

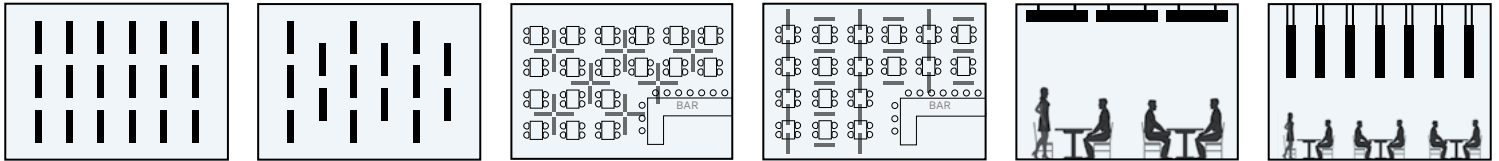
Understanding this Document

The layout you choose to suspend your baffles in, will have an impact on their performance. The tests on the following pages will show how density, spacing and suspension height effect acoustic performance, allowing you to optimize your design accordingly.

The key figure to look for is 'Array NRC.' This is the NRC (Noise Reduction Coefficient) value of the panel when placed in the particular array situation. Compare this to the panel's NRC when hanging by itself and you'll see the benefits of certain array layouts over others.

General Principles

- **Density:** The number of baffles in a given area will determine the rate of sound absorption. This can vary depending on room size and noise levels.
- **Pattern:** Spread evenly for general sound control or alternate panel direction to absorb sound waves moving in multiple directions. Using a grid like 'tic-tac-toe' layout will improve the performance as more random energy will be absorbed in the room. Suspending the baffles in both X and Y axes will capture noise in both directions.
- **Suspension Height:** Leave a minimum 3" (76mm) of air space between the panel and ceiling, up to a maximum of 75" (150cm). Panels can be suspended horizontally or vertically.



Array Variations

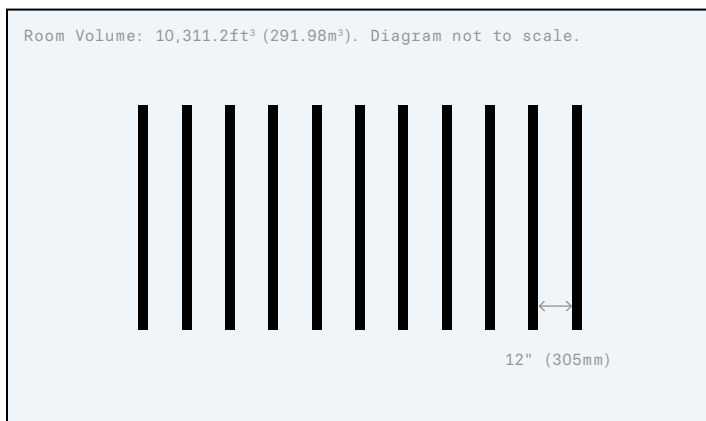
Array 1 (Pages 2-11)

Broadway Beams 72 x 9 x 1.5" (1,829 x 229 x 40mm)

1x11 grid, 12" (305mm) between panels

Suspended 41.25" (1,048mm) from the ceiling

RAL™A24-434 Test



Array-NRC: 0.75

over 76.85ft² (7.14m²) of extended continuous surface area

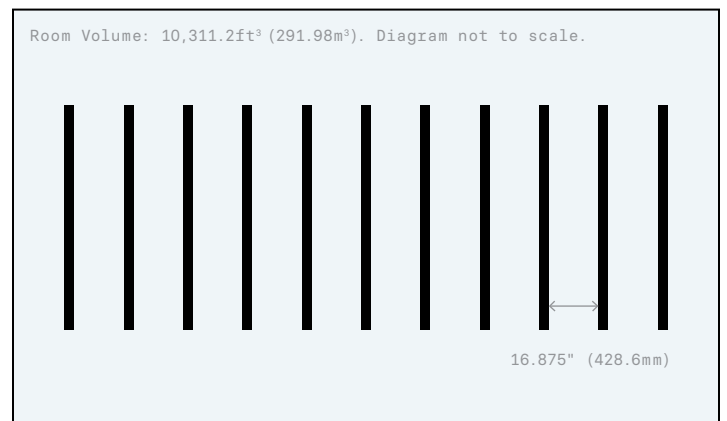
Array 2 (Pages 12-21)

Broadway Beams 72 x 9 x 1.5" (1,829 x 229 x 40mm)

