

**Acoustic Systems
Acoustical Research Facility
Official Laboratory Report
AS-TL1734A**

Subject: Sound Transmission Loss Test

Date: November 1, 2000

Contents: Transmission Loss Data, One-third octave Bands
Transmission Loss Data, octave Bands
Sound Transmission Class Rating
Outdoor/Indoor Transmission Class Rating

On:
**ArmorCore Level 4 Bullet Resistant Fiberglass Panels
(Thickness 1-3/8") Butt jointed with Batten Strip, Mechanically
Attached with sealant.**

For:
Waco Composites, Inc.

Acoustic Systems Acoustical Research Facility is NVLAP-Accredited for this and other test procedures.

Introduction

The Transmission Loss of a partition in a specified frequency band is defined as ten times the common logarithm of the airborne sound power incident on the partition to the sound power transmitted by the partition and radiated on the other side. The quantity so obtained is expressed in decibels.

Applicable Standards

ASTM E 90-97, "Standard Method for Laboratory Measurement of Airborne Sound
Transmission Loss of Building Partitions"

ASTM E 413-87 "Classification for Sound Insulation Rating"

ASTM E 1332-90 "Classification for Determination of Outdoor-Indoor Transmission
Class"

Specimen Description

The test specimen was comprised of two (2) composite panels and (1) batten strip, all of the same composition. Each composite panel had the dimensions of 1219 mm in width by 2438 mm in height by 35 mm in thickness [48 by 96 by 1-3/8 inches]. They were butted together along the long dimension and secured with a 102 mm in width by 2438 mm in height by 35 mm in thickness [4 by 96 by 1-3/8 inches] batten strip on the Receive

Room side of the specimen. The batten strip joined the two (2) composite panels together using pairs of sheet metal screws spaced nominally 305 mm [12 inches] on center along the long dimension of the specimen. Sealant was then applied on both sides of the batten strip at the rate of one (1) tube per 4.9m [16 feet].

The test specimen was designed, manufactured, submitted for test, and designated “ArmorCore Level 4 Bullet-Resistant Fiberglass Panels (Thickness 1-3/8”) Butt Jointed with Mechanically Attached Batten Strip w/Sealant” by Waco Composites, Inc. of Waco, TX. Each component of the specimen was constructed with multiple plies of woven roving fiberglass impregnated with a thermoset polyester resin. The unit was then hydraulically pressed to its final thickness using 1.4×10^7 Pa [2000 pounds per square inch]. These composite panels were fully cured at the time of testing. The sealant, however applied along the edges of the batten strip was not fully cured.

The total weight of the test specimen was measured to be 449.5 kg [990 pounds].

Test Specimen Mounting

The specimen was mounted in the 2440 mm by 2440 mm transmission loss test opening. The perimeter of the specimen was sealed to the edge of the test aperture with dense mastic putty and metal battens. The calculated transmission loss of the test assembly was adjusted to account for sound power transmitted through the facility boundaries.

Description of Test

Two (2) loudspeakers in a 200 cubic meter reverberation chamber, designated as the “Source Room”, produced broadband pink noise. A 254 cubic meter reverberation chamber, designated as the “Receive Room”, is coupled to the Source Room through the transmission loss opening. The steady-state space-time average sound pressure levels in the Source and Receive Room were determined using rotating microphone booms and a Norsonic NI-830 Dual Channel real Time Analyzer. Sound absorption in the Receive Room was determined by reverberation time measurements. The precision of the resulting calculated Sound Transmission Loss varies with frequency band and is included in the Data Table that follows. The test was performed in accordance with ASTM E90-97 except where discussed. This test took place at ACOUSTIC SYSTEMS ACOUSTICAL RESEARCH FACILITY, Austin, Texas, on October 5, 2000.

Transmission Loss Data

The Sound Transmission Loss of the test specimen at the preferred one-third octave band center frequencies is tabulated below and then presented graphically. Octave-band Transmission Loss values are calculated as described in section 12.4 of ASTM E90-97.

**Waco Composites, Inc.- ArmorCore Level 4 Bullet-Resistant Fiberglass Panels
(Thickness 1-3/8") Butt Jointed with Mechanically Attached Batten Strip w/Sealant**

1/3 octave Band Center Freq. (Hz)	Transmission Loss (dB)	Uncertainty (+/-dB)	Notes	Octave Band TL (dB)	STC Deficiencies
50	27		[d][g]		
63	31		[d][g]	29	
80	30	1.7	[d][g]		
100	29	1.8			
125	35	2.6	[d]	32	
160	35	1.5			
200	36	0.7			
250	36	0.9		37	
315	38	0.6			
400	37	0.6			2
500	35	0.5		36	5
630	36	0.4			5
800	37	0.4			5
1000	40	0.4		39	3
1250	40	0.3			4
1600	41	0.2			3
2000	44	0.3		43	
2500	47	0.3			
3150	50	0.2			
4000	52	0.2		51	
5000	50	0.3			
6300	56	0.4			
8000	59	0.5		58	
10000	59	0.8	[a][c]		
STC	40				
OITC	37				

During the test, environmental conditions in the Receive Room were 24.5C with 66.6% relative humidity. Conditions in the Source Room were 24.4C with 52.3% relative humidity. The precision values [±] tabulated above represent 95% probability that the true mean value lies within the stated range.

Respectfully Submitted,

Michael C. Black
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**Waco Composites, Inc. ArmorCore Level 4 Bullet Resistant Fiberglass Panels (Thickness 1-3/8") Butt Joined with Mechanically Attached Batten Strip w/Sealant AS-TL1734A; STC 40
OITC 37**

