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Measurement of Airborne Sound Insulation (Separating Walls) At Gwynne Gardens, East Grinstead

Dated: 30th October 2007

Report No: N141

Client : Hillreed Homes Ltd

Comparison with Approved Document E (2003) to the Building Regulations 2000.

Test No.	Rooms	D _{nT,w} + C _{tr} (dB)			L' _{nT,w} (dB)		
		Measured	Required	Pass/Fail	Measured	Required	Pass/Fail
1	Plot 1 to Plot 2 – Living Room to Living Room	53	≥45	Pass	N/A	N/A	N/A
2	Plot 1 to Plot 2 – Bedroom 1 to Bedroom 1	55	≥45	Pass	N/A	N/A	N/A

DJ Harris. MIOA
Research Manager

Steven Knight
Principal Engineer

Serial Number : 0268

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Measurement of the Airborne Sound Insulation (Separating Walls) At Gwynne Gardens, East Grinstead

Summary

This report presents the results of field measurements carried out to determine the Standardised Level Difference (D_{nT}) between houses for Hillreed Homes Ltd on site at Gwynne Gardens, East Grinstead. The measurements were carried out in accordance with British Standard BS EN ISO 140-4:1998 & BS EN ISO 140-7:1998 respectively. Single figure ratings of airborne sound insulation performance known as the Weighted Standardised Level Difference ($D_{nT,w}$) and also with an adaptation for low frequency noise ($D_{nT,w} + C_{tr}$) were determined from these measurements according to British Standard BS EN ISO 717-1:1997. The results are also compared with the requirements of current Building Regulations 2000, AD E (2003).

2. Building Construction

2.1 General

The plots tested were two storey dwelling houses. The construction was of brick and block construction with a pitched, tiled roof.

2.2 Separating Wall

The separating wall construction consisted of a 12.5mm plasterboard on dabs/ nominal 8mm render/ 100mm Celcon Standard aircrete blockwork laid using Celfix Thin Layer mortar/ 75mm cavity / 100mm Celcon Standard aircrete blockwork laid using Celfix Thin Layer mortar/ nominal 8mm render/ 12.5mm plasterboard on dabs. The blockwork leaves were tied using Ancon HRT4 ties.

2.3 External Flanking wall

The flanking wall consisted of Brick/ 50mm cavity/ 50mm rigid insulation/ 115 mm Celcon Standard aircrete blockwork laid using Celfix Thin Layer mortar. The wall was finished internally using 12.5mm plasterboard on dabs.

2.4 Partition Wall

The internal partitions were constructed using 75mm metal studwork (with mineral wool infill where necessary) and finished with 12.5mm plasterboard both sides.

3 Airborne Sound Insulation - Method of Measurement To BS EN ISO 140-4:1998

The measurements were carried out in accordance with British Standards BS EN ISO 140-4:1998, BS EN ISO 717-1:1997 and the Building Regulations 2000. The tests were performed using a standard procedure of ten microphone positions in each of the source and receiving rooms. A single loud speaker with omni directional radiation, generating white noise was used as the noise source and was located in two positions (five fixed microphone positions each speaker position).

Measurements were taken at each one-third octave band interval with centre frequencies between 100 Hz and 3150Hz inclusive. Reverberation times were then measured using a standard procedure of six microphone positions in the receiving rooms. A single loud speaker with omni directional radiation, generating white noise was used as the noise source and was located in two positions (three fixed microphone positions each speaker position) and three decay measurements were taken at each microphone position. Background noise levels were measured in the receiving rooms and the measurements were then standardised as follows:

3.1 Standardised Level Difference (D_{nT} in dB)

$$D_{nT} = L_1 - L_2 + 10 \lg \frac{T}{T_0} \text{ dB}$$

- Where
- D_{nT} is the Standardised Level Difference (dB)
 - L_1 is the mean sound pressure level in source room (dB)
 - L_2 is the mean sound pressure level in receiving room (dB)
 - T is the mean reverberation time of the receiving room (seconds)
 - T_0 is the reference reverberation time of 0.5 seconds

The weighted Standardised Level Difference and also with adaptation factor for low frequency noise ($D_{nT,w} + C_{tr}$) in decibels (dB) was calculated by comparing the sixteen values of Standardised Level Difference with a defined reference curve which is incremented until the requirements of BS EN ISO717-1:1997 are met.