1x11 grid, 16.875" (428.6mm) between panels

Suspended 41.25" (1,054mm) from the ceiling

RAL™A24-435 Test



Array-NRC: 0.60

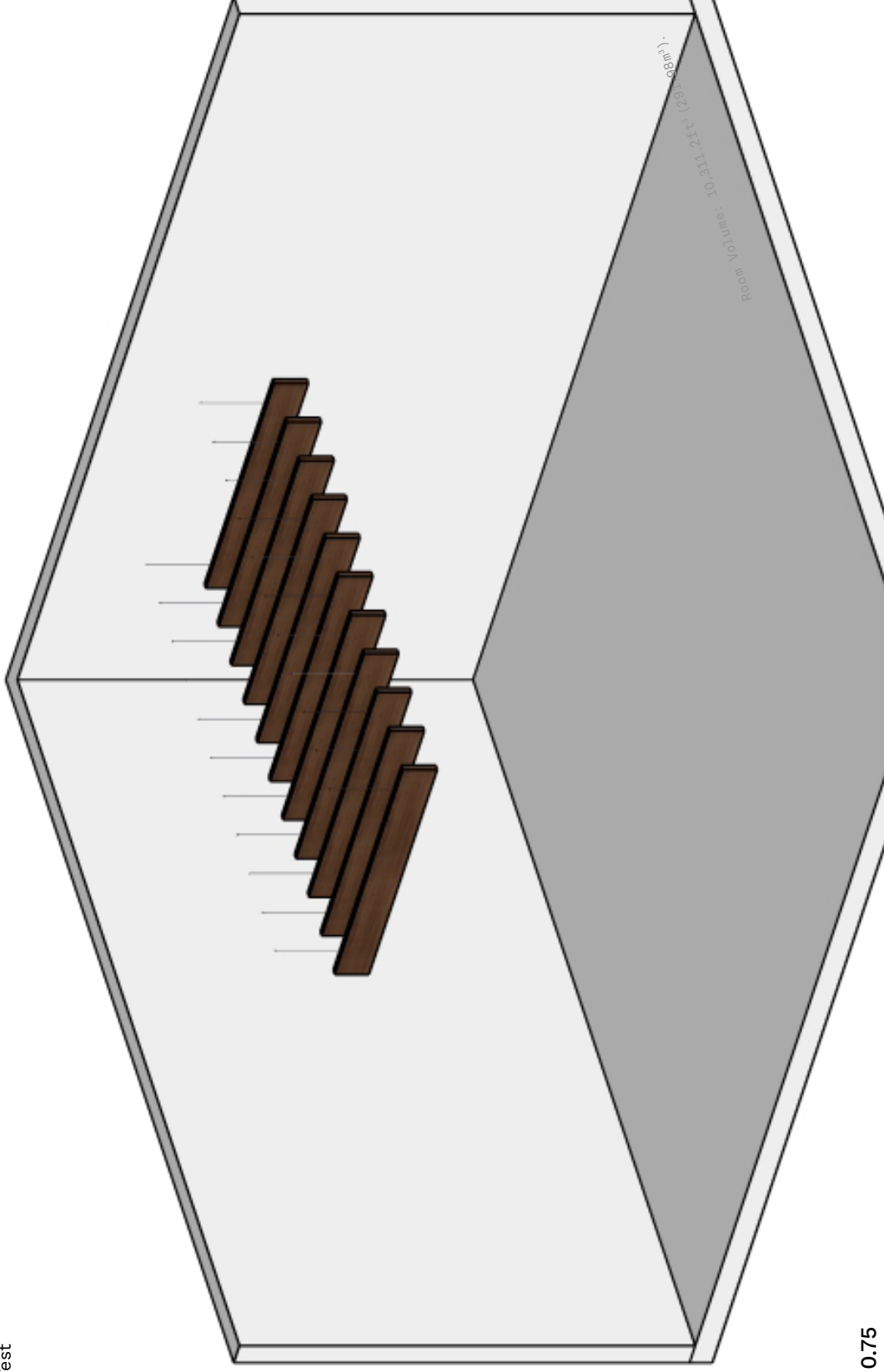
over 107.64ft² (10m²) of extended continuous surface area



BROADWAY Beams

Array 1

Broadway Beams 72 x 9 x 1.5" (1,829 x 229 x 40mm)
1x11 grid, 12" (305mm) between panels
Suspended 41.25" (1,048mm) from the ceiling
RAL™ A24-434 Test



Array-NRC: 0.75
over 76.85ft² (7.14m²) of extended continuous surface area



A Division of Radial Engineering Ltd.
1845 Kingsway Ave. Unit 1165, Port Coquitlam, BC V3C 0H3, Canada
Tel: 604-942-1001 • Fax: 604-942-1010 • www.primacoustic.com

Be Heard

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Port Coquitlam, BC, Canada

Sound Absorption
RAL™-A24-434

CONDUCTED: 2024-11-05

Page 1 of 9

ON: Primacoustic - Broadway Beam (1 row of 11 objects, objects spaced 12" o.c.)

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 C423-23: "Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method." The specimen mounting was performed according to ASTM E795-23: "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 Primacoustic - Broadway Beam (1 row of 11 objects, objects spaced 12" o.c.). 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

Product Name: Primacoustic - Broadway Beam
Manufacturer: Radial Engineering

SPECIMEN MEASUREMENTS & TEST CONDITIONS

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

Test Specimen

Product Type: Baffles
Dimensions: 11 baffles @ 38 mm (1.5 in.) wide by 1829 mm (72 in.) long
Depth: 229 mm (9 in.)
Overall Weight: 29.26 kg (64.5 lbs)

Radial Engineering
2024-11-05

RAL™-A24-434
Page 2 of 9

SPECIMEN MEASUREMENTS & TEST CONDITIONS (continued)

Physical Measurements (per object)

Dimensions: 0.23 m (9.0 in) wide by 1.83 m (72.0 in) long
Thickness: 0.04 m (1.5 in)
Weight: 2.66 kg (5.86 lbs)

Test Environment

Room Volume: 291.98 m³
Temperature: 21.2 °C ± 0.0 °C (Requirement: ≥ 10 °C and ≤ 5 °C change)
Relative Humidity: 59.95 % ± 0.5 % (Requirement: ≥ 40 % and ≤ 5 % change)
Barometric Pressure: 97.8 kPa (Requirement not defined)

Each sound absorbing object had an exposed surface area of 0.993 m² (10.7 ft²). The total exposed surface area of all sound-absorbing objects was 10.9 m² (118 ft²).

MOUNTING METHOD

Type JV-MOD Mounting: The specimen is an array of 11 spaced sound absorbing objects suspended from cables such that the closest face is located approximately 1048 mm (41.25 in.) from the horizontal test surface. This approximates the mounting method of a typical ceiling baffle installation. The objects were evenly distributed in a single row, spaced 305 mm (12 in.) on center. The width of the installed object array was 3086 mm (121.5 in.) and the length of the installed object array was 1829 mm (72 in.). The area of extended continuous surface attributed to the object array was 7.14 m² (76.8 ft²).

