

**Acoustic Systems  
Acoustical Research Facility  
Official Laboratory Report  
AS-TL1735**

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 1/2")  
Butt Jointed with Batten Strip, Mechanically Attached**

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 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.

The test specimen was designed, manufactured, submitted for test, and designated “ArmorCore Level 3 Bullet Resistant Fiberglass Panels (Thickness ½”) Butt Jointed with Batten Strip, Mechanically Attached” 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  $1.4 \times 10^7$  Pa [2000 pounds per square inch]. The test specimen was fully cured at the time of testing.

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, 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.

**Waco Composites, Inc.-ArmorCore Level 3 Bullet-Resistant Fiberglass Panels  
(Thickness 1/2") Butt Jointed with Batten Strip, Mechanically Attached**

<b>1/3 Octave Band Center Freq. (Hz)</b>	<b>Transmission Loss (dB)</b>	<b>Uncertainty (+/-dB)</b>	<b>Notes</b>	<b>Octave Band TL (dB)</b>	<b>STC Deficiencies</b>
<b>50</b>	22		[d][g]		
<b>63</b>	23		[g]	22	
<b>80</b>	23	1.8	[g]		
<b>100</b>	20	1.9			
<b>125</b>	26	2.5		23	
<b>160</b>	25	1.5			
<b>200</b>	27	0.7			
<b>250</b>	29	0.9		29	
<b>315</b>	31	0.6			
<b>400</b>	32	0.6			
<b>500</b>	33	0.5		33	
<b>630</b>	34	0.4			
<b>800</b>	35	0.4			
<b>1000</b>	35	0.4		34	
<b>1250</b>	32	0.3			4
<b>1600</b>	28	0.2			8
<b>2000</b>	29	0.3		29	7
<b>2500</b>	31	0.3			5
<b>3150</b>	35	0.2			1
<b>4000</b>	38	0.2		36	
<b>5000</b>	37	0.3			
<b>6300</b>	37	0.4			
<b>8000</b>	40	0.5		38	
<b>10000</b>	38	0.8			
<b>STC</b>	<b>32</b>				
<b>OITC</b>	<b>30</b>				

During the test, environmental conditions in the Receive Room were 24.9C with 69.1 % 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 Batten Strip, Mechanically Attached AS-TL1735; STC 32 OITC 30**

