627 RIVERBANK DRIVE
GENEVA, IL 60134

630-232-0104

Test Report

www.riverbankacoustics.com

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WALLACE CLEMENT SABINE

SPONSOR: **Elven Technologies Inc**
Rancho Cordova, CA

Normal Incidence Absorption
RAL™-X25-016

CONDUCTED: 2025-08-11

ON: FireGuard Light

TEST METHOD

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 E1050-24: "Standard Test Method for Impedance and Absorption of Acoustical Materials Using a Tube, Two Microphones and a Digital Frequency Analysis System". Individual specimen material samples were mounted within a sample holder and attached to one of two impedance tube sizes. For testing 100 mm diameter samples, the measurement parameters were: 2 Hertz (Hz) frequency resolution; 100 averages; Hanning time window. For testing 29 mm diameter samples, the measurement parameters are: 4 Hertz (Hz) frequency resolution; 100 averages; Hanning time window. Broadband noise generated within the impedance tube was captured by two internal microphones. Using the transfer function and the complex reflection coefficient calculations provided by the standard, the normal incidence sound absorption coefficients were determined for each sample. Each of the six total samples (3 100 mm diameter samples, 3 29 mm samples) was tested three times. A detailed description of the measurement procedure is available upon request.

SPECIMEN MATERIALS AND SAMPLE FABRICATION

The test specimen was designated by the test sponsor as FireGuard Light. A full external visual inspection by RAL personnel verified the following information:

Test Samples for 100 mm Diameter Impedance Tube

Thickness:	Sample 1 @ ~7 mm
	Sample 2 @ ~7 mm
	Sample 3 @ ~7 mm
	Average @ ~7 mm
Mass:	Sample 1 @ 20 grams
	Sample 2 @ 20 grams
	Sample 3 @ 22 grams
	Average @ 21 grams

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SPECIMEN MATERIALS AND SAMPLE FABRICATION (continued)

Test Samples for 29 mm Diameter Impedance Tube

Thickness:	Sample 1 @ ~7 mm
	Sample 2 @ ~7 mm
	Sample 3 @ ~7 mm
	Average @ ~7 mm
Mass:	Sample 1 @ 2 grams
	Sample 2 @ 2 grams
	Sample 3 @ 2 grams
	Average @ 2 grams

The samples were cut from sheets of material provided by the sponsor using a die and trimmed with scissors. The variation inherent in the sample preparation method may produce variation in sample behavior.

Test Environment

Temperature:	27.1 ± 0.1 ºC (80.8 ± 0.2 ºF)
Relative Humidity:	45.8 ± 0.9 %
Barometric Pressure:	99.0 ± 0.1 kPa
Characteristic Impedance of Air:	398.4 ± 0.1 Pa s/m

MOUNTING AND FIT CONDITIONS

The assembled impedance tubes were mounted vertically, with the sound source aiming downward and the test samples directly against the tube termination back plate with the perimeter left unsealed.

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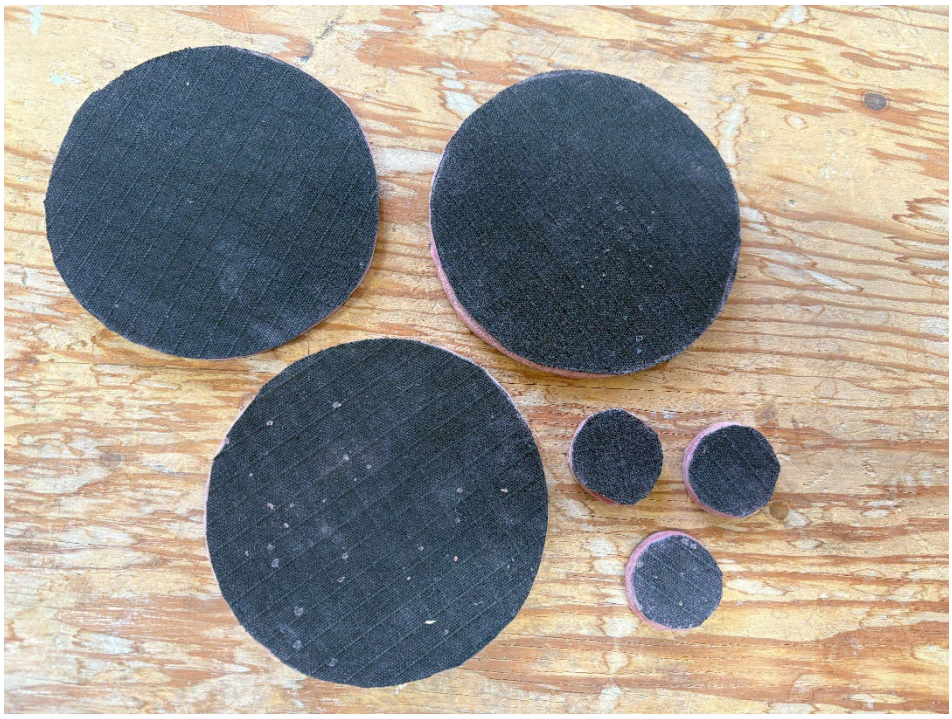

