

**Acoustic Systems
Acoustic Research Facility
Official Laboratory Report
AS-TL1735A**

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 3 Bullet-Resistant Fiberglass Panels (Thickness ½")
Butt Jointed with Mechanically Attached Batten Strip w/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 one (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 12.7 mm in thickness [48 by 96 by ½ inches]. They were

butted together along the long dimension and secured with a 102 mm in width by 2438 mm in height by 12.7 mm in thickness [4 by 96 by ½ 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 4.9 m [16 feet].

The test specimen was designed, manufactured, submitted for test, and designated “ArmorCore Level 3 Bullet Resistant Fiberglass Panels (Thickness ½”) 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 149 kg [328 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, designed 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-839 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 3 Bullet-Resistant Fiberglass Panels
(Thickness 1/2") 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	22		[d][g]		
63	23		[g]	22	
80	23	1.8	[g]		
100	21	1.9			
125	27	2.6		24	
160	26	1.5			
200	28	0.7			
250	29	0.9		30	
315	32	0.6			
400	33	0.6			
500	34	0.5		34	
630	35	0.4			
800	36	0.4			
1000	36	0.4		34	
1250	32	0.3			4
1600	28	0.2			8
2000	31	0.3		30	5
2500	34	0.2			2
3150	37	0.2			
4000	40	0.2		39	
5000	42	0.4			
6300	43	0.4			
8000	46	0.5		46	
10000	50	0.8			
STC	32				
OITC	30				

During the test, environmental conditions in the Receive Room were 25.7c with 66.6% relative humidity. Conditions in the Source Room were 25.8C with 61.6% 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
Laboratory Technical Director

**Waco Composites, Inc. ArmorCore Level 3 Bullet-Resistant Fiberglass Panels (Thickness 1/2") Butt Jointed with Mechanically Attached Batten Strip w/Sealant AS-TL1735A; STC 32
OITC 30**

