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Technical Report

Report Number C/04/5L/3050/1

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Project

The Laboratory Determination of The Airborne Sound Transmission of a Timber Floor Construction

Prepared for

Gang Nail Systems Ltd
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By

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UKAS TESTING
0444

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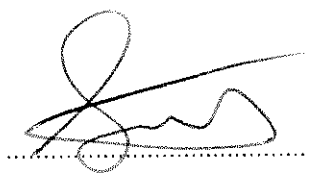
1.0 Summary

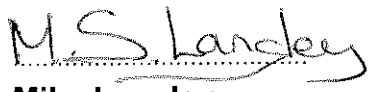
Tests have been done in SRL's Laboratory at Holbrook House, Sudbury, Suffolk, to determine the sound reduction index of a timber floor construction in accordance with BS EN ISO 140-3:1995, BS 2750:Part 3:1995

From these measurements the required results have been derived and are presented in both tabular and graphic form in Data Sheets 1 to 4.

The results are given in 1/3rd octave bands over the frequency range 50Hz to 10kHz, which is beyond that required by the test standard. Measurements outside the standard frequency range are not UKAS accredited.



Allen Smalls
Laboratory Manager
Quality Manager



Mike Langley
Technical Director
Technical Manager

For and on behalf of
Sound Research Laboratories Ltd

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Contents

2.0 Details of Measurements

2.1 Location

Sound Research Laboratories Ltd
Holbrook House
Little Waldingfield
Sudbury
Suffolk
CO10 OTH

2.2 Test Dates

13 August 2004

2.3 Instrumentation and Apparatus Used

Make	Description	Type
E D I	Microphone Multiplexer	
	Microphone Power Supply Unit	
Norwegian Electronics	Real Time Analyser	830
	Rotating Microphone Boom	231
Olivetti	Computer	M290S
Brüel & Kjaer	12mm Condenser Microphones	4166
	Windshields	UA0237
	Pre Amplifiers	2639
	Microphone Calibrator	4231
	Omnipower Sound Source	4296
Larson Davis	12mm Condenser Microphone	2560
SRL	Power Amplifiers	
Celestion	Loudspeakers	100w

Douglas Curtis	Rotating Microphone Boom	
Brannan	Hygrometer	
TOA	Graphic Equalizer	E-1231
	Power Amplifier	DPA-800

2.4 References

BS EN ISO 140-3:1995	Laboratory measurement of airborne sound insulation of building elements
BS EN ISO 717-1:1997	Rating of sound insulation in buildings and of building elements. Airborne Sound Insulation.

2.5 Personnel Present

Paul Baron	Gang Nail Systems

3.0 Description of Test

3.1 Description of Sample

Timber floor system consisting of:

22mm tongue and grooved chipboard (15.7kg/m^2) screwed to Gang Nail Systems A1 engineered joists.

Joists at 600mm centres, resting in test aperture.

Chipboard sealed at perimeter with mastic.

Ceiling of 15mm British Gypsum SoundBloc (12.8kg/m^2) screwed to joists.

Chipboard and plasterboard weighed by SRL.

See also Diagrams 1 to 4 (supplied by Gang Nail Systems).

Please note detail on drawings describes chipboard being nailed, where it was actually screwed.

Four tests were done, details in section 4 and on data sheets in this report.

Sampling plan: none (only enough material for test)

Sample condition: new

Details supplied by Gang Nail Systems & SRL

Sample installed by SRL

3.2 Sample Delivery date

11 August 2004

3.3 Test Procedures

The sample was mounted and tested in accordance with the relevant standard. The method and procedure is described in Appendix 1.

4.0 Results

The results of the measurements and subsequent analysis are given in Data Sheets 1 to 4 and summarised below.

Results relate only to the items tested.

SRL Test No.	Description in Brief	R_w
2	22mm chipboard screwed at 300mm centres (not glued)	40
3	As test 2, glue applied under chipboard to joists and to chipboard joints.	40
4	As test 3, half of the screws removed from chipboard.	40
5	As test 4, all screws removed from chipboard	42

