Riverbank Acoustical LABORATORIES®

RIVERBANK ACOUSTICAL LABORATORIES
NOVELTY TESTING
Fun Tests · Serious Results

TEST REPORT

SPONSOR: RIVERBANK ACOUSTICAL LABORATORIES | GENEVA, IL

PRODUCT NAME:

FRASER FIR CHRISTMAS TREES (7–8 FT. TALL)

TEST DATE:

DECEMBER 8, 2022

TEST METHOD:

ASTM C423–22

RATING:

A22–508: Average Sound Absorption per Object (250Hz, 500Hz, 1kHz, 2kHz) =2.87 Sabins (ft^2)

WWW.RIVERBANKACOUSTICS.COM | INFO@RIVERBANKACOUSTICS.COM | 630.232.0104
1512 SOUTH BATAVIA AVENUE | GENEVA, IL | 60134

1512 S BATAVIA AVENUE
GENEVA, IL 60134

630-232-0104

Test Report

www.riverbankacoustics.com

FOUNDED 1918 BY
WALLACE CLEMENT SABINE

SPONSOR: **Riverbank Acoustical Laboratories**
Geneva, IL

Sound Absorption
RAL™-A22-508

CONDUCTED: 2022-12-08

ON: Fraser Fir Christmas Trees with Decorations (7-8 ft. tall)

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 C423-22: "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 Fraser Fir Christmas Trees with Decorations (7-8 ft. tall). 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

Freshly Cut Live Abies Fraser Fir Christmas Trees

SPECIMEN MEASUREMENTS & TEST CONDITIONS

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

Tree #1

Materials:	Fir tree fixed to wood board base
Base Diameter:	1143 mm (45 in.)
Height:	2159 mm (85 in.)
Overall Weight:	10.66 kg (23.5 lbs)

Tree #2

Materials:	Fir tree fixed to wood board base
Base Diameter:	1219 mm (48 in.)
Height:	2286 mm (90 in.)
Overall Weight:	9.07 kg (20 lbs)

NVLAP TESTING
NVLAP LAB CODE 100227-0

RIVERBANK ACOUSTICAL LABORATORIES IS ACCREDITED BY NVLAP (LAB CODE 100227-0) FOR ACOUSTICAL TESTING SERVICES IN ACCORDANCE WITH ISO/IEC 17025:2017 AND FOR THIS PROCEDURE. THIS REPORT MUST NOT BE USED BY THE CLIENT TO CLAIM PRODUCT CERTIFICATION, APPROVAL, OR ENDORSEMENT BY RAL, NVLAP, NIST, OR ANY AGENCY OF THE U.S. GOVERNMENT. THIS REPORT SHALL NOT BE MODIFIED WITHOUT THE WRITTEN APPROVAL OF RAL. THE RESULTS REPORTED APPLY ONLY TO THE SPECIFIC SAMPLE SUBMITTED FOR TESTING; RAL ASSUMES NO RESPONSIBILITY FOR THE PERFORMANCE OF ANY OTHER SAMPLE.

Tree #3

Materials:	Fir tree fixed to wood board base
Base Diameter:	1219 mm (48 in.)
Height:	2477 mm (97.5 in.)
Overall Weight:	10.21 kg (22.5 lbs)

Garland

Materials:	Tinsel Garland
Overall Weight:	0.45 kg (1 lbs) total distributed across three (3) trees
Installation:	Loosely wrapped around trees

Ornaments

Materials:	Plastic sphere ornaments with wire hangers
Dimensions:	111 ornaments @ approx. 57 mm (2.25 in.) diameter
Overall Weight:	0.91 kg (2 lbs)
Installation:	Hung on trees

Physical Measurements (Overall)

Object Quantity:	3
Average Height:	2.31 m (91.0 in)
Total Weight:	31.3 kg (69.0 lbs)

Test Environment

Room Volume:	291.98 m³
Temperature:	20.0 °C ± 0.2 °C (Requirement: ≥ 10 °C and ≤ 5 °C change)
Relative Humidity:	60.05 % ± 2.3 % (Requirement: ≥ 40 % and ≤ 5 % change)
Barometric Pressure:	99.8 kPa (Requirement not defined)

MOUNTING METHOD

Type J Mounting: The specimen is an array of 3 spaced sound absorbing objects. The objects were evenly distributed in an equilateral tringle arrangement with one tree center over each of the triangle corners. The average slant length of the triangles was approximately 2390 mm (94 in.). By approximating the geometry of each tree as a right-angle cone without base, the total approximate lateral surface area for the set of objects was 13.4 m^2 (144.5 ft^2).

