

# 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  
Indianapolis, IN

Sound Absorption Test  
RAL™-A04-034

ON: Sono Columns

Page 1 of 4

CONDUCTED: 10 March 2004

### 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 C423-02a and E795-00. 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. 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 Sono Columns. The overall dimensions of the specimen as measured were nominally 2.44 m (96 in.) wide by 2.74 m (108 in.) long and 152 mm (6 in.) thick. The specimen consisted of eighteen (18) pieces. Each piece was 305 mm (12 in.) wide by 1.22 m (48 in.) long. The specimen was tested in the laboratory's 292 m<sup>3</sup> (10,311 ft<sup>3</sup>) test chamber.

The manufacturer's description of the specimen was as follows: Sono Columns are 4' x 1' x 6" columns of acoustic foam. Five grooves, each 3/4" diameter, are cut in the face of each unit. The density of the acoustic foam is approximately 1.8 PCF and the units are charcoal gray in color. A visual inspection verified the manufacturer's description of the specimen.

The weight of the entire specimen as measured was 23.4 kg (51.5 lbs), an average of 3.5 kg/m<sup>2</sup> (0.72 lbs/ft<sup>2</sup>). The area used in the calculations was 6.7 m<sup>2</sup> (72 ft<sup>2</sup>). The room temperature at the time of the test was 21°C (70°F) and 64±1% relative humidity.

### MOUNTING A

The test specimen was laid directly against the test surface.

This report shall not be reproduced except in full, without the written approval of RAL.

THE RESULTS REPORTED ABOVE APPLY ONLY TO THE SPECIFIC SAMPLE SUBMITTED FOR MEASUREMENT. NO RESPONSIBILITY IS ASSUMED FOR PERFORMANCE OF ANY OTHER SPECIMEN.



ACCREDITED BY DEPARTMENT OF COMMERCE, NATIONAL VOLUNTARY LABORATORY  
ACCREDITATION PROGRAM FOR SELECTED TEST METHODS FOR ACOUSTICS.  
THE LABORATORY'S ACCREDITATION OR ANY OF ITS TEST REPORTS IN NO WAY CONSTITUTES  
OR IMPLIES PRODUCT CERTIFICATION, APPROVAL, OR ENDORSEMENT BY NIST.

# 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

Auralex Acoustics

RAL™-A04-034

10 March 2004

Page 2 of 4

### TEST RESULTS

1/3 Octave Center Frequency (Hz)	Absorption Coefficient	Total Absorption In Sabins
100	0.81	58.65
** 125	1.10	79.47
160	1.21	87.21
200	1.41	101.35
** 250	1.36	97.80
315	1.46	105.42
400	1.50	108.03
** 500	1.50	107.67
630	1.46	105.46
800	1.41	101.26
** 1000	1.38	99.46
1250	1.37	98.92
1600	1.36	98.11
** 2000	1.34	96.53
2500	1.32	95.39
3150	1.31	94.55
** 4000	1.33	95.58
5000	1.31	93.99

SAA = 1.41  
NRC = 1.40

This report shall not be reproduced except in full, without the written approval of RAL.

THE RESULTS REPORTED ABOVE APPLY ONLY TO THE SPECIFIC SAMPLE SUBMITTED FOR MEASUREMENT. NO RESPONSIBILITY IS ASSUMED FOR PERFORMANCE OF ANY OTHER SPECIMEN.



ACCREDITED BY DEPARTMENT OF COMMERCE, NATIONAL VOLUNTARY LABORATORY  
ACCREDITATION PROGRAM FOR SELECTED TEST METHODS FOR ACOUSTICS.  
THE LABORATORY'S ACCREDITATION OR ANY OF ITS TEST REPORTS IN NO WAY CONSTITUTES  
OR IMPLIES PRODUCT CERTIFICATION, APPROVAL, OR ENDORSEMENT BY NIST.

