AIRO

Report No. L/3194 Page 1 of 8

for
EA Mimarlik Insaat Teknolojileri San.ve. Tic.Ltd.Sti
1420/3 Sokak NO. 22 Kizilkanat Silesi D Blok D.12
Alsancak
Izmir
Turkey

Dated: 18 July 2011

LABORATORY MEASUREMENTS

OF THE

REDUCTION OF TRANSMITTED

IMPACT NOISE

BY

PANETTI

OVERLAID BY

CONCRETE FLOORING

Report Author: M Sawyer MIOA

ACOUSTICAL INVESTIGATION & RESEARCH ORGANISATION LTD

Duxons Turn
Maylands Avenue
Hemel Hempstead
Hertfordshire
HP2 4SB
Telephone: 01442 247146

UKAS TESTING
0483

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1. INTRODUCTION

This report presents the results of measurements made in the AIRO Acoustics Laboratory of the reduction of transmitted impact noise by 5 mm and 8 mm thick Panetti when overlaid by concrete flooring.

The measurements were made on 6 July 2011 for EA Mimarlik Insaat Teknolojileri San.ve. Tic.Ltd.Sti.

Measurements of the reduction of transmitted impact noise, Reduction of Impact Sound Pressure Level (ΔL), were conducted in accordance with British Standard BS EN ISO 140 (ref 1) (see Appendix A1). Single figure ratings of the reduction of impact noise, known as the Weighted Reduction of Impact Sound Pressure Level (ΔL_w) and the Spectrum Adaptation Term ($C_{I,\Delta}$), are derived from these measurements in accordance with British Standard BS EN ISO 717 (ref 2).

AIRO is a UKAS accredited testing laboratory No. 0483 and measurements to the above British Standards are included on our schedule of accreditation. UKAS is the United Kingdom Accreditation Service.

2. SUMMARY OF RESULTS

The results of the measurements presented in this report are summarised in the following table:

AIRO Test No.	Test Specimen	ΔL_w dB
L/3194/1	5 mm Panetti overlaid by concrete flooring	21
L/3194/2	8 mm Panetti overlaid by concrete flooring	22

Approved by:

D L Watts

Eur Ing D L Watts BEng CEng FIOA
Principal Consultant

Report Author:

M Sawyer

M Sawyer MIOA
Laboratory Supervisor

3. TEST SPECIMEN DETAILS AND CONDITIONS

3.1 5 mm Panetti overlaid by concrete flooring

AIRO Test No. L/3194/1

The test specimen comprised 5 mm thick Panetti polyethylene-based polymeric foam (100 kg/m³) which was supplied as a 1250 mm wide roll and laid with tightly butted edges to cover the 3.80 m x 3.70 m Standard Floor. The test specimen was overlaid by a 75 mm thick precast concrete slab of area 1.2 m x 1.2 m to simulate a floating screed. The measured mass of the 5 mm Panetti and nominal mass of the precast concrete slab are 0.5 kg/m² and 150 kg/m² respectively.