Figure 1 – Test samples

Figure 2 – Detail of sample material

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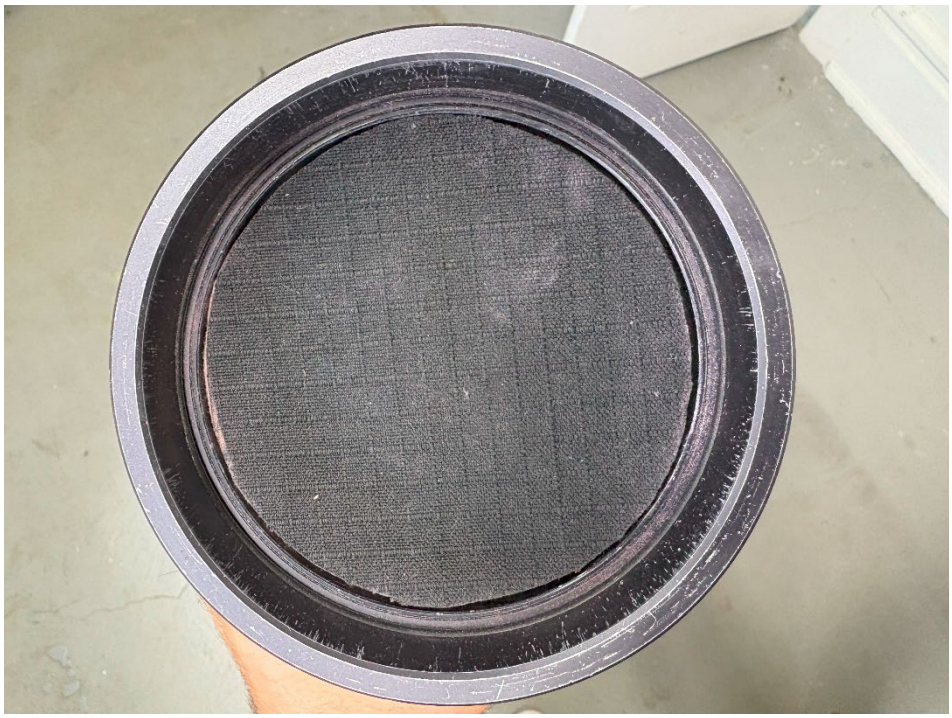

Figure 3 – Typical sample mounting for 100 mm diameter impedance tube

Figure 4 – Typical sample mounting for 29 mm diameter impedance tube

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TEST RESULTS

Values of normal incidence sound absorption coefficient tabulated below are the arithmetic average of the measured results of all samples tested in the corresponding impedance tube size. For the bands from 500 Hz to 1600 Hz, the values given below are obtained from further averaging of results from the two impedance tube sizes. Frequency ranges for each tube size are consistent with requirements given in ASTM E1050-24 Section 6.2.2.

1/3 Octave Band Center Frequency (Hz)	Normal Incidence Sound Absorption Coefficient
80	0.01
100	0.03
125	0.04
160	0.00
200	0.04
250	0.03
315	0.05
400	0.05
500	0.07
630	0.10
800	0.12
1000	0.19
1250	0.32
1600	0.42
2000	0.49
2500	0.46
3150	0.52
4000	0.67
5000	0.70
6300	0.51

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TEST RESULTS (Continued)

The normal incidence sound absorption coefficient for each individual sample is shown below.

Sample Name: Sample 1
Tube Diameter: 100 mm
Sample Thickness: ~7 mm
Sample Mass: 20 grams

Frequency (Hz)	Test 1	Test 2	Test 3	Average
80	0.00	0.01	0.00	0.00
100	0.03	0.00	0.03	0.02
125	0.04	0.04	0.03	0.03
160	0.01	0.01	0.01	0.01
200	0.04	0.03	0.04	0.04
250	0.03	0.03	0.03	0.03
315	0.05	0.05	0.05	0.05
400	0.05	0.05	0.05	0.05
500	0.06	0.06	0.06	0.06
630	0.08	0.08	0.08	0.08
800	0.12	0.12	0.12	0.12
1000	0.18	0.18	0.18	0.18
1250	0.34	0.35	0.35	0.35
1600	0.44	0.44	0.44	0.44

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TEST RESULTS (Continued)

Sample Name: Sample 2
Tube Diameter: 100 mm
Sample Thickness: ~7 mm
Sample Mass: 20 grams