# 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

Auralex Acoustics

RAL™-A04-034

10 March 2004

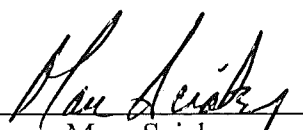
Page 3 of 4

### TEST RESULTS (Continued)


The sound absorption average (SAA) is defined as a single number rating, the average, rounded to the nearest 0.01, of the sound absorption coefficient of a material for the twelve one-third octave bands from 200 through 2500 Hz, inclusive.

The noise reduction coefficient (NRC) is defined from previous versions of this same test method as the average of the coefficients at 250, 500, 1000, and 2000 Hz, expressed to the nearest integral multiple of 0.05.

Tested by

  
Marc Sciaky  
Senior Technician

Approved by

  
David L. Moyer  
Laboratory Manager

This report shall not be reproduced except in full, without the written approval of RAL.

THE RESULTS REPORTED ABOVE APPLY ONLY TO THE SPECIFIC SAMPLE SUBMITTED FOR MEASUREMENT. NO RESPONSIBILITY IS ASSUMED FOR PERFORMANCE OF ANY OTHER SPECIMEN.



ACCREDITED BY DEPARTMENT OF COMMERCE, NATIONAL VOLUNTARY LABORATORY  
ACCREDITATION PROGRAM FOR SELECTED TEST METHODS FOR ACOUSTICS.  
THE LABORATORY'S ACCREDITATION OR ANY OF ITS TEST REPORTS IN NO WAY CONSTITUTES  
OR IMPLIES PRODUCT CERTIFICATION, APPROVAL, OR ENDORSEMENT BY NIST.