NVLAP TESTING
NVLAP LAB CODE 100227-0

RIVERBANK ACOUSTICAL LABORATORIES IS ACCREDITED BY NVLAP (LAB CODE 100227-0) FOR ACOUSTICAL TESTING SERVICES IN ACCORDANCE WITH ISO/IEC 17025:2017 AND FOR THIS PROCEDURE. THIS REPORT MUST NOT BE USED BY THE CLIENT TO CLAIM PRODUCT CERTIFICATION, APPROVAL, OR ENDORSEMENT BY RAL, NVLAP, NIST, OR ANY AGENCY OF THE U.S. GOVERNMENT. THIS REPORT SHALL NOT BE MODIFIED WITHOUT THE WRITTEN APPROVAL OF RAL. THE RESULTS REPORTED APPLY ONLY TO THE SPECIFIC SAMPLE SUBMITTED FOR TESTING; RAL ASSUMES NO RESPONSIBILITY FOR THE PERFORMANCE OF ANY OTHER SAMPLE.

Figure 1 – Specimen mounted in test chamber

Figure 2 – Specimen garland prior to installation

NVLAP TESTING
NVLAP LAB CODE 100227-0

RIVERBANK ACOUSTICAL LABORATORIES IS ACCREDITED BY NVLAP (LAB CODE 100227-0) FOR ACOUSTICAL TESTING SERVICES IN ACCORDANCE WITH ISO/IEC 17025:2017 AND FOR THIS PROCEDURE. THIS REPORT MUST NOT BE USED BY THE CLIENT TO CLAIM PRODUCT CERTIFICATION, APPROVAL, OR ENDORSEMENT BY RAL, NVLAP, NIST, OR ANY AGENCY OF THE U.S. GOVERNMENT. THIS REPORT SHALL NOT BE MODIFIED WITHOUT THE WRITTEN APPROVAL OF RAL. THE RESULTS REPORTED APPLY ONLY TO THE SPECIFIC SAMPLE SUBMITTED FOR TESTING; RAL ASSUMES NO RESPONSIBILITY FOR THE PERFORMANCE OF ANY OTHER SAMPLE.

Figure 3 – Specimen garland prior to installation

Figure 4 – Specimen ornaments prior to installation

NVLAP TESTING
NVLAP LAB CODE 100227-0

RIVERBANK ACOUSTICAL LABORATORIES IS ACCREDITED BY NVLAP (LAB CODE 100227-0) FOR ACOUSTICAL TESTING SERVICES IN ACCORDANCE WITH ISO/IEC 17025:2017 AND FOR THIS PROCEDURE. THIS REPORT MUST NOT BE USED BY THE CLIENT TO CLAIM PRODUCT CERTIFICATION, APPROVAL, OR ENDORSEMENT BY RAL, NVLAP, NIST, OR ANY AGENCY OF THE U.S. GOVERNMENT. THIS REPORT SHALL NOT BE MODIFIED WITHOUT THE WRITTEN APPROVAL OF RAL. THE RESULTS REPORTED APPLY ONLY TO THE SPECIFIC SAMPLE SUBMITTED FOR TESTING; RAL ASSUMES NO RESPONSIBILITY FOR THE PERFORMANCE OF ANY OTHER SAMPLE.

Figure 5 – Individual specimen tree

Figure 6 – Individual specimen tree

NVLAP TESTING
NVLAP LAB CODE 100227-0

RIVERBANK ACOUSTICAL LABORATORIES IS ACCREDITED BY NVLAP (LAB CODE 100227-0) FOR ACOUSTICAL TESTING SERVICES IN ACCORDANCE WITH ISO/IEC 17025:2017 AND FOR THIS PROCEDURE. THIS REPORT MUST NOT BE USED BY THE CLIENT TO CLAIM PRODUCT CERTIFICATION, APPROVAL, OR ENDORSEMENT BY RAL, NVLAP, NIST, OR ANY AGENCY OF THE U.S. GOVERNMENT. THIS REPORT SHALL NOT BE MODIFIED WITHOUT THE WRITTEN APPROVAL OF RAL. THE RESULTS REPORTED APPLY ONLY TO THE SPECIFIC SAMPLE SUBMITTED FOR TESTING; RAL ASSUMES NO RESPONSIBILITY FOR THE PERFORMANCE OF ANY OTHER SAMPLE.

