

**ACOUSTIC SYSTEMS
ACOUSTICAL RESEARCH FACILITY
OFFICIAL LABORATORY REPORT
AS-SA2359A**



Subject: Sound Absorption Test

Date: 30 December 2003

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

on

**Pattern CS Panel w/Unfaced Fiberglass of Density 1.5 pcf and Thickness 2”
Type A Mounting**

for

Noise Control Systems

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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 423-00 “Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method”
ASTM E 795-00 “Standard Practices for Mounting Test Specimens during Sound Absorption Tests”

TEST SPECIMEN

The test specimen was an assembly of interior panels whose overall dimensions were 3048 mm in length by 2438 mm in width by 57.2 mm in depth [120 by 96 by 2-1/4 inches]. The test specimen was submitted for test and designated “Pattern CS Panel w/Unfaced Fiberglass of Density 1.5 pcf and Thickness 2” – Type A Mounting” by Noise Control Systems of Covington, LA. Two (2) panels, each of plan dimensions 3048 mm in length by 1218 mm in width [120 by 48 inches], were butted together at the central vertical edge to make the overall assembly size. Each panel was of identical construction as follows:

- Facing – 0.8 mm [0.032 inch] thick perforated aluminum corrugated sheet with 3 mm [1/8 inch] holes on 8 mm [21/64 inch] staggered centers, giving a percentage open area of 13%
- Outside Framing – 52 mm by 52 mm [2 by 2 inches] fir
- Internal Stiffeners – Vertical 52 mm by 52 mm [2 by 2 inches] fir placed 610 mm [24 inches] on-center
- Backing – 13 mm [1/2 inch] plywood secured to outside framing and internal stiffeners with 9.5mm in width by 38mm in length [3/8 by 1-1/2 inches] mechanical applied staples.
- Fill – Place in cavities of the assembly. Fill was supplied by Noise Control Systems. Five (5) pads, each of nominal dimension 609 mm in width by 1218 mm in length by 51 mm in thickness [24 by 48 by 2 inches], were installed in each panel. Knauf manufactured the unfaced fibrous glass material with a density of 24 kg/m³ [1.5 pounds/ft³].

Test specimen weight was measured to be 97.2 kg [214 pounds], giving a weight per unit area of 13.1 kg/m² [2.7 pounds/ft²].

TEST SPECIMEN MOUNTING

The test specimen was tested in a **Type A Mounting** in strict accordance with ASTM 795-00 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. The central seam of the test specimen facing the sound field was not taped.

DESCRIPTION OF TEST

The decay rate of sound [which is inversely related to sound absorption] is measured upon terminating a steady-state broadband pink noise signal in the 254 m³ reverberation chamber. Five ensemble averages containing thirty-two decays each are measured with both the test specimen inside of and removed from the chamber. These decays were averaged and analyzed using ASTM C423-00 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 the sound absorption coefficients for the twelve (12) one-third octave bands from 200 Hz through 2500 Hz inclusive. The Noise Reduction Coefficient (NRC) is a four-frequency average of the Sound Absorption Coefficient. A rotating microphone boom and a Norsonic NI-830 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 C423-00 except where noted. This test was conducted at **ACOUSTIC SYSTEMS ACOUSTICAL RESEARCH FACILITY**, Austin, TX, on 10 December 2003.

SOUND ABSORPTION DATA

The measured Sound Absorption [in units of area] and Sound Absorption Coefficients of the test specimen at the preferred one-third octave band center frequencies are tabulated and presented graphically herein.

**Noise Control Systems – Pattern CS Panel w/ Unfaced Fiberglass of Density 1.5 pcf and Thickness 2”
Type A Mounting**

1/3 Octave Band Center Freq. (Hz)	Sound Absorption (m ²)	Notes	Sound Absorption Coefficient	Repeatability* (+/-)
100	1.34	[a]	0.18	
125	1.55		0.21	0.06
160	2.08		0.28	
200	2.63		0.35	
250	3.83		0.52	0.05
315	6.22		0.84	
400	7.37		0.99	
500	8.05		1.08	0.06
630	7.89		1.06	
800	8.16		1.10	
1000	8.33		1.12	0.05
1250	7.78		1.05	
1600	7.66		1.03	
2000	7.38		0.99	0.05
2500	7.30		0.99	
3150	7.27		0.98	
4000	7.36		1.00	0.07
5000	7.05		0.96	
Sound Absorption Average (SAA)		0.93		
Noise Reduction Coefficient (NRC)		0.95		

Notes: [a] denotes room absorption greater than required by ASTM C423-00; however the reverberation chamber qualifies to all testing requirements of Annex A3. [b] due to the very low absorption of the specimen tested, actual absorption values cannot be determined within repeatability values given in the results table. The result for this band should be considered inconclusive. * Repeatability values represent estimates of absolute differences between two single test results within the laboratory that are obtained on the same material under the same conditions in a Type A Mounting. Values are based on Round Robin testing. Repeatability values represent the probability of 95% that single tests lay within this range. Table 2 of ASTM C423-00 also presents Reproducibility values – values that are estimates between different laboratories that test the identical material.

