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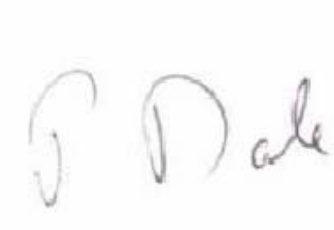
REPORT ON THE DETERMINATION OF AIRBORNE SOUND TRANSMISSION LOSS IN ONE-THIRD OCTAVE BANDS AND WEIGHTED SOUND REDUCTION INDEX (R_w) OF A STEEL STUD WALL WITH 10 MM PLASTERBOARD AND SELECTION 500 CAVITY INSULATION.

Testing Procedure:	AS 1191-2002
Testing Laboratory:	Applied Acoustics Laboratory RMIT University, Applied Physics Melbourne, Victoria 3000, Australia NATA Accreditation Number 1421
Client:	Insulfoam Solutions 68 Pakington Street. Geelong West, Victoria Australia 3218
Date of Test:	9th January 2007
Date of Report:	29th January 2007
Report Number:	121I/07-002/PD
Testing Officer:	Peter Dale



Peter Dale
Approved NATA Signatory

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1. INTRODUCTION

The test described in this report was carried out at the request of Insulfoam Solutions on to determine the airborne sound transmission loss and the weighted sound transmission index of a steel stud wall system with Selection 500 cavity insulation..

The test has been carried out using the pair of sound transmission rooms of the Applied Physics Discipline, RMIT University. The sample under test is mounted in the vertical aperture between a reverberant source room and a reverberant receiving room.

The sound pressure level difference resulting between these two rooms when a sound source operates in the source room is used in conjunction with the surface area of the sample and the equivalent absorption area of the receiving room to determine the airborne sound transmission loss of the sample.

Testing has been carried out in accordance with Australian Standard 1191:2002 - Acoustics: Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions. The weighted sound transmission index (R_w) has been determined as specified in AS/NZS ISO 717.1:2004 – Acoustics: Rating of sound insulation in buildings and of building elements, Part I: Airborne Sound Insulation.

The measuring facilities and method have been accredited by the National Association of Testing Authorities, Australia (NATA) Accreditation No. 1421, and testing has been conducted fully in accordance with those terms of accreditation.

2. TEST FACILITIES

The sound transmission suite consists of a reverberant source room volume of 115.82 cubic metres and a reverberant receiving room of volume 114.73 cubic metres. Both rooms have an irregular geometry featuring a pentagonal floor plan with no two walls parallel, and with non-parallel floors and ceilings. The rooms are constructed of 305mm reinforced concrete, supported on laminated-rubber isolators, and acoustically de-coupled from one another by a 50mm closed cell polyurethane gasket.

The irregular room shape has been chosen to assist in the production of diffuse sound fields. Such diffuseness is further enhanced:

(a) In the receiving room by the inclusion of nine fixed non-rectangular panels, suspended in the room with random orientation. Six panels each have an area of 1.44 square metres and three each have an area of 1.67 square metres. The total one-sided area of these panel diffusers is 13.65 square metres, being 55.7% of that of the largest single boundary surface (the ceiling).

(b) In the source room by inclusion of nine fixed non-rectangular polyvinyl chloride panels suspended in the room with random orientation. Four panels each have an area 1.86 square metres, the other five each have an area 1.24 square metres. The total one-sided area of these panel diffusers is 13.64 square metres, being 56.5% of that of the largest single boundary surfaces (the ceiling).

The average sound absorption coefficient of the diffusers and the internal surfaces of the rooms is below 0.06 in each test frequency band.

3. EQUIPMENT

The equipment used in performing this test is listed below.

Lap Top Computer	Manuf. By Dell: 1.6GHz Intel Pentium, 591MHz - 1.00GB RAM S/N: X10-60264
Pulse LabShop Version 10 Software	Bruel & Kjaer
Pulse Hardware Interface	Bruel & Kjaer Type 3560B-030 S/N: 2463302
Measuring Amplifier	Bruel & Kjaer Type 2610 S/N 1646952
Microphone 1	Bruel & Kjaer Type 4192 S/N 2114482
Microphone 2	Bruel & Kjaer Type 4192 S/N 2114481
Microphone 3	Bruel & Kjaer Type 4192 S/N 2493521
Microphone 4	Bruel & Kjaer Type 4192 S/N 2493522
Microphone Preamplifier 1	GRAS Type 26AK S/N 21137
Microphone Preamplifier 2	GRAS Type 26AK S/N 44523
Microphone Preamplifier 3	GRAS Type 26AK S/N 19528
Microphone Preamplifier 4	GRAS Type 26AK S/N 19529
Microphone Power Supply 1	Bruel & Kjaer Type 2804 S/N 619032
Microphone Power Supply 2	Bruel & Kjaer Type 2804 S/N 684339
Band-pass Filter Set	Rockland Wavetek Type 852
Amplifier	Yamaha Type AX-500 S/N M48342910
Speakers	Lorantz Audio

4. PROCEDURES

Testing has been conducted in accordance with the methods of AS1191:2002 – Acoustics: Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.

