ACOUSTIC SYSTEMS
ACOUSTICAL RESEARCH FACILITY
OFFICIAL LABORATORY REPORT
AS-SA2432
AS-SA2432A

Subject: **Sound Absorption Test**

Date: **14 June 2004**

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

on

6619 QUARRY Unbacked
100% Xorel

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 – 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 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 " 6619 QUARRY Unbacked – 100% Xorel" by Carnegie of Rockville Center, NY. The 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 on 2438 mm in length by 2438 mm in width by 52 mm in depth *[96 by 96 by 2 inches]* RA-22 fiberglass batts of density 35.2 kg/m^3 *[2.2 pounds per cubic foot]*: one (1) with (Test Number AS-SA2432A) and one (1) without (Test Number AS-SA2432) the fabric application installed. The plan area of test was 5.95 m^2 *[64 ft^2]*.

The specimens were 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 weight of the fabric tested was 1.1 kg *[2.5 pounds]*. The overall weight of the fabric application plus fiberglass batts was 11.6 kg *[25.5 pounds]*.

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 254 m^3 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 using a linear averaging algorithm 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 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 C 423 – 00 except where noted. This test took place at **ACOUSTIC SYSTEMS ACOUSTICAL RESEARCH FACILITY**, Austin, TX, on 10 June 2004.

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 on the following pages and then presented graphically.

AS-SA2432

Carnegie - RA-22 Fiberglass Batts (8-24"x48") WITHOUT 6619 QUARRY Unbacked – 100% Xorel
Thickness - 2" Type A Mounting

1/3 Octave Band Center Freq. (Hz)	Sound Absorption (m^2)	Notes	Sound Absorption Coefficient	Repeatability* (+/-)
100	1.80	[a]	0.30	
125	2.50		0.42	0.06
160	2.34		0.39	
200	3.49		0.59	
250	5.15		0.87	0.05
315	6.39		1.08	
400	7.20		1.21	
500	7.23		1.22	0.06
630	7.27		1.22	
800	6.95		1.17	
1000	6.86		1.15	0.05
1250	6.55		1.10	
1600	6.24		1.05	
2000	6.05		1.02	0.05
2500	5.97		1.00	
3150	6.01		1.01	
4000	6.18		1.04	0.07
5000	6.17		1.04	
Sound Absorption Average (SAA)		**1.06**		
Noise Reduction Coefficient (NRC)		**1.05**		

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 lie 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 AS-SA2432, environmental conditions in the reverberation chamber were 23.3C and 76.3% relative humidity and remained within strict limits imposed by the laboratory.

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AS-SA2432A

Carnegie - RA-22 Fiberglass Batts (8-24"x48") WITH 6619 QUARRY Unbacked – 100% Xorel
Thickness - 2" Type A Mounting

1/3 Octave Band Center Freq. (Hz)	Sound Absorption (m^2)	Notes	Sound Absorption Coefficient	Repeatability* (+/-)
100	0.13	[a]	0.02	
125	2.78		0.47	0.06
160	2.49		0.42	
200	3.97		0.67	
250	5.67		0.95	0.05
315	6.91		1.16	
400	7.43		1.25	
500	7.64		1.28	0.06
630	7.58		1.28	
800	7.02		1.18	
1000	6.98		1.17	0.05
1250	6.63		1.12	
1600	6.32		1.06	
2000	6.14		1.03	0.05
2500	6.13		1.03	
3150	6.18		1.04	
4000	6.23		1.05	0.07
5000	6.05		1.02	
Sound Absorption Average (SAA)		**1.10**		
Noise Reduction Coefficient (NRC)		**1.10**		

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 lie 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 AS-SA2432A, environmental conditions in the reverberation chamber were 23.5C and 76.6% relative humidity and remained within strict limits imposed by the laboratory.

