Airborne Sound Transmission Loss and Impact Sound Transmission Measurements Performed on Specimen B3414-3

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INTRODUCTION

Airborne sound transmission measurements were performed on a wall assembly with a single layer of the product identified by the client as QuietRock QR-530 Serenity on one side, and a double layer on the other side, of a single row of 38 mm x 89 mm wood studs, spaced 610 mm on center with 90 mm of glass fibre batts. For report purposes, this wall assembly is identified as Specimen B3414-3. A complete description of the tests procedure is outlined in the Test Procedure Section.

SPECIMEN DESCRIPTION

Construction on the wall assembly began on 16-June-04. The airborne sound transmission loss test was performed on 16-Jun-04. The wall assembly comprised the following elements, listed from one side of the wall to the other.

Specimen B3414-3

Table 1: Element breakdown of Specimen B3414-3

Element	Surface weight (kg/m^2)	Mass (kg)
16 mm QuietRock QR-530 Serenity	13.45	120.0
38mm x 89mm wood studs, 610mm oc (on center) including headers		36.7
90 mm glass fibre batts, R12	0.9	8.0
16 mm QuietRock QR-530 Serenity	13.40	119.5
16 mm QuietRock QR-530 Serenity	13.43	119.8
TOTAL		404

Total thickness: 137 mm

The Specimen B3414-3 was mounted in the IRC acoustical wall test opening which measures 3.66 m x 2.44 m. The area used for the calculation of the airborne sound transmission loss was 8.92 m^2.

The wood studs were spaced at 610mm on center. The glass fibre batts with a thickness of 90 mm were installed in the single wood stud cavity. On one side of the wall, a single

layer of 16mm QuietRock QR-530 Serenity drywall was installed vertically to the wood studs and on the other side a double layer of QuietRock QR-530 Serenity was installed vertically to the wood studs. All layers were attached to the wood studs with Type S drywall screws, 41mm long and spaced at 406mm oc along the edges and in the field. The joints of the base layer of the QuietRock QR-530 Serenity were staggered by 610mm QuietRock QR-530 Serenity face layer. A product identified by the client as QuietSeal is used to seal all the joints of the QuietRock QR-530 Serenity then covered with metal tape. All the previous screw holes were caulked with QuietSeal. The perimeter of the specimen was also caulked with QuietSeal and covered with metal tape.

The measured temperature and relative humidity in the large chamber during testing were 20.9^{o}C and 67.0%, respectively. The measured temperature and relative humidity in the small chamber during testing were 21.9^{o}C and 62.3%, respectively.

RESULTS

Results of the airborne sound transmission loss measurements for Specimen B3414-3 are given in Table 2 and Figure 1.

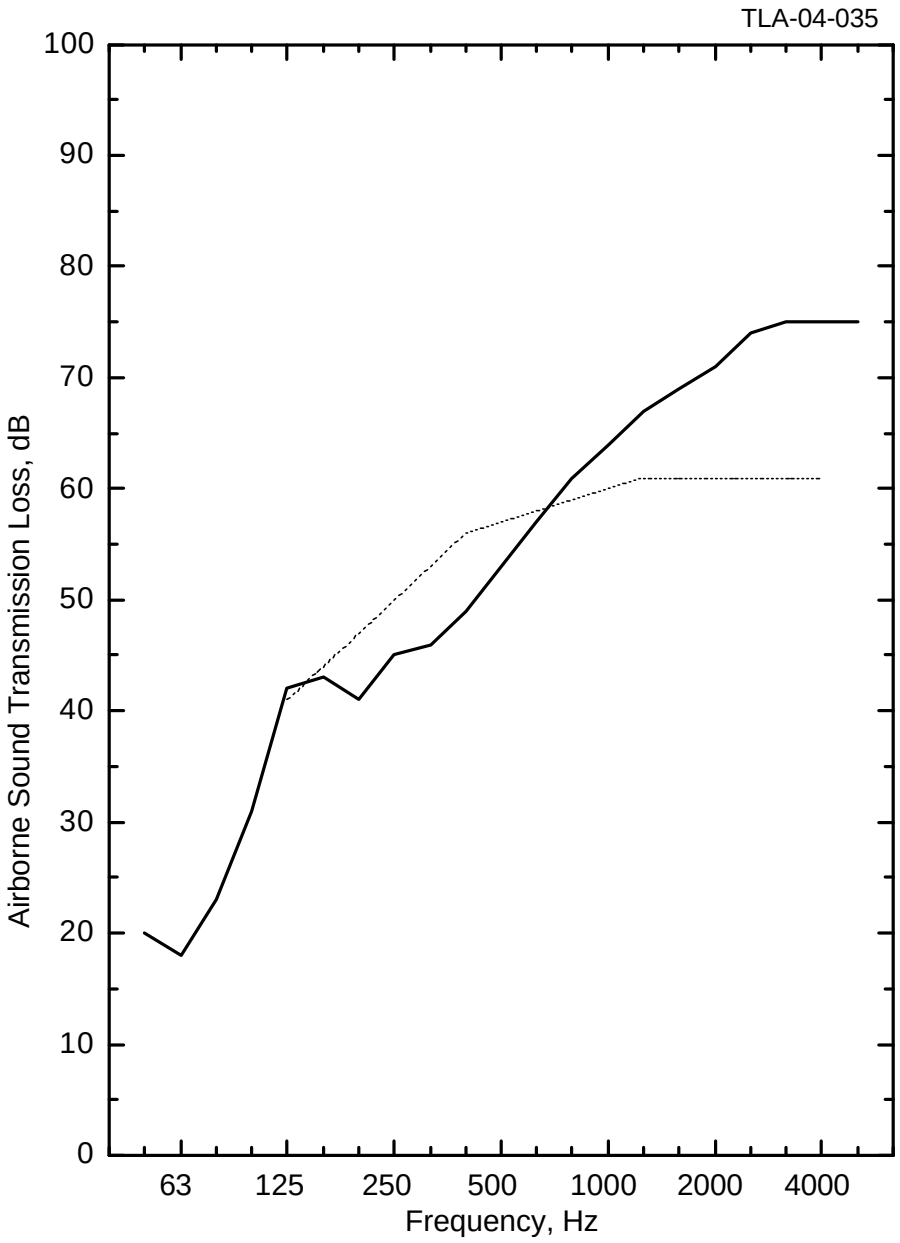
Table 2: Airborne sound transmission loss measurements of Specimen B3414-3, TLA-04-035.

