

Test Report:

Laboratory airborne and impact sound insulation of a timber joist separating floor and an internal floor with and without TENMAT downlighter covers and Aspect Lighting downlights

Test report number 213942







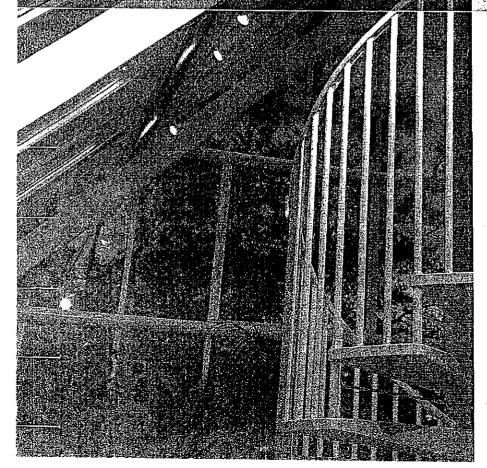


TENMAT LTD

2 September 2003









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1 Introduction

BRE Acoustics was commissioned by TENMAT LTD to carry out airborne and impact sound insulation measurements in the BRE vertical transmission suite (Building 9), BRE, Garston, Watford, Hertfordshire, WD25 9XX.

This report details the testing outlined in BRE proposal 110454.

2 Testing details

2.1 Test dates and personnel

The measurements detailed in this report were made on 31 July 2003, 01 August 2003, 08 August 2003 and 12 August 2003 by Mr M Burdett and Mr J Healey of BRE Acoustics.

2.2 Test method and applicable standards

Measurement of airborne and impact sound insulation was made in accordance with BS EN ISO 140: Part 3 (1995) and BS EN ISO 140: Part 6 (1998). Single number quantities were calculated in accordance with BS EN ISO 717: Part 1 (1997) and BS EN ISO 717: Part 2 (1997).

BRE Acoustics holds UKAS accreditation for the measurement of sound insulation in the field and the laboratory. The measurements were conducted using the procedures accredited by UKAS.





2.3 Instrumentation

The equipment used to conduct the tests is identified in Table 1.

Table 1 Equipment list

Equipment description *	Manufacturer	Туре	UKAS identification number
Real time analyser	NEAS	840	13/003
Microphone calibrator	B&K	4231	01/003
Condenser microphone	B&K	4165	02/011, 02/010
Microphone pre-amplifier	B&K	2619	04/011, 04/012
Graphic equaliser	Phonic	PEQ 3300	10/002
Tapping machine	NEAS	211	11/001
Loudspeaker	B&K	4224	11/008

The gain of the real time analyser was adjusted to give a reading of 94.0 dB at 1 kHz using the B&K type 4231 calibrator.

All equipment is calibrated following BRE procedures, using reference equipment calibrated by a UKAS accredited laboratory.





2.4 Test numbers

Table 2 lists each test element along with its corresponding test number. The construction details for each test element can be found from Table 3 by referring to the test number.

Table 2 Test numbers

Test number	Test element	Source room volume (m³)	Receive room volume (m³)	Common area (m²)
L03_272	Floor	69	58	17.6
L03_273	Floor	58	69	17.6
L03_274	Floor	69	58	17.6
L03_275	Floor	58	69	17.6
L03_278	Floor	69	59	17.6
L03_279	Floor	59	69	17.6
L03_280	Floor	69	59	17.6
L03_281	Floor	59	69	17,6





2.5 Construction details with test numbers

The construction details are shown in Table 3.

Table 3 Construction details

Test element	Test number	Construction details
Separating floor	L03_272 L03_273	 1 x 18 mm Nexfor tongue and groove Caberboard (12.4 kg/m²), joints taped and perimeter sealed, bonded with Lafarge adhesive dabs to 1 x 15 mm Lafarge dBcheck plasterboard (13 kg/m²), laid on 20 mm Rockfloor (150 kg/m³), laid on 30 mm Rockfloor (175 kg/m³), laid on 1 x 15 mm Smartply OSB (9 kg/m²), screwed to timber joists (50 mm x 200 mm) at 400 mm centres 2 x 50 mm Rockwool Flexi (38 kg/m³), supported by brackets between joists, HEP RB 565 3000 resilient bars at 400 mm centres 2 x 15 mm Lafarge dBcheck plasterboard (13 kg/m²), perimeter sealed, joints taped and filled
Separating floor with downlights	L03_274 L03_275	 1 x 18 mm Nexfor tongue and groove Caberboard (12.4 kg/m²), joints taped and perimeter sealed, bonded with Lafarge adhesive dabs to 1 x 15 mm Lafarge dBcheck plasterboard (13 kg/m²), laid on 20 mm Rockfloor (150 kg/m³), laid on 30 mm Rockfloor (175 kg/m³), laid on 1 x 15 mm Smartply OSB (9 kg/m²), screwed to timber joists (50 mm x 200 mm) at 400 mm centres 2 x 50 mm Rockwool Flexi (38 kg/m³), between joists, supported by brackets HEP RB 565 3000 resilient bars at 400 mm centres 2 x 15 mm Lafarge dBcheck plasterboard (13 kg/m²), perimeter sealed, joints taped and filled 9 x Aspect Lighting fixed halogen downlights and TENMAT downlighter covers FF109 (150 mm diameter, 150 mm height), each fitted in 60 mm diameter holes in plasterboard
Internal floor	L03_278 L03_279	1 x 22 mm Nexfor tongue and groove Caberboard (15 kg/m²), joints taped and perimeter sealed, screwed to timber joists (50 mm x 200 mm) at 600 mm centres with noggings at 1200 mm centres 1 x 12.5 mm Lafarge Echeck plasterboard (10.3 kg/m²), perimeter sealed, joints taped and filled





Internal floor with downlights		1 x 22 mm Nexfor tongue and groove Caberboard (15 kg/m²), joints taped and perimeter sealed, screwed to timber joists (50 mm x 200 mm) at 600 mm centres with noggings at 1200 mm centres 1 x 12.5 mm Lafarge Echeck plasterboard (10.3 kg/m²), perimeter sealed, joints taped and filled 9 x Aspect Lighting fixed halogen downlights and TENMAT downlighter covers FF109 (150 mm diameter, 150 mm height), each fitted in 60 mm diameter holes in plasterboard
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M.	1	Laboratory airborne and impact sound insulation of a timber joist separating floor and an internal floor with and without TENMAT downlighter covers and Aspect Lighting	
Ti di		an internal floor with and without TENMAT downlighter covers and Aspect Lighting downlights	BRE
			10.00

2.6 Sound insulation test results

The single number quantities for the sound insulation tests are shown in Table 4. The UKAS test result sheets are included in the appendices.

