INTRODUCTION

Airborne sound transmission loss measurements were made on two acoustical barriers. The two barriers were of identical construction, with a frame containing planks of different types of wood.

Detailed descriptions and test results are given in the following pages.

TEST PROCEDURE FOR TRANSMISSION LOSS

Tests were conducted in accordance with ASTM E90, Standard Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions, and of ISO 140/III 1978(E), Laboratory Measurement of Airborne Sound Insulation of Building Elements. The Sound Transmission Class was determined in accordance with ASTM Standard Classification E413. The Weighted Sound Reduction Index was determined in accordance with ISO 717, Rating of Sound Insulation in Buildings and of Building Elements, Part 1: Airborne Sound Insulation in Buildings and of Interior Building Elements. The wall test opening measures 3.05 m x 2.44 m. The volume of the source room is 65 m^3. The volume of the receiving room is 250 m^3. Each room has a calibrated Bruel & Kjaer condenser microphone that is moved under computer control to nine positions to spatially sample the source and receiving room sound pressure levels. In addition to fixed diffusing panels, the large room also has a rotating diffuser panel.

Measurements are controlled by a desktop PC-type computer interfaced to a Norwegian Electronics 830 real time analyser. Sound pressure levels are measured for 15 seconds at each of nine microphone positions and then averaged to get the average sound pressure level in the room. Five sound decays are averaged to get the reverberation time at each microphone position. These times are averaged to get reverberation times for the room.

SPECIMEN DESCRIPTION

ACOUSTICAL BARRIER "A"

Acoustical barrier "A" consisted primarily of tongue and groove pieces of hemlock (2.38 m x 0.14 m x 40 mm thick, average surface weight 30 kg/m^2). The 22 pieces of wood were held in place with 3.05 m of aluminum alloy track (2.1 kg/m) 86 mm high x 60 mm wide attached to the test frame top and bottom. The area used for calculation of transmission loss was 6.78 m^2.

RESULTS - WALL "A"

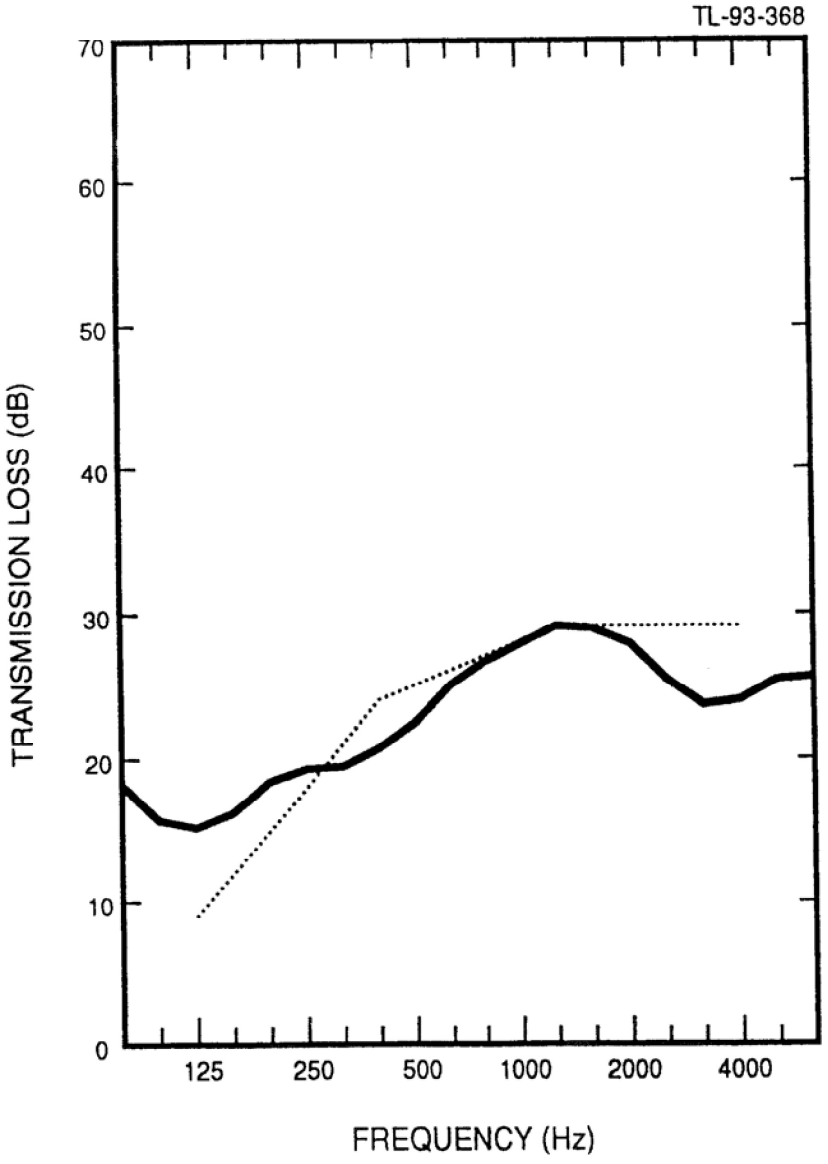
Results of the airborne sound transmission loss measurements of Acoustical barrier "A" are given in Table 1 and Figure 1, which follow.