End of Text

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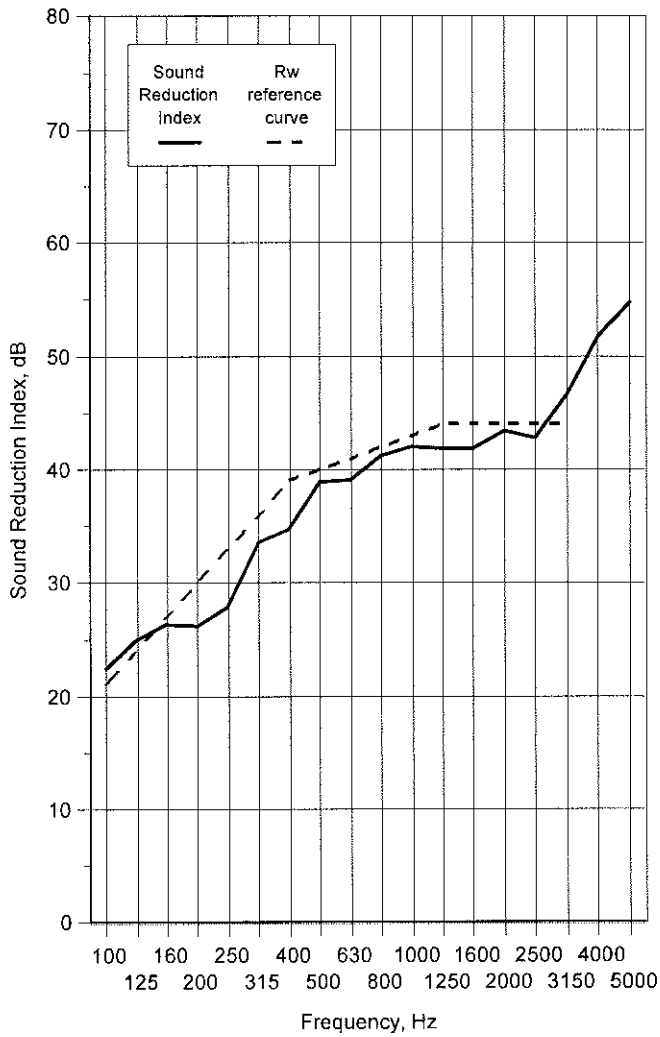
Data Sheet 1

Test Number :	2	**Air temperature:**	22 °C
Client:	Gang Nail Systems	**Air humidity:**	55 %
Test Date:	13/08/2004	**Receiving room volume**	115 m3
Sample length:	4 m	**Source room volume:**	50 m3
Sample width:	2.7 m	**Sample weight:**	28.5 kg/m2

Product Identification: **22mm T&G chipboard (no glue) screwed at 300mm centres to joists 15mm Soundbloc to ceiling**

Freq f Hz	Sound Reduction Index, dB 1/3 Oct	1/1 Oct
50+	25.8	
63+	29.0	26.1
80+	24.6	
100	22.4	
125	25.0	24.3
160	26.4	
200	26.2	
250	27.9	28.3
315	33.7	
400	34.7	
500	38.9	37.0
630	39.1	
800	41.2	
1000	42.0	41.7
1250	41.8	
1600	41.9	
2000	43.4	42.7
2500	42.8	
3150	46.7	
4000	51.7	49.8
5000	54.8	
6300+	59.7	
8000+	63.6	62.5
10000+	68.0 *	
Average 100-3150	35.9	



Rating according to BS EN ISO 717-1:1997
Rw(C;Ctr)= **40 (-2;-5)**dB

Notes * designates measurement corrected for background
designates limit of measurement due to background
+ designates frequency beyond standard and not UKAS accredited

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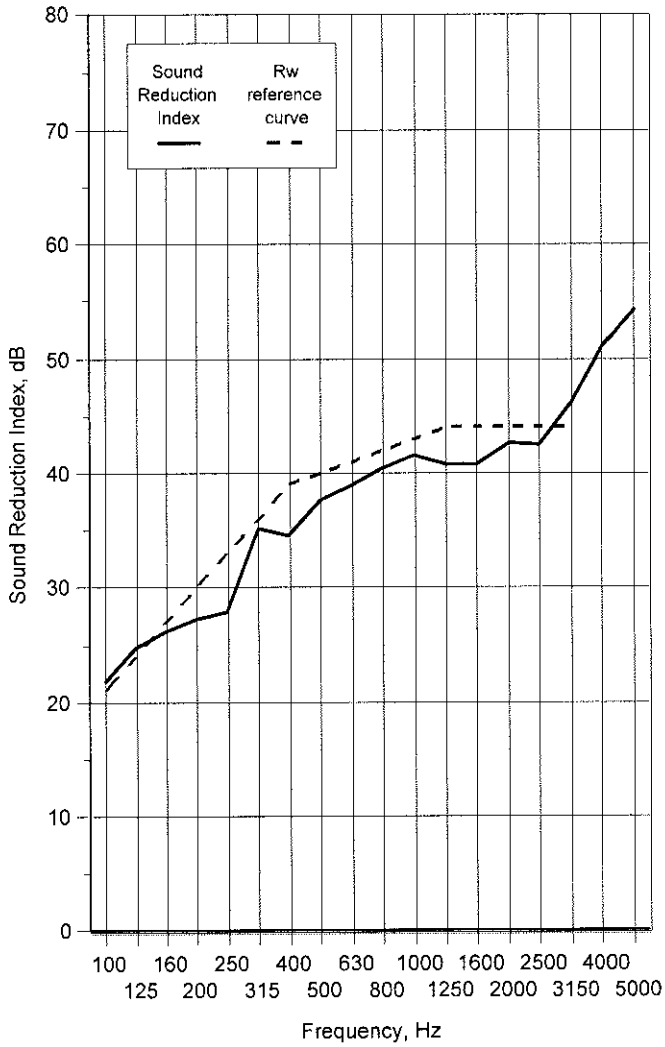
Data Sheet 2