Respectfully Submitted,

Michael C. Black
Laboratory Technical Director

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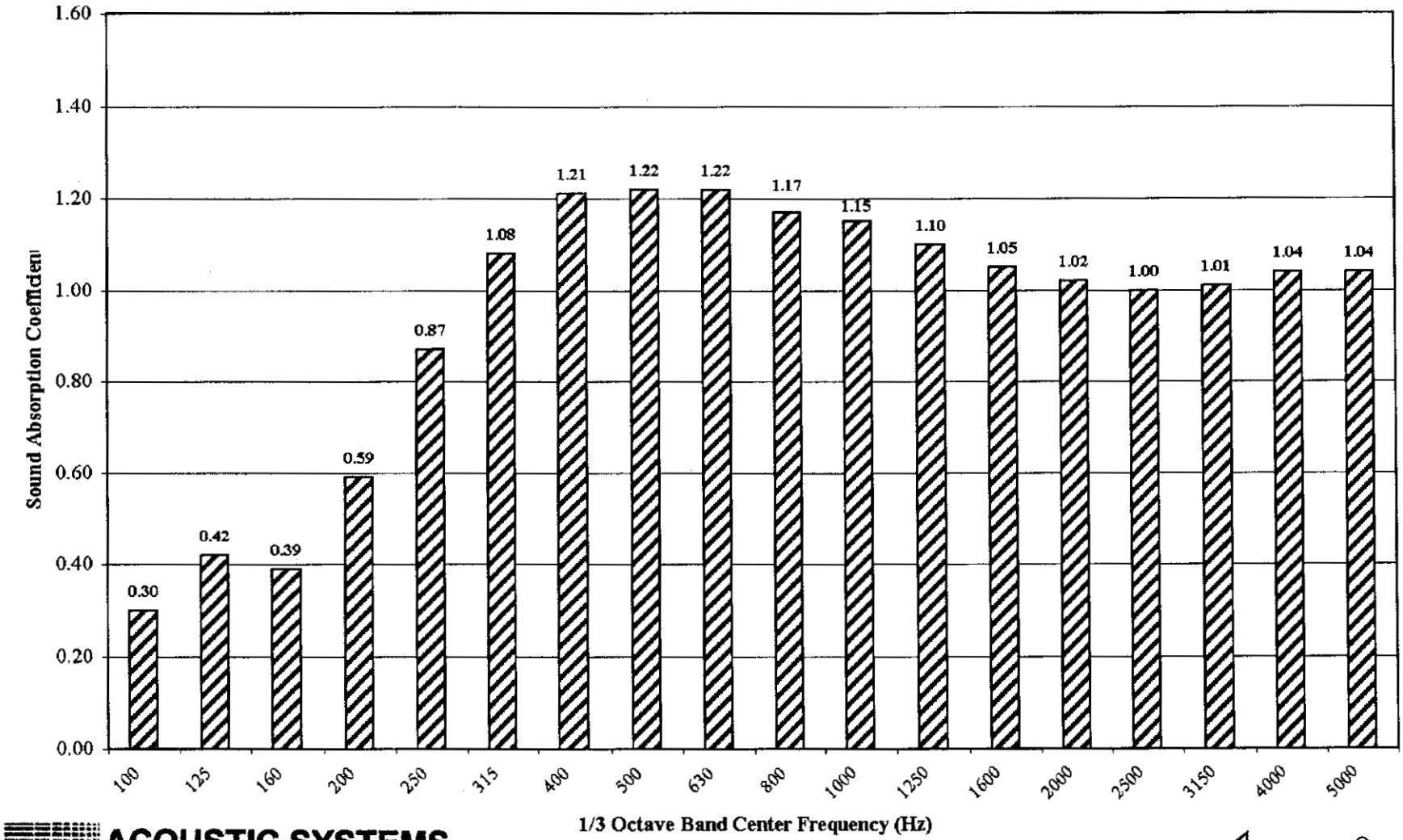
Carnegie RA-22 Fiberglass - Eight (8) 48"x24"x2" Batts - Type A Mounting
AS-SA2432; SAA 1.06; NRC 1.05



