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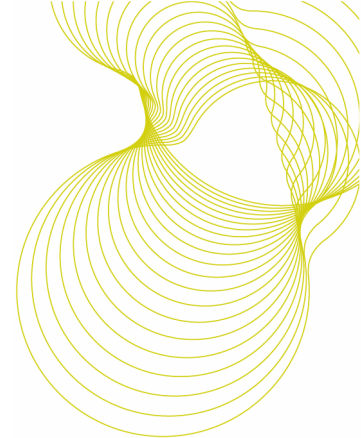
**Laboratory airborne  
sound insulation of  
metal access panels  
with and without Xetal/E-  
coustiquilt**

Prepared for:  
Fire Proofing Services

Test report number 251449



0578



**Tested by**

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Name Mr M Burdett  
Position Consultant  
Date 14 July 2004


Signature 

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**Prepared by**

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Name Mr M Burdett  
Position Consultant  
Date 14 July 2004

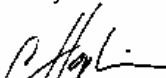
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**Checked by**

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Name Dr C Hopkins  
Position Principal Consultant  
Date 14 July 2004

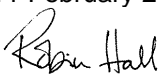
Signature 

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**Approved on behalf of BRE**

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Name Dr R Hall  
Position Principal Consultant  
Date 11 February 2009

Signature 

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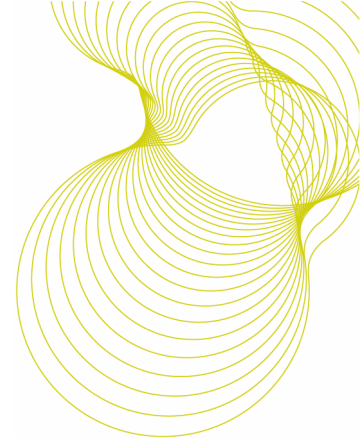
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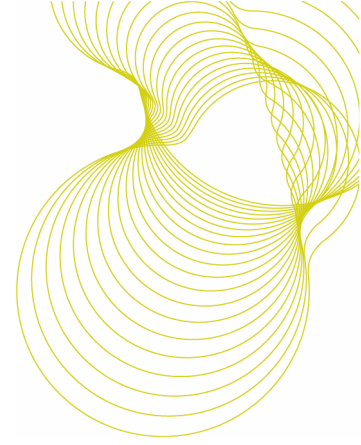
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## **1 Introduction**

BRE Acoustics was commissioned by Fire Proofing Services, Evolution House, Aston Road, Nuneaton, CV11 5EL to issue this report which is based on airborne sound insulation measurements carried out in the BRE horizontal transmission suite (Building 9), BRE, Garston, Watford, Hertfordshire, WD25 9XX. The measurement data were previously published in BRE reports 215403 and 218510.

## **2 Testing details**

### **2.1 Test dates and personnel**

The measurements detailed in this report were made on 19 November 2003 and 25 November 2003 by Mr M Burdett and Dr R Hall of BRE Acoustics.

### **2.2 Test method and applicable standards**

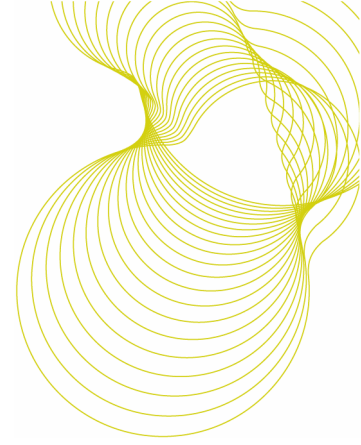
Measurement of airborne sound insulation was made in accordance with BS EN ISO 140-3:1995. Single number quantities were calculated in accordance with BS EN ISO 717-1:1997.

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 Test element installation**

The test elements for tests L103-024, L103-025 and L103-026 were installed in a filler wall by Xetal Consultants Ltd.

The filler wall (see test L103-032) was installed by BRE.



## 2.4 Instrumentation

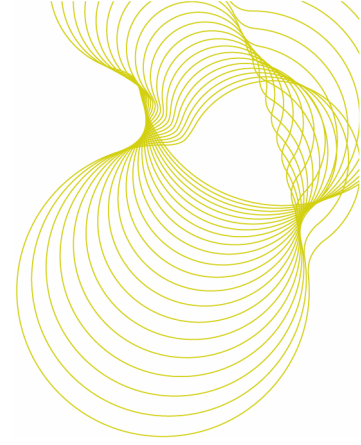
The equipment used to conduct the tests is identified in Table 1.