Radial Engineering
2024-11-05

RAL™-A24-434
Page 3 of 9



Figure 1 – Specimen mounted in test chamber

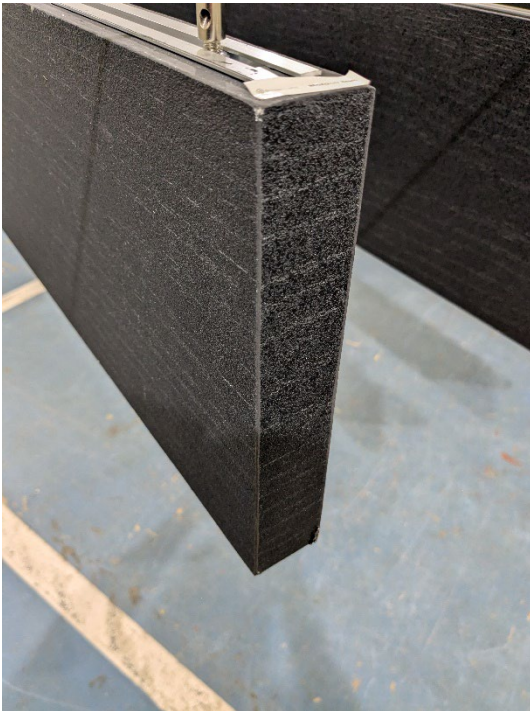


Figure 2 – Detail of specimen materials

Radial Engineering
2024-11-05

RAL™-A24-434
Page 4 of 9



Figure 3 – Detail of specimen materials

Radial Engineering
2024-11-05

RAL™-A24-434
Page 5 of 9

TEST RESULTS

The preferred presentation of sound absorption test results for arrays of spaced objects is sound absorption (m^2) per object and total sound absorption (m^2) at each one-third-octave band

ASTM C423-23 Appendix X2 allows calculation of sound absorption per m^2 (SA/m^2) based on the projected horizontal surface area attributable to an array of objects. The extended continuous surface area used in this calculation is to be determined using the following procedure:

$S_{array} = (w + w_1) \times (l + 0.3)$ If the set of objects consists of a single row of equal sized objects with equal space between each. (ASTM E423-23 X.2.3.2)

Where:

S_{array} = area of extended continuous surface attributed to the object array, m^2

w = the measured width of the installed object array, in meters

w_1 = the distance between objects in the array along the width, in meters

l = the measured length of the object array, in meters

Note: A standard distance of 0.3 meters is added to the array length to account for the assumed area between this set of objects and an adjacent array of objects.

The sound absorption per m^2 (SA/m^2) is calculated based on the following formula:

$$\alpha_{array} = (A_2 - A_1) / S_{array}$$

Where:

α_{array} = sound absorption per m^2 (SA/m^2) of extended continuous surface, no units,

A_1 = absorption of the empty reverberation room, m^2 and

A_2 = absorption of the room after the specimen has been installed, m^2 .

S_{array} = area of extended continuous surface attributed to the test specimen, m^2

Radial Engineering
2024-11-05

RAL™-A24-434
Page 6 of 9

TEST RESULTS (continued)


1/3 Octave Center Frequency (Hz)	Total Absorption		Absorption per Object		α_{array} (Sabins/ft ²) (SA/m ²)
	(m ²)	(Sabins)	(m ² / Object)	(Sabins / Object)	
100	0.26	2.80	0.02	0.25	0.04
** 125	0.44	4.74	0.04	0.43	0.06
160	0.59	6.31	0.05	0.57	0.08
200	0.99	10.70	0.09	0.97	0.14
** 250	1.67	17.94	0.15	1.63	0.23
315	2.68	28.89	0.24	2.63	0.38
400	3.07	33.05	0.28	3.00	0.43
** 500	3.98	42.85	0.36	3.90	0.56
630	5.23	56.31	0.48	5.12	0.73
800	6.89	74.16	0.63	6.74	0.97
** 1000	7.76	83.50	0.71	7.59	1.09
1250	8.40	90.37	0.76	8.22	1.18
1600	8.42	90.58	0.77	8.23	1.18
** 2000	8.45	90.98	0.77	8.27	1.18
2500	8.19	88.16	0.74	8.01	1.15
3150	7.80	83.91	0.71	7.63	1.09
** 4000	7.49	80.64	0.68	7.33	1.05
5000	7.42	79.86	0.67	7.26	1.04

Array-NRC 0.75 over 7.14 m² of extended continuous surface area

Array-SAA 0.77 over 7.14 m² of extended continuous surface area

Tested by 
Marc Sciaky
Senior Experimentalist

Report by 
Keith Kimberling
Test Engineer

Approved by 
Eric P. Wolfram
Laboratory Manager

Note: Sound absorption per m² (SA/m²), and therefore the reported Single Number Ratings, are highly dependent on the exact sample shape, size, spacing, and extended continuous surface area present in the test and subsequent calculations. Changes to any of these parameters will change the resulting values. These presented results are valid only for the specific configuration present in this test.