Figure 7 – Individual specimen tree

NVLAP TESTING
NVLAP LAB CODE 100227-0

RIVERBANK ACOUSTICAL LABORATORIES IS ACCREDITED BY NVLAP (LAB CODE 100227-0) FOR ACOUSTICAL TESTING SERVICES IN ACCORDANCE WITH ISO/IEC 17025:2017 AND FOR THIS PROCEDURE. THIS REPORT MUST NOT BE USED BY THE CLIENT TO CLAIM PRODUCT CERTIFICATION, APPROVAL, OR ENDORSEMENT BY RAL, NVLAP, NIST, OR ANY AGENCY OF THE U.S. GOVERNMENT.
THIS REPORT SHALL NOT BE MODIFIED WITHOUT THE WRITTEN APPROVAL OF RAL. THE RESULTS REPORTED APPLY ONLY TO THE SPECIFIC SAMPLE SUBMITTED FOR TESTING; RAL ASSUMES NO RESPONSIBILITY FOR THE PERFORMANCE OF ANY OTHER SAMPLE.

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.).

1/3 Octave Center Frequency	Total Absorption		Absorption per Object	
(Hz)	(m^2)	(Sabins)	(m^2 / Object)	(Sabins / Object)
100	0.91	9.77	0.30	3.26
** 125	0.31	3.38	0.10	1.13
160	0.53	5.67	0.18	1.89
200	0.39	4.20	0.13	1.40
** 250	0.95	10.23	0.32	3.41
315	0.48	5.15	0.16	1.72
400	0.43	4.64	0.14	1.55
** 500	0.52	5.55	0.17	1.85
630	0.60	6.49	0.20	2.16
800	0.70	7.57	0.23	2.52
** 1000	0.73	7.84	0.24	2.61
1250	0.89	9.57	0.30	3.19
1600	1.00	10.73	0.33	3.58
** 2000	1.01	10.84	0.34	3.61
2500	1.31	14.13	0.44	4.71
3150	1.43	15.39	0.48	5.13
** 4000	1.58	17.03	0.53	5.68
5000	1.84	19.78	0.61	6.59

Tested by Marc Sciaky
Marc Sciaky
Senior Experimentalist

Report by Keith Kimberling
Keith Kimberling
Test Engineer

Approved by Eric P. Wolfram
Eric P. Wolfram
Laboratory Manager

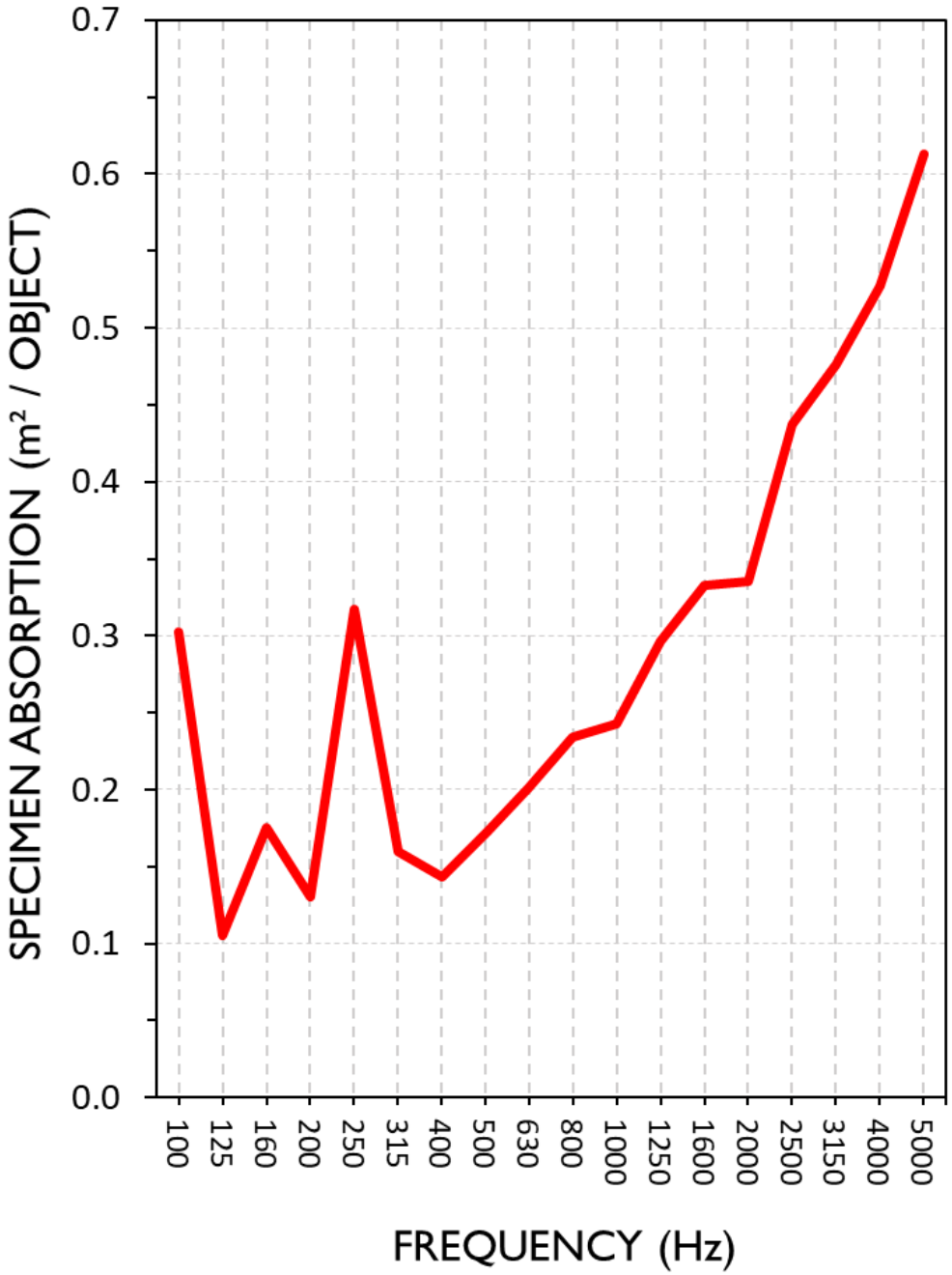
Digitally signed by
Eric P Wolfram
Date: 2022.12.14
12:43:44 -06'00'