4. Test Rooms

The following tests were performed at Hillreed Homes Ltd site at Gwynne Gardens, East Grinstead

A. Plot 1 to Plot 2 – Conducted on 24-10-2007

Test 1 = Lounge to Lounge

B. Plot 1 to Plot 2 – Conducted on 24-10-2007

Test 2 = Bedroom 1 to Bedroom 1

Drawings of plot layouts are shown on drawings attached.

All doors and windows were closed for the tests. All plots were unfurnished.

5. Room Volumes and Common Separating Element Area

The room volumes and common separating element areas were as follows

	Source Room Volume (m ³)	Receiving Room Volume (m ³)	Common Separating Element Area (m ²)
Test 1	38.1	38.1	8.3
Test 2	25.9	24.1	6.4

6. Results

The Weighted Standardised Level Differences, D_{nT_w} have been derived in accordance with BS EN ISO 717-1: 1997. The D_{nT_w} is equivalent to a mean rating of 61dB with the calculated results for the tests shown on sheets 6 to 7.

The Weighted Standardised Level Difference, $D_{nT,w}$ with adaptation for low frequency noise ($D_{nT,w} + C_{tr}$) has been calculated in accordance with BS EN ISO 717-1:1997. A mean value for the two tests of value of 54dB is calculated, with a minimum value of 53dB.

Standardized Level Difference according to ISO 140-4
Field measurements of airborne sound insulation between rooms

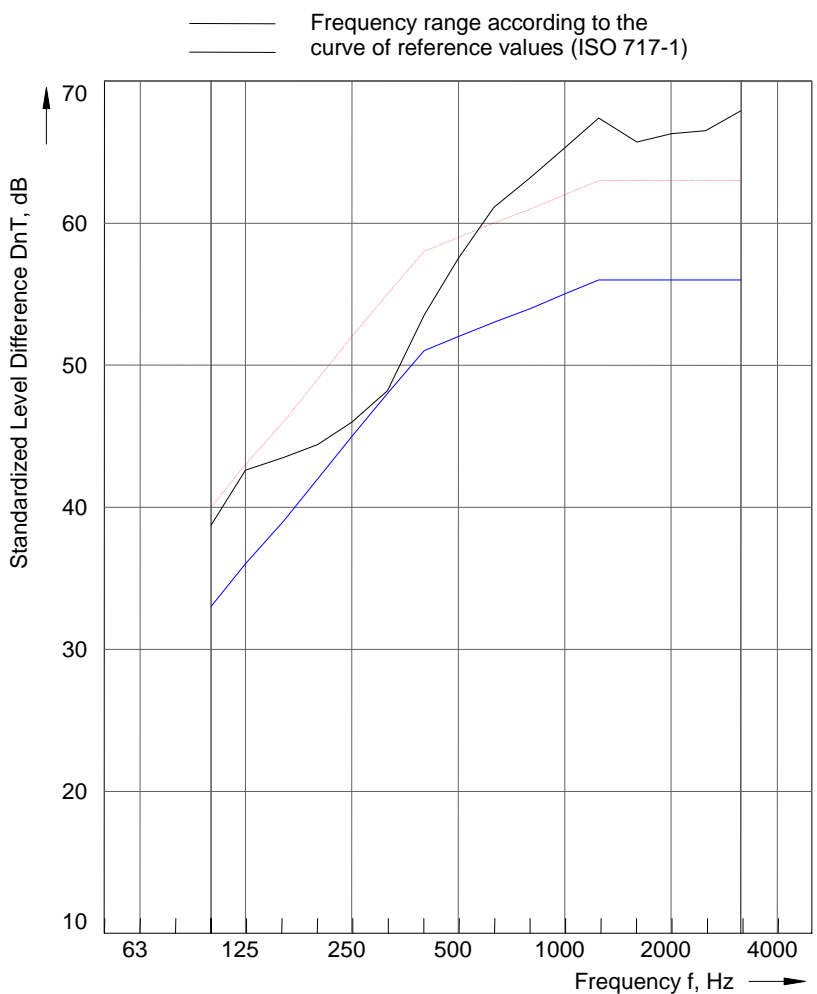
Client: Hillreed Homes Ltd

Date of test: 24/10/2007

Description and identification of the building construction and test arrangement, direction of measurement:
 Test 1 - Plot 1 to Plot 2 - Lounge to Lounge