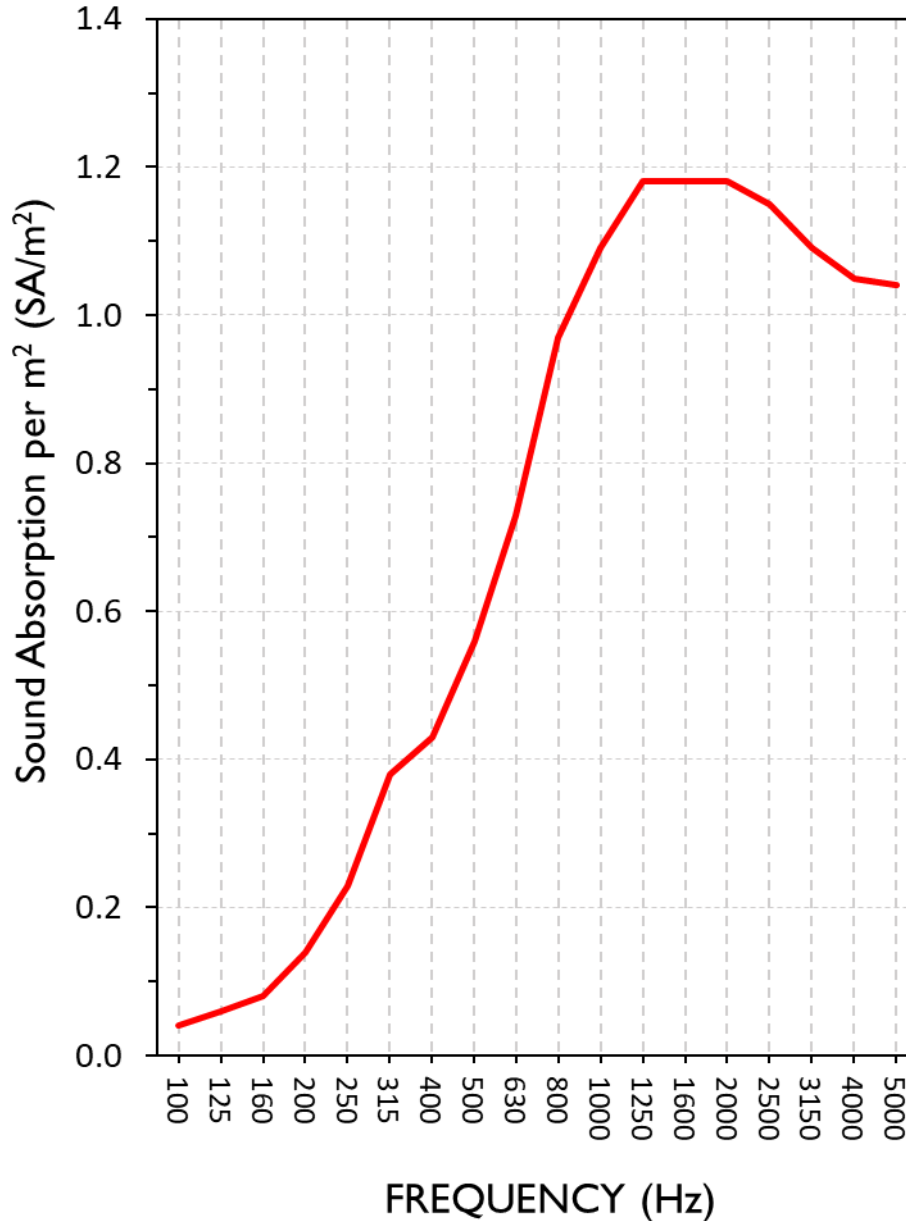


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SOUND ABSORPTION REPORT

Primacoustic - Broadway Beam (1 row of 11 objects, objects spaced 12" o.c.)



Array-NRC 0.75 over 7.14 m² of extended continuous surface area
Array-SAA 0.77 over 7.14 m² of extended continuous surface area



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Radial Engineering
 2024-11-05

RAL™-A24-434
 Page 8 of 9

APPENDIX A: Extended Frequency Range Data

Specimen: Primacoustic - Broadway Beam (1 row of 11 objects, objects spaced 12" o.c.) (See Full Report)

The following non-accredited data were obtained in accordance with ASTM C423-23, 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 Object		α_{array} (Sabins/ft ²)
	(m ²)	(Sabins)	(m ² / Object)	(Sabins / Object)	(SA/m ²)
31.5	-0.57	-6.14	-0.05	-0.56	-0.08
40	0.47	5.07	0.04	0.46	0.07
50	-0.14	-1.55	-0.01	-0.14	-0.02
63	-0.31	-3.29	-0.03	-0.30	-0.04
80	0.04	0.48	0.00	0.04	0.01
100	0.26	2.80	0.02	0.25	0.04
125	0.44	4.74	0.04	0.43	0.06
160	0.59	6.31	0.05	0.57	0.08
200	0.99	10.70	0.09	0.97	0.14
250	1.67	17.94	0.15	1.63	0.23
315	2.68	28.89	0.24	2.63	0.38
400	3.07	33.05	0.28	3.00	0.43
500	3.98	42.85	0.36	3.90	0.56
630	5.23	56.31	0.48	5.12	0.73
800	6.89	74.16	0.63	6.74	0.97
1000	7.76	83.50	0.71	7.59	1.09
1250	8.40	90.37	0.76	8.22	1.18
1600	8.42	90.58	0.77	8.23	1.18
2000	8.45	90.98	0.77	8.27	1.18
2500	8.19	88.16	0.74	8.01	1.15
3150	7.80	83.91	0.71	7.63	1.09
4000	7.49	80.64	0.68	7.33	1.05
5000	7.42	79.86	0.67	7.26	1.04
6300	7.18	77.24	0.65	7.02	1.01
8000	7.13	76.73	0.65	6.98	1.00
10000	7.10	76.44	0.65	6.95	0.99
12500	6.66	71.69	0.61	6.52	0.93