NVLAP TESTING
NVLAP LAB CODE 100227-0

RIVERBANK ACOUSTICAL LABORATORIES IS ACCREDITED BY NVLAP (LAB CODE 100227-0) FOR ACOUSTICAL TESTING SERVICES IN ACCORDANCE WITH ISO/IEC 17025:2017 AND FOR THIS PROCEDURE. THIS REPORT MUST NOT BE USED BY THE CLIENT TO CLAIM PRODUCT CERTIFICATION, APPROVAL, OR ENDORSEMENT BY RAL, NVLAP, NIST, OR ANY AGENCY OF THE U.S. GOVERNMENT.
THIS REPORT SHALL NOT BE MODIFIED WITHOUT THE WRITTEN APPROVAL OF RAL. THE RESULTS REPORTED APPLY ONLY TO THE SPECIFIC SAMPLE SUBMITTED FOR TESTING; RAL ASSUMES NO RESPONSIBILITY FOR THE PERFORMANCE OF ANY OTHER SAMPLE.

SOUND ABSORPTION REPORT

Fraser Fir Christmas Trees with Decorations (7-8 ft. tall)



NVLAP TESTING
NVLAP LAB CODE 100227-0

RIVERBANK ACOUSTICAL LABORATORIES IS ACCREDITED BY NVLAP (LAB CODE 100227-0) FOR ACOUSTICAL TESTING SERVICES IN ACCORDANCE WITH ISO/IEC 17025:2017 AND FOR THIS PROCEDURE. THIS REPORT MUST NOT BE USED BY THE CLIENT TO CLAIM PRODUCT CERTIFICATION, APPROVAL, OR ENDORSEMENT BY RAL, NVLAP, NIST, OR ANY AGENCY OF THE U.S. GOVERNMENT. THIS REPORT SHALL NOT BE MODIFIED WITHOUT THE WRITTEN APPROVAL OF RAL. THE RESULTS REPORTED APPLY ONLY TO THE SPECIFIC SAMPLE SUBMITTED FOR TESTING; RAL ASSUMES NO RESPONSIBILITY FOR THE PERFORMANCE OF ANY OTHER SAMPLE.