Source room volume: 38.1 m³
 Receiving room volume: 38.10 m³

Frequency f Hz	DnT 1/3 Octave dB
50 63 80	
100	38.7
125	42.6
160	43.5
200	44.4
250	46.0
315	48.2
400	53.5
500	57.5
630	61.1
800	63.2
1000	65.3
1250	67.4
1600	65.7
2000	66.3
2500	66.5
3150	67.9
4000	
5000	



Rating according to ISO 717-1

DnT,w(C;Ctr) = 59 (-2; -6) dB

Evaluation based on field measurement results obtained in one-third-octave bands by an engineering method

Standardized Level Difference according to ISO 140-4
Field measurements of airborne sound insulation between rooms

Client: Hillreed Homes Ltd

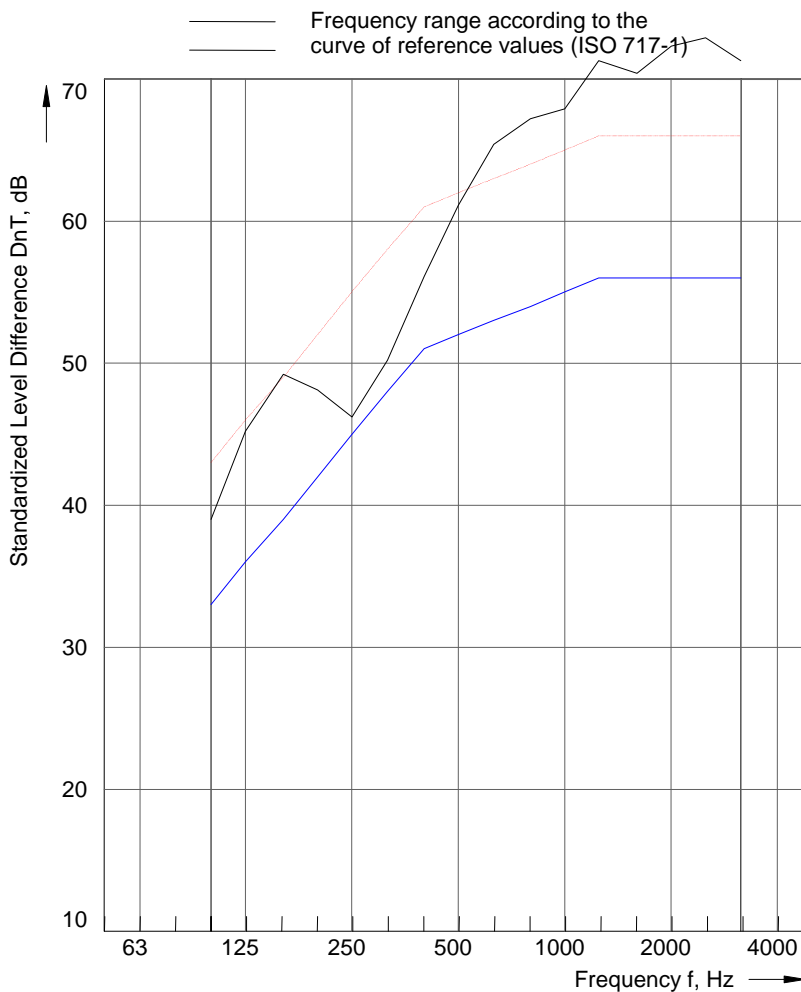
Date of test: 24/10/2007

Description and identification of the building construction and test arrangement, direction of measurement:

Test 2 - Plot 1 to Plot 2 - Bedroom 1 to Bedroom 1

Source room volume: 25.9 m³
 Receiving room volume: 24.10 m³

Frequency f Hz	DnT 1/3 Octave dB
50 63 80	
100	39.0
125	45.2
160	49.2
200	48.1
250	46.2
315	50.2
400	56.1
500	61.1
630	65.4
800	67.2
1000	67.9
1250	71.3
1600	70.4
2000	72.3
2500	72.9
3150	71.3
4000	
5000	



Rating according to ISO 717-1

DnT,w(C;Ctr) = 62 (-2; -7) dB

Evaluation based on field measurement results obtained in one-third-octave bands by an engineering method

No. of test report: 0268-N141 Page 7 of 8

Name of test institute: H+H UK Ltd

Date: 26/10/2007

Signature:

7. Conclusions

The results are compared with The Building Regulations 2000 Approved Document E, Section 0, Table 1a which specifies that the Weighted Standardised Level Difference $D_{nT,w}$ + Ctr for airborne sound tests on separating walls between dwellings, should be no less than 45dB for any individual result. It can be seen that the results from tests 1 and 2 exceed this minimum individual test value.