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2024-11-05

RAL™-A24-434
Page 9 of 9

APPENDIX B: Instruments of Traceability

Specimen: Primacoustic - Broadway Beam (1 row of 11 objects, objects spaced 12" o.c.) (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	3160-106974	2024-08-15	2025-08-15
Bruel & Kjaer Mic And Preamp G	Type 4943-B-001	2525858	2024-05-07	2025-05-07
Bruel & Kjaer Pistonphone	Type 4228	2781248	2024-07-19	2025-07-19
EXTECH Hygro 959	SD700	A099959	2024-03-29	2025-03-29

APPENDIX C: Revisions to Original Test Report

Specimen: Primacoustic - Broadway Beam (1 row of 11 objects, objects spaced 12" o.c.) (See Full Report)

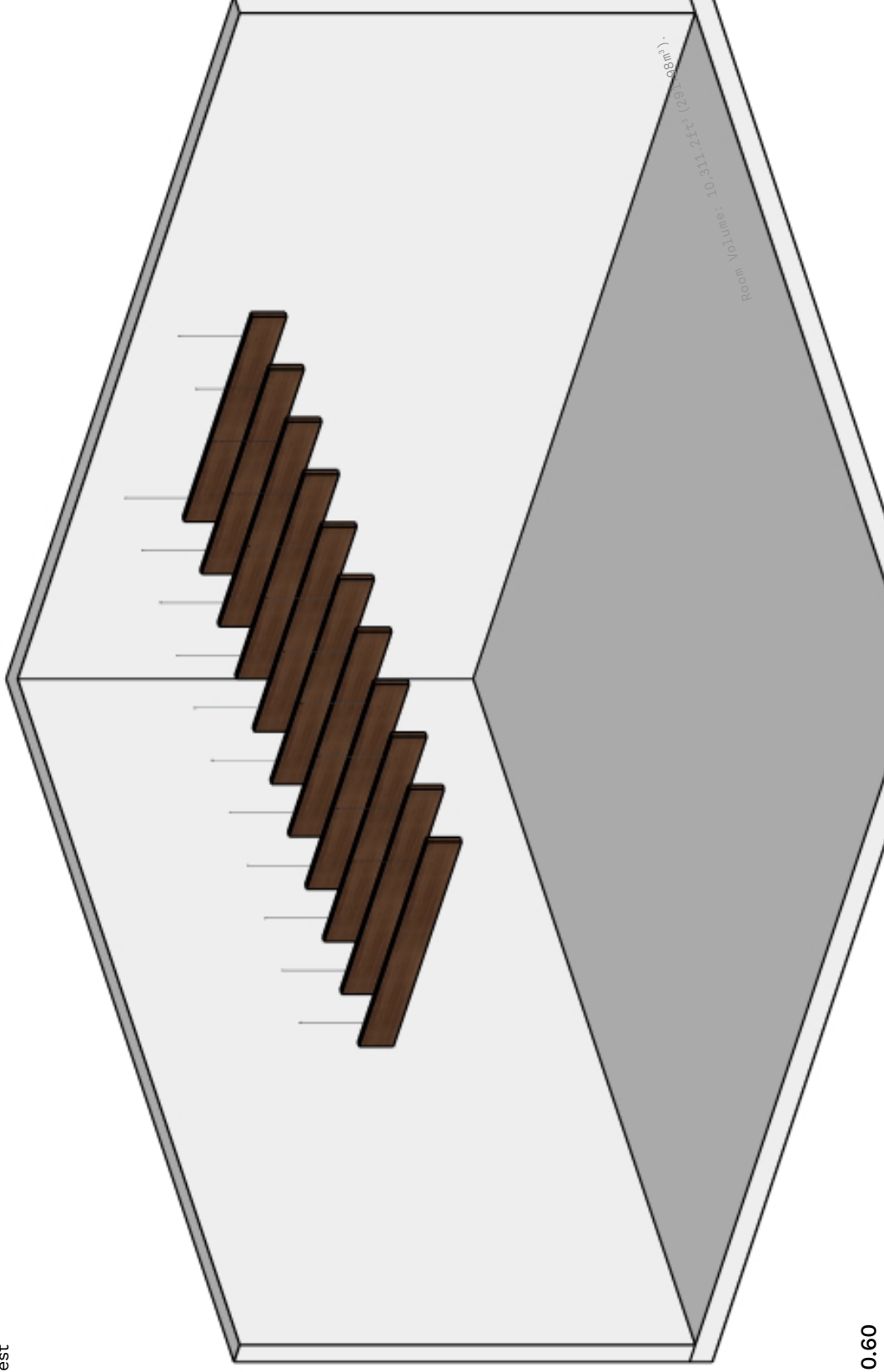
<u>Date</u>	<u>Revision</u>
2025-01-28	Original report issued

END

BROADWAY Beams

Array 2

Broadway Beams 72 x 9 x 1.5" (1,829 x 229 x 40mm)
1x11 grid, 16.875" (428.6mm) between panels
Suspended 41.25" (1,054mm) from the ceiling
RAL™ A24-435 Test



Array-NRC: 0.60
over 107.64ft² (10m²) of extended continuous surface area

SPONSOR: **Radial Engineering**
Port Coquitlam, BC, Canada

Sound Absorption
RAL™-A24-435

CONDUCTED: 2024-11-05

Page 1 of 9

ON: Primacoustic - Broadway Beam (1 row of 11 objects, objects spaced 16.875" o.c.)

