



**ETS-LINDGREN
ACOUSTIC RESEARCH LABORATORY
OFFICIAL LABORATORY REPORT
AS-SA3667/AS-SA3667A
Revision 0**

Subject: Sound Absorption Test

Date: 04 August 2009

Contents: Sound Absorption Data, One-third Octave bands
Sound Absorption Coefficients, One-third Octave bands
Sound Absorption Average (SAA)
Noise Reduction Coefficient (NRC)

on

**6425 NEXUS, Xorel, Unbacked
Type A Mounting**

for

Carnegie

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INTRODUCTION

"The sound absorption coefficient is a property of the material composing the surface. It is ideally defined as the fraction of the randomly incident sound power absorbed by the surface."

[ASTM C 423]

APPLICABLE STANDARDS

- ASTM C 423 – 08a "Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method"
- ASTM E 795 – 05 "Standard Practices for Mounting Test Specimens during Sound Absorption Tests"

TEST SPECIMEN

The test specimen consisted of a 2438 mm in length by 2438 mm in width [96 by 96 inches] fabric application that was manufactured, submitted for test, and designated "6425 NEXUS, Xorel, Unbacked" by Carnegie of Rockville Center, NY. Nominal manufacturer quoted weight of the test specimen is 0.34 kg/m [11 ounces per linear yard].

In order to test the acoustic characteristics of the fabric for a specific application, two (2) separate absorption tests were conducted. As a basis, one (1) layer of Johns Manville WHXG fiberglass insulation, density 32 kg/m³ [2.0 pounds per cubic foot] was placed on the Reverberation Room floor in a Type A Mount. The dimensions of this specimen's component were 2438 mm in length by 2438 mm in width by 52 mm in depth [96 by 96 by 2 inches]. This component served as the underlayment for the fabric application. This underlayment was tested with (Test Number AS-SA3667A) and without (Test Number AS-SA3667) the fabric application installed. The plan area for both tests was 5.95 m² [64 ft²].

The weight of the fabric tested was 1.7 kg [3.7 pounds]. The overall weight of the fabric application plus fiberglass was 11.4 kg [25.0 pounds].

TEST SPECIMEN MOUNTING

The specimens were tested in a **Type A Mounting** in strict accordance with ASTM 795-05 requirements. The edges of the test specimens were flashed with sheet metal to restrict sound absorption to the face of the specimen. The sheet metal flashings were duct taped to the reverberation chamber floor. Metal tape was used to seal the top surface of the specimen to the flashings.

DESCRIPTION OF TEST

The decay rate of sound [which is directly related to sound absorption] is measured upon terminating a steady-state broadband pink noise signal in the 408-m³ reverberation chamber. Ten (10) ensemble averages containing twenty (20) decays each are measured with both the test specimen inside of and removed from the chamber. These decays were averaged using a linear averaging algorithm and analyzed using ASTM C423-08a required methods to determine sound absorption present in the reverberation chamber. The difference between these two (2) sound absorption tests (with and without the test specimen) at a given frequency is defined as the sound absorption of the specimen. The Sound Absorption Coefficient is the sound absorption per unit area of the test specimen. Sound Absorption Average (SAA) is the average of sound absorption coefficients for twelve (12) one-third-octave bands from 200 Hz through 2500 Hz inclusive. Noise Reduction Coefficient (NRC) is a four-frequency average of the Sound Absorption Coefficient. A rotating microphone boom and a Norsonic 840 Dual Channel Real Time Analyzer, computer controlled using custom software, are used for all measurements. Measurements are made in the ISO-preferred one-third octave bands from 100 Hz to 5000 Hz. The test was conducted in strict accordance with ASTM C423 – 08a. A reverberation room qualification report for testing to this standard is available on request.

These tests took place at **ETS-LINDGREN ACOUSTIC RESEARCH LABORATORY**, Cedar Park, TX, on 24 July 2009.

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SOUND ABSORPTION DATA

Measured Sound Absorption [in units of area] and Sound Absorption Coefficients of the test specimens at the preferred one-third octave band center frequencies are provided in the tables below and then presented graphically.

