

Customer Details: Reflex Mouldings Ltd
33 Fairgreen Road
Markethill
Co Armagh
BT60 1PW

For the attention of: Rhonda Russell

Technical Report

Subject: Impact Noise Reduction
Your Ref: Homestyle
Our Ref: FLO 0175268/0923/AS/SLM
Date: 10th June 2009

Conditions of Issue:

This report may be forwarded to other parties provided that it is not changed in any way. It must not be published, for example by including it in advertisements, without the prior, written permission of SATRA.

Results given in this report refer only to the samples submitted for analysis and tested by SATRA. Comments are for guidance only.

Tests marked † fall outside the UKAS Accreditation Schedule for SATRA. All interpretations of results of such tests and the comments based upon them are outside the scope of UKAS accreditation and are based on current SATRA knowledge.

A satisfactory test report in no way implies that the product tested is approved by SATRA and no warranty is given as to the performance of the product tested. SATRA shall not be liable for any subsequent loss or damage incurred by the client as a result of information supplied in the report.

Report signed by: Sarah Morris
Position: Floorcoverings Technologist
Department: Floorcoverings



THE LABORATORY DETERMINATION OF THE REDUCTION OF TRANSMITTED IMPACT NOISE (SOUND ABSORPTION)

As requested by Reflex Mouldings Ltd, an assessment to determine the reduction of transmitted impact noise (Sound Absorption) of the polyvinyl chloride interlocking floor tile submitted has been undertaken, as detailed below.

SAMPLE SUBMITTED

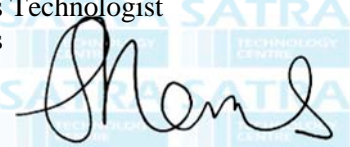
Sample reference:	Homestyle
Description:	Homogeneous polyvinyl chloride interlocking floor tile (Flexi tile)
Colour:	Navy Blue *
Finish:	Slate *
Thickness:	5mm *
Batch no:	26212 CT/15 *
Dimensions:	450mm x 450mm
Sampling plan:	Enough for testing only
Sample condition:	New
Sample installed by:	SRL Laboratory
Appearance:	



Intended application:	Commercial/Contract/Industrial use
Date received:	1 st June 2009
Date conditioned:	2 nd June 2009
Test date:	3 rd June 2009
Testing conducted by:	A Smalls ⁽¹⁾

Note:

* Information as stipulated by the client.



TESTS CARRIED OUT

- BS EN ISO 140-8: 1998 Laboratory measurements of the reduction of transmitted impact noise by floor coverings on a heavyweight standard floor ⁽¹⁾⁽²⁾
- BS EN ISO 717-2: 1997 Rating of sound insulation in buildings and of building elements – Impact Sound Insulation ⁽¹⁾⁽²⁾

Note:

- (1) Work subcontracted under UKAS accreditation to SATRA approved laboratory (SRL Ltd).
- (2) The sample was mounted / located and tested in accordance with the relevant standard. The method and procedure is described in Appendix 1.
- (3) The measurement uncertainty is given in Appendix 2.

RESULTS

Under the instruction and guidance of SATRA Technology Centre, tests have been done in SRL's Laboratory at Holbrook House, Sudbury, to determine the reduction of transmitted impact noise of a polyvinyl chloride interlocking floor tile, in accordance with BS EN ISO 140-8: 1998.

From the measurements the required results have been derived and are presented in both tabular and graphic form in Data sheet 1 and summarized below. The results are given in 1/3rd octave bands over the frequency range 100Hz to 5 kHz.