Frequency (Hz)	Test 1	Test 2	Test 3	Average
80	0.00	0.00	0.03	0.00
100	0.02	0.03	0.03	0.03
125	0.04	0.04	0.03	0.03
160	0.00	0.00	0.00	0.00
200	0.04	0.04	0.04	0.04
250	0.03	0.03	0.03	0.03
315	0.05	0.05	0.05	0.05
400	0.05	0.05	0.05	0.05
500	0.06	0.06	0.06	0.06
630	0.08	0.08	0.09	0.08
800	0.12	0.12	0.12	0.12
1000	0.21	0.21	0.21	0.21
1250	0.34	0.34	0.34	0.34
1600	0.45	0.46	0.45	0.45

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TEST RESULTS (Continued)

Sample Name: Sample 3
Tube Diameter: 100 mm
Sample Thickness: ~7 mm
Sample Mass: 22 grams

Frequency (Hz)	Test 1	Test 2	Test 3	Average
80	0.03	0.04	0.04	0.04
100	0.03	0.05	0.02	0.03
125	0.05	0.04	0.04	0.04
160	0.00	0.00	0.00	0.00
200	0.03	0.03	0.03	0.03
250	0.03	0.03	0.03	0.03
315	0.04	0.04	0.04	0.04
400	0.05	0.05	0.05	0.05
500	0.05	0.05	0.05	0.05
630	0.07	0.07	0.07	0.07
800	0.09	0.10	0.10	0.10
1000	0.16	0.16	0.16	0.16
1250	0.30	0.31	0.31	0.31
1600	0.44	0.45	0.45	0.45

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TEST RESULTS (Continued)

Sample Name: Sample 1
Tube Diameter: 29 mm
Sample Thickness: ~7 mm
Sample Mass: 2 grams

Frequency (Hz)	Test 1	Test 2	Test 3	Average
500	0.08	0.08	0.08	0.08
630	0.12	0.14	0.13	0.13
800	0.11	0.12	0.12	0.12
1000	0.16	0.18	0.17	0.17
1250	0.27	0.29	0.29	0.28
1600	0.35	0.36	0.35	0.36
2000	0.47	0.47	0.47	0.47
2500	0.47	0.45	0.46	0.46
3150	0.53	0.53	0.53	0.53
4000	0.68	0.70	0.70	0.69
5000	0.73	0.75	0.75	0.74
6300	0.66	0.64	0.64	0.65

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TEST RESULTS (Continued)

Sample Name: Sample 2
Tube Diameter: 29 mm
Sample Thickness: ~7 mm
Sample Mass: 2 grams

Frequency (Hz)	Test 1	Test 2	Test 3	Average
500	0.08	0.08	0.08	0.08
630	0.12	0.12	0.12	0.12
800	0.12	0.12	0.12	0.12
1000	0.19	0.19	0.19	0.19
1250	0.28	0.28	0.27	0.28
1600	0.43	0.42	0.42	0.43
2000	0.53	0.54	0.54	0.54
2500	0.50	0.51	0.52	0.51
3150	0.55	0.56	0.56	0.56
4000	0.66	0.66	0.67	0.66
5000	0.65	0.65	0.64	0.65
6300	0.41	0.41	0.41	0.41

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TEST RESULTS (Continued)

Sample Name: Sample 3
Tube Diameter: 29 mm
Sample Thickness: ~7 mm
Sample Mass: 2 grams

Frequency (Hz)	Test 1	Test 2	Test 3	Average
500	0.07	0.08	0.08	0.08
630	0.14	0.13	0.13	0.13
800	0.15	0.15	0.15	0.15
1000	0.21	0.21	0.22	0.21
1250	0.35	0.34	0.34	0.35
1600	0.42	0.42	0.41	0.42
2000	0.45	0.45	0.45	0.45
2500	0.40	0.41	0.41	0.41
3150	0.47	0.49	0.50	0.48
4000	0.65	0.67	0.68	0.67
5000	0.72	0.71	0.70	0.71
6300	0.47	0.47	0.47	0.47

Tested/Report by _____
Keith Kimberling
Test Engineer

Approved by _____
Eric P. Wolfram
Laboratory Manager

Digitally signed by
Eric P Wolfram
Date: 2025.08.13
13:28:48 -05'00'