# RIVERBANK ACOUSTICAL LABORATORIES

1512 S. BATAVIA AVENUE  
GENEVA, ILLINOIS 60134

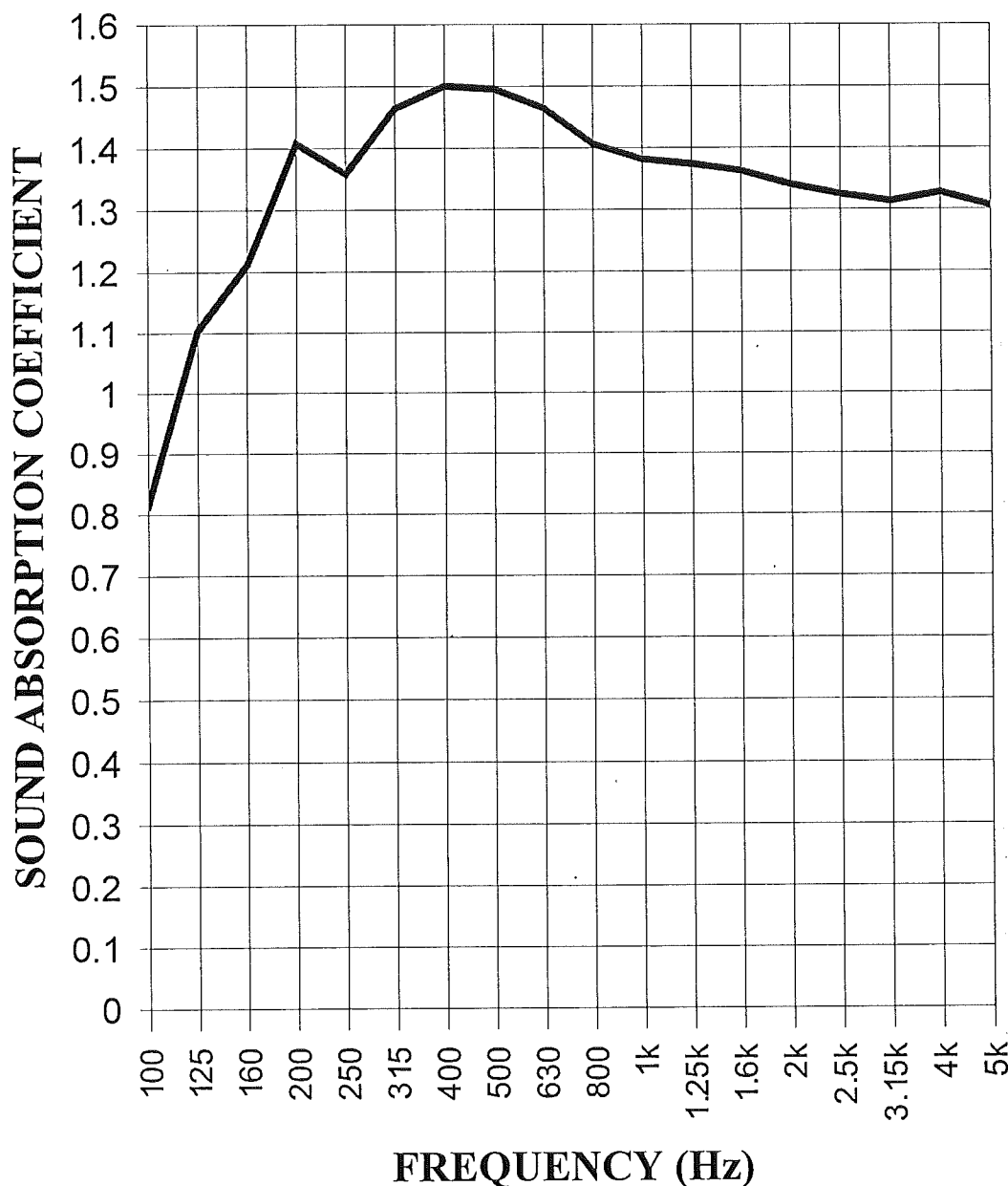
Alion Science and Technology

630/232-0104  
FOUNDED 1918 BY  
WALLACE CLEMENT SABINE

## TEST REPORT

SOUND ABSORPTION REPORT  
RAL - A04-034

PAGE 4 OF 4



SAA = 1.41

NRC = 1.40

This report shall not be reproduced except in full, without the written approval of RAL.

THE RESULTS REPORTED ABOVE APPLY ONLY TO THE SPECIFIC SAMPLE SUBMITTED FOR MEASUREMENT. NO RESPONSIBILITY IS ASSUMED FOR PERFORMANCE OF ANY OTHER SPECIMEN.



ACCREDITED BY DEPARTMENT OF COMMERCE, NATIONAL VOLUNTARY LABORATORY  
ACCREDITATION PROGRAM FOR SELECTED TEST METHODS FOR ACOUSTICS.  
THE LABORATORY'S ACCREDITATION OR ANY OF ITS TEST REPORTS IN NO WAY CONSTITUTES  
OR IMPLIES PRODUCT CERTIFICATION, APPROVAL, OR ENDORSEMENT BY NIST.

FOR: Auralex Acoustics

ON: Sono Columns and Pro Columns

CONDUCTED: 10 March 2004

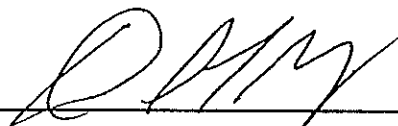
Page 1 of 1

SUBJECT: Additional Frequency Data for Absorption Testing

As requested by the client, sound absorption values were calculated at additional test frequencies. Although the measurements were made in accordance with the procedures described in ASTM C423-02a, 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:

Reference Test Number	Absorption Coefficient Frequency (Hz)		
	50	63	80
RAL™-A04-034	0.23	0.26	0.29
RAL™-A04-035	0.34	0.39	0.54

Submitted by



David L. Moyer  
Laboratory Manager

Riverbank Acoustical Laboratories (RAL)<sup>TM</sup>  
 Sound Absorption and Sound Absorption Coefficients  
 by the Reverberation Room Method ASTM C 423-02/NVLAP 08/P03