TEST METHODOLOGY

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INFORMATION PROVIDED BY SPONSOR

The test specimen was designated by the sponsor as Primacoustic - Broadway Beam (1 row of 11 objects, objects spaced 16.875" o.c.). 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

Product Name: Primacoustic - Broadway Beam
Manufacturer: Radial Engineering

SPECIMEN MEASUREMENTS & TEST CONDITIONS

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

Test Specimen

Product Type: Baffles
Dimensions: 11 baffles @ 38 mm (1.5 in.) wide by 1829 mm (72 in.) long
Depth: 229 mm (9 in.)
Overall Weight: 29.26 kg (64.5 lbs)

Radial Engineering
2024-11-05

RAL™-A24-435
Page 2 of 9

SPECIMEN MEASUREMENTS & TEST CONDITIONS (continued)

Physical Measurements (per object)

Dimensions: 0.23 m (9.0 in) wide by 1.83 m (72.0 in) long
Thickness: 0.04 m (1.5 in)
Weight: 2.66 kg (5.86 lbs)

Test Environment

Room Volume: 291.98 m³
Temperature: 21.3 °C ± 0.0 °C (Requirement: ≥ 10 °C and ≤ 5 °C change)
Relative Humidity: 59.8 % ± 0.0 % (Requirement: ≥ 40 % and ≤ 5 % change)
Barometric Pressure: 97.8 kPa (Requirement not defined)

Each sound absorbing object had an exposed surface area of 0.993 m² (10.7 ft²). The total exposed surface area of all sound-absorbing objects was 10.9 m² (118 ft²).

MOUNTING METHOD

Type JV-MOD Mounting: The specimen is an array of 11 spaced sound absorbing objects suspended from cables such that the closest face is located approximately 1054 mm (41.5 in.) from the horizontal test surface. This approximates the mounting method of a typical ceiling baffle installation. The objects were evenly distributed in a single row, spaced 429 mm (16.875 in.) on center. The width of the installed object array was 170.25 and the length of the installed object array was 1829 mm (72 in.). The area of extended continuous surface attributed to the object array was 10.0 m² (108 ft²).