Table 4 Test results

Test number	R _w (C;C _{tr}) (dB)	$L_{n,w}(C_i)$ (dB)		
L03_272	66 (-5;-12)	- 14° - 12°		
L03_273		54 (2)		
L03_274	65 (-5;-12)			
L03 275		54 (2)		
L03_278	41 (-2;-7)			
L03_279	. 5 . 5.25	79 (0)		
L03_280	42 (-2:-7)			
L03_281	1. 1. 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	80 (-1)		



7



2.7 Photographs

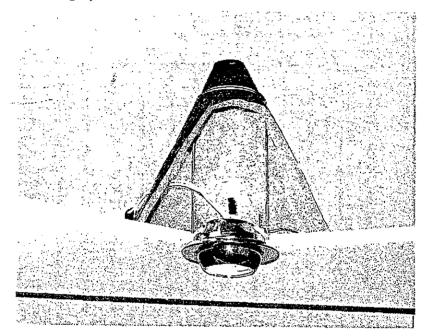


Figure 1: Cut away section of TENMAT FF109 downlighter cover and downlight (Illustration provided by TENMAT Ltd)





2.8 Plans

The joist installations for the separating and internal floors are illustrated in Figures 2 and 3. The ends of the joists rest on the masonry ledge in the laboratory.

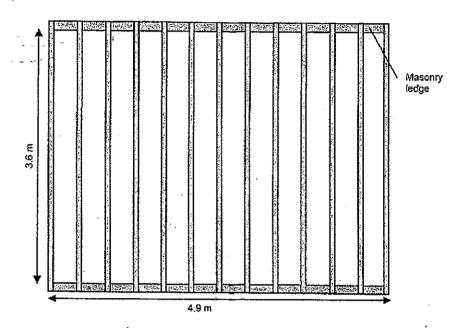


Figure 2: Joists for separating floor at 400 mm centres

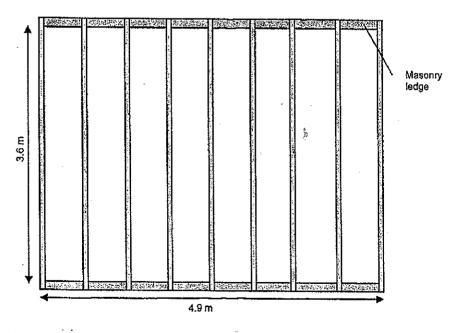


Figure 3: Joists for internal floor at 600 mm centres





3 Appendices

3.1	UKAS test resi	uit sheets

Page nu	ımber -	Test number
13		L03_272
15		L03_273
17		L03_274
19		L03_275
21		L03_278
23		L03_279
25		L03_280
27		L03_281



Laboratory measurement of airborne sound insulation of building elements Sound reduction index according to BS EN ISO 140-3:1995

BRE vertical transmission suite (B9)

Client:

TENMAT LTD

Test date:

31/07/2003

Test number: L03_272

Test element: Floor

Test element area:

17.6 m²

Mass per unit area:

86 kg/m²

0578

Description:

Separating floor (see Table 3 Construction details).

Source room volume: Receive room volume:

69 m³

Air temperature:

22 °C

Air relative humidity:

68 %

	R
Frequency	One-third
(Hz)	octave
	(dB)
50	15.8
63	20.9
80	25.4
100	35.7
125	41.2
160	46.7
200	52.1
250	59.2
315	63.2
400	67.1
500	70.1
630	71.4
800	73.5

1,000

1,250

1,600

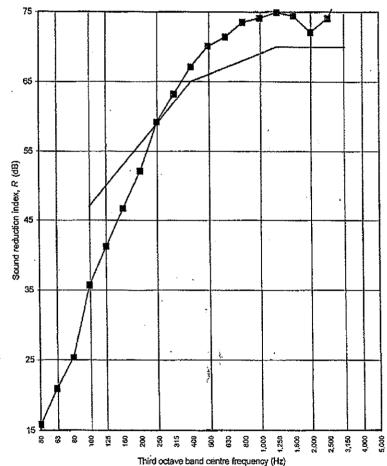
2.000

2,500

3,150

4,000

5,000



+ Receiving room level adjusted for background

74.1

74.9

744

72.1

74.1

79.3

80.7

84.4

Rating according to BS EN ISO 717-1:1997 $R_{w}(C;C_{tr}) = 66 (-5;-12) \text{ dB} \quad C_{50-3150} = -14 \text{ dB} \quad C_{50-5000} = -13 \text{ dB} \quad C_{100-5000} = -4 \text{ dB}$ $C_{tr,50-3150} = -28 \text{ dB} \quad C_{tr,50-5000} = -28 \text{ dB} \quad C_{tr,100-5000} = -12 \text{ dB}$

Evaluation based on laboratory measurement results obtained by an engineering method

Based on the data provided in BS EN 20140-2:1993 it is estimated that the measurement uncertainty should not exceed ±1 dB for the single-number quantity (R_w) and should not exceed the values in Table A1 of BS EN 20140-2:1993 for the data in the individual third octaves (R)





Laboratory measurement of airborne sound insulation of building elements Sound reduction index according to BS EN ISO 140-3:1995 BRE vertical transmission suite (B9)

Client:

TENMAT LTD

Test date:

31/07/2003

Test number; L03_272

Test element: Floor

Test element area:

17.6 m²

Mass per unit area:

86 kg/m²

0578

Description:

Separating floor (see Table 3 Construction details).