Test Number	Sample Description	ΔL_w
A3	Homestyle (PVC interlocking floor tile)	16

Instrumentation and Apparatus Used

Make	Description	Type
EDI	Microphone Multiplexer Microphone power supply unit	
Norwegian Electronics	Tapping Machine Real Time Analyser	211 830
Brüel & Kjaer	12mm Condenser microphones Windshields Pre Amplifiers Microphone Calibrator Sound level Meter	4166 UA0237 2639, 2669C 4231 2260
Larson Davis	12 mm Condenser microphone	2560
SRL	Power Amplifiers	
Celestion	Loudspeakers	100w
Thermo Hygro	Temperature and humidity Probe	
TOA	Graphic Equalizer	E-1231

Data Sheet 1

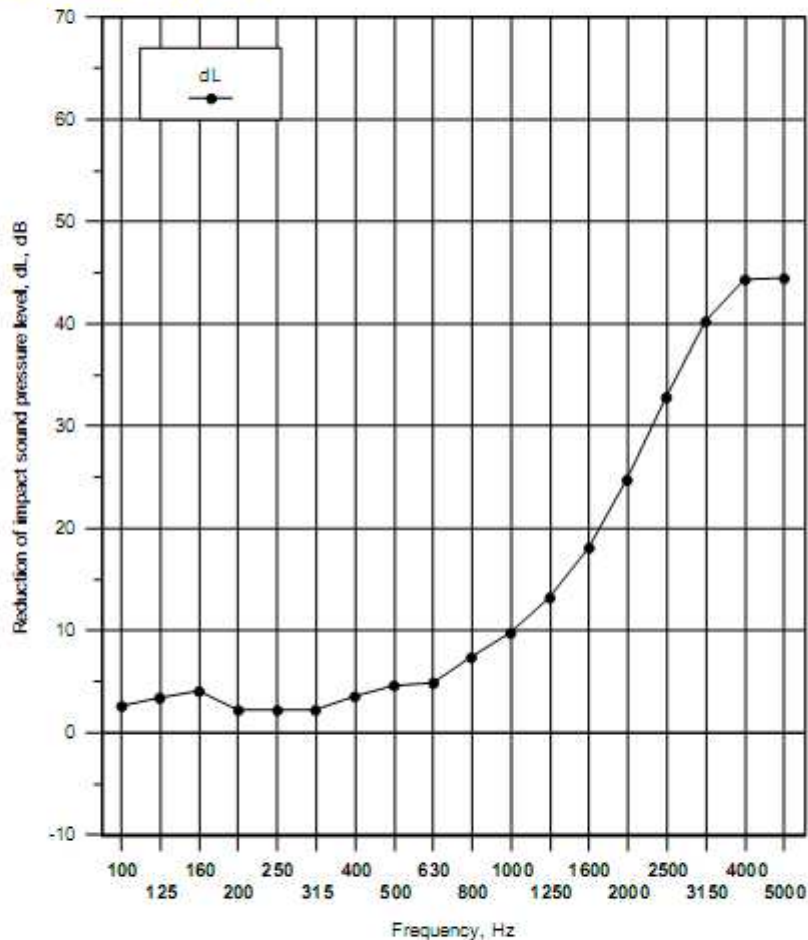
Reduction of impact sound pressure level according to BS EN ISO 140-8 : 1998

Laboratory measurements of the reduction of transmitted impact noise by floor coverings on a heavyweight standard floor

Test Number:	A3	Air temp. in the source room:	21.1 deg.C
Test Date:	03/06/2009	Air humidity in the source room:	43 %
Client:	SATRA	Receiving room volume:	300 m3
Method of mounting:	Loose laid	Sample mass:	6.8 kg/m2
		Thickness:	6 mm
		The sample did not suffer visible damage during the test	

Production identification: PVC interlocking floor tiles - Trade name : Homestyle
SATRA reference : FLO 0175268

Freq f Hz	Ln,0	dL
	Third octave dB	Third octave dB
100	67.6	2.6
125	69.3	3.4
160	68.8	4.1
200	68.5	2.2
250	69.1	2.3
315	70.8	2.2
400	72.1	3.6
500	71.9	4.7
630	71.7	4.9
800	72.4	7.4
1000	72.7	9.8
1250	73.6	13.3
1600	74.2	18.1
2000	74.9	24.8
2500	75.4	32.9
3150	75.6	40.2
4000	75.1	44.4
5000	72.6	44.5



Ln,0: Is the normalised impact sound pressure level of the bare heavyweight test floor.
dL: Is the reduction of impact sound pressure level resulting from the installation of the test floor covering.
* Denotes results corrected for background # Denotes results at background