Radial Engineering
2024-11-05

RAL™-A24-435
Page 3 of 9

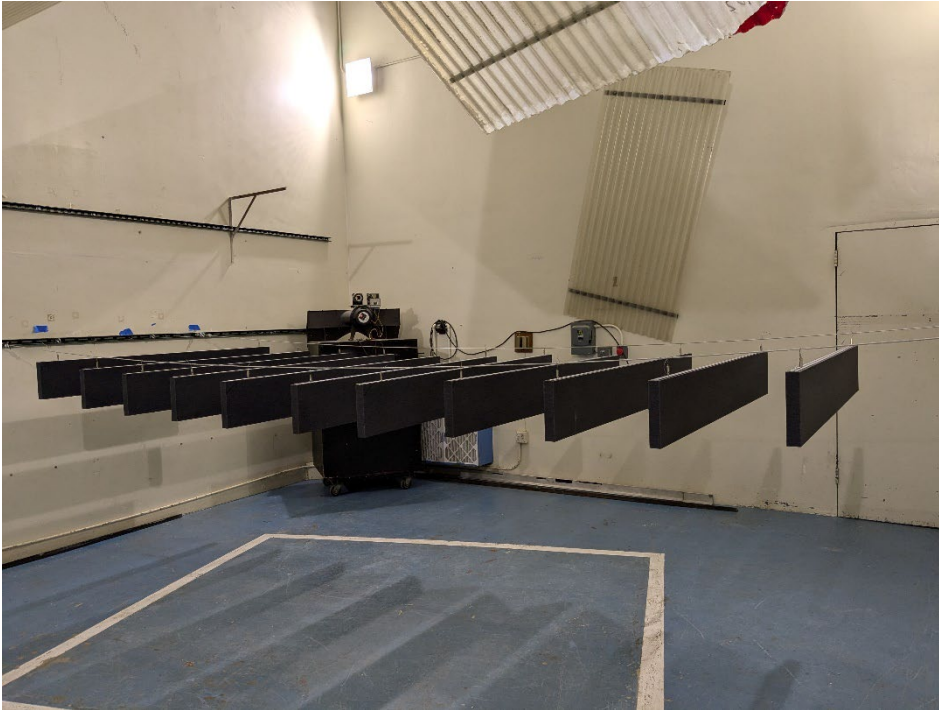


Figure 1 – Specimen mounted in test chamber



Figure 2 – Detail of specimen materials

Radial Engineering
2024-11-05

RAL™-A24-435
Page 4 of 9

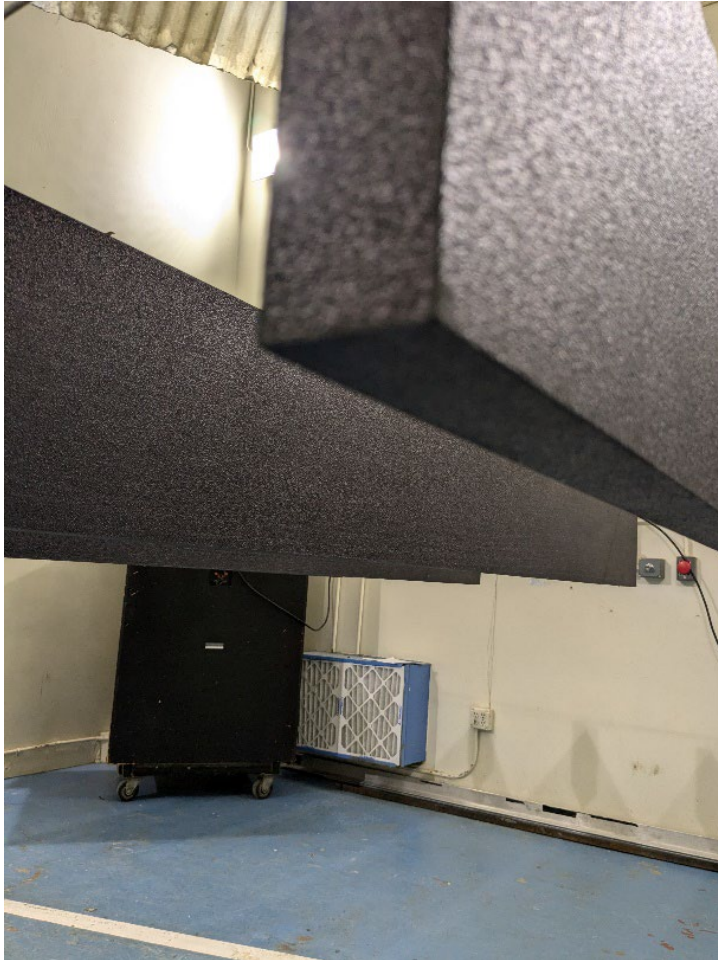


Figure 3 – Detail of specimen materials

Radial Engineering
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RAL™-A24-435
Page 5 of 9

TEST RESULTS

The preferred presentation of sound absorption test results for arrays of spaced objects is sound absorption (m^2) per object and total sound absorption (m^2) at each one-third-octave band

ASTM C423-23 Appendix X2 allows calculation of sound absorption per m^2 (SA/m^2) based on the projected horizontal surface area attributable to an array of objects. The extended continuous surface area used in this calculation is to be determined using the following procedure:

$S_{array} = (w + w_1) \times (l + 0.3)$ If the set of objects consists of a single row of equal sized objects with equal space between each. (ASTM E423-23 X.2.3.2)

Where:

S_{array} = area of extended continuous surface attributed to the object array, m^2

w = the measured width of the installed object array, in meters

w_1 = the distance between objects in the array along the width, in meters

l = the measured length of the object array, in meters

Note: A standard distance of 0.3 meters is added to the array length to account for the assumed area between this set of objects and an adjacent array of objects.

The sound absorption per m^2 (SA/m^2) is calculated based on the following formula:

$$\alpha_{array} = (A_2 - A_1) / S_{array}$$

Where:

α_{array} = sound absorption per m^2 (SA/m^2) of extended continuous surface, no units,

A_1 = absorption of the empty reverberation room, m^2 and

A_2 = absorption of the room after the specimen has been installed, m^2 .

S_{array} = area of extended continuous surface attributed to the test specimen, m^2

Radial Engineering
2024-11-05

RAL™-A24-435
Page 6 of 9

TEST RESULTS (continued)

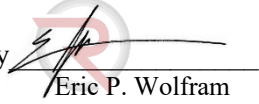
1/3 Octave Center Frequency (Hz)	Total Absorption		Absorption per Object		α_{array} (Sabins/ft ²) (SA/m ²)
	(m ²)	(Sabins)	(m ² / Object)	(Sabins / Object)	
100	0.44	4.77	0.04	0.43	0.04
** 125	0.57	6.10	0.05	0.55	0.06
160	0.60	6.41	0.05	0.58	0.06
200	1.10	11.87	0.10	1.08	0.11
** 250	1.58	17.06	0.14	1.55	0.16
315	2.76	29.68	0.25	2.70	0.27
400	2.97	31.97	0.27	2.91	0.30
** 500	4.42	47.56	0.40	4.32	0.44
630	6.07	65.36	0.55	5.94	0.60
800	8.03	86.39	0.73	7.85	0.80
** 1000	8.99	96.73	0.82	8.79	0.90
1250	9.30	100.08	0.85	9.10	0.93
1600	9.35	100.63	0.85	9.15	0.93
** 2000	9.20	99.07	0.84	9.01	0.92
2500	9.12	98.15	0.83	8.92	0.91
3150	8.42	90.65	0.77	8.24	0.84
** 4000	8.24	88.68	0.75	8.06	0.82
5000	8.10	87.18	0.74	7.93	0.81

Array-NRC 0.60 over 10.0 m² of extended continuous surface area

Array-SAA 0.61 over 10.0 m² of extended continuous surface area

Tested by 
Marc Sciaky
Senior Experimentalist

Report by 
Keith Kimberling
Test Engineer

Approved by 
Eric P. Wolfram
Laboratory Manager

Note: Sound absorption per m² (SA/m²), and therefore the reported Single Number Ratings, are highly dependent on the exact sample shape, size, spacing, and extended continuous surface area present in the test and subsequent calculations. Changes to any of these parameters will change the resulting values. These presented results are valid only for the specific configuration present in this test.