Source room volume:

69 m³

Air temperature:

22 °C

Receive room volume:

58 m³

Air relative humidity:

68 %

Frequency	Reverberation	Background	Source	Receive	R
	time	level	level	levei	
(Hz)	(s)	(dB)	(dB)	(dB)	(dB)
50	0.61	14.6	76.5	61.4	15.8
63	0.83	15.9	77.6	58.7	20.9
80	1.14	9.6	83.2	61.1	25.4
100	1,27	8.2	90.1	58.3	35.7
125	1,47	7.1	94.5	57.8	41.2
160	1.62	6.6	96.9	55.0	46.7
200	1.82	6.1	95.9	49.2	52.1
250	2.11	6.6	96.6	43.4	59.2
315	1.98	6.2	98.8	41.4	63.2
400	1.96	4.5	100.3	38.9	67.1
500	1.85	4.0	1 01.8	37,1	70.1
630	1.64	3.7	101.5	35.0	71.4
800	1.53	3.7	100.6	31.7	73.5
1,000	1.51	3.8	98.2	28.7	74.1
1,250	1.52	4.2	, 98.6	28.3	74.9
1,600	1.48	4.6	100.4	30.6	74.4
2,000	1.33	5.0	103.2	35.1	72.1
2,500	1.34	5.5	102.6	32.6	74.1
3,150	1.46	6.0	99.6	24.8	79.3
4,000	1.40	6.5	100.2	23.7	80.7
5,000	1.28	6.7	95.0	14.4	84.4

⁺ Receiving room level adjusted for background

R _w (C;C _{tr})	to BS EN ISO 717-1:1 = 66 (-5;-12) dB		= -14 dB	C ₅₀₋₅₀₀₀	= -13 dB	C ₁₀₀₋₅₀₀₀	= -4 dB
		C tr,50-3150	= -28 dB	C _{tr,50-5000}	= -28 dB	C _{tr.100-5000}	= -12 dB
Evaluation based on I	aboratory measurement results	obtained by an engin	seering method				
	ita provided in BS EN 2			measurement unce	dainn should not e	vesed +1 dB for the	pipala aumbar
eventity (P.)		0740-2, 1993 K IS	esamated that the A1 of BS EN 2014	measurement unce	rtainty should not e	xceed ±1 dB for the	single-num





Laboratory measurement of impact sound insulation of floors Normalized impact sound pressure level according to BS EN ISO 140-6:1998

BRE vertical transmission suite (B9)

Client:

TENMAT LTD

Test date:

31/07/2003

Test number: L03 273

Test element: Floor

Test element area:

17.6 m²

Mass per unit area:

86 kg/m²

Description:

Separating floor (see Table 3 Construction details).

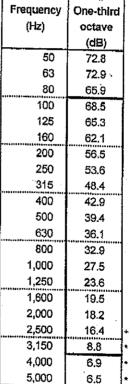
Source room volume: Receive room volume:

58 m³ 69 m³

Air temperature: Air relative humidity: 22 °C

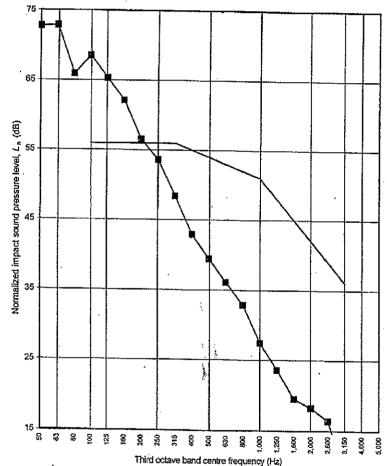
68 %

	_
	Ln
Frequency	One-third
(Hz)	octave
	(dB)
50	72.8
63	72.9 -
80	65.9
100	68.5
125	65.3
160	62.1
200	56.5
250	53.6
315	48.4
400	42.9



⁺ Receiving room level adjusted for background

^{*} Receiving room level within 6 dB of background



Rating according to BS EN ISO 717-2:1997

 $L_{n,w}(C_1)$

= 54 (2) dB

 $C_{1,50-2500} = 8 \text{ dB}$

Besed on the data provided in BS EN 20140-2:1993 it is estimated that the measurement uncertainty should not exceed ±1 dB for the single-number quentity ($L_{n,w}$) and should not exceed the values in Table A1 of BS EN 20140-2:1993 for the data in the individual third actives (L_n)



Laboratory measurement of impact sound insulation of floors Normalized impact sound pressure level according to BS EN ISO 140-6:1998

BRE vertical transmission suite (B9)

Cllent:

TENMAT LTD

Test date:

31/07/2003

Test number: L03_273

Test element: Floor

Test element area:

17.6 m²

Mass per unit area:

86 kg/m²

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Description:

Separating floor (see Table 3 Construction details).

Source room volume:

 58 m^3

Air temperature:

22 °C

Receive room volume:

69 m³

Air relative humidity:

68 %

ſ	Frequency	Reverberation	Background	Impact	L
- 1		time	level	level	

ļ	Frequency	Reverberation	Background	Impact	L_{Π}	
		time	fevel	level		
	(Hz)	(s) ·	(dB)	(dB)	(dB)	
	50	1.86	12.9	75.1	72.8	
	. 63	1.10	10.7	72.9	72.9	
	80	1.60	9.8	67.5	65.9	
	100	1.66	9.3	70.3	68.5	
	125	1.79	8.2	67.4	65.3	
i	160	1.83	7.2	64.3	62.1	ŀ
	200	1.94	6.6	59.0	56.5	
ļ	250	1.85	6.5	55.9	53,6	
	315	1.79	5.5	50.5	48.4	
	400	1.86	5.0	45.1	42.9	
	500	1.87	4.5	41.7	39.4	
	630	1.82	4.1	38.3	36.1	
	800	1.73	4.0	34.8	32.9	
	1,000	1.66	3.9	29.3	27.5	
	1,250	1.66	3.9	25.4	23.6	
	1,600	1.64	4.1	21,2	19.5	
	2,000	1.55	4.6	19.7	18.2	
	2,500	1.45	4.9	17.6	16.4	+
	3,150	1.40	5.5	9.9	8.8	*
i	4,000	1.30	6.2	7.6	6.9	*
	5,000	1.20	6.7	6.9	6.5	*