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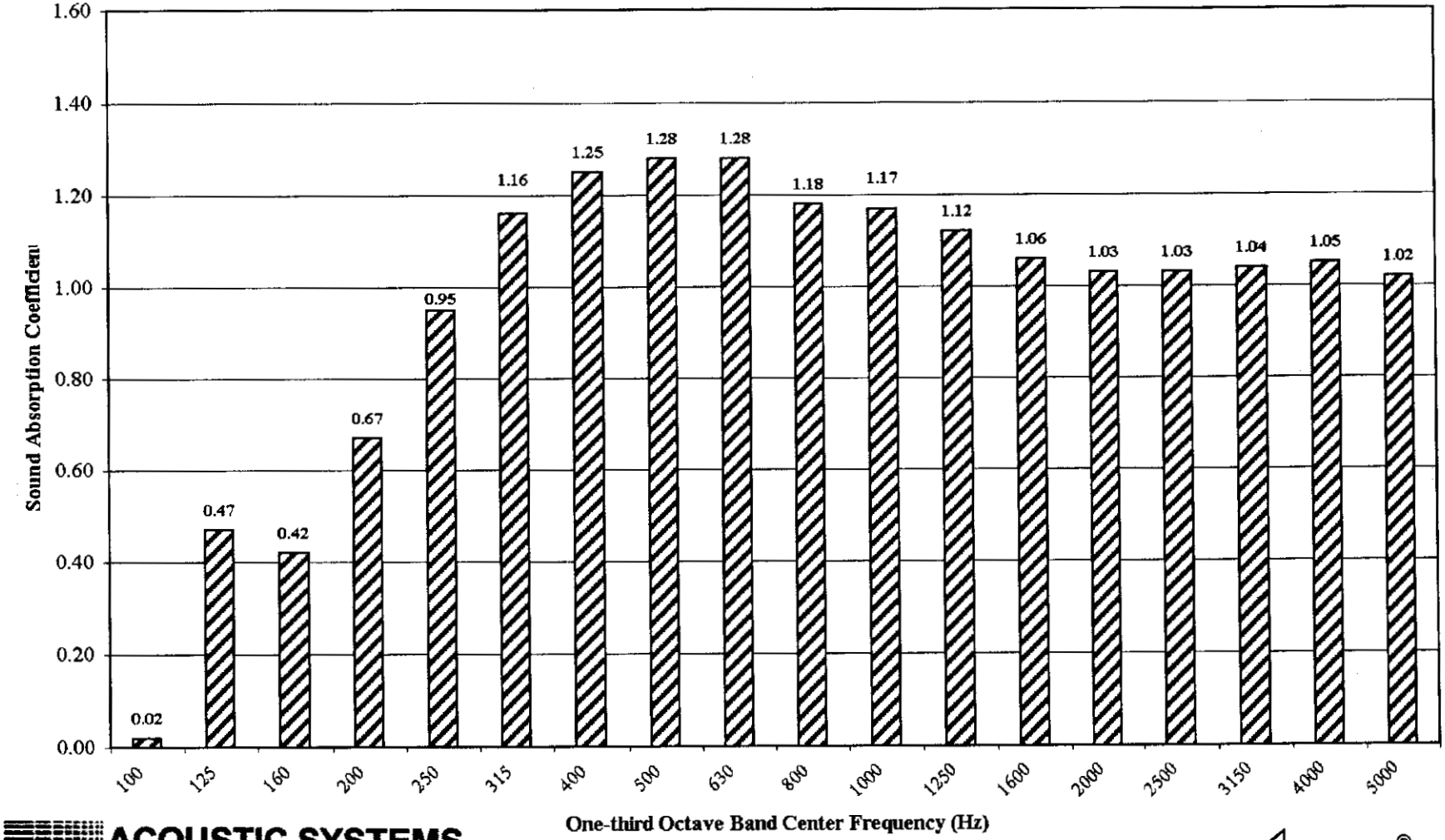
Carnegie 6619 QUARRY 100% Xorel Unbacked over RA-22 Batts - Thickness 2" - Type A Mounting
AS-SA2432A; SAA 1.10; NRC 1.10