Rating according to BS EN ISO 717-2:1997

Weighted reduction of impact sound pressure level of sample and (spectrum adaptation term) =	dLw (Cid) = 18 (-10) dB
Weighted normalised impact sound pressure level of bare reference floor and (spectrum adaptation term) =	Ln,r,D,w (C1,r,D) = 78 (-11) dB
Weighted normalised impact sound pressure level of reference floor with sample and (spectrum adaptation term) =	Ln,r,w (C1,r) = 62 (+1) dB

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

v1.2

Appendix 1 - Test Procedure

Measurement of impact sound reduction of a floor covering in accordance with BS EN ISO 140-8: 1998 – Category 1 (Small Samples) – TP13

In the laboratory, impact sound reduction is determined from the difference a sample floor covering makes to the sound pressure levels generated by a standard impact machine. The impact machine, known as a tapping machine, is operated standing first on a concrete slab and then on the test sample installed on that slab. The test sample is installed on top of the roof of a reverberation room, which is acoustically “live”, and the sound pressure levels are measured in that room. The test is done under conditions which restrict the transmission of sound other than directly through the sample and test slab. The measured sound pressure levels are corrected for the amount of sound absorption in the reverberation room.

The reverberation room, which has a volume of 300 cubic metres, is constructed from 215mm brick which is internally plastered with a reinforced concrete roof and floor. The room is isolated from the surrounding structure by resilient mountings and seals, ensuring good acoustic isolation. Reverberation time measurements are done to calibrate the reverberation room.

At least three test samples are installed in predetermined positions. The tapping machine is placed in turn immediately either side of the first test sample/position and operated on the bare concrete roof slab. With the tapping machine operating on the bare slab, the resulting sound pressure levels in the room are sampled using a spaced array of microphones connected to a real time analyser. The signal is filtered into one-third octave bandwidths, integrated and averaged. Six microphones are used with minimum separating distances as follows:

- 0.7m between microphone positions
- 0.7m between any microphone position and room boundaries or diffusers
- 1.0m between any microphone position and the upper floor being excited by the tapping machine

The procedure is then repeated on the bare concrete slab immediately either side of each of the other sample positions. The individual values for the different positions are arithmetically averaged to give the impact sound pressure level ($L_{i,o}$). This is corrected to a reference room absorption, referred to as normalising, to give the normalised impact sound pressure levels ($L_{n,o}$) for the bare concrete slab.

$$L_{n,o} = L_{i,o} + 10 \log \frac{A}{A_{ref}} \quad \text{in decibels}$$

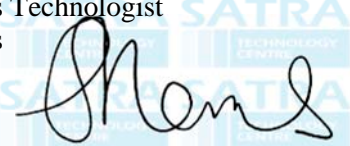
Where A is the actual absorption of the test chamber A_{ref} is the reference room absorption of 10m^2 .

The whole procedure is then repeated in turn on each of the samples to obtain the normalised impact sound pressure levels with covering (L_i) and the corresponding normalised levels (L_n).

The reduction of impact sound pressure level (improvement of impact sound insulation) ΔL , for a given frequency band is determined as follows:

$$\Delta L = L_{n0} - L_n$$

The weighted Impact Sound Improvement Index ΔL_w , is a single figure rating of impact sound reduction and is calculated in accordance with BS EN ISO 717-2: 1997.



The impact sound pressure levels for the test floor with test sample depend to small extent on the particular test floor itself. To standardise these levels they are adjusted by calculation to what they would be if the bare concrete slab were replaced by a reference floor. The impact sound pressure levels that would be produced on the bare reference floor ($L_{n,o}$) are defined in BS EN ISO 717-2: 1997. Using these, the impact sound pressure levels for the sample on the reference floor ($L_{n,r}$) and the corresponding weighted level ($L_{n,w,r}$) are calculated in accordance with the same standard.

Appendix 2 – Measurement Uncertainty BS EN ISO 140-8: 1998 – TP13

The following values of uncertainty are based on the standard uncertainty multiplied by a coverage factor of $k=2$, which provides a level of confidence of approximately 95%.