3.2 8 mm Panetti overlaid by concrete flooring

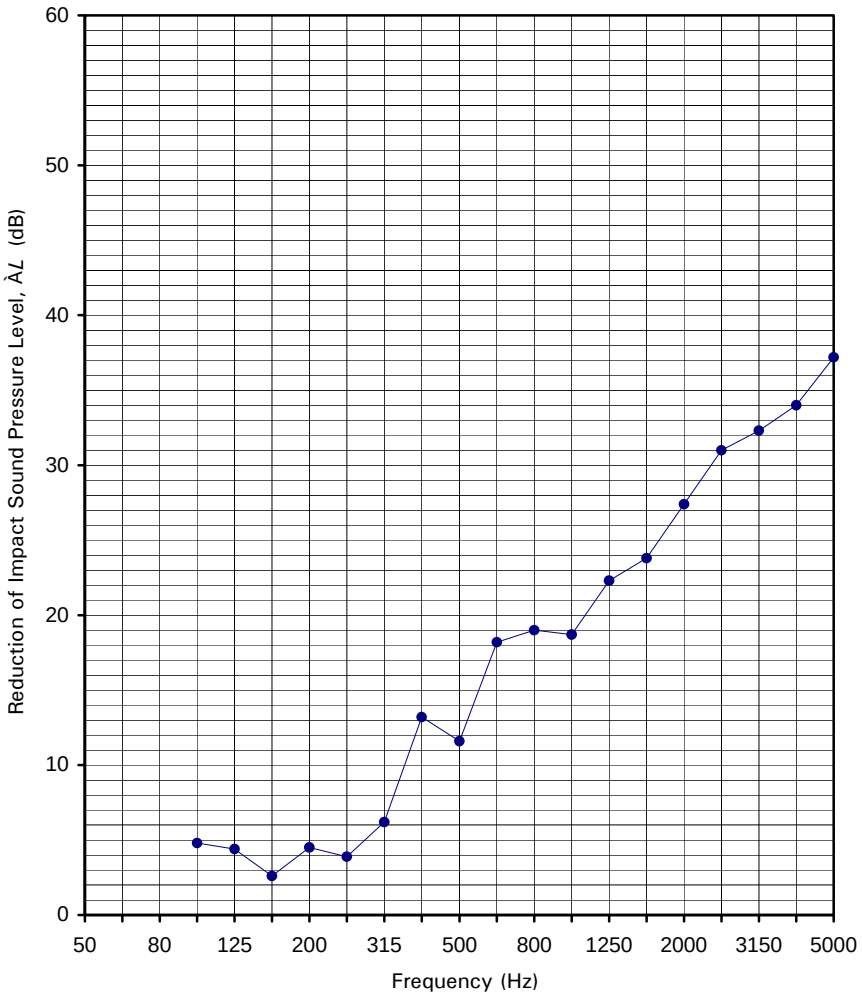
AIRO Test No. L/3194/2

The test specimen comprised 8 mm thick Panetti polyethylene-based polymeric foam (100 kg/m³) which was supplied as a 1250 mm wide roll and laid with tightly butted edges to cover the 3.80 m x 3.70 m Standard Floor. The test specimen was overlaid by a 75 mm thick precast concrete slab of area 1.2 m x 1.2 m to simulate a floating screed. The measured mass of the 8 mm Panetti and nominal mass of the precast concrete slab are 0.8 kg/m² and 150 kg/m² respectively.

Reduction of Impact Sound Pressure Level according to BS EN ISO 140-8:1998

Test No. L/3194/1 Date of Test: 6 July 2011
Client: EA Mimarlik Insaat Teknolojileri San.ve. Tic.Ltd.Sti.
Specimen: 5 mm Panetti overlaid by concrete flooring
Installed by: AIRO
Receive Chamber volume: 208 m³
Source Chamber air temperature: 22°C
Source Chamber relative humidity: 80% Mass per unit area: 0.5 kg/m²

Frequency (Hz)	ÀL (dB)	$L_{n,0}$ (dB)
50		
63		
80		
100	4.8	62.4
125	4.4	66.5
160	2.6	66.9
200	4.5	70.1
250	3.9	70.5
315	6.2	71.8
400	13.2	70.8
500	11.6	74.1
630	18.2	73.1
800	19.0	73.8
1000	18.7	74.2
1250	22.3	74.8
1600	23.8	75.4
2000	27.4	75.7
2500	31.0	76.0
3150	32.3	75.3
4000	34.0	74.2
5000	37.2	72.1
6300		
8000		
10000		



Measured result

Rating according to BS EN ISO 717-2:1997

ΔL_w = **21 dB** $C_{I,\Delta}$ = **-11 dB**

$L_{n,r,0,w}$ = 78 dB $C_{I,r,0}$ = -11 dB
$L_{n,r,w}$ = 57 dB $C_{I,r}$ = 0 dB

These results are based on test made with an artificial source under laboratory conditions (engineering method)

Approved by:

D L Watts

Eur Ing D L Watts BEng CEng FIOA
Principal Consultant

Report Author:

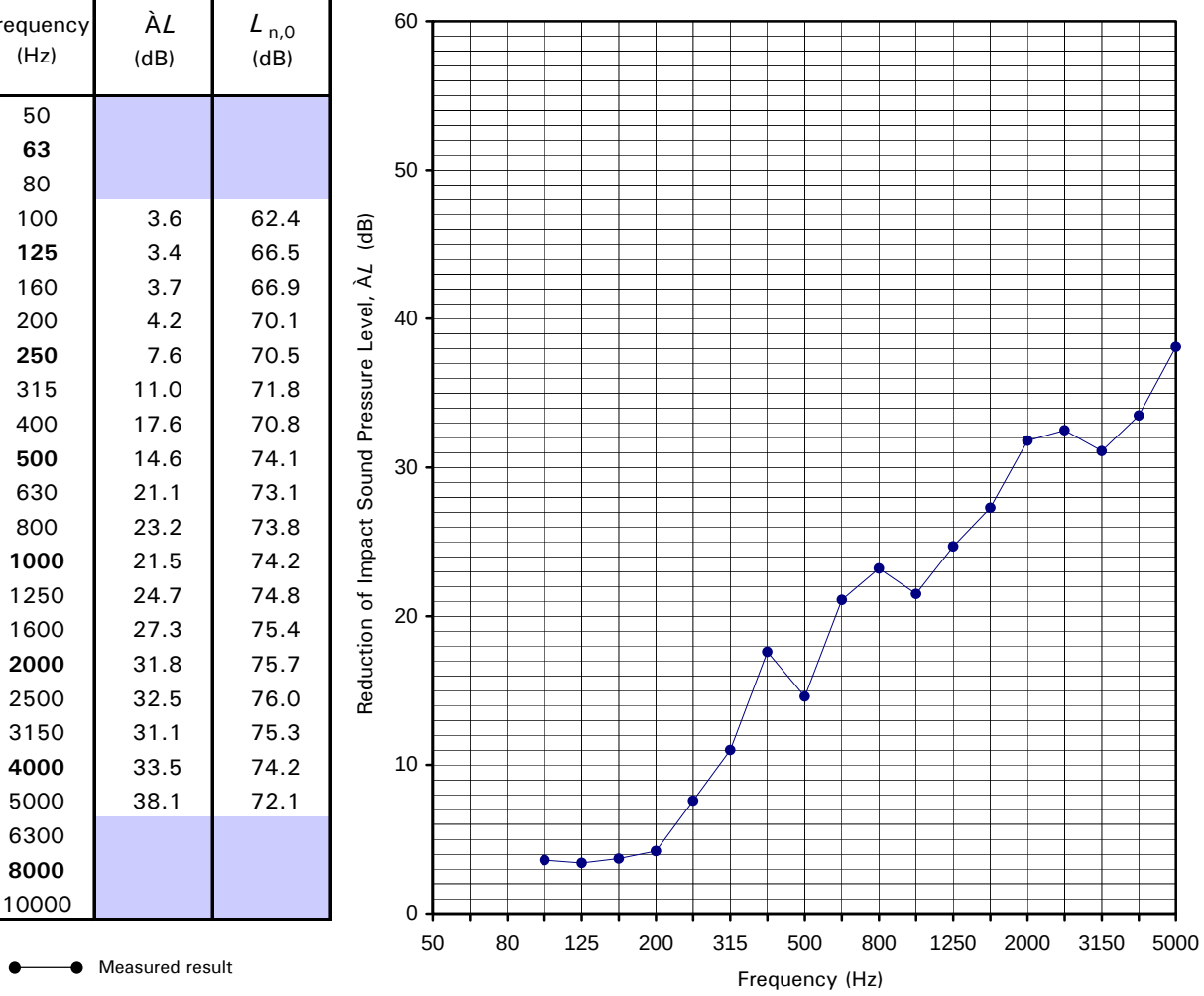
M Sawyer

M Sawyer MIOA
Laboratory Supervisor

Reduction of Impact Sound Pressure Level according to BS EN ISO 140-8:1998

Test No. L/3194/2 Date of Test: 6 July 2011
Client: EA Mimarlik Insaat Teknolojileri San.ve. Tic.Ltd.Sti.
Specimen: 8 mm Panetti overlaid by concrete flooring
Installed by: AIRO
Receive Chamber volume: 208 m³
Source Chamber air temperature: 22°C
Source Chamber relative humidity: 80% Mass per unit area: 0.8 kg/m²

Frequency (Hz)	ÀL (dB)	$L_{n,0}$ (dB)
50		
63		
80		
100	3.6	62.4
125	3.4	66.5
160	3.7	66.9
200	4.2	70.1
250	7.6	70.5
315	11.0	71.8
400	17.6	70.8
500	14.6	74.1
630	21.1	73.1
800	23.2	73.8
1000	21.5	74.2
1250	24.7	74.8
1600	27.3	75.4
2000	31.8	75.7
2500	32.5	76.0
3150	31.1	75.3
4000	33.5	74.2
5000	38.1	72.1
6300		
8000		
10000		



Rating according to BS EN ISO 717-2:1997

ΔL_w = **22 dB** $C_{I,\Delta}$ = **-11 dB**

$L_{n,r,0,w}$ = 78 dB $C_{I,r,0}$ = -11 dB
$L_{n,r,w}$ = 56 dB $C_{I,r}$ = 0 dB

These results are based on test made with an artificial source under laboratory conditions (engineering method)

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APPENDIX A1 - METHOD OF MEASUREMENT TO BS EN ISO 140-8:1998

The reduction of impact noise due to a floor covering is measured by use of an artificial source of impact sound, known as a tapping machine, which has a mass of approximately 18 kg and is supported on three legs.