Test Number :	3	**Air temperature:**	22 °C
Client:	Gang Nail Systems	**Air humidity:**	55 %
Test Date:	13/08/2004	**Receiving room volume**	115 m3
Sample length:	4 m	**Source room volume:**	50 m3
Sample width:	2.7 m	**Sample weight:**	28.5 kg/m2
Product Identification:	**As test 2, chipboard glued to joists and to adjoining chipboard**		

Freq f Hz	Sound Reduction Index, dB 1/3 Oct	1/1 Oct
50+	27.4	
63+	30.1	26.8
80+	24.5	
100	21.8	
125	24.8	23.9
160	26.2	
200	27.3	
250	27.9	29.0
315	35.2	
400	34.5	
500	37.7	36.6
630	38.9	
800	40.5	
1000	41.6	40.9
1250	40.8	
1600	40.8	
2000	42.6	41.9
2500	42.5	
3150	46.2	
4000	51.1	49.3
5000	54.3	
6300+	59.3	
8000+	63.2	62.1
10000+	66.7 *	
Average 100-3150	35.6	



Rating according to BS EN ISO 717-1:1997

Rw(C;Ctr)= **40 (-2;-5)** dB

Notes * designates measurement corrected for background

\# designates limit of measurement due to background

\+ designates frequency beyond standard and not UKAS accredited

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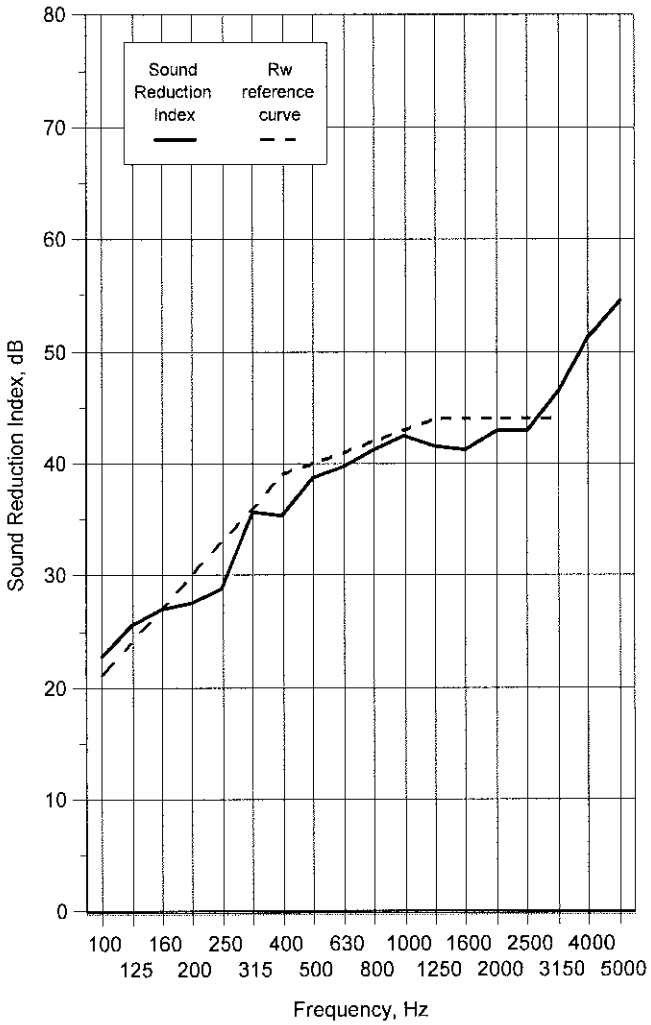
Data Sheet 3

Test Number :	4	**Air temperature:**	22 °C
Client:	Gang Nail Systems	**Air humidity:**	55 %
Test Date:	13/08/2004	**Receiving room volume**	115 m3
Sample length:	4 m	**Source room volume:**	50 m3
Sample width:	2.7 m	**Sample weight:**	28.5 kg/m2
Product Identification:	**As test 3, half the screws in chipboard removed.**		