Therefore the result satisfies the airborne sound insulation performance requirements of the Building Regulations 2000 Approved Document E.

D J Harris. MIOA
Research Manager

Steven Knight
Principal Engineer

Appendix 1

Equipment Used : All as supplied by Bruell & Kjaer

Microphone – Ref Serial Number 2275739

Microphone – Ref Serial Number 2305844

Speaker – Omni Power 4296 - Ref Serial Number 2071502

Modular Precision Sound Analyser Type 2260 – Ref Serial Number 2320970

LAB Gruppen LAB 300 Power Amplifier – Ref Serial Number 104-029

AKG Wireless Microphone System 80 – Reference SNR 24223 Incorporating Remote Unit PT80 Ref Serial Number 288120007

Acoustical Calibrator Type 4231 – Ref Serial Number 2313303

DBX Professional Products 2 Series – Type 131 Graphic Equaliser (BK 16)

Associated Bruell & Kjaer Pre Amplifiers Ref ZC 0026 (BK 3 & 4)

Neutrik Speakon Ref NL4MM & Loudspeaker Cable (BK 6,7,8 & 9)

Microphone Extension Leads x 3 (BK 11,12 & 13)

Dual Lemo Adaptor (BK 2)

Microphone Holder x 2

Lightweight Tripod x 3



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Measurement of Airborne Sound Insulation (Separating Walls) At Gwynne Gardens, East Grinstead

Dated: 14th March 2008

Report No: N148

Client : Hillreed Homes Ltd

Comparison with Approved Document E (2003) to the Building Regulations 2000.

Test No.	Rooms	D _{nT,w} + C _{tr} (dB)			L' _{nT,w} (dB)		
		Measured	Required	Pass/Fail	Measured	Required	Pass/Fail
1	Plot 9 to Plot 10 – Lounge to Lounge	51	≥45	Pass	N/A	N/A	N/A
2	Plot 9 to Plot 10 – Bedroom 2 to Bedroom 2	51	≥45	Pass	N/A	N/A	N/A

DJ Harris. MIOA
Research Manager

Steven Knight
Principal Engineer

Serial Number : 0276

Page 1 of 8



Measurement of the Airborne Sound Insulation (Separating Walls) At Gwynne Gardens, East Grinstead

Summary

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2.3 External Flanking wall

The flanking wall consisted of Brick/ 50mm cavity/ 50mm rigid insulation/ 115 mm Celcon Standard aircrete blockwork laid using Celfix Thin Layer mortar. The wall was finished internally using 12.5mm plasterboard on dabs.

2.4 Partition Wall

The internal partitions were constructed using 75mm metal studwork (with mineral wool infill where necessary) and finished with 12.5mm plasterboard both sides.

3 Airborne Sound Insulation - Method of Measurement To BS EN ISO 140-4:1998

The measurements were carried out in accordance with British Standards BS EN ISO 140-4:1998, BS EN ISO 717-1:1997 and the Building Regulations 2000. The tests were performed using a standard procedure of ten microphone positions in each of the source and receiving rooms. A single loud speaker with omni directional radiation, generating white noise was used as the noise source and was located in two positions (five fixed microphone positions each speaker position).

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- Where
- D_{nT} is the Standardised Level Difference (dB)
 - L_1 is the mean sound pressure level in source room (dB)
 - L_2 is the mean sound pressure level in receiving room (dB)
 - T is the mean reverberation time of the receiving room (seconds)
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4. Test Rooms

The following tests were performed at Hillreed Homes Ltd site at Gwynne Gardens, East Grinstead

A. Plot 9 to Plot 10 – Conducted on 29-02-2008

Test 1 = Lounge to Lounge

B. Plot 9 to Plot 10 – Conducted on 29-02-2008

Test 2 = Bedroom 2 to Bedroom 2

Drawings of plot layouts are shown on drawings attached.