Frequency (Hz)	Airborne Sound Transmission Loss (dB)	95% Confidence Limit[1]	Deviation Below the STC Contour
50	20		
63	18		
80	23		
100	31		
125	42	±2.2	
160	43	±1.6	1
200	41	±1.0	6
250	45	±0.9	5
315	46	±0.7	7
400	49	±0.6	7
500	53	±0.6	4
630	57	±0.5	1
800	61	±0.4	
1000	64	±0.4	
1250	67	±0.3	
1600	69	±0.3	
2000	71	±0.4	
2500	74	±0.5	
3150	75	±0.5	
4000	75	±0.5	
5000	75		
Sound Transmission Class (STC)[2] =57			
Weighted Sound Reduction (R_W)[3] =56			

[1] Acoustical measurement in rooms is a sampling process and as such has associated with it a degree of uncertainty. By using enough microphone and loudspeaker positions, the uncertainty can be reduced and upper and lower limits assigned to the probable error in the measurement. These limits are called 95% confidence limits. They are calculated for each test according to the procedures in ASTM 90 must be less than upper limits given in the standards. These confidence limits do not relate directly to the variation expected when a nominally identical specimen is built, installed and tested (repeatability). Nor do they relate to the differences expected when nominally identical specimens are tested in different laboratories (reproducibility).

[2] Sound Transmission Class (STC) calculated according to ASTM E413.

[3] Weighted Sound Reduction (R_w) calculated according to ISO 717.



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1250	67
1600	69
2000	71
2500	74
3150	75
4000	75
5000	75

STC 57

Figure 1: Airborne sound transmission loss results for Specimen B3414-3. The solid line is the experimental data and the dotted line is the STC 57 contour.

NOTES ON THE SIGNIFICANCE OF TEST RESULTS

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 floor performance. Thus, the rating is intended to correlate with subjective impressions of the sound insulation provided against the sounds of speech, radio, television, music, 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.

Extended Frequency Range

Standard test procedures require measurements in 1/3-octave bands over a specified frequency range (125 to 4000 Hz for ASTM E90). Within those ranges, reproducibility has been assessed by inter-laboratory round robin studies. The standards recommend making measurements and reporting results over a larger frequency range, and this report presents such results, which may be useful for expert evaluation of the specimen performance. The precision of results outside the standard ranges has not been established, and is expected to depend on laboratory-specific factors such as room size and specimen dimensions.

FACILITIES AND EQUIPMENT

The acoustics wall test facility comprises two reverberation rooms with a moveable test frame between the two rooms. One room has a volume of 138 m^3. The volume of the other room is 250 m^3. In this report they are referred to as the small and large chambers, respectively.

Measurements are controlled by a desktop PC-type computer interfaced to a Bruel & Kjaer 2144 real time analyser. Each room has a calibrated Bruel & Kjaer condenser microphone with a type 4166 cartridge that is moved under computer control to nine positions used for the acoustical measurements. Each room has four loudspeakers

driven by separate amplifiers and noise sources. To increase the randomness of the sound field, there are also fixed diffusing panels in each room.

TEST PROCEDURE

Airborne Sound Transmission Loss

Airborne sound transmission measurements were conducted in accordance with the requirements of ASTM E90, "Standard Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions", and of ISO 140-3, "Laboratory Measurement of Airborne Sound Insulation of Building Elements".

The Sound Transmission Class (STC) was determined in accordance with ASTM E413, "Classification for Rating Sound Insulation". The Weighted Sound Reduction Index (R_w) was determined in accordance with ISO 717-1, "Rating of Sound Insulation in Buildings and of Building Elements, Part 1: Airborne Sound Insulation".

One-third octave band sound pressure levels were measured for 32 seconds at nine microphone positions in each room and then averaged to get the average sound pressure level in the room. Five sound decays were averaged to get the reverberation time at each microphone position in the receiving room. These times were averaged to get the average reverberation times for the room.

The average sound pressure levels of both the source and receiving rooms and the average reverberation times of the receiving room were used to calculate sound transmission loss values.

Airborne sound transmission loss tests were performed in the forward (receiving room is the large room) and reverse (receiving room is the small room) directions. Results presented in this report are the average of the tests in these two directions.

A complete description of the test procedure, information on the flanking limit of the facility and reference specimen test results are available on request.