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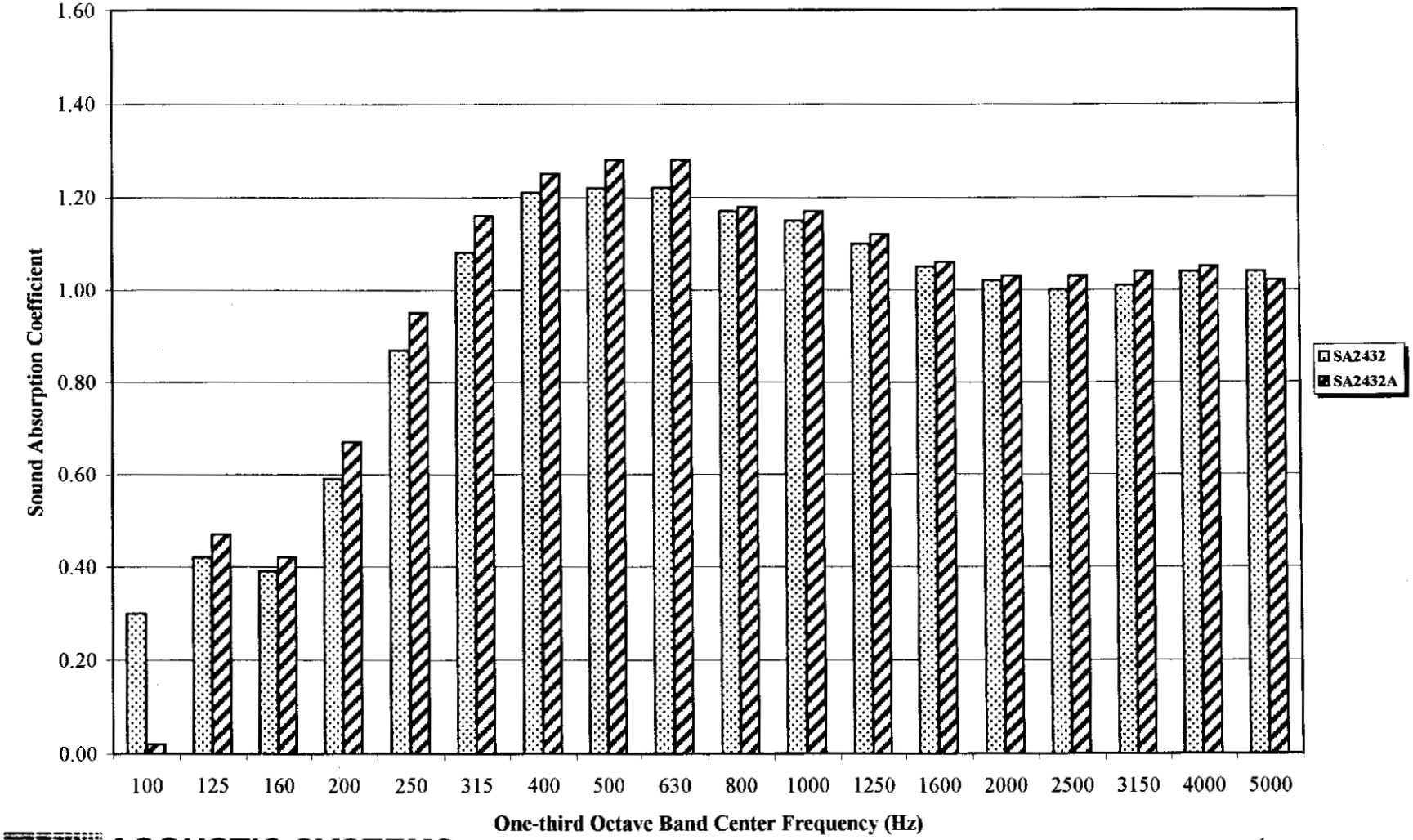
Carnegie Test Results RA-22 Fiberglass Batts WITHOUT (SA2432) and WITH (SA2432A)
6619 QUARRY Unbacked - 100% Xorel Thickness 2" Type A Mounting



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