AS-SA3667

**Carnegie – Johns Manville WHXG Insulation WITHOUT 6425 NEXUS, Xorel, Unbacked
Thickness - 2" Type A Mounting**

One-third Octave Band Center Freq. (Hz)	Sound Absorption (m ²)	Notes	Sound Absorption Coefficient	Repeatability* (+/-)	Reproducibility** (+/-)
100	1.42		0.24	0.15	0.27
125	1.65		0.28	0.11	0.22
160	2.79		0.47	0.11	0.23
200	3.33		0.56	0.09	0.17
250	4.55		0.77	0.07	0.15
315	6.03		1.01	0.09	0.22
400	6.38		1.07	0.14	0.16
500	6.97		1.17	0.09	0.14
630	7.20		1.21	0.06	0.14
800	6.87		1.15	0.07	0.14
1000	6.67		1.12	0.06	0.12
1250	6.49		1.09	0.05	0.13
1600	6.32		1.06	0.05	0.14
2000	6.05		1.02	0.05	0.13
2500	6.07		1.02	0.06	0.14
3150	5.83		0.98	0.08	0.15
4000	5.86		0.99	0.11	0.16
5000	5.79		0.97	0.15	0.21
Sound Absorption Average (SAA)			1.02	0.03	0.08
Noise Reduction Coefficient (NRC)			1.00	NA	NA

Notes: [a] due to the very low absorption of the specimen tested, actual absorption values cannot be determined within repeatability values given. The result for this band should be considered inconclusive.

*Repeatability values are those values below which the absolute difference between two (2) single test results in the same laboratory that are obtained with the same method on identical test material under the same conditions in a Type A Mounting. Values are based on Round Robin testing between 16 laboratories. Repeatability values represent the probability of 95% that single tests lay within this absolute range. **Reproducibility values are those values below which the absolute difference between two (2) single test results from different laboratories that are obtained with the same method on identical test material in a Type A Mounting. Values are based on Round Robin testing between 16 laboratories. Reproducibility values represent the probability of 95% that single tests between laboratories lay within this absolute range.

During the test AS-SA3667, environmental conditions in the reverberation chamber were 22.2C and 62.2% relative humidity and remained within strict limits imposed by the laboratory.

AS-SA3667A

**Carnegie – Johns Manville WHXG Insulation WITH 6425 NEXUS, Xorel, Unbacked
Thickness - 2" Type A Mounting**

One-third Octave Band Center Freq. (Hz)	Sound Absorption (m ²)	Notes	Sound Absorption Coefficient	Repeatability* (+/-)	Reproducibility** (+/-)
100	1.45		0.24	0.15	0.27
125	1.95		0.33	0.11	0.22
160	3.54		0.60	0.11	0.23
200	4.46		0.75	0.09	0.17
250	5.62		0.95	0.07	0.15
315	6.96		1.17	0.09	0.22
400	7.02		1.18	0.14	0.16
500	7.32		1.23	0.09	0.14
630	7.25		1.22	0.06	0.14
800	6.79		1.14	0.07	0.14
1000	6.57		1.10	0.06	0.12
1250	6.24		1.05	0.05	0.13
1600	6.01		1.01	0.05	0.14
2000	5.70		0.96	0.05	0.13
2500	5.59		0.94	0.06	0.14
3150	5.37		0.90	0.08	0.15
4000	5.09		0.86	0.11	0.16
5000	4.79		0.81	0.15	0.21
Sound Absorption Average (SAA)			1.06	0.03	0.08
Noise Reduction Coefficient (NRC)			1.05	NA	NA

Notes: [a] due to the very low absorption of the specimen tested, actual absorption values cannot be determined within repeatability values given. The result for this band should be considered inconclusive.

*Repeatability values are those values below which the absolute difference between two (2) single test results in the same laboratory that are obtained with the same method on identical test material under the same conditions in a Type A Mounting. Values are based on Round Robin testing between 16 laboratories. Repeatability values represent the probability of 95% that single tests lay within this absolute range. **Reproducibility values are those values below which the absolute difference between two (2) single test results from different laboratories that are obtained with the same method on identical test material in a Type A Mounting. Values are based on Round Robin testing between 16 laboratories. Reproducibility values represent the probability of 95% that single tests between laboratories lay within this absolute range.

During the test AS-SA3667A, environmental conditions in the reverberation chamber were 22.2C and 62.6% relative humidity and remained within strict limits imposed by the laboratory.