Freq f Hz	Sound Reduction Index, dB 1/3 Oct	1/1 Oct
50+	26.6	
63+	29.4	26.8
80+	25.4	
100	22.7	
125	25.5	24.7
160	26.9	
200	27.6	
250	28.8	29.5
315	35.7	
400	35.3	
500	38.7	37.5
630	39.7	
800	41.2	
1000	42.5	41.7
1250	41.6	
1600	41.2	
2000	43.0	42.3
2500	43.0	
3150	46.5	
4000	51.3	49.5
5000	54.6	
6300+	59.5	
8000+	63.8	62.5
10000+	67.9 *	
Average 100-3150	36.2	



Rating according to BS EN ISO 717-1:1997
Rw(C;Ctr)= **40 (-1;-5)** dB

Notes * designates measurement corrected for background
designates limit of measurement due to background
+ designates frequency beyond standard and not UKAS accredited

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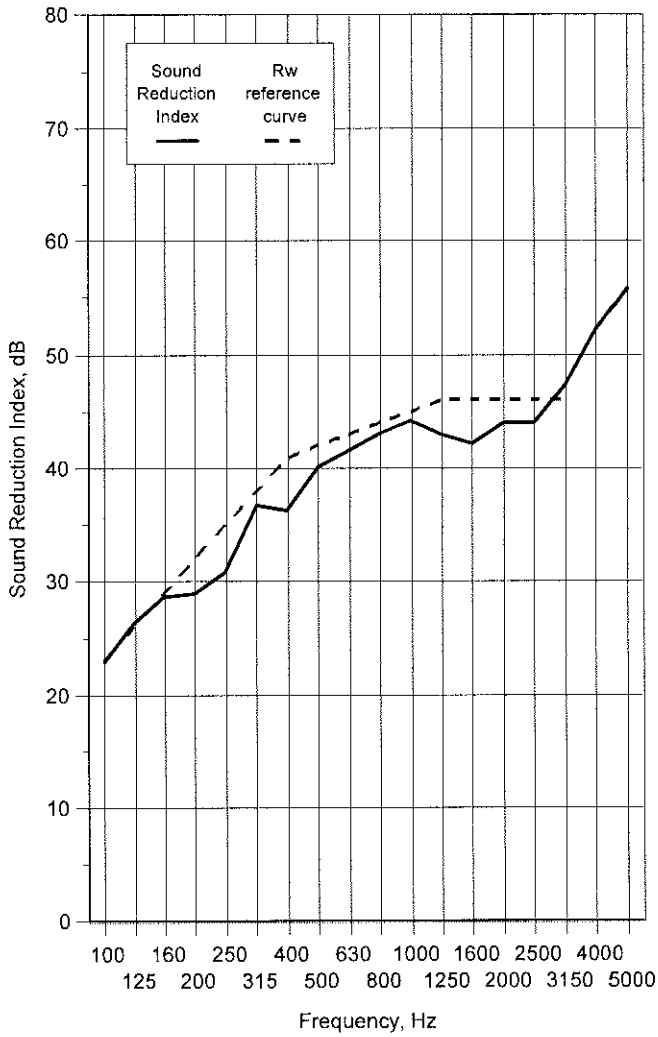
Data Sheet 4

Test Number :	5	**Air temperature:**	22 °C
Client:	Gang Nail Systems	**Air humidity:**	55 %
Test Date:	13/08/2004	**Receiving room volume**	115 m3
Sample length:	4 m	**Source room volume:**	50 m3
Sample width:	2.7 m	**Sample weight:**	28.5 kg/m2
Product Identification:	**As test 4, all screws removed.**		

Freq f Hz	Sound Reduction Index, dB 1/3 Oct	1/1 Oct
50+	26.4	
63+	29.5	27.1
80+	26.2	
100	22.9	
125	26.4	25.3
160	28.6	
200	28.9	
250	30.8	31.1
315	36.7	
400	36.2	
500	40.1	38.7
630	41.5	
800	43.1	
1000	44.2	43.4
1250	43.0	
1600	42.1	
2000	44.1	43.3
2500	44.0	
3150	47.4	
4000	52.3	50.5
5000	55.8	
6300+	60.5	
8000+	64.9	63.4
10000+	68.3 *	
Average 100-3150	37.5	



Rating according to BS EN ISO 717-1:1997
Rw(C;Ctr)= **42 (-2;-5)**dB

Notes * designates measurement corrected for background
designates limit of measurement due to background
+ designates frequency beyond standard and not UKAS accredited