TEST NUMBER: A04-033 - L

TEST DATE: MARCH 09, 2004

CLIENT: Auralex Acoustics  
 DESIGNATION: Sono Columns - 4 units - standing upright  
 DIMENSIONS: 0" x 0" x 0"  
 NUMBER OF UNITS: 4  
 WEIGHT: 0 lbs      AREA WEIGHT: 0.00 lbs/ft<sup>2</sup>  
 MOUNTING: Other      EDGE SEAL: Unsealed  
 SPECIMEN DETAILS:

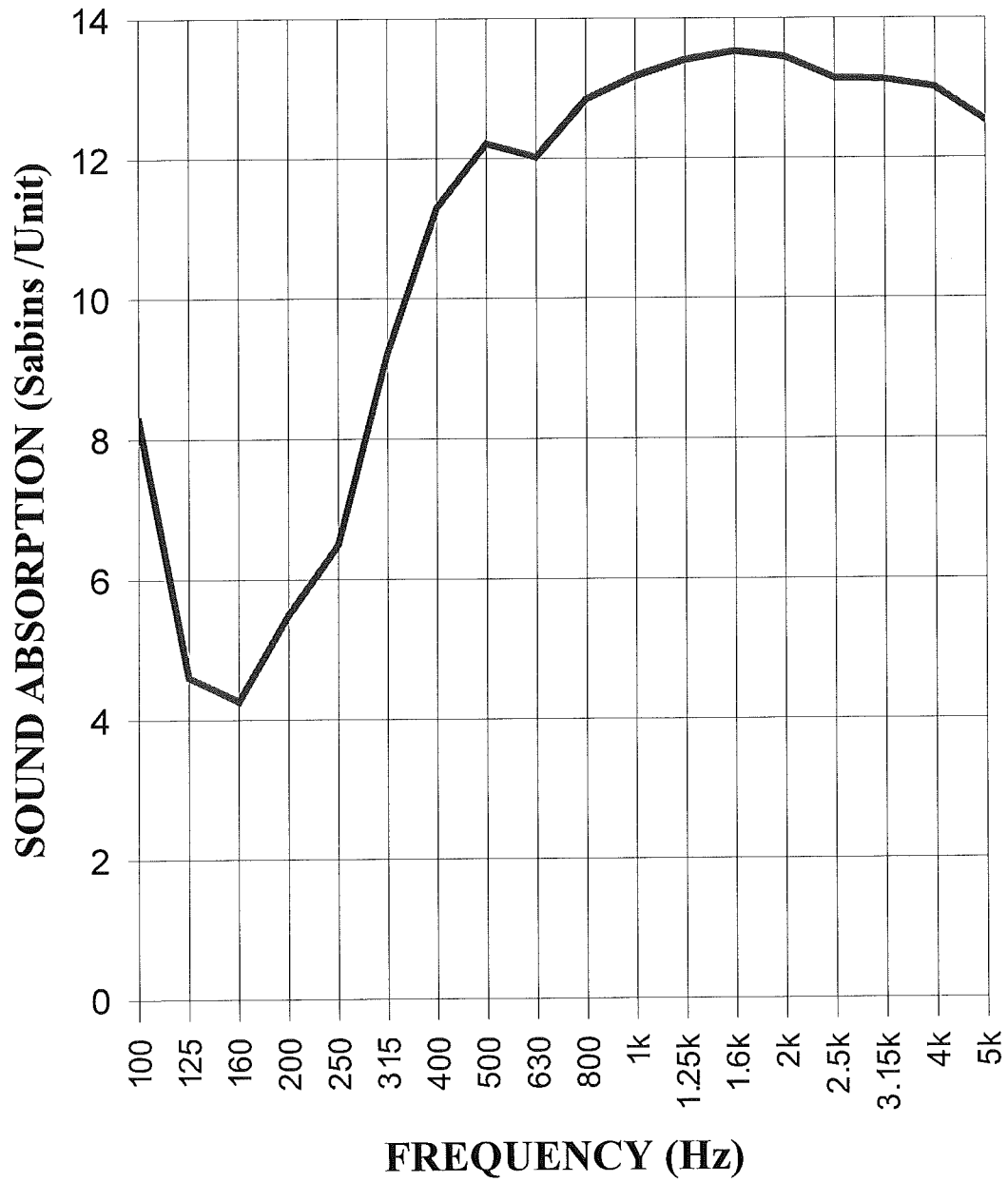
TEST ROOM DETAILS: Room 0 Volume = 10311 ft<sup>3</sup> Area = 2864.3 ft<sup>2</sup>  
 FILE NAME: A04\_033\_040309\_L.doc