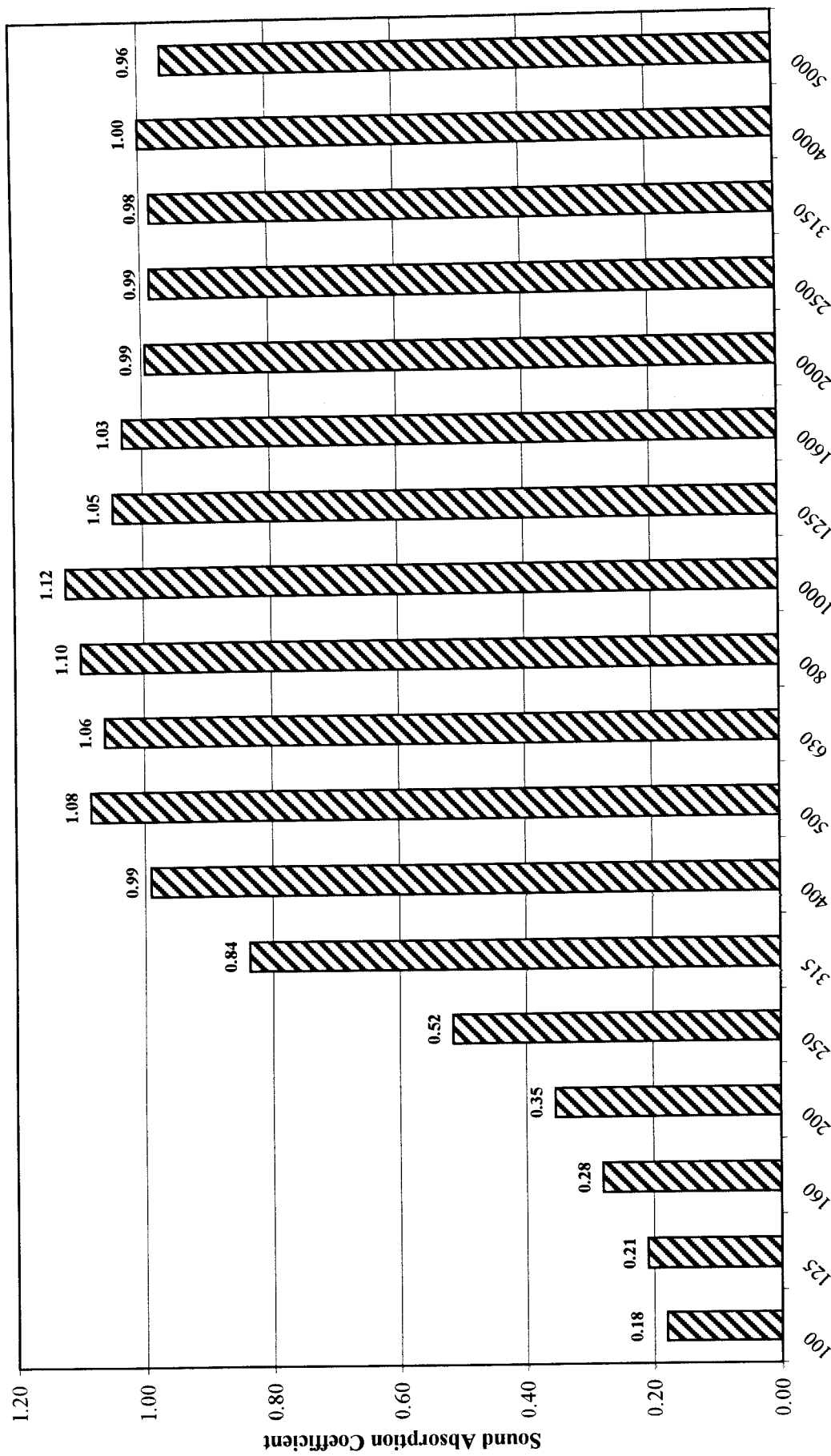
During the test, environmental conditions in the reverberation chamber were 16.7°C and 67.1% relative humidity and remained within strict limits imposed by the laboratory.

Respectfully Submitted,



Michael C. Black
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Noise Control Systems Pattern CS Panel w/ Unfaced Fiberglass of Density 1.5 pcf and Thickness 2"
AS-SA2359A; SAA 0.93; NRC 0.95



One-third Octave Band Center Frequency (Hz)