⁺ Receiving room level edjusted for background

Rating according to BS EN ISO 717-2:1997

 $L_{n,w}(C_i)$

= 54 (2) dB

 $C_{1,50-2500} = 8 \text{ dB}$

Evaluation based on laboratory measurement results obtained by an engineering method

Based on the data provided in BS EN 20140-2:1993 it is estimated that the measurement uncertainty should not exceed ±1 dB for the single-number quantity (L_{n,w}) and should not exceed the values in Table A1 of BS EN 20140-2:1993 for the data in the Individual third octaves (L_n)



^{*} Receiving room level within 6 dB of background



Laboratory measurement of airborne sound insulation of building elements Sound reduction index according to BS EN ISO 140-3:1995

BRE vertical transmission suite (B9)

Client:

TENMAT LTD

Test date:

01/08/2003

Test number: L03 274

Test element: Floor

Test element area:

17.6 m²

Mass per unit area:

86 kg/m²

057

Description:

Separating floor with downlighters: 9 x Aspect Lighting fixed halogen downlights and

TENMAT downlighter covers FF109 (150 mm diameter, 150 mm height),

Each fitted in 60 mm diameter holes in plasterboard Separating floor (see table 3 Construction details)

Source room volume:

69 m³

Air temperature:

21 °C

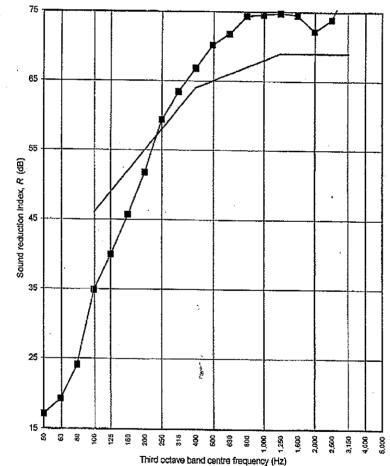
Receive room volume:

58 m³

Air relative humidity:

70 %

Receive (Ooth Volume:				
	R			
Frequency	One-third			
(Hz)	octave			
	(dB)			
50	17.1			
63	19.3			
80	24.1			
100	34.9			
125	40.0			
160	45.7			
200	51.8			
250	59.4			
315	63.4			
400	66.8			
500	70,2			
630	71.8			
800	74.4			
1,000	74.6			
1,250	74.8			
1,600	74.5			
2,000	72.2			
2,500	73.9			
3,150	79.0			
4,000	80.9			
5,000	84.5			



+ Receiving room level adjusted for background

Rating according to BS EN ISO 717-1:1997 $R_{W}(C;C_{tr}) = 65 (-5;-12) \text{ dB} \quad C_{50:3150} = -14 \text{ dB} \quad C_{50:5000} = -13 \text{ dB} \quad C_{100:5000} = -4 \text{ dB}$ $C_{tr,50:3150} = -27 \text{ dB} \quad C_{tr,50:5000} = -27 \text{ dB} \quad C_{tr,100:5000} = -12 \text{ dB}$

Evaluation based on laboratory measurement results obtained by an engineering method

Based on the data provided in BS EN 20140-2:1993 it is estimated that the measurement uncertainty should not exceed ± 1 dB for the single-number quantity (R_w) and should not exceed the values in Table A1 of BS EN 20140-2:1993 for the data in the individual third cotaves (R)





Laboratory measurement of airborne sound insulation of building elements Sound reduction index according to BS EN ISO 140-3:1995

BRE vertical transmission suite (B9)

Client:

TENMAT LTD

Test date:

01/08/2003

Test number: L03_274

Test element: Floor

Test element area:

17.6 m²

Mass per unit area:

86 ka/m²

Description:

Separating floor with downlighters: 9 x-Aspect Lighting fixed halogen downlights and

TENMAT downlighter covers FF109 (150 mm diameter, 150 mm height),

Each fitted in 60 mm diameter holes in plasterboard Separating floor (see table 3 Construction details)

Source room volume:

69 m³

Air temperature:

21 °C

Receive room volume:

58 m³

Air relative humidity:

70 %

Frequency	Reverberation	Background	Source	Receive	R
	time	level	levet	level	
(Hz)	(s)	(dB)	- (dB)	(dB)	(dB)
50	0.65	16.7	77.4	61.1	17.1
63	0.69	10.5	77.8	59.6	19.3
80	0.89	9.2	83.1	61.3	24.1
100	1.24	8.1	89.7	58.5	34.9
125	1.44	7.7	94.6	59.0	40.0
160	1.66	6.4	97.0	56.3	45.7
200	1.94	5.7	96.0	49.8	51.8
250	1.95	6.6	97.1	43.4	59.4
315	1.94	5.8	99.3	41.5	63.4
400	1.92	4.7	100.2	39.0	66.8
500	1.85	3.8	101.8	37.1	70.2
630	1.68	3.6	101.7	34.9	71.8
800	1.59	3.6	100.8	31.3	74.4
1,000	1.51	3.7	98.3	28.3	74.6
1,250	1.51	4.0	98.3	28.1	74.8
1,600	1.47	4.5	100.4	30.4	74.5
2,000	1.32	5.0	103,3	35.1	72.2
2,500	1.38	5.5	102.6	32.9	73.9
3,150	1.47	6.0	99.8	25.2	79.0
4,000	1.44	6.4	100.6	24.0	80.9
5,000	1.28	6.7	95.3	14.6	84.5

Rating according to BS EN ISO 717-1:1997

= 65 (-5;-12) dB C₅₀₋₃₁₅₀

Ck.50-3150

= -14 dB

C₅₉₋₅₀₀₀ $C_{\rm tr,50-5000}$

≂-13 dB $= -27 \, dB$ C₁₀₀₋₅₀₀₀ C_{tr,100-5000} = -4 dB = -12 dB

valuation based on laboratory measurement results obtained by an engineering method

Based on the data provided in BS EN 20140-2:1993 it is estimated that the measurement uncertainty should not exceed ±1 dB for the single-number quantity (R.,) and should not exceed the values in Table A1 of BS EN 20140-2:1993 for the data in the individual third octaves (R)