1/3 OCTAVE CENTER FREQ. (Hz)	ABSORPTION PER UNIT	TOTAL ABSORPTION  (SABINS)
50	-2.40666	-9.63
63	8.01758	32.07
80	7.11355	28.45
100	8.27026	33.08
125	4.60551	18.42
160	4.26254	17.05
200	5.49075	21.96
250	6.48365	25.93
315	9.21603	36.86
400	11.29011	45.16
500	12.21181	48.85
630	12.01664	48.07
800	12.84328	51.37
1000	13.17461	52.70
1250	13.40473	53.62
1600	13.52872	54.11
2000	13.44578	53.78
2500	13.14400	52.58
3150	13.12318	52.49
4000	13.01061	52.04
5000	12.53246	50.13

Test Conducted by: Marc Sciaky

This single report page and accompanying graph contain the instantaneous raw data as provided to the client after testing of the specimen. This data, although accurate, is incomplete without the full specimen description, mounting details and signature pages. The full report referenced by the RAL test number above should be consulted for further information regarding these results.

SOUND ABSORPTION REPORT  
RAL - A04-033 - L



SOUND ABSORPTION in SABINS PER UNIT

Test Conducted by *Marc Sciaky*  
Marc Sciaky

Riverbank Acoustical Laboratories (RAL)<sup>TM</sup>

TEST NUMBER: A04-033 - L TEST DATE: MARCH 09, 2004

CLIENT: Auralex Acoustics  
DESIGNATION: Sono Columns - 4 units - standing uprightTEST ROOM DETAILS: Room 0 Volume = 10311 ft<sup>3</sup> Area = 2864.3 ft<sup>2</sup>

## SPECIMEN DATA

1/3 OCTAVE CENTER FREQ. (Hz)	DECAY TIME FOR 60 dB IN SECONDS (Rt)	DECAY RATE (dB/s)	ABSORPTION (SABINS)	% UNCERTAINTY WITH 95% CONF. LIMITS FOR ABSORP. OF REV. RM.
50	2.811	21.345	179.58	4.33
63	3.468	17.303	145.57	7.32
80	4.058	14.784	124.38	6.12
100	4.380	13.699	115.25	4.51
125	4.786	12.538	105.48	3.82
160	5.105	11.753	98.88	2.81
200	5.093	11.782	99.12	2.41
250	4.897	12.252	103.08	2.53
315	4.417	13.585	114.30	1.60
400	4.117	14.573	122.60	1.85
500	3.902	15.377	129.37	1.49
630	3.951	15.187	127.77	1.89
800	3.773	15.903	133.80	1.24
1000	3.605	16.642	140.01	0.84
1250	3.256	18.429	155.05	1.07
1600	3.062	19.597	164.87	0.89
2000	2.807	21.376	179.84	0.70
2500	2.619	22.906	192.71	0.71
3150	2.493	24.072	202.52	0.76
4000	2.305	26.026	218.96	0.65
5000	2.030	29.563	248.72	0.58