Table 1: Airborne sound transmission loss measurements of Acoustical barrier "A", TL93-368.

Frequency (Hz)	Sound Transmission Loss (dB)	95% Confidence Limits*	Deviation Below the STC Contour
80	18	±3.3	
100	16	±2.0	
125	15	±1.2	
160	16	±0.9	
200	18	±1.1	
250	19	±0.4	
315	19	±0.6	-2
400	21	±0.5	-3
500	22	±0.3	-3
630	25	±0.4	-1
800	27	±0.3	
1000	28	±0.2	
1250	29	±0.3	
1600	29	±0.3	
2000	28	±0.2	-1
2500	25	±0.3	-4
3150	24	±0.2	-5
4000	24	±0.4	-5
5000	25	±0.3	
6300	26	±0.4	

Sound Transmission Class (STC) = 25

Weighted Sound Reduction (R_w) = 26



Frequency (Hz)	Transmission Loss (dB)
80	18
100	16
125	15
160	16
200	18
250	19
315	19
400	21
500	22
630	25
800	27
1000	28
1250	29
1600	29
2000	28
2500	25
3150	24
4000	24
5000	25
6300	26

STC 25

Figure 1: Airborne sound transmission loss measurements of Acoustical barrier "A". The solid line is the experimental data and the dotted line is the STC 25 contour.

ECIMEN DESCRIPTION - ACOUSTICAL BARRIER "B"

Acoustical barrier "B" consisted primarily of tongue and groove pieces of pine (2.38 m x 0.14 m x 40 mm thick, average surface weight 28 kg/m^2). The 22 pieces of wood were held in place with 3.05 m of aluminum alloy track (2.1 kg/m) 86 mm high x 60 mm wide attached to the test frame top and bottom. The area used for calculation of transmission loss was 6.78 m^2.

RESULTS - ACOUSTICAL BARRIER "B"