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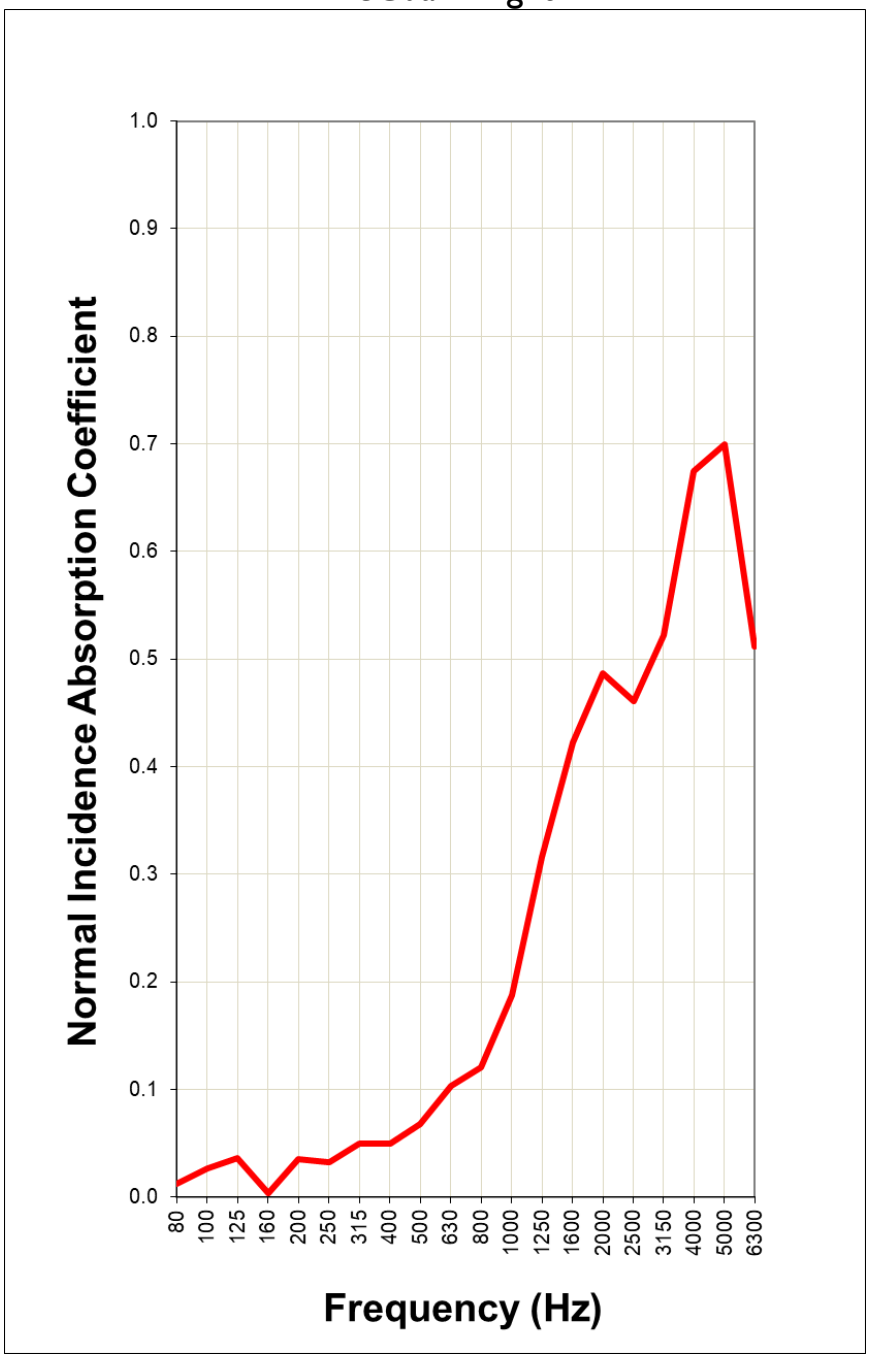
NORMAL INCIDENCE SOUND ABSORPTION REPORT

FireGuard Light



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APPENDIX A: Instruments of Traceability

Specimen: FireGuard Light (See Full Report)

Description	Model	Serial Number	Date of Certification
Brüel & Kjær Pistonphone	Type 4228	2781248	2025-07-21
Brüel & Kjær Impedance Tube	Type 4206	2587621	N/A
Brüel & Kjær Microphone	Type 4187	2576518	2025-01-27
Brüel & Kjær Microphone	Type 4187	2576519	2025-01-27
Brüel & Kjær Microphone Preamplifier	Type 2670	2576649	2025-01-27
Brüel & Kjær Microphone Preamplifier	Type 2670	3344935	2025-01-27
Brüel & Kjær Power Amplifier	Type 2716-C	00082783	N/A
System 2	Type 3160-A-042	3160-106974	2024-08-15
Ohaus Scout Digital Scale	SP6000	7124440959	2025-08-04
Extech Environmental Data Logger	SD700	A074985	2025-07-30

APPENDIX B: Revisions to Original Test Report

Specimen: FireGuard Light (See Full Report)

Date	Revision
2025-08-13	Original report issued

END

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