Laboratory measurement of impact sound insulation of floors

Normalized impact sound pressure level according to BS EN ISO 140-6:1998

BRE vertical transmission suite (B9)

Client:

TENMAT LTD

Test date:

01/08/2003

Test number: L03_275

Test element: Floor

Test element area:

17.6 m²

Mass per unit area:

86 kg/m²

Description:

Separating floor with downlighters: 9 x Aspect Lighting fixed halogen downlights and

TENMAT downlighter covers FF109 (150 mm diameter, 150 mm height),

Each fitted in 60 mm diameter holes in plasterboard

Separating floor (see table 3 Construction details)

Source room volume: Receive room volume:

58 m³

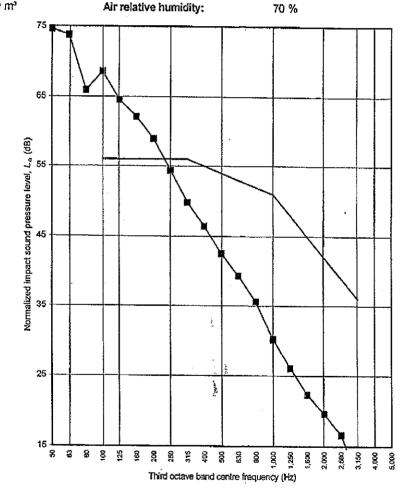
69 m³

Air temperature:

21 °C

70 %

	Ln	
Frequency	One-third	ļ
(Hz)	octave	١
····	(dB)	l
50	74.6	l
63	73.8	l
80	65.9	
100	68.6	Ì
125	64.5	l
160	62.1	l
200	58.9	ĺ
250	54.4	l
315	49.8	ŀ
400	46.4	l
500	42.5	l
630	39.3	
800	35,6	
1,000	30.2	
1,250	26.1	١
1,600	22.3	
2,000	19,6	
2,500	16.6	ŀ
3,150	9.6	ŀ
4,000	6.6	ŀ
5,000	6.0	ŀ



⁺ Recaiving room level adjusted for background

Reting according to BS EN ISO 717-2:1997

 $L_{n,w}(C_i)$

= 54 (2) dB

 $C_{1,50-2500} = 9 \text{ dB}$

Evaluation based on laboratory measurement results obtained by an engineering method

Based on the data provided in BS EN 20140-2:1993 it is estimated that the measurement uncertainty should not exceed ±1 dB for the single-number quantity (Ln.,) and should not exceed the values in Table A1 of BS EN 20140-2:1993 for the data in the individual third octaves (L,)

^{*} Receiving room level within 6 dB of background



Laboratory measurement of impact sound insulation of floors

Normalized impact sound pressure level according to BS EN ISO 140-6:1998

BRE vertical transmission suite (B9)

Client:

TENMAT LTD

Test date:

01/08/2003

Test number: L03 275

Test element: Floor

Test element area:

17.6 m²

Mass per unit area:

86 kg/m²

0578

Description:

Separating floor with downlighters: 9 x Aspect Lighting fixed halogen downlights and

TENMAT downlighter covers FF109 (150 mm diameter, 150 mm height),

Each fitted in 60 mm diameter holes in plasterboard Separating floor (see table 3 Construction details)

Source room volume:

58 m³

Air temperature:

21 °C

Receive room volume:

69 m³

Air relative humidity:

70 %

Frequency	Reverberation	Background	Impact	Γu	7
	time	level	level		
(Hz)	(s)	(dB)	(dB)	{dB}	1
50	1.77	24.1	76.7	74.6	1
63	1.08	11.6	73.7	73.8	1
80	1.70	10.1	67.8	65.9	
100	1.53	11.3	70.0	63.6	
125	1.63	7.9	66.2	64.5	ł
160	1.81	9.0	64.3	62.1	1
200	1.81	6.8	61.1	58.9	1
250	1.74	6.9	56.3	54.4	
315	1.75	5.9	51.8	49.8	
400	1.72	5.2	48.4	46.4	
500	1.76	4.9	44.6	42.5	
630	1.72	4.4	41.3	39.3	
800	1.73	4.2	37.6	35.6	
1,000	1.67	4.1	32.0	30.2	
1,250	1.66	4.0	27.9	26.1	
1,600	1.59	4.3	23.9	22.3	
2,000	1.52	4.7	21.0	19.6	
2,500	1.43	5.1	17.7	16.6	+
3,150	1.39	5.6	17.7 10.6	9.6	+
4,000	1.28	6.2	7.3	6.6	*
5,000	1.20	6.8	6.4	6.0	*

⁺ Receiving room level adjusted for background

Rating according to BS EN ISO 717-2:1997

Lnw(Ci)

= 54 (2) dB

 $C_{1.50-2500} = 9 \text{ dB}$

Evaluation based on laboratory measurement results obtained by an engineering method

Based on the data provided in BS EN 20140-2:1993 it is estimated that the measurement uncertainty should not exceed ±1 dB for the single-number quantity (L_{n,w}) and should not exceed the values in Table A1 of BS EN 20140-2:1993 for the data in the individual third octaves (L_n)



Receiving room level within 6 dB of background



Laboratory measurement of airborne sound insulation of building elements Sound reduction index according to BS EN ISO 140-3:1995

BRE vertical transmission suite (B9)

Client:

TENMAT LTD

Test date:

08/08/2003

Test number: L03_278

Test element: Floor

Test element area:

17.6 m²

Mass per unit area:

34 kg/m²

0578

Description:

Internal floor (see Table 3 Construction details)

Source room volume:

69 m³

Air temperature:

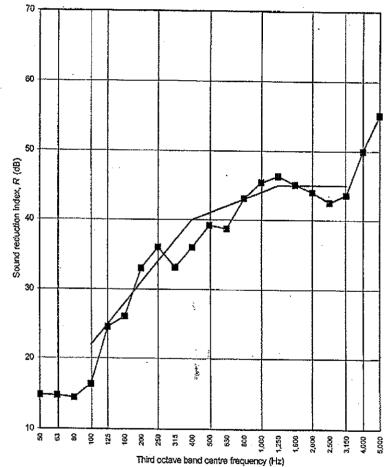
24 °C

Receive room volume: 59 m³

Air relative humidity:

78 %

	R
Frequency	One-third
(Hz)	octave
	(dB)
50	14.8
63	14.7
80	14.4
100	16.3
125	24.6
160	26.1
200	33.0
250	36.0
315	33.1
400	36.0
500	39.2
630	38.7
800	43.1
1,000	45.4
1,250	46.3
1,600	45.1
2,000	44.0
2,500	42.5
3,150	43.6
4,000	50.0



Rating according to BS EN ISO 717-1:1997

5,000

=41(-2;-7) dB

55.2

= -3 dB

= -11 dB

C₅₀₋₃₁₅₀

C₅₀₋₅₀₀₀ C_{tr,50-5000} = -2 dB =-11 dB C₁₀₀₋₅₀₀₀ C_{tr,100-5000} = -1 dB = -7 dB

 $C_{t,50-3150}$ Evaluation based on laboratory measurement results obtained by an engineering method

Based on the data provided in BS EN 20140-2:1993 it is estimated that the measurement uncertainty should not exceed ±1 dB for the single-number quantity (R.,.) and should not exceed the values in Table A1 of BS EN 20140-2:1993 for the data in the individual third octaves (R)





Laboratory measurement of airborne sound insulation of building elements Sound reduction Index according to BS EN ISO 140-3:1995

BRE vertical transmission suite (B9)

Client:

TENMAT LTD

Test date:

08/08/2003

Test number: L03 278

Test element: Floor

Test element area:

17.6 m²

Mass per unit area:

34 kg/m²

0578

Description:

Internal floor (see Table 3 Construction details)

Frequency

Source room volume:

69 m³

Air temperature:

Background

24 °C

Receive room volume:

59 m³

Reverberation

1.33

1.44

1.40

1.25

 $C_{50-3150}$

C_{8.50-3150}

Air relative humidity:

Source

78 %

R

Receive

T

1

40

刘 4

1

time leve! level ievei (Hz) (s) (dB)(dB) (dB) (dB) 50 0.98 10.8 79.3 67.1 14.8 63 1.12 9.8 79.4 67.9 14.7 80 1.03 8.9 83.9 72.3 14.4 100 1.19 9.5 90.5 77.7 16.3 125 1.39 7.3 95.8 75.3 24.6 160 1.54 6.6 97.8 76.3 26.1 200 1.90 6.8 97.4 69.9 33.0 250 1.84 5.1 97.9 67.2 36.0 315 1.73 4.5 99.2 71.2 33.1 400 1.89 4.5 100.8 70.2 36.0 500 1.88 3.9 101.8 68.1 39.2 630 1.77 3.7 101.4 67.9 38.7 800 1.65 3.7 100.8 62.6 43.1 1.000 1.66 3.9 98.2 57.6 45.4 1,250 1.57 4.2 98.3 56.7 46.3 1,600 1.54 4.6 99.6 59.1 45.1 2,000 1.33 5.1 101.0 61.0

Rating according to BS EN ISO 717-1:1997

 $R_w(C;C_b) = 41 (-2;-7) dB$

2,500

3,150

4,000

5,000

=-3 dB = -11 dB

5.6

6.1

6.5

6.8

C₅₀₋₅₀₀₀ $C_{tr,50-5000}$

98.6

94.3

95.7

90.0

= -2 dB= -11 dB

60.0

55.0

49.9

38.5

C₁₀₀₋₅₀₀₀ Ctr,100-5000

44.0

42.5

43.6

50.0

55.2

= -1 dB = -7 dB

Evaluation based on laboratory measurement results obtained by an engineering method

Based on the deta provided in BS EN 20140-2:1993 it is estimated that the measurement uncertainty should not exceed ±1 dB for the single-number quentity (R.,) and should not exceed the values in Table A1 of BS EN 20140-2:1993 for the data in the individual third octaves (R)



BRE

Laboratory measurement of impact sound insulation of floors

Normalized impact sound pressure level according to BS EN ISO 140-6:1998

BRE vertical transmission suite (B9)

Client:

TENMAT LTD

Test date:

08/08/2003

Test number: L03_279

Test element: Floor

Test element area:

17.6 m²

Mass per unit area:

34.0 kg/m²

0578

Description:

Internal floor (see Table 3 Construction details)

Source room volume:

59 m³ 69 m³ Air temperature:

24 ℃

Air relative humidity:

78 %

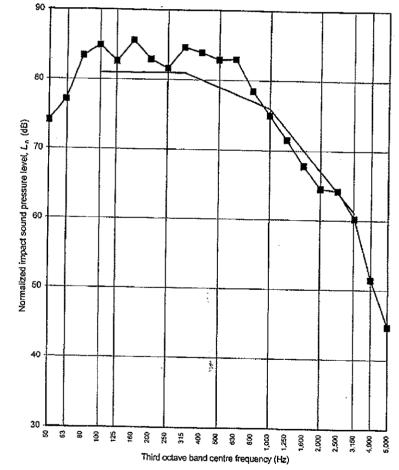
Receive room volume:					
Ln					
One-third					
octave					
(dB)					
74.1					
77.1					
83.4					
84.9					
82.6					
85.6					
82.9					
81.6					
84.6					
83.9					
82.9					
83.0					
78.5					
75.0					
71.5					
67.8					
64.5					

2,500

3,150

4.000

5,000



Rating according to BS EN ISO 717-2:1997

64.2

60.2

51.4

44.7

 $L_{n,w}(C_1)$

= 79(0) dB

 $C_{1,50-2500} = 0 \text{ dB}$

Evaluation based on laboratory measurement results obtained by an engineering method

Based on the data provided in BS EN 20140-2:1993 it is estimated that the measurement uncertainty should not exceed ±1 dB for the single-number quantity (Ln,,) and should not exceed the values in Table A1 of BS EN 20140-2:1993 for the data in the individual third extenses (Ln)