Random noise is fed to a single loudspeaker placed in a corner of the source room. In each one-third octave band of centre frequency 100Hz to 5000Hz, the mean sound pressure level in each room is found by the use of microphones connected to a Bruel & Kjaer Pulse Analyser. Eight independent locations of the microphone are used in each room, with the signals temporally averaged for the sampling time of 64 seconds.

The equivalent absorption area of the receiving room is determined by measurement of the reverberation time in each one-third octave band. A loudspeaker is placed in one corner of the receiving room and 10 decays are obtained at each of the eight microphone positions, between 100Hz and 5000Hz. The microphone signal is relayed via a microphone amplifier, to the Bruel & Kjaer Pulse Analyser. The analyser is interfaced to a personal computer. A program running on the personal computer allows the determination of the reverberation time from the sound decays in accordance with AS ISO 354:2006 - Acoustics: Measurements of Sound Absorption in a Room.

The measuring equipment has been calibrated by an external accredited calibration laboratory, and is in current calibration.

5. SAMPLE DECRIPTION

The sample tested comprised of a 90mm steel frame comprising steel top and bottom plate with 90mm steel studs at 600mm centres. One side of the wall was sheeted with 10mm standard plasterboard and screw fixed to the Steel frame.

Selection 500 was then applied to the cavity of the wall. The thickness of the foam was between 65mm and 90mm. A second sheet of 10mm standard core plasterboard was then installed on the second face of the wall. The plasterboard was installed horizontally and the joins were staggered on either side of the wall. The plasterboard junctions were stopped with jointing compound and the perimeter on both faces of the wall were sealed with a flexible mastic.
The estimated surface density of the sample (excluding framing) is 13kg/m^2.

The sample was tested mounted into the vertical aperture of the RMIT Transmission Suite giving a total area of sample of 10.69m^2.

6. RESULTS

The measured airborne sound transmission loss, R dB, at each one-third octave bandwidth of centre frequencies between 100Hz – 5000Hz is given in tabular form to the nearest decibel. The Weighted Sound Reduction Index (R_w) reference curve, in each one-third octave bandwidth of centre frequencies between 100Hz and 3150Hz are expressed in tabular form and are also represented graphically for the sample tested. There are no significant errors in transmission loss values due to flanking transmission, filler wall or background noise. The Weighted Sound Reduction Index of the sample is determined in accordance with AS/NZS ISO 717.1-2004.

The precision in the results is expressed as the 95% confidence interval in the determined sound transmission loss. The K value used to determine the 95% confidence interval is 2.361. This interval is estimated from the 95% confidence interval in each of the average source room level, the average receiving room level and the receiving room absorption/surface area of sample. These values are included in the table of results.

6.1 Sample - Test Conditions

Temperature:	Receive Room	: 24.0^{0}C.
	Send Room	: 24.0 ^{0}C.
Humidity:	Receive Room	: 40%.
	Send Room	: 40%.
Room Volumes:	Receive room	: 116.17 m^3.
	Source room	: 120.01 m^3.
Sample Surface Area:	10.69 m^2	

6.2 Sound Transmission Loss Results and Weighted Sound Reduction Index R_w:

The Weighted Sound Reduction Index of the test sample is: R_w ($C;C_{tr}$) = 40(-2;-7 dB).

Based on laboratory measurements. Rating determined in accordance with AS/NZS ISO 717.1-2004

Table I: Table of results for 10mm plasterboard wall with a steel stud frame and Selection 500 cavity insulation.

1/3 Octave Centre Frequency Hz	Sound Transmission Loss : R dB	R_w 40 Reference Curve	95% Confidence levels, dB.
100	21.3	21	3.0
125	21.1	24	1.5
160	20.8	27	2.0
200	23.0	30	1.7
250	27.8	33	1.1
315	32.4	36	1.1
400	36.3	39	0.8
500	41.0	40	0.7
630	45.3	41	0.7
800	47.5	42	0.6
1000	49.5	43	0.5
1250	52.3	44	0.4
1600	55.6	44	0.5
2000	56.4	44	0.5
2500	47.1	44	0.5
3150	43.5	44	0.5
4000	48.5	-	0.5
5000	51.3	-	0.4

Chart I: Graph of results for 10mm plasterboard wall with a steel stud frame and Selection 500 cavity insulation.