## INPUTS:

PULSE PROGRAM TEMPLATE: Reverb_Rm0_Pre.plt	AVERAGING METHOD: Exponential
FREQUENCY RANGE: 50 Hz to 5000 Hz	AVERAGING TIME: 1/32 s
	OUTPUT INTERVAL: 34 ms
Environmental Conditions:	
START: 71°F 59% RH	NUM OF SPECTRA: 200
COMPLETION: 70°F 59% RH	APPROXIMATE DECAY TIME: 6.8 sec
	NUM OF MEASUREMENTS: 80
MINIMUM # OF POINTS: 26 at 5000 Hz	NUM OF GROUPS: 1
FILE NAME: A04_033_040309_L.doc	DELAY PROCESSING: Delay

Test Conducted by: Marc Sciaky



Riverbank Acoustical Laboratories (RAL)<sup>TM</sup>

TEST NUMBER: A04-033 - L TEST DATE: MARCH 09, 2004

CLIENT: Auralex Acoustics  
 DESIGNATION: Sono Columns - 4 units - standing upright

TEST ROOM DETAILS: Room 0 Volume = 10311 ft<sup>3</sup> Area = 2864.3 ft<sup>2</sup>

## EMPTY ROOM DATA

1/3 OCTAVE CENTER FREQ. (Hz)	DECAY TIME FOR 60 dB IN SECONDS (Rt)	DECAY RATE (dB/s)	ABSORPTION (SABINS)	% UNCERTAINTY WITH 95% CONF. LIMITS FOR ABSORP. OF REV. RM.
50	2.669	22.479	189.21	2.53
63	4.450	13.485	113.50	6.05
80	5.265	11.396	95.93	4.69
100	6.146	9.762	82.17	4.06
125	5.801	10.343	87.06	2.70
160	6.172	9.722	81.83	2.79
200	6.545	9.167	77.16	2.50
250	6.546	9.166	77.15	2.24
315	6.522	9.199	77.43	1.29
400	6.521	9.201	77.44	1.35
500	6.272	9.566	80.52	1.13
630	6.336	9.470	79.71	0.97
800	6.127	9.792	82.43	0.92
1000	5.784	10.374	87.32	0.76
1250	4.979	12.050	101.43	0.89
1600	4.560	13.159	110.76	0.79
2000	4.006	14.977	126.06	0.70
2500	3.604	16.649	140.14	0.69
3150	3.366	17.824	150.03	0.69
4000	3.026	19.831	166.92	0.71
5000	2.543	23.593	198.59	0.61

## INPUTS:

PULSE PROGRAM TEMPLATE: Reverb_Rm0_Pre.plt	AVERAGING METHOD: Exponential
FREQUENCY RANGE: 50 Hz to 5000 Hz	AVERAGING TIME: 1/32 s
	OUTPUT INTERVAL: 34 ms
Environmental Conditions:	
START: 70°F 58% RH	NUM OF SPECTRA: 200
COMPLETION: 70°F 59% RH	APPROXIMATE DECAY TIME: 6.8 sec
	NUM OF MEASUREMENTS: 80
MINIMUM # OF POINTS: 33 at 5000 Hz	NUM OF GROUPS: 1
FILE NAME: MTRM0_040309_A.doc	DELAY PROCESSING: Delay

Test Conducted by: Marc Sciaky

Riverbank Acoustical Laboratories (RAL)<sup>TM</sup>  
 Sound Absorption and Sound Absorption Coefficients  
 by the Reverberation Room Method ASTM C 423-02/NVLAP 08/P03

TEST NUMBER: A04-033 - L TEST DATE: MARCH 09, 2004

CLIENT: Auralex Acoustics  
 DESIGNATION: Sono Columns - 4 units - standing upright  
 DIMENSIONS: 0" wide x 0" long x 0" thick  
 NUMBER OF UNITS: 4  
 WEIGHT: 0 lbs AREA WEIGHT: 0.00 lbs/ft<sup>2</sup>  
 MOUNTING: Other EDGE SEAL: Unsealed  
 SPECIMEN DETAILS:

TEST ROOM DETAILS: Room 0 Volume = 10311 ft<sup>3</sup> Area = 2864.3 ft<sup>2</sup>  
 FILE NAME: A04\_033\_040309\_L.doc

1/3 OCTAVE CENTER FREQ. (Hz)	ABSORPTION PER UNIT	TOTAL ABSORPTION (SABINS)	% UNCERTAINTY WITH 95% CONF. LIMITS FOR ABSORP. OF REV. RM.
50	-2.40666	-9.63	-49.55
63	8.01758	32.07	26.41
80	7.11355	28.45	27.24
100	8.27026	33.08	19.49
125	4.60551	18.42	32.76
160	4.26254	17.05	20.58
200	5.49075	21.96	14.71
250	6.48365	25.93	13.02
315	9.21603	36.86	5.93
400	11.29011	45.16	5.31
500	12.21181	48.85	4.37
630	12.01664	48.07	5.22
800	12.84328	51.37	3.36
1000	13.17461	52.70	2.74
1250	13.40473	53.62	3.66
1600	13.52872	54.11	2.81
2000	13.44578	53.78	2.60
2500	13.14400	52.58	2.81
3150	13.12318	52.49	3.73
4000	13.01061	52.04	3.57
5000	12.53246	50.13	3.53

Test Conducted by: Marc Sciaky

Riverbank Acoustical Laboratories (RAL)<sup>TM</sup>  
 Sound Absorption and Sound Absorption Coefficients  
 by the Reverberation Room Method ASTM C 423-02/NVLAP 08/P03

TEST NUMBER: A04-034

TEST DATE: MARCH 10, 2004

CLIENT: Auralex Acoustics  
 DESIGNATION: Sono Columns  
 DIMENSIONS: 96" x 108" x 6"  
 AREA: 72.0 ft<sup>2</sup>  
 WEIGHT: 51.5 lbs      AREA WEIGHT: 0.72 lbs/ft<sup>2</sup>  
 MOUNTING: A      EDGE SEAL: Unsealed  
 SPECIMEN DETAILS: 18 @ 12" x 48" x 6"

TEST ROOM DETAILS: Room 0 Volume = 10311 ft<sup>3</sup> Area = 2864.3 ft<sup>2</sup>  
 FILE NAME: A04\_034\_040310\_A.doc