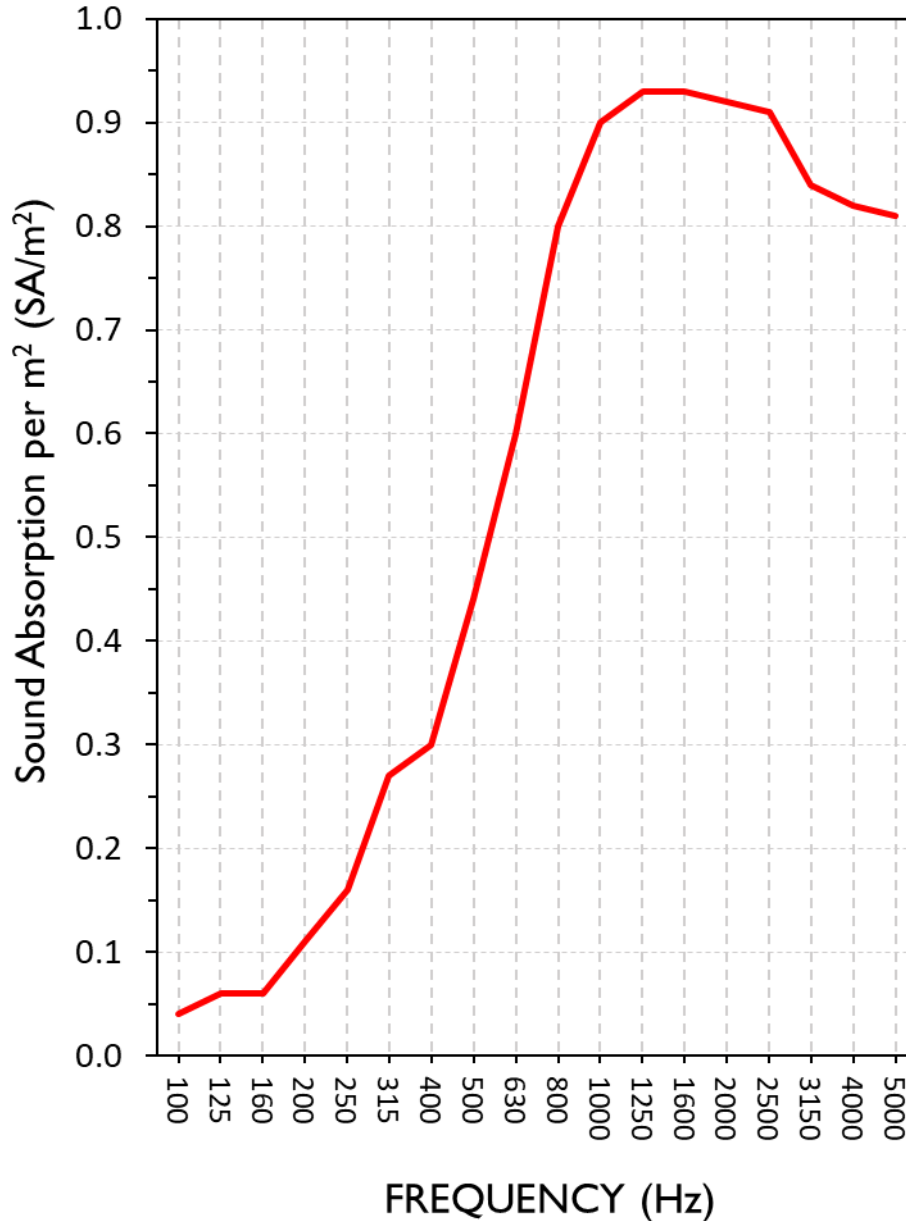


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SOUND ABSORPTION REPORT

Primacoustic - Broadway Beam (1 row of 11 objects, objects spaced 16.875" o.c.)



Array-NRC 0.60 over 10.0 m² of extended continuous surface area
Array-SAA 0.61 over 10.0 m² of extended continuous surface area

Radial Engineering
 2024-11-05

RAL™-A24-435
 Page 8 of 9

APPENDIX A: Extended Frequency Range Data

Specimen: Primacoustic - Broadway Beam (1 row of 11 objects, objects spaced 16.875" o.c.) (See Full Report)

The following non-accredited data were obtained in accordance with ASTM C423-23, 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 Object		α_{array} (Sabins/ft ²)
	(m ²)	(Sabins)	(m ² / Object)	(Sabins / Object)	(SA/m ²)
31.5	-0.42	-4.56	-0.04	-0.41	-0.04
40	0.03	0.28	0.00	0.03	0.00
50	-0.34	-3.64	-0.03	-0.33	-0.03
63	-0.33	-3.52	-0.03	-0.32	-0.03
80	0.39	4.15	0.04	0.38	0.04
100	0.44	4.77	0.04	0.43	0.04
125	0.57	6.10	0.05	0.55	0.06
160	0.60	6.41	0.05	0.58	0.06
200	1.10	11.87	0.10	1.08	0.11
250	1.58	17.06	0.14	1.55	0.16
315	2.76	29.68	0.25	2.70	0.27
400	2.97	31.97	0.27	2.91	0.30
500	4.42	47.56	0.40	4.32	0.44
630	6.07	65.36	0.55	5.94	0.60
800	8.03	86.39	0.73	7.85	0.80
1000	8.99	96.73	0.82	8.79	0.90
1250	9.30	100.08	0.85	9.10	0.93
1600	9.35	100.63	0.85	9.15	0.93
2000	9.20	99.07	0.84	9.01	0.92
2500	9.12	98.15	0.83	8.92	0.91
3150	8.42	90.65	0.77	8.24	0.84
4000	8.24	88.68	0.75	8.06	0.82
5000	8.10	87.18	0.74	7.93	0.81
6300	7.99	86.05	0.73	7.82	0.80
8000	7.88	84.85	0.72	7.71	0.79
10000	7.96	85.69	0.72	7.79	0.79
12500	6.95	74.86	0.63	6.81	0.69



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Radial Engineering
2024-11-05

RAL™-A24-435
Page 9 of 9

APPENDIX B: Instruments of Traceability

Specimen: Primacoustic - Broadway Beam (1 row of 11 objects, objects spaced 16.875" o.c.) (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	3160-106974	2024-08-15	2025-08-15
Bruel & Kjaer Mic And Preamp G	Type 4943-B-001	2525858	2024-05-07	2025-05-07
Bruel & Kjaer Pistonphone	Type 4228	2781248	2024-07-19	2025-07-19
EXTECH Hygro 959	SD700	A099959	2024-03-29	2025-03-29

APPENDIX C: Revisions to Original Test Report

Specimen: Primacoustic - Broadway Beam (1 row of 11 objects, objects spaced 16.875" o.c.) (See Full Report)

<u>Date</u>	<u>Revision</u>
2025-01-28	Original report issued

END