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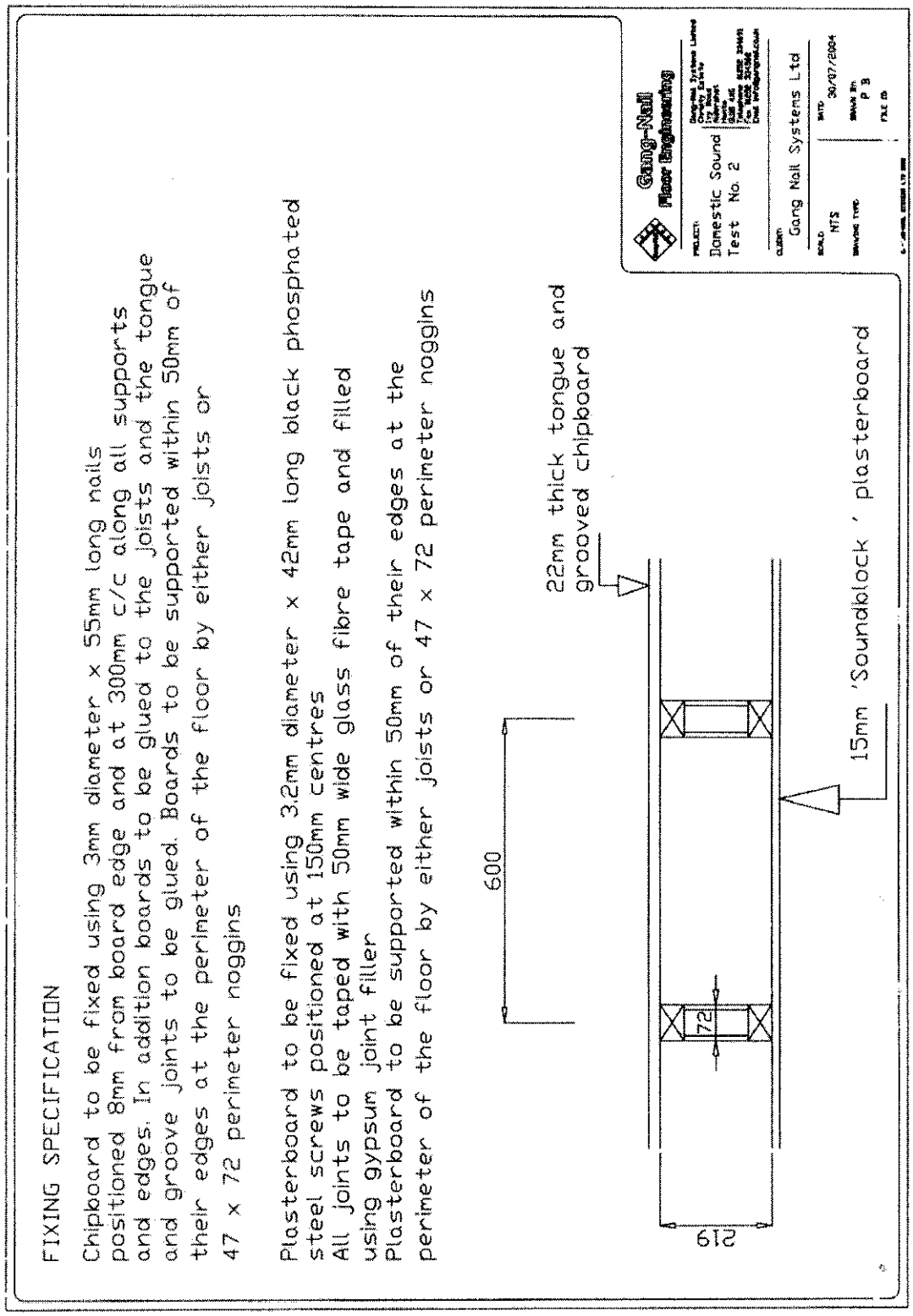
Drawing 1