Laboratory measurement of impact sound insulation of floors

Normalized impact sound pressure level according to BS EN ISO 140-6:1998

BRE vertical transmission suite (B9)

Client:

TENMAT LTD

Test date:

08/08/2003

Test number: L03_279

Test element: Floor

Test element area:

17.6 m²

Mass per unit area:

34.0 kg/m²

Description:

Internal floor (see Table 3 Construction details)

Source room volume:

59 m³

Air temperature:

24 °C

Receive room volume:

69 m³

Air relative humidity:

78 %

Frequency	Reverberation	Background	Impact	La
1	time	level	level	, , ,
(Hz)	(s)	(dB)	(dB)	(dB)
50	3.60	15.5	79.2	74.1
63	1.55	11.9	78.5	77.1
80	1.30	10.6	84.1	83.4
100	1.38	9.9	85.8	84.9
125	1.62	8.5	84.3	82.6
160	1.74	7.7	87.5	85.6
200	1.69	8.8	84.8	82,9
· 250	1.67	6,3	83.3	81.6
315	1.49	6.6	85.9	84.6
400	1.68	5.2	85.7	83.9
500	1.83	4.8	85.1	82.9
630	1.71	4.5	84.9	83.0
800	1.68	4.2	80.4	78.5
1,000	1.71	4.1	76.9	75.0
1,250	1.69	4.1	73.3	71.5
1,600	1.66	4.4	69.6	67.8
2,000	1.54	4.6	65.9	64.5
2,500	1.45	5.0	65.3	64.2
3,150	1.38	5.6	61.1	60.2
4,000	1.30	6.2	52.1	51.4
5,000	1.20	6.7	45.1	44.7

Rating according to BS EN ISO 717-2:1997

 $L_{n,w}(C_i)$

= 79 (0) dB

 $C_{1,50-2500} = 0 \text{ dB}$

Evaluation based on laboratory measurement results obtained by an engineering method

Based on the data provided in BS EN 20140-2:1993 it is estimated that the measurement uncertainty should not exceed ±1 dB for the single-number quantity $(L_{n,\omega})$ and should not exceed the values in Table A1 of BS EN 20140-2:1993 for the data in the individual third octaves (L_n)





Laboratory measurement of airborne sound insulation of building elements Sound reduction index according to BS EN ISO 140-3:1995

BRE vertical transmission suite (B9)

Client:

3

¥

TENMAT LTD

Test date:

12/08/2003

Test number: L03_280

Test element: Floor



Test element area:

17.6 m²

Mass per unit area:

34.0 kg/m²

Description:

Internal floor with downlighters: 9 x Aspect Lighting fixed halogen downlights and TENMAT downlighter covers FF109 (150 mm diameter, 150 mm height),

Each fitted in 60 mm diameter holes in plasterboard

internal floor (see table 3 Construction details)

Source room volume:

69 m³

Air temperature:

25 °C

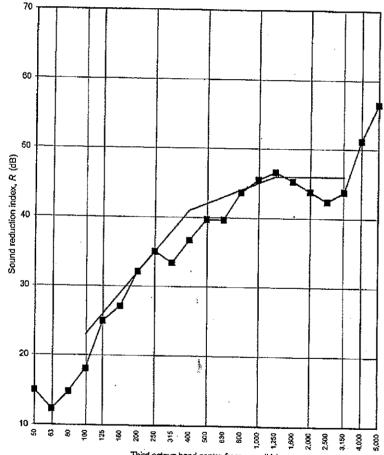
Receive room volume:

59 m³

Air relative humidity:

69 %

	÷
	R
Frequency	One-third
(Hz)	octave
	(dB) .
50	15.0
63	12.3
80	14.8
100	18.1
125	25.0
160	27.1
200	32.1
250	35.0
315	33.4
400	36.7
500	39.7
630	39.7
800	43.6
1,000	45.5
1,250	46.6
1,600	45.3
2,000	43.8
2,500	42.4
3,150	43.8



Third octave band centre frequency (Hz)

Rating according to BS EN ISO 717-1:1997

 $R_w(C;C_{tr})$

4.000

5,000

= 42 (-2;-7) dB

51.2

56.5

C₅₀₋₃₁₅₀

C_{tr.50-3150}

= -3 dB = -12 dB

C₅₀₋₅₀₀₀

C_{17,50-5000}

= -2 dB = -12 dB C₁₀₀₋₅₀₀₀ C_{tr,100-5000} = -1 dB= -7 dB

ratory measurement results obtained by an engineering method

Based on the data provided in BS EN 20140-2:1993 it is estimated that the measurement uncertainty should not exceed ±1 dB for the single-number quantity (R_w) and should not exceed the values in Table A1 of BS EN 20140-2:1993 for the data in the individual third octaves (R)



Laboratory measurement of airborne sound insulation of building elements Sound reduction Index according to BS EN ISO 140-3:1995 BRE vertical transmission suite (B9)

Client:

TENMAT LTD

Test date:

12/08/2003

Test number: L03_280

Test element: Floor

Test element area:

17.6 m²

Mass per unit area:

34.0 kg/m²

Description:

Internal floor with downlighters: 9 x Aspect Lighting fixed halogen downlights and TENMAT downlighter covers FF109 (150 mm diameter, 150 mm height),

Each fitted in 60 mm diameter holes in plasterboard Internal floor (see table 3 Construction details)

Source room volume:

69 m³

Air temperature:

25 °C

Receive room volume:

59 m³

Air relative humidity:

69 %

Frequency	Reverberation Background		Source	Receive	R
	time	level	level	level	
(Hz)	(s)	(dB)	(dB)	(dB)	(dB)
50	. 0.90	12.3	80.2	67.4	15.0
63	1.07	10.3	79.6	70.3	12.3
80	1.00	9.0	86.3	74.2	14.8
100	1.11	8.5	93.3	78.3	18.1
125	1.60	7.7	96.9	76.6	25.0
160	· 1.63	6.8	98.0	75.7	27.1
200	1.94	6.2	96.6	70.1	32.1
250	1.75	5.2	96.7	66.8	35.0 ·
315	1.89	4.7	99.4	71.4	33.4
400	1.92	4.3	100.7	69.5	36.7
500	1.88	4.0	101.6	67.4	39.7
630	1.78	3.9	101.5	67.0	39.7
800	1.68	3.8	100.3	61.7	43.6
1,000	. 1.58	4.0	97.8	57.0	45.5
1,250	1.62	4.2	97.7	56.0	46.6
1,600	1.56	4.6	99.2	58.6	45.3
2,000	1.34	5.0	100.6	60.8	43.8
2,500	1.35	5.6	98.2	59.8	42,4
3,150	1.45	6.1	94.1	54.6	43.8
4,000	1.40	6.6	96.3	49.3	51.2
5,000	1.30	6.8	93.1	40.4	56.5