APPENDIX A: Extended Frequency Range Data

Specimen: Fraser Fir Christmas Trees with Decorations (7-8 ft. tall) (See Full Report)

The following non-accredited data were obtained in accordance with ASTM C423-22, 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 Object (m^2 / Object)	Absorption per Object (Sabins / Object)
63	0.27	2.94	0.09	0.98
80	0.17	1.83	0.06	0.61
100	0.91	9.77	0.30	3.26
125	0.31	3.38	0.10	1.13
160	0.53	5.67	0.18	1.89
200	0.39	4.20	0.13	1.40
250	0.95	10.23	0.32	3.41
315	0.48	5.15	0.16	1.72
400	0.43	4.64	0.14	1.55
500	0.52	5.55	0.17	1.85
630	0.60	6.49	0.20	2.16
800	0.70	7.57	0.23	2.52
1000	0.73	7.84	0.24	2.61
1250	0.89	9.57	0.30	3.19
1600	1.00	10.73	0.33	3.58
2000	1.01	10.84	0.34	3.61
2500	1.31	14.13	0.44	4.71
3150	1.43	15.39	0.48	5.13
4000	1.58	17.03	0.53	5.68
5000	1.84	19.78	0.61	6.59
6300	1.82	19.59	0.61	6.53
8000	2.23	23.98	0.74	7.99
10000	2.21	23.80	0.74	7.93

NVLAP TESTING
NVLAP LAB CODE 100227-0

RIVERBANK ACOUSTICAL LABORATORIES IS ACCREDITED BY NVLAP (LAB CODE 100227-0) FOR ACOUSTICAL TESTING SERVICES IN ACCORDANCE WITH ISO/IEC 17025:2017 AND FOR THIS PROCEDURE. THIS REPORT MUST NOT BE USED BY THE CLIENT TO CLAIM PRODUCT CERTIFICATION, APPROVAL, OR ENDORSEMENT BY RAL, NVLAP, NIST, OR ANY AGENCY OF THE U.S. GOVERNMENT. THIS REPORT SHALL NOT BE MODIFIED WITHOUT THE WRITTEN APPROVAL OF RAL. THE RESULTS REPORTED APPLY ONLY TO THE SPECIFIC SAMPLE SUBMITTED FOR TESTING; RAL ASSUMES NO RESPONSIBILITY FOR THE PERFORMANCE OF ANY OTHER SAMPLE.

APPENDIX B: Instruments of Traceability

Specimen: Fraser Fir Christmas Trees with Decorations (7-8 ft. tall) (See Full Report)

Description	Model	Serial Number	Date of Certification	Calibration Due
System 1	Type 3160-A-042	3160-106968	2022-07-12	2023-07-12
Bruel & Kjaer Mic And Preamp C	Type 4943-B-001	2311439	2022-05-02	2023-05-02
Bruel & Kjaer Pistonphone	Type 4228	2781248	2022-07-22	2023-07-22
EXTECH Hygro 959	SD700	A099959	2022-03-22	2023-03-22

APPENDIX C: Revisions to Original Test Report

Specimen: Fraser Fir Christmas Trees with Decorations (7-8 ft. tall) (See Full Report)

Date	Revision
2022-12-13	Original report issued

END

NVLAP TESTING
NVLAP LAB CODE 100227-0

RIVERBANK ACOUSTICAL LABORATORIES IS ACCREDITED BY NVLAP (LAB CODE 100227-0) FOR ACOUSTICAL TESTING SERVICES IN ACCORDANCE WITH ISO/IEC 17025:2017 AND FOR THIS PROCEDURE. THIS REPORT MUST NOT BE USED BY THE CLIENT TO CLAIM PRODUCT CERTIFICATION, APPROVAL, OR ENDORSEMENT BY RAL, NVLAP, NIST, OR ANY AGENCY OF THE U.S. GOVERNMENT.
THIS REPORT SHALL NOT BE MODIFIED WITHOUT THE WRITTEN APPROVAL OF RAL. THE RESULTS REPORTED APPLY ONLY TO THE SPECIFIC SAMPLE SUBMITTED FOR TESTING; RAL ASSUMES NO RESPONSIBILITY FOR THE PERFORMANCE OF ANY OTHER SAMPLE.

Riverbank Acoustical Laboratories
1512 S. Batavia Ave.
Geneva, IL 60134-3302

Tel: 630-232-0104
Fax: 630-232-0138
Email: RAL@riverbankacoustics.com

SPONSOR: **Riverbank Acoustical Laboratories**
Geneva, IL

Report Referenced: **RAL™-A22-508**

CONDUCTED: 2022-12-08

ON: Fraser Fir Christmas Trees with Decorations (7-8 ft. tall) (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. Rating titles for these methods are prepended with the word “Apparent”. These rating names and their associated acronyms are provided by RAL and shall not be misconstrued as originating from any current standard.