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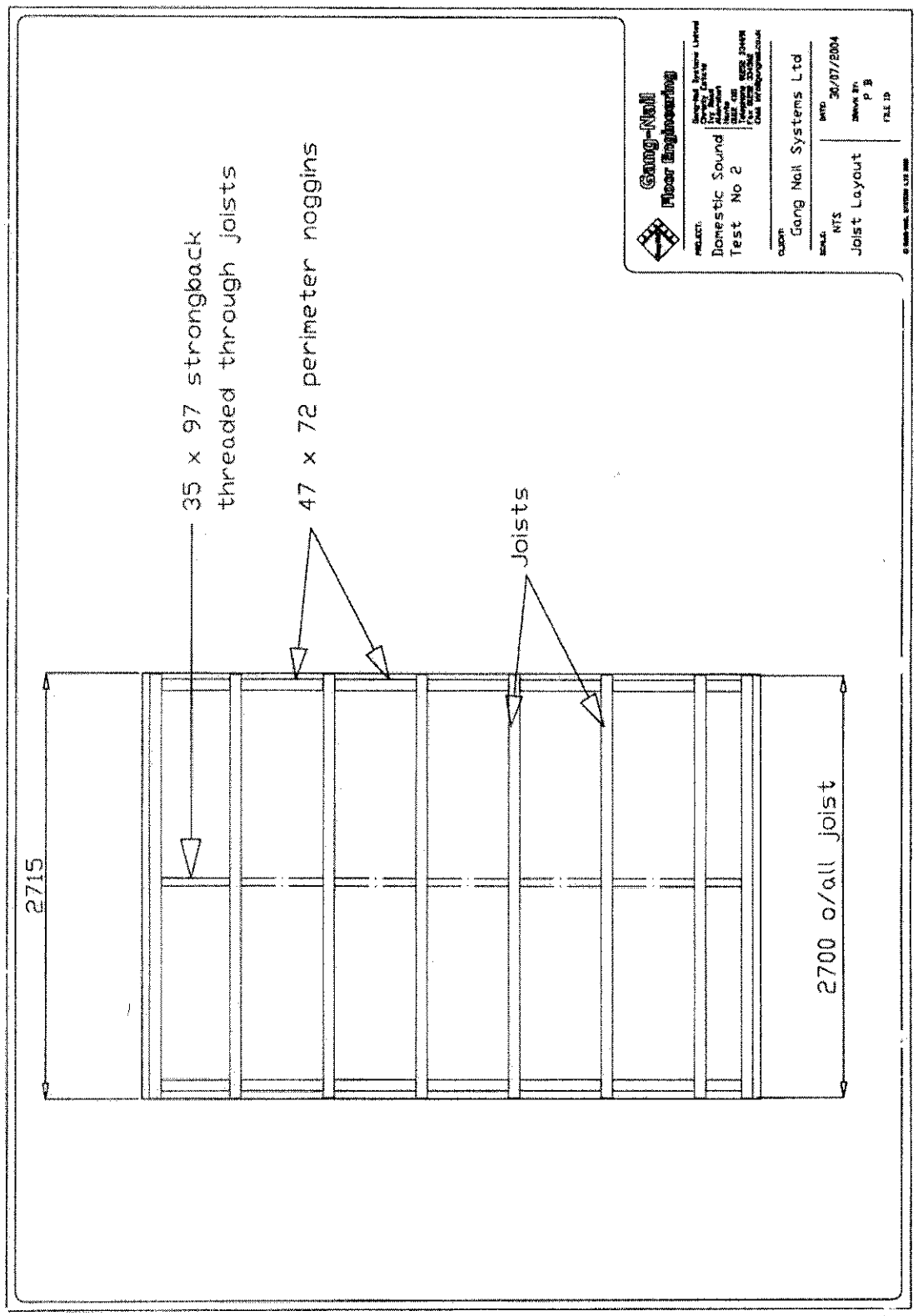
Drawing 2