All doors and windows were closed for the tests. All plots were unfurnished.

5. Room Volumes and Common Separating Element Area

The room volumes and common separating element areas were as follows

	Source Room Volume (m ³)	Receiving Room Volume (m ³)	Common Separating Element Area (m ²)
Test 1	40.1	40.1	6.8
Test 2	26.5	26.5	5.3

6. Results

The Weighted Standardised Level Differences, D_{nT_w} have been derived in accordance with BS EN ISO 717-1: 1997. The D_{nT_w} is equivalent to a mean rating of 60dB with the calculated results for the tests shown on sheets 6 to 7.

The Weighted Standardised Level Difference, $D_{nT,w}$ with adaptation for low frequency noise ($D_{nT,w} + C_{tr}$) has been calculated in accordance with BS EN ISO 717-1:1997. A mean value for the two tests of 51dB is calculated, with a minimum value of 51dB.

Standardized Level Difference according to ISO 140-4
Field measurements of airborne sound insulation between rooms

Client: Hillreed Homes Ltd

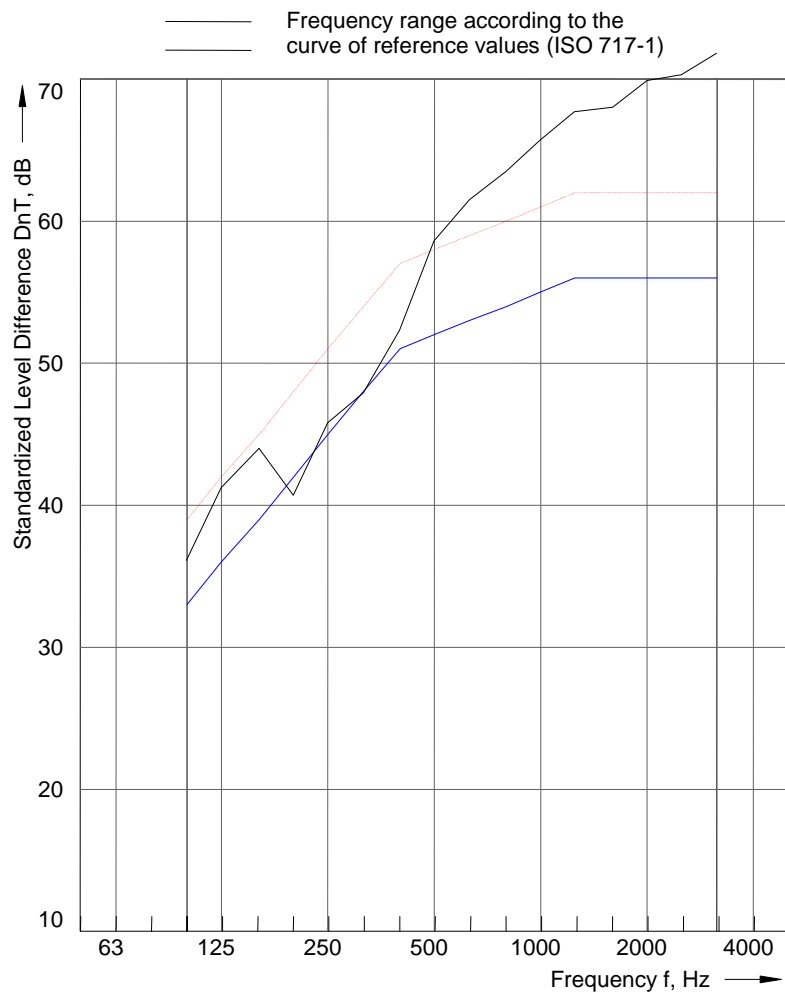
Date of test: 29/02/2008

Description and identification of the building construction and test arrangement, direction of measurement:

Test 1 - Plot 9 to Plot 10 - Lounge to Lounge

Source room volume: 40.1 m³
 Receiving room volume: 40.10 m³

Frequency f Hz	DnT 1/3 Octave dB
50 63 80	
100	36.1
125	41.2
160	44.0
200	40.7
250	45.8
315	47.9
400	52.3
500	58.6
630	61.5
800	63.5
1000	65.7
1250	67.7
1600	68.0
2000	69.9
2500	70.3
3150	71.8
4000	
5000	



