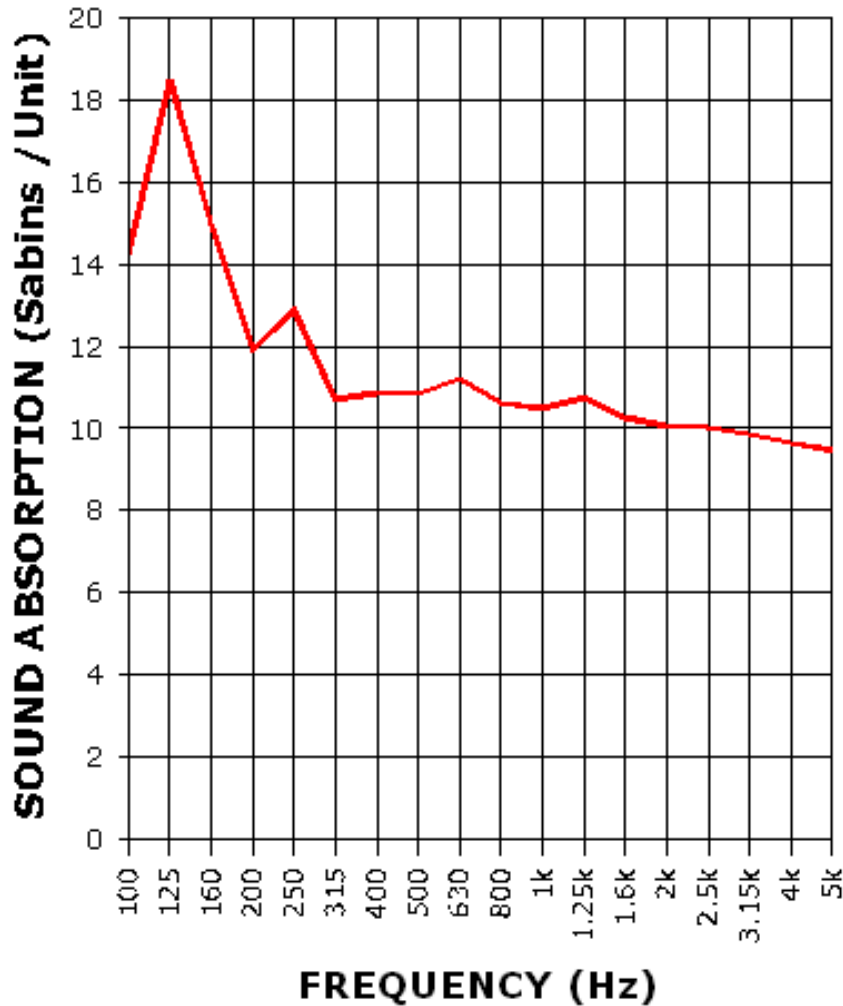
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Appendix to ASTM C423 Sound Absorption Test
Extra Frequency Data

Product Description: Deep 6 Bass Trap Panel (See Full Report)

Riverbank Acoustical Laboratories is accredited to perform sound absorption coefficient measurements for the frequency range of 100Hz to 5,000Hz. However, we calculate sound absorption values at additional test frequencies as a service to our clients.

Although these measurements were made in accordance with the procedures described in ASTM C423-09a, they do not qualify as part of the standard. Since the results are representative of the test environment only, they are unofficial and intended for research and development guidelines rather than for commercial purposes. The sound absorption values at additional frequencies were as follows:

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1/3 Octave Center Frequency (Hz)	Sound Absorption Sabins per Unit	Sound Absorption Total Sabins
40	5.86	46.91
50	4.87	38.93
63	2.40	19.20
80	12.76	102.09
6300	8.67	69.37
8000	7.90	63.16
10000	7.22	57.77

END

NVLAP

NVLAP LAB CODE 100227-0

FOR: **Auralex Acoustics, Inc.**   Report Referenced: **RAL™-A14-257**
Indianapolis, IN.   Page 1 of 2

CONDUCTED: 2014-11-18

ON: Deep 6 Bass Trap Panel (See Full Test Report for Details)

Appendix A 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. 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 reverberation room covered by the objects, including floor and wall surface. The bass traps covered 91.93 ft^2 of chamber 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 C423-09a. In acoustical modeling applications, the apparent sound absorption coefficient data can be assigned to floor and wall surface segments for approximation of the bass trap absorption performance (assuming panel 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 (14.07 ft^2 per panel x 8 panels = 112.6 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 C423-09a. 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 panel.
The total sound absorption yielded by the specimen is divided by the combined surface area of the largest face of each panel in the specimen (8.04 ft^2 per panel x 8 panels = 64.32 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 C423-09a.

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Appendix A: Data Note: See full test report for details of mounting position, spacing and configuration as these parameters greatly affect sound absorption performance.

Specimen Absorption (US)			Method 1	Method 2	Method 3
			Apparent Abs. Coefficient From Total Area Covered	Apparent Abs. Coefficient From Total Exposed Surface Area	Apparent Abs. Coefficient From One Face per Panel
Freq. (Hz)	Sabins	Sabins/Panel			
40	46.91	5.86	0.51	0.42	0.73
50	38.93	4.87	0.42	0.35	0.61
63	**19.20**	**2.40**	**0.21**	**0.17**	**0.30**
80	102.09	12.76	1.11	0.91	1.59
100	114.27	14.28	1.24	1.02	1.78
125	**148.02**	**18.50**	**1.61**	**1.32**	**2.30**
160	119.91	14.99	1.30	1.07	1.86
200	95.45	11.93	1.04	0.85	1.48
250	**102.92**	**12.87**	**1.12**	**0.91**	**1.60**
315	85.60	10.70	0.93	0.76	1.33
400	86.86	10.86	0.94	0.77	1.35
500	**86.64**	**10.83**	**0.94**	**0.77**	**1.35**
630	89.68	11.21	0.98	0.80	1.39
800	84.92	10.62	0.92	0.75	1.32
1,000	**83.79**	**10.47**	**0.91**	**0.74**	**1.30**
1,250	85.86	10.73	0.93	0.76	1.33
1,600	82.01	10.25	0.89	0.73	1.27
2,000	**80.31**	**10.04**	**0.87**	**0.71**	**1.25**
2,500	80.14	10.02	0.87	0.71	1.25
3,150	78.83	9.85	0.86	0.70	1.23
4,000	**77.18**	**9.65**	**0.84**	**0.69**	**1.20**
5,000	75.81	9.48	0.82	0.67	1.18
6,300	69.37	8.67	0.75	0.62	1.08
8,000	**63.16**	**7.90**	**0.69**	**0.56**	**0.98**
10,000	57.77	7.22	0.63	0.51	0.90
		Apparent NRC:	**1.00**	**0.80**	**1.40**
		Apparent SAA:	0.95	0.77	1.35

Prepared by *Chris Nottoli*
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