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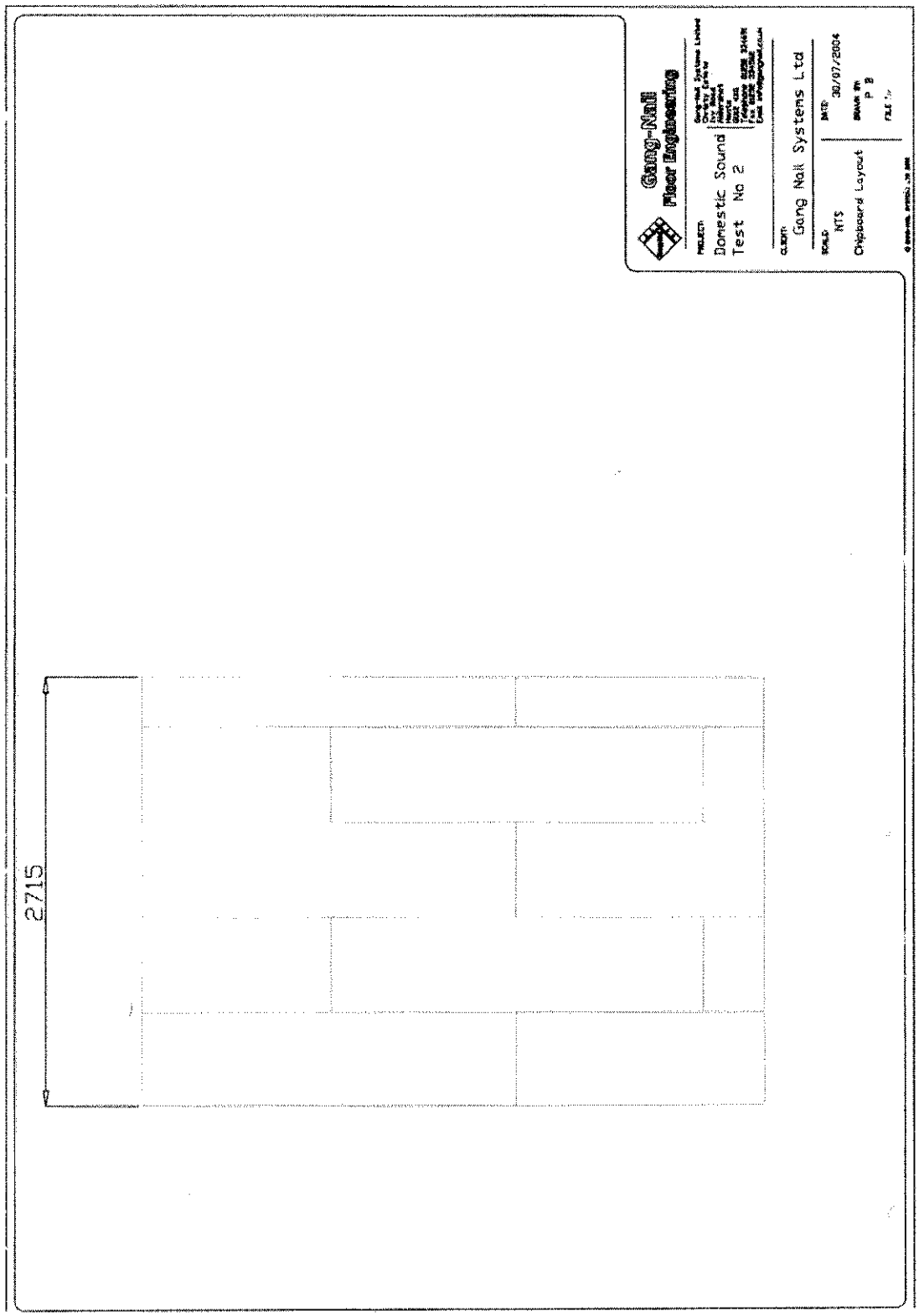
Drawing 3



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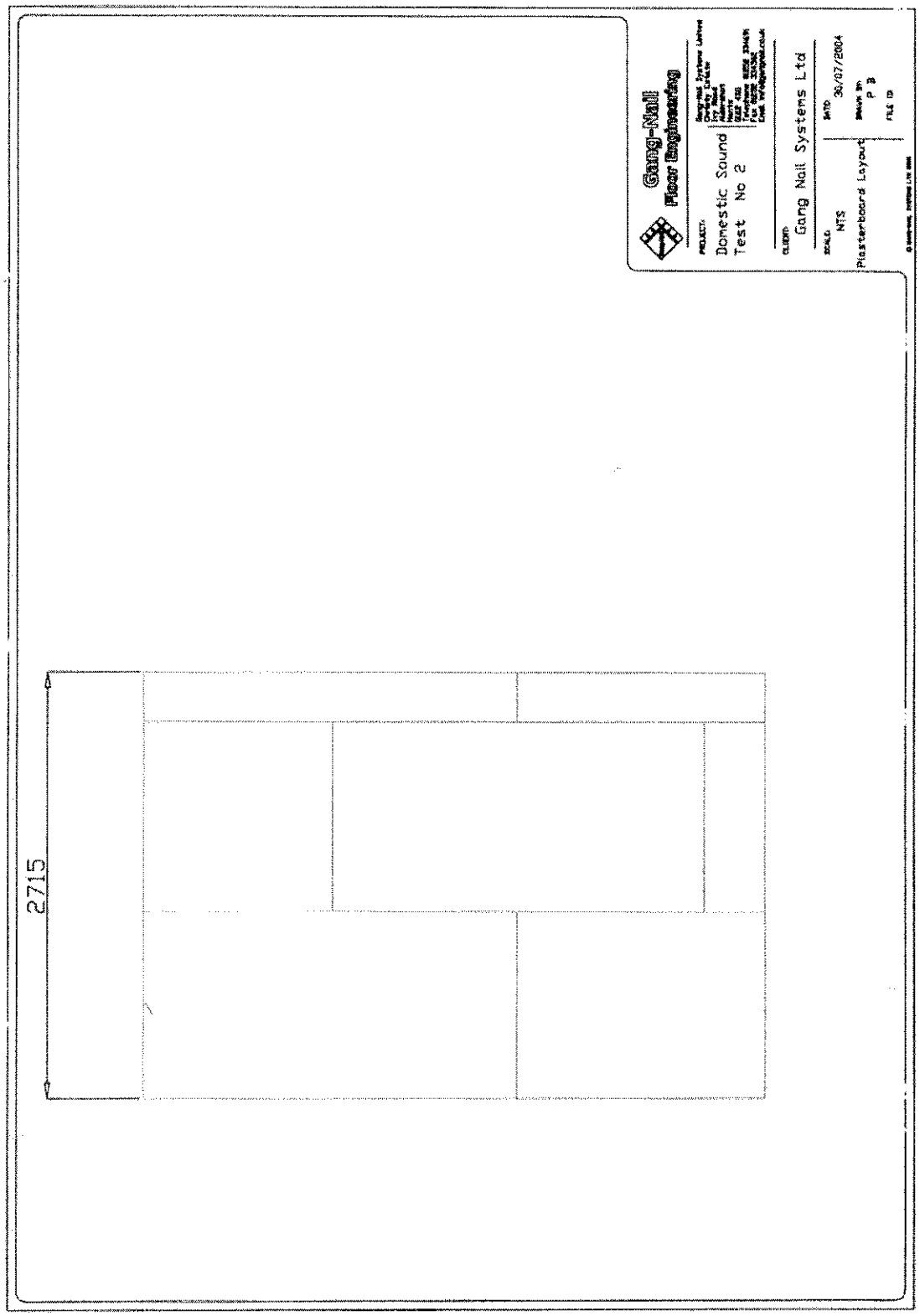
Drawing 4