A Standard Floor comprising 150 mm thick reinforced concrete and area 11.2 square metres when viewed from the underside is suspended in an aperture between two vertically adjacent reverberant chambers, both constructed of 215 mm brick with reinforced concrete floors and ceilings. The lower chamber, used as the receiving chamber, rests on resilient mountings to give good acoustic isolation from the source chamber above it and the building exterior. To improve the diffusion of the sound fields both chambers are irregularly shaped and contain several reflecting diffuser panels.

A standard tapping machine is used as the impact source which is located sequentially in five positions over the floor. Measurements are made in the receiving chamber at the one-third octave intervals from 100 Hz to 5000 Hz as prescribed in the Standard (ref 1). The measurements are made with a microphone attached to a rotating microphone boom to obtain a good average of the transmitted sound pressure levels. The process is carried out with the tapping machine placed on the floor covering over the Standard Floor and also in the absence of the floor covering. Measurements are also made of the noise level in the absence of the tapping machine in order that corrections for background noise may be made if appropriate.

The Normalized Impact Sound Pressure Level (NISPL) in decibels (dB) is calculated in each frequency band using the equation:

$$L_{n,0} \text{ or } L_n = L_i + 10 \lg \frac{A}{A_0} \qquad \text{dB} \qquad \text{Equation (i)}$$

where: $L_{n,0}$ is the NISPL of the Standard Floor (dB)

L_n is the NISPL of the sample on the Standard Floor (dB)

L_i is the measured sound pressure level in the receiving chamber (dB re 20μPa)

A is the equivalent absorption area in the receiving chamber (m²)

A_0 is the reference absorption areas, equal to 10 m²

The equivalent absorption area in the receiving chamber is determined from twelve sets of reverberation time measurements using a microphone connected to a rotating microphone boom. The measurements are made in accordance with International Standard ISO 354:2003 (ref 3) and the value of 'A' determined using Sabine's formula:

$$A = \frac{0.16\,V}{T} \qquad \text{m}^2 \qquad \text{Equation (ii)}$$

where: V is the volume of the receiving chamber (m³)

T is the reverberation time of the receiving chamber (seconds)

The Reduction of Impact Sound Pressure Level (RISPL) is then:

$$\Delta L = L_{n,0} - L_n \quad \text{dB} \quad \text{Equation (iii)}$$

To obtain a repeatable single figure rating of the sample's performance, the method prescribed in BS EN ISO 717-2:1997 is followed. This method applies the measured RISPL figures to a set of specified NISPL figures for an idealized 'Reference Floor' in order that the Weighted Reduction of Impact Sound Pressure Level (ΔL_w) in decibels (dB) and the related Spectrum Adaptation Term ($C_{I,\Delta}$), also in decibels, may be calculated.

The calibration of all equipment is traceable via an unbroken chain to National Standards.

Deviations from BS EN ISO 140-8:1998 Methodology

BS EN ISO 140-8:1998 requires that the resilient layer and concrete floating floor should cover the entire area, or at least 10 m², of the Standard Floor. For this project a 75 mm thick precast concrete slab of area 1.2 m x 1.2 m was laid over the resilient layer which covered the entire area of the Standard Floor. Measurements were made using 5 tapping machine positions on the precast slab which was moved across the resilient layer and Standard Floor in order that a good average may be obtained.

APPENDIX A2 - PRACTICAL APPLICATION OF TEST RESULTS

It should be noted that the Weighted Reduction of Impact Sound Pressure Level (ΔL_w) is a property of the floor covering alone and is obtained by comparing Reductions of Impact Sound Pressure Level (ΔL) measured on a heavy concrete floor with the performance of the idealized Reference Floor. In buildings, when the floor covering forms part of a floor the resultant transmitted impact sound will depend upon the performance of the base floor and additional factors such as the relative surface areas involved and the nature and acoustic characteristics of the receiving space.

APPENDIX A3 - REFERENCES

1. British Standard BS EN ISO 140
   Acoustics - Measurement of sound insulation in buildings and of building elements

   BS EN ISO 140-8:1998
   Laboratory measurements of the reduction of transmitted impact noise by floor coverings on a heavyweight standard floor

2. British Standard BS EN ISO 717
   Acoustics - Rating of sound insulation in buildings and of building elements

   BS EN ISO 717-1:1997
   Impact sound insulation

3. International Standard ISO 354:2003
   Acoustics - Measurement of sound absorption in a reverberation room

APPENDIX A4 - SCHEDULE OF EQUIPMENT

Use	Type	Serial No.
Noise Source	B&K 3204 Tapping Machine	351719
Measuring System	Norsonic 840 Real Time Analyzer	16009
	B&K 4165 ½" Condenser Microphone	1471398
	B&K 2669 Microphone Pre-Amplifier	1856926
	NEAS 212 Rotating Microphone Boom	12172
Calibration	B&K 4228 Pistonphone	1756569