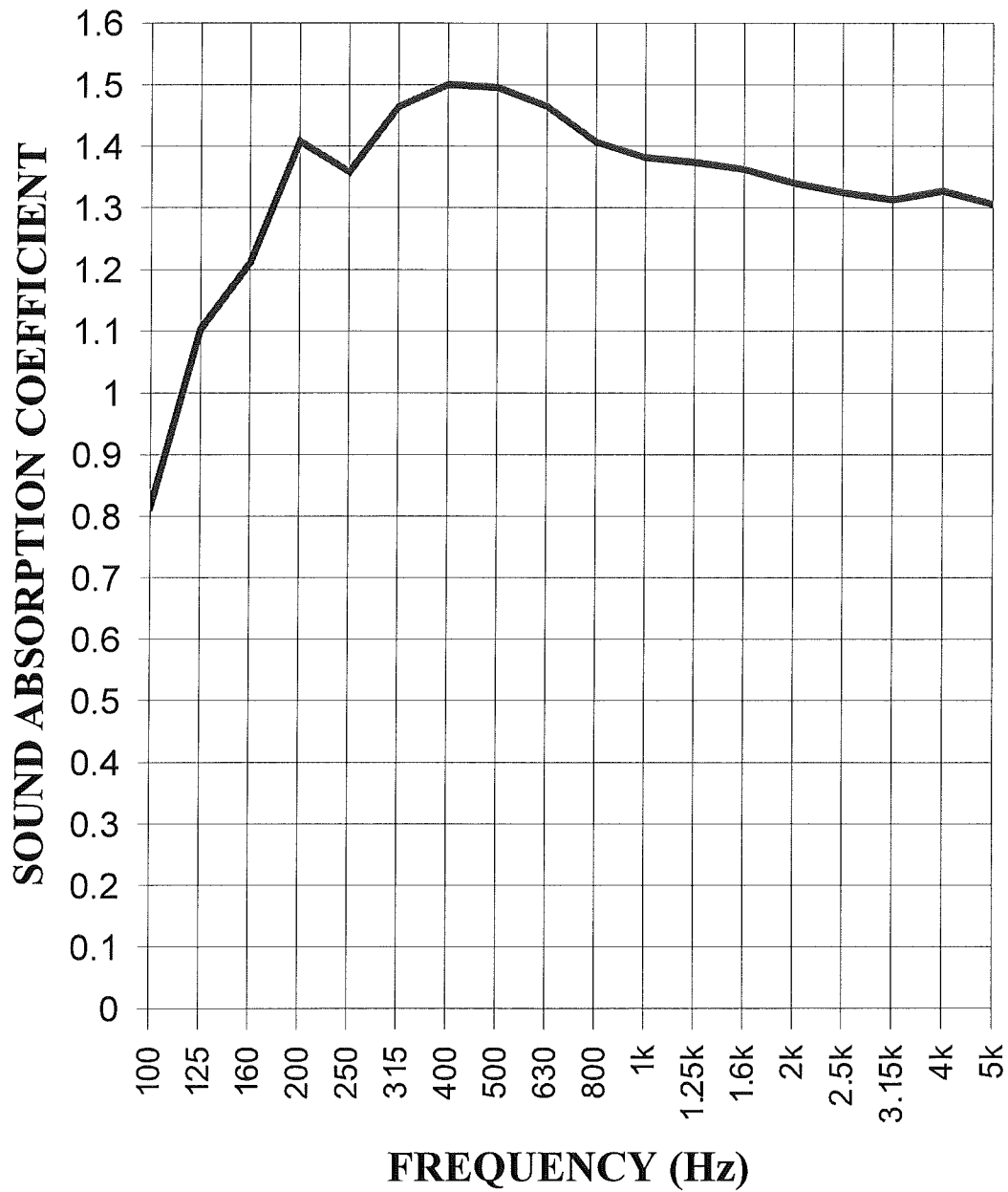
1/3 OCTAVE CENTER FREQ. (Hz)	ABSORPTION COEFFICIENT		TOTAL ABSORPTION  (SABINS)
50	0.23137	0.23	16.66
63	0.25872	0.26	18.63
80	0.29047	0.29	20.91
100	0.81457	0.81	58.65
125	1.10381	1.10	79.47
160	1.21118	1.21	87.21
200	1.40762	1.41	101.35
250	1.35835	1.36	97.80
315	1.46422	1.46	105.42
400	1.50041	1.50	108.03
500	1.49543	1.50	107.67
630	1.46470	1.46	105.46
800	1.40638	1.41	101.26
1000	1.38133	1.38	99.46
1250	1.37383	1.37	98.92
1600	1.36258	1.36	98.11
2000	1.34068	1.34	96.53
2500	1.32491	1.32	95.39
3150	1.31313	1.31	94.55
4000	1.32746	1.33	95.58
5000	1.30547	1.31	93.99

**SOUND ABSORPTION AVERAGE [ SAA ] = 1.41**  
**NOISE REDUCTION COEFFICIENT [ NRC ] = 1.40**

Test Conducted by: Marc Sciaky

This single report page and accompanying graph contain the instantaneous raw data as provided to the client after testing of the specimen. This data, although accurate, is incomplete without the full specimen description, mounting details and signature pages. The full report referenced by the RAL test number above should be consulted for further information regarding these results.

SOUND ABSORPTION REPORT  
RAL - A04-034



SAA = 1.41  
NRC = 1.40

Test Conducted by *Marc Sciaky*  
Marc Sciaky