Rating according to BS EN ISO 717-1:1997

= 42 (-2;-7) dB

C₅₀₋₃₁₅₀

Ctr.50-3150

= -3 dB $= -12 \, dB$

C₅₀₋₅₀₀₀ C_{tr.60-5000} = -2 dB

= -12 dB

C 100-5000

C_{17,100-5000}

= -1 dB = -7 dB

asion based on laboratory measurement results obtained by an engineering mornod

Based on the data provided in BS EN 20140-2:1993 it is estimated that the measurement uncertainty should not exceed ±1 dB for the single-number quantity (R.,.) and should not exceed the values in Table A1 of 68 EN 20140-2:1993 for the data in the individual third octaves (R)





Laboratory measurement of impact sound Insulation of floors

Normalized Impact sound pressure level according to BS EN ISO 140-6:1998

BRE vertical transmission suite (B9)

Client

TENMAT LTD

Test date:

12/08/2003

Test number: L03_281

Test element: Floor

Test element area:

17.6 m²

Mass per unit area:

34 kg/m²

0578

Description:

Internal floor with downlighters: 9 x Aspect Lighting fixed halogen downlights and

TENMAT downlighter covers FF109 (150 mm diameter, 150 mm height),

Each fitted in 60 mm diameter holes in plasterboard

Internal floor (see table 3 construction details)

Source room volume: Receive room volume: 59 m³

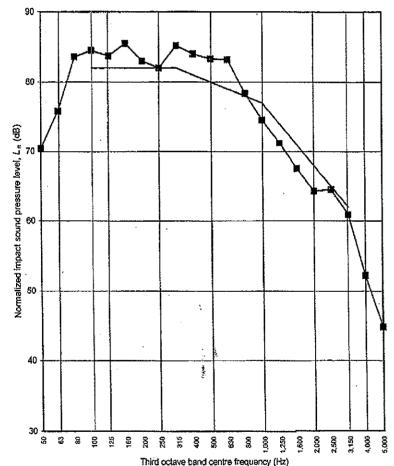
Air temperature:

25 °C

Air relative humidity:

69 %

	Ln
Frequency	One-third
(Hz)	octave
	(dB)
50	70.4
63	75.8
80	83.6
100	84.5
125	83.7
160	85.5
200	83.0
250	82.0
315	85.2
400	84.0
500	83.3
630	83.2
800	78.4
1,000	74,5
1,250	71.2
1,600	67.6
2,000	64.3
2,500	64.5
3,150	60.9
4,000	52.2
5,000	44.9



Rating according to BS EN ISO 717-2:1997

 $L_{n,w}(C_i)$

= 80 (-1) dB

 $C_{1.50-2500} = -1 \text{ dB}$

Evaluation based on laboratory measurement results obtained by an engineering method

Eased on the data provided in BS EN 20140-2:1993 it is estimated that the measurement uncertainty should not exceed ±1 dB for the single-number quantity (Ln,w) and should not exceed the values in Table A1 of BS EN 20140-2:1993 for the data in the individual third octaves (Ln).





Laboratory measurement of impact sound insulation of floors

Normalized impact sound pressure level according to BS EN ISO 140-6:1998

BRE vertical transmission suite (B9)

Client:

TENMAT LTD

Test date:

12/08/2003

Test number: L03_281

Test element: Floor

Test element area:

Description:

17.6 m²

Mass per unit area:

34 kg/m²

internal floor with downlighters: 9 x Aspect Lighting fixed halogen downlights and

TENMAT downlighter covers FF109 (150 mm diameter, 150 mm height),

Each fitted in 60 mm diameter holes in plasterboard

Internal floor (see table 3 construction details)

Source room volume:

59 m³

Air temperature:

25 °C

Receive room volume:

69 m³

Air relative humidity:

69 %

Frequency	Reverberation	Background	Impact	Ln
	time	evel	tevel	
(Hz)	· {s}	(dB)	(dB)	(dB)
50	3.45	18.4	75.4	70.4
63	1.42	11.5	76.9	75.8
80	1.20	11.0	84.0	83.6
100	1.27	12.7	85.1	84.5
125	1.51	9.7	85.1	83.7
160	1.60	7.4	87.1	85.5
200	1.64	8.2	84.7	83.0
250	1.74	6.1	83.9	82.0
315	1.51	5.4	86.5	85.2
400	1.62	5.1	85.7	84.0
500	1.79	4.6	85.4	83.3
630	1.67	4.3	85.0	83.2
800	1.70	4.0	80.3	78.4
1,000	1.68	3.9	76.3	74.5
1,250	1.68	4.1	73.0 ⁵	71.2
1,600	1.63	4.3	69.3	67.6
2,000	1.55	4.7	65,8	. 64.3
2,500	1.48	5.1	65.7 61.7	64.5
3,150	. 1.35	5.6	61.7	60.9
4,000	1.32	6.3	53.0	52.2
5,000	1.20	6.9	45.2	44.9

Rating according to BS EN ISO 717-2:1997

 $L_{n,w}(C_1)$

= 80 (-1) dB

 $C_{1,50-2500} = -1 \text{ dB}$

Evaluation based on laboratory measurement results obtained by an engineering method

Based on the data provided in BS:EN 20140-2:1993 it is estimated that the measurement uncertainty should not exceed ±1 dB for the single-number quantity ($L_{n,w}$) and should not exceed the values in Table A1 of BS EN 20140-2;1993 for the data in the individual third cotaves (L_{n})

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