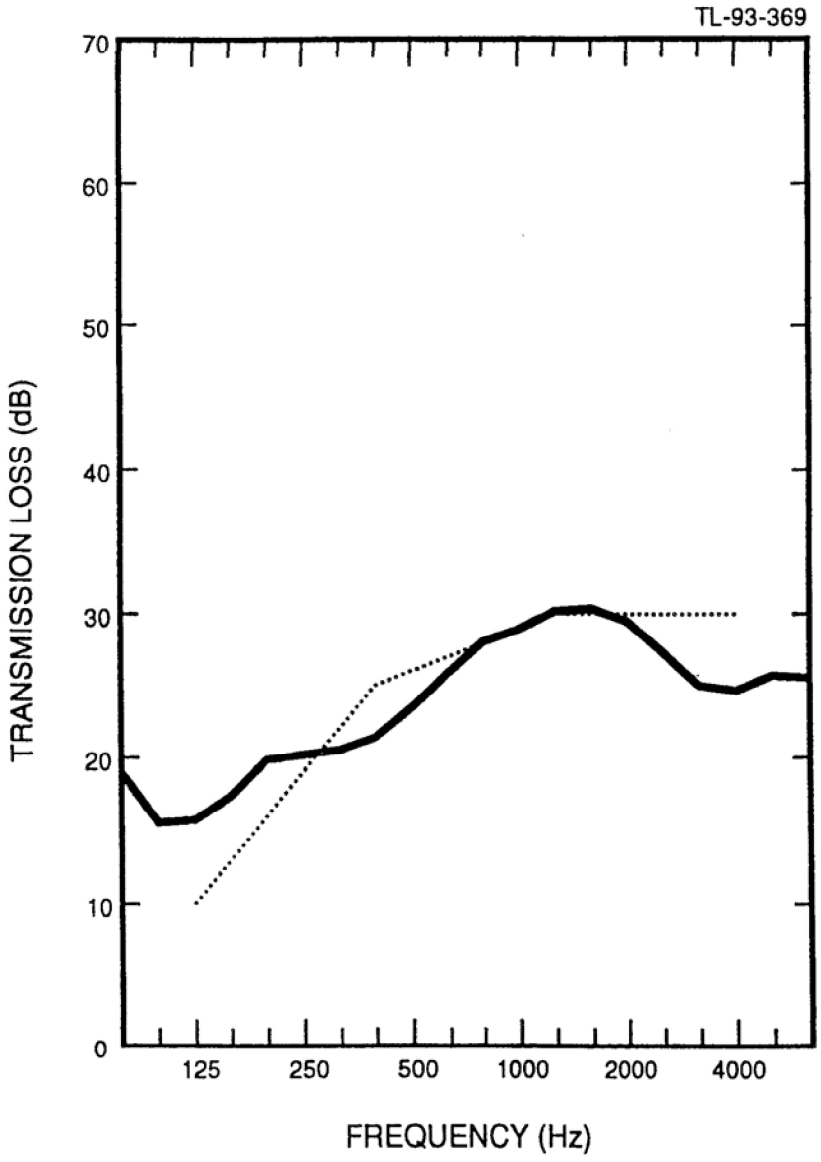
Results of the airborne sound transmission loss measurements of Acoustical barrier "B" are given in Table 2 and Figure 2, which follow.

Table 2: Airborne sound transmission loss measurements of Acoustical barrier "B", TL93-369.

Frequency (Hz)	Sound Transmission Loss (dB)	95% Confidence Limits*	Deviation Below the STC Contour
80	19	±3.6	
100	16	±2.0	
125	16	±1.0	
160	17	±0.9	
200	20	±0.9	
250	20	±0.4	
315	20	±0.6	-2
400	21	±0.6	-4
500	23	±0.3	-3
630	26	±0.4	-1
800	28	±0.3	
1000	29	±0.3	
1250	30	±0.3	
1600	30	±0.2	
2000	29	±0.2	-1
2500	27	±0.3	-3
3150	25	±0.3	-5
4000	25	±0.4	-5
5000	26	±0.4	
6300	26	±0.5	

Sound Transmission Class (STC) = 26

Weighted Sound Reduction (R_w) = 27



Frequency (Hz)	Transmission Loss (dB)
80	19
100	16
125	16
160	17
200	20
250	20
315	20
400	21
500	23
630	26
800	28
1000	29
1250	30
1600	30
2000	29
2500	27
3150	25
4000	25
5000	26
6300	26

STC 26

Figure 2: Airborne sound transmission loss measurements of Wall "B". The solid line is the experimental data and the dotted line is the STC 26 contour.

'OTES ON THE .IGNIFICANCE OF TEST RESULTS

Confidence Limits

Acoustical measurement in rooms is a sampling process and as such has associated with it a degree of uncertainty. By correctly performing a number of measurements, the uncertainties can be reduced and upper and lower limits assigned to the probable error in the measurement. These limits are called confidence limits. Thus, where a quantity (Q) has associated with it a confidence limit ±C then one can say with 95% confidence that the true quantity is in the interval Q - C to Q + C.

Sound Transmission Class And Weighted Sound Reduction Index

The Sound Transmission Class (STC) and Weighted Sound Reduction Index (R_w) are single-figure rating schemes intended to rate the acoustical performance of a partition element under typical conditions involving office or dwelling separation. The higher the value of either rating, the better the wall performance. Thus, the rating is intended to correlate with subjective impressions of the sound insulation provided against the sounds of speech, radio, television, office machines and similar sources of noise characteristic of offices and dwellings. In applications involving noise spectra that differ markedly from those referred to above (for example, heavy machinery, power transformers, aircraft noise, motor vehicle noise), the STC and R_w are of limited use. Generally, in such applications it is desirable to consider explicitly the noise spectra and the insulation requirements.