Frequency, Hz	Uncertainty, \pm dB
100	1
125	1
160	1
200	1
250	1
315	0.7
400	0.7
500	0.7
630	0.7
800	1
1000	1
1250	1
1600	1.2
2000	1.8
2500	1.8
3150	1.8

TERMS AND CONDITIONS OF BUSINESS:

1. **GENERAL**
Work done or services undertaken are subject to the terms and conditions detailed below and all other conditions, warranties and representations, expressed or implied are hereby excluded.
2. **PRICES**
Prices are based on current material and production costs, exchange rates, duty and freight and are subject to change without notice.
3. **DELIVERY ESTIMATES**
Delivery estimates are made in good faith and date from receipt of a written order and full information to enable us to proceed. While we make every effort to fulfil them, such estimates are subject to unforeseen events and if not maintained, cannot give rise to any claim. Offers "ex stock" are subject to prior sale.
4. **CANCELLATION AND RETURNS**
Cancellation of orders for goods, services, training or consultancy is only acceptable by prior agreement of SATRA or its subsidiaries (hereafter referred to as "SATRA") and a charge will normally be made.
5. **CLAIMS**
Claims for errors, shortages etc should be notified within 10 days of date of receipt. In the event of goods damaged in transit, packing materials should be retained for examination; otherwise no liability can be accepted.
6. **PAYMENT TERMS**
Payment terms are net 21 days from date of invoice. Failure to comply with the terms of payment may result in delayed delivery of goods and services and a review of your credit account. Should the customer become subject to an administration order, or becomes bankrupt or goes into liquidation, SATRA has a right to cancel any contract and discontinue any work. SATRA reserves the right to adjust US Dollar and Euro sales price where customer exceeds credit terms and where the exchange rate has moved more than 10% since invoicing.
7. **RETENTION OF TITLE**
All goods remain the property of SATRA until paid in full. Under no circumstances will a customer's purchase order override our Retention of Title clause. In the case of software, the ownership of the software remains with SATRA. Payment of invoices in full will entitle the customer to use the software under licence until (a) they cease to be a member of SATRA or (b) they cease trading. In both instances, the licence shall then revert to SATRA.
8. **GUARANTEE**
All goods manufactured by SATRA are guaranteed both as regards material and workmanship. Any part returned carriage paid, within twelve months from date of supply and found defective, will be repaired or replaced at our option free of charge. SATRA admits no liability for loss, damage or delay consequent on any defect in any goods supplied by SATRA.
9. **TEST REPORTS**
Results given in test reports refer only to samples submitted for analysis and tested by SATRA. A satisfactory test report in no way implies that the product tested is approved by SATRA and no warranty is given as to the performance of the product tested. SATRA shall not be liable for any subsequent loss or damage incurred by the client as a result of information supplied in a test report.
10. **RESPONSIBILITY**
Every effort is made to ensure accuracy in description, drawings and other information in correspondence, catalogues, etc but no warranty is given in this respect and we shall not be liable for any error therein. SATRA carries out all tests and/or advises only on the basis that the same are carried out, made or given without any responsibility whether for negligence or otherwise. SATRA and its servants or agents will not be liable for any damage or loss direct or indirect of whatsoever kind, whether or not the same results directly or indirectly from negligence on the part of SATRA or its servants or agents.
11. **CONFIDENTIALITY**
Unless specifically excluded in the terms of an individual contract between SATRA and its client, the following shall apply to all reports, advice, drawings, photographs, specifications or data:
 - i. The above shall not be disclosed to third parties or used in litigation without the consent of SATRA.
 - ii. Where SATRA has given consent to disclosure, the client shall draw the attention of the third party to these terms of business and the basis on which SATRA undertakes test, reporting and advising. The client shall indemnify SATRA for any failure to do so.
 - iii. The above items are submitted to the client as confidential documents. Confidentiality shall continue to apply after completion of the business, but shall cease to apply to information or knowledge which may come into the public domain.
12. **CONSTRUCTION AND ARBITRATION**
The laws of England shall govern all contracts and the parties submit to exclusive jurisdiction of the courts of England, unless otherwise agreed.