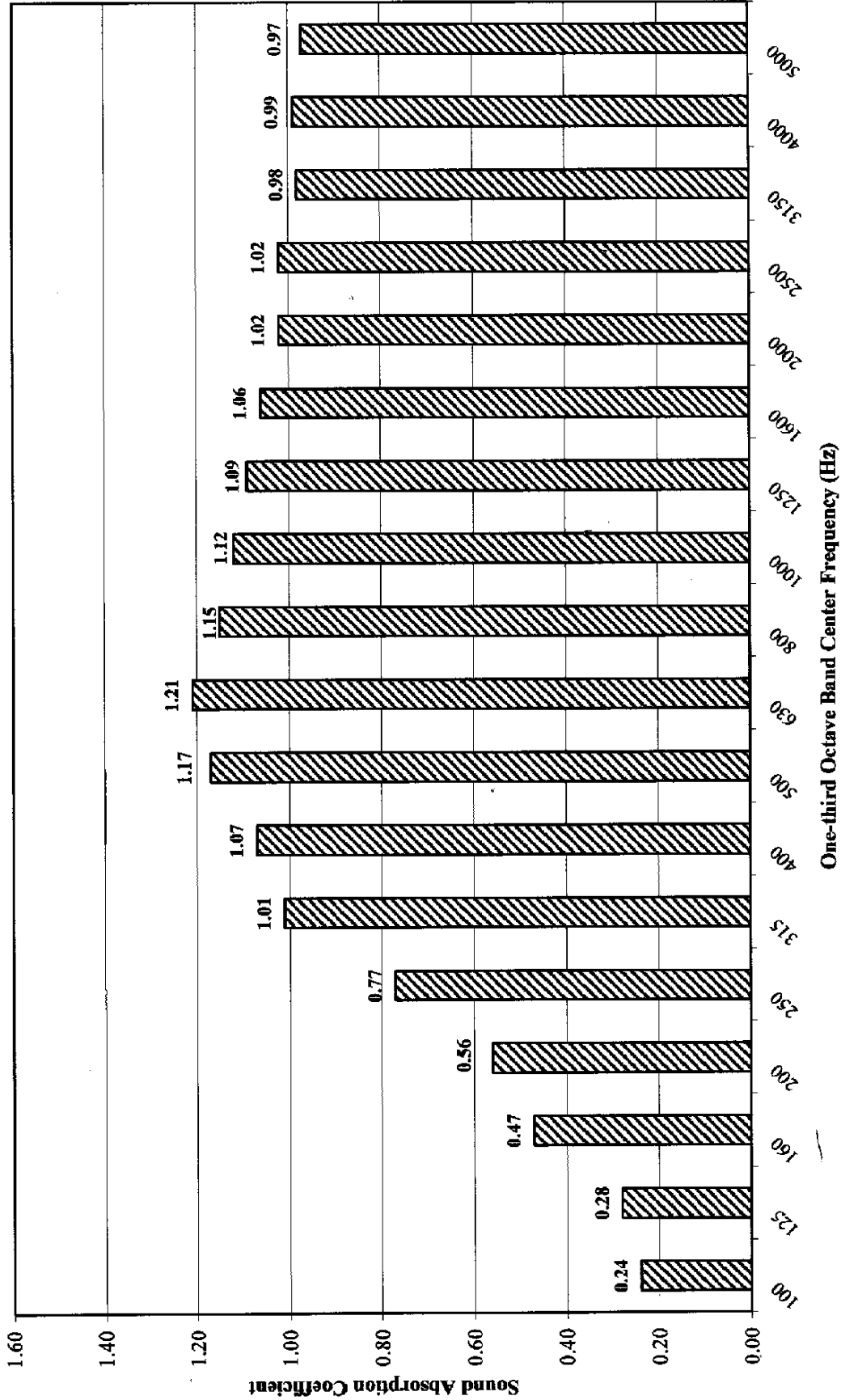
Respectfully Submitted,



Michael C. Black
Laboratory Technical Director

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**Carnegie Johns Mansville Fiberglass WITHOUT 6425 NEXUS, Xorel, Unbacked
Thickness-2", Type A Mount AS-SA3667; SAA 1.02 NRC 1.00**



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Carnegie Test Results With (AS-SA3667A) and Without (AS-SA3667) 6425 NEXUS, Xorel, Unbacked on 2" Johns Manville WHXG Insulation Type A Mounting