Appendix 1

Floor System Test Method

Measurement of Sound Transmission in accordance with BS EN ISO 140-3:1995 - TP15

In the laboratory, airborne sound transmission is determined from the difference in sound pressure levels measured across a test sample installed between two reverberant rooms. The difference in measured sound pressure levels is corrected for the amount of absorption in the receiving room. The test is done under conditions which restrict the transmission of sound by paths other than directly through the sample. The source sound field is randomly incident on the sample.

The test sample is constructed in the floor aperture between the two rectangular reverberant (i.e. acoustically "live") rooms, both of which are constructed from 215mm thick brickwork. The floor/ceiling which forms the common area between the two rooms has overall dimensions of 4.85m x 3.9m, into which is an aperture 3.98m x 2.5m. The test sample is built and sealed carefully into the aperture.

The upper room, termed the source room, has a volume of $50m^3$ and is isolated by the surrounding structure by the use of resilient mountings. The lower or receiving room has a volume of $115m^3$. Reverberation time measurements are done in the receiving room to calibrate it.

Broad band pink noise is produced in the source room from an electronic generator and power amplifier. The resulting sound pressure levels in both rooms are sampled using a microphone mounted on an oscillating boom and connected to a real time analyser. The signal is filtered into one third octave band widths, integrated and averaged. The value obtained at each frequency is known as the average sound pressure level for either the source or the receiving room. The change in level across the test sample is termed the sound pressure level difference, i.e.

$$D = L_1 - L_2$$

D is the sound pressure level difference in dB

L_1 is the average sound pressure level in the source room in dB

L_2 is the average sound pressure level in the receiving room in dB

The sound reduction index (R) is also known by the American term "sound transmission loss". It is defined as the number of decibels by which sound energy

randomly incident on the test sample, is reduced in transmitting through it and is given by the formula:

$$R = D + 10\log(S/A) \text{ in decibels}$$

where

S is the area of the sample (m^2)

A is the total absorption in the receiving room (m^2)

The sound reduction index is an expression of the laboratory sound transmission performance of a particular element or construction. It is a function of the mass, thickness, sealing and method of mounting, but is independent of the overall area of the sample.

However, when an example of this floor is installed on site, the sound insulation obtained will depend upon its surface area, as well as the absorption in the receiving room. The larger the area the greater the sound energy transmitted. Also, the overall sound insulation of a floor is affected by the sound transmission through other building elements, some of which may have an inferior performance to the sample. In practice, therefore, the potential sound reduction index of a sample is not fully realised on site. Furthermore, the sound reduction index of a particular sample floor can only be measured accurately in a laboratory, because only under such controlled conditions can the sound transmission path be limited to the sample under test.

R_w is a single figure rating of sound insulation and is calculated in accordance with the relevant section of BS EN ISO 717-1:1997.

Appendix 2

Measurement Uncertainty
BS EN ISO 140-3:1995 - TP15

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

Frequency, Hz	Uncertainty, ± dB
100	2.6
125	2.4
160	2.1
200	2.1
250	1.5
315	1.5
400	1.2
500	1.2
800	1.0
1000	1.0
1250	1.0
1600	1.0
2000	1.0
2500	1.0
3150	1.0