Method 1) Apparent Sound Absorption Coefficient calculated from extended test specimen envelope
The total sound absorption yielded by the specimen is divided by the surface area of the test surface covered by the set of objects, including intermediate spaces, with additional added area to allow theoretical extrapolation for larger arrays. This method is not applicable in this case.

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. This method is not applicable in this case since the total exposed surface area is not obtainable.

Method 3) Apparent Sound Absorption Coefficient calculated from one face per object
The total sound absorption yielded by the specimen is divided by the surface area of one side of one large face for each object in the specimen. In this case, the single face per tree was defined as the curved surface of a right-angle circular cone approximating the shape of the tree. Each cone’s diameter and height were based on the specimen measurements detailed earlier in this report. Based on this, the surface area of tree #1 is 4.01 m^2 (43.2 ft^2). The surface area of tree #2 is 4.53 m^2 (48.8 ft^2). The surface area of tree #3 is 4.88 m^2 (52.6 ft^2). The total lateral surface area of all trees based on this method is 13.4 m^2 (144.5 ft^2). Apparent sound absorption coefficients, and subsequently the Apparent Noise Reduction Coefficient (A*NRC) and Apparent Sound Absorption Average (A*SAA) ratings, are calculated using this surface area based on the methods described in ASTM C423-22.

Method 4) Apparent Sound Absorption Coefficient calculated from specimen envelope without extension
In this instance, method 4 presents the total sound absorption yielded by the specimen divided by the total circular test surface area covered by the objects, not including intermediate spaces. Based on this, the surface area of tree #1 is 1.03 m^2 (11.04 ft^2). The surface area of tree #2 is 1.17 m^2 (12.57 ft^2). The surface area of tree #3 is 1.17 m^2 (12.57 ft^2). The total surface area covered by all trees based on this method is 3.36 m^2 (36.18 ft^2). Apparent sound absorption coefficients, and subsequently the Apparent Noise Reduction Coefficient (A*NRC) and Apparent Sound Absorption Average (A*SAA) ratings, are calculated using this surface area based on the methods described in ASTM C423-22.

Riverbank Acoustical Laboratories
1512 S. Batavia Ave.
Geneva, IL 60134-3302

Tel: 630-232-0104
Fax: 630-232-0138
Email: RAL@riverbankacoustics.com

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 (ft^2)			Method 1	Method 2	Method 3	Method 4
Freq. (Hz)	**Sabins**	**Sabins / Object**	**Apparent** Abs. Coefficient From Total Coverage Area N/A	**Apparent** Abs. Coefficient From Total Exposed Surface Area N/A	**Apparent** Abs. Coefficient From Cone Lateral Surface Area (144.5 ft^2)	**Apparent** Abs. Coefficient From Unextended Coverage Area (36.2 ft^2)
63	2.94	0.98	N/A	N/A	0.02	0.08
80	1.83	0.61	N/A	N/A	0.01	0.05
100	9.77	3.26	N/A	N/A	0.07	0.27
125	3.38	1.13	N/A	N/A	0.02	0.09
160	5.67	1.89	N/A	N/A	0.04	0.16
200	4.20	1.40	N/A	N/A	0.03	0.12
250	10.23	3.41	N/A	N/A	0.07	0.28
315	5.15	1.72	N/A	N/A	0.04	0.14
400	4.64	1.55	N/A	N/A	0.03	0.13
500	5.55	1.85	N/A	N/A	0.04	0.15
630	6.49	2.16	N/A	N/A	0.04	0.18
800	7.57	2.52	N/A	N/A	0.05	0.21
1,000	7.84	2.61	N/A	N/A	0.05	0.22
1,250	9.57	3.19	N/A	N/A	0.07	0.26
1,600	10.73	3.58	N/A	N/A	0.07	0.30
2,000	10.84	3.61	N/A	N/A	0.07	0.30
2,500	14.13	4.71	N/A	N/A	0.10	0.39
3,150	15.39	5.13	N/A	N/A	0.11	0.43
4,000	17.03	5.68	N/A	N/A	0.12	0.47
5,000	19.78	6.59	N/A	N/A	0.14	0.55
6,300	19.59	6.53	N/A	N/A	0.14	0.54
8,000	23.98	7.99	N/A	N/A	0.17	0.66
10,000	23.80	7.93	N/A	N/A	0.16	0.66
		Apparent NRC:	**N/A**	**N/A**	**0.05**	**0.25**
		Apparent SAA:	**N/A**	**N/A**	**0.06**	**0.22**

Prepared by _____
Keith Kimberling
Test Engineer