Rating according to ISO 717-1

DnT,w(C;Ctr) = 58 (-2; -7) dB

Evaluation based on field measurement results obtained in one-third-octave bands by an engineering method

No. of test report: 0276-N148 Page 6 of 8

Name of test institute: H + H UK Ltd

Date: 14/03/2008

Signature:

Standardized Level Difference according to ISO 140-4
Field measurements of airborne sound insulation between rooms

Client: Hillreed Homes Ltd

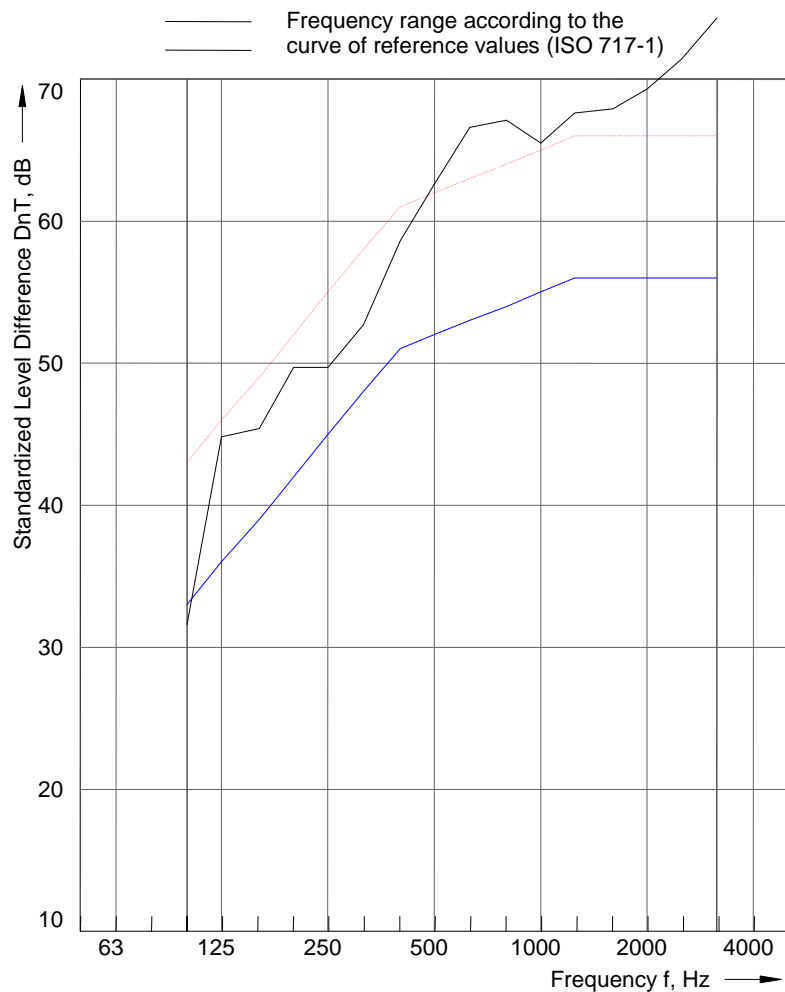
Date of test: 29/02/2008

Description and identification of the building construction and test arrangement, direction of measurement:

Test 2 - Plot 9 to Plot 10 - Bedroom 2 to Bedroom 2

Source room volume: 26.5 m³
 Receiving room volume: 26.50 m³

Frequency f Hz	DnT 1/3 Octave dB
50 63 80	
100	31.6
125	44.8
160	45.4
200	49.7
250	49.7
315	52.7
400	58.6
500	62.6
630	66.6
800	67.1
1000	65.5
1250	67.6
1600	67.9
2000	69.3
2500	71.4
3150	74.3
4000	
5000	



Rating according to ISO 717-1

DnT,w(C;Ctr) = 62 (-4;-11) dB

Evaluation based on field measurement results obtained in one-third-octave bands by an engineering method

No. of test report: 0276-N148 Page 7 of 8

Name of test institute: H + H UK Ltd

Date: 14/03/2008

Signature:

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