**Table 1** Equipment list

Equipment description	Manufacturer	Type	UKAS identification number
Real time analyser	NEAS	840	13/003
Microphone calibrator	B & K	4231	01/002
Condenser microphone	B & K	4165	02/005, 02/001, 02/003
Microphone pre-amplifier	B & K	2619	04/005, 04/001, 04/003
Microphone rotating boom	NEAS	212NA	14/004, 14/005
Graphic equaliser	Phonic	PEQ 3300	10/001
Loudspeaker	B & K	4224	11/007

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 in accordance with BRE procedures, using reference equipment calibrated by a UKAS accredited laboratory.

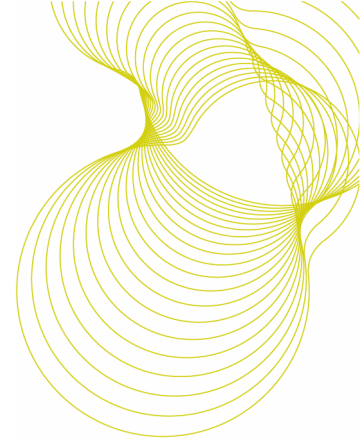


## 2.5 Test numbers

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

<b>Test number</b>	<b>Test element</b>	<b>Source room volume (m<sup>3</sup>)</b>	<b>Receive room volume (m<sup>3</sup>)</b>	<b>Common area (m<sup>2</sup>)</b>
L103-024	Access hatch	130	115	1.1
L103-025	Access hatch	130	115	1.1
L103-026	Access hatch	130	115	1.1
L103-032	Wall	130	115	9.9

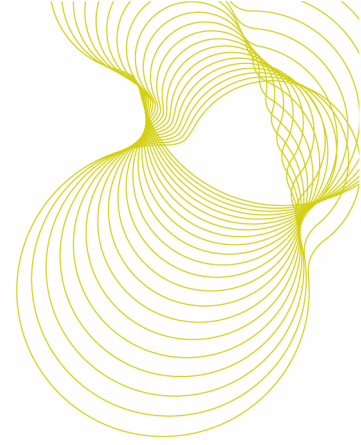


## 2.6 Construction details with test numbers

The construction details are shown in Table 3.

**Table 3** Construction details

Test element	Test number	Construction details
Access hatch	L103-024	<ul style="list-style-type: none"> <li>• Acoustic access panel (37 kg/m<sup>2</sup>) with Xetal/E-coustiquilt</li> </ul>
	L103-025	<ul style="list-style-type: none"> <li>• Acoustic access panel (37 kg/m<sup>2</sup>) with Xetal/E-coustiquilt with 45 mm x 35 mm timber batten frame butted to inner frame</li> </ul>
	L103-026	<ul style="list-style-type: none"> <li>• Standard fire rated access panel (30 kg/m<sup>2</sup>)</li> </ul>
Wall	L103-032	<ul style="list-style-type: none"> <li>• 2 x 15 mm Knauf Soundshield wallboard (14 kg/m<sup>2</sup>) screwed to</li> <li>• 45 mm x 70 mm independent timber studs at 400 mm centres</li> <li>• 100 mm cavity with 100 mm Knauf Crown combi-roll (10 kg/m<sup>3</sup>) between studs</li> <li>• 215 mm Tarmac Topcrete dense aggregate block wall (430 kg/m<sup>2</sup>) painted with two coats of high quality masonry paint on each side</li> <li>• 100 mm cavity with 100 mm Knauf Crown combi-roll (10 kg/m<sup>3</sup>) between</li> <li>• 45 mm x 70 mm independent timber studs at 400 mm centres</li> <li>• 2 x 15 mm Knauf Soundshield wallboard (14 kg/m<sup>2</sup>) screwed to studs</li> </ul>



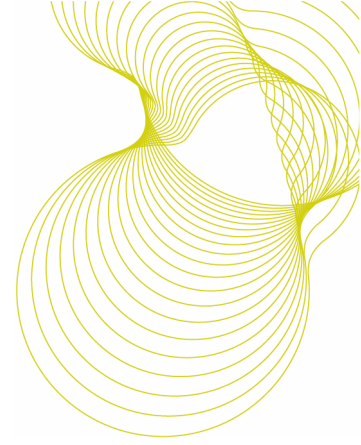
## 2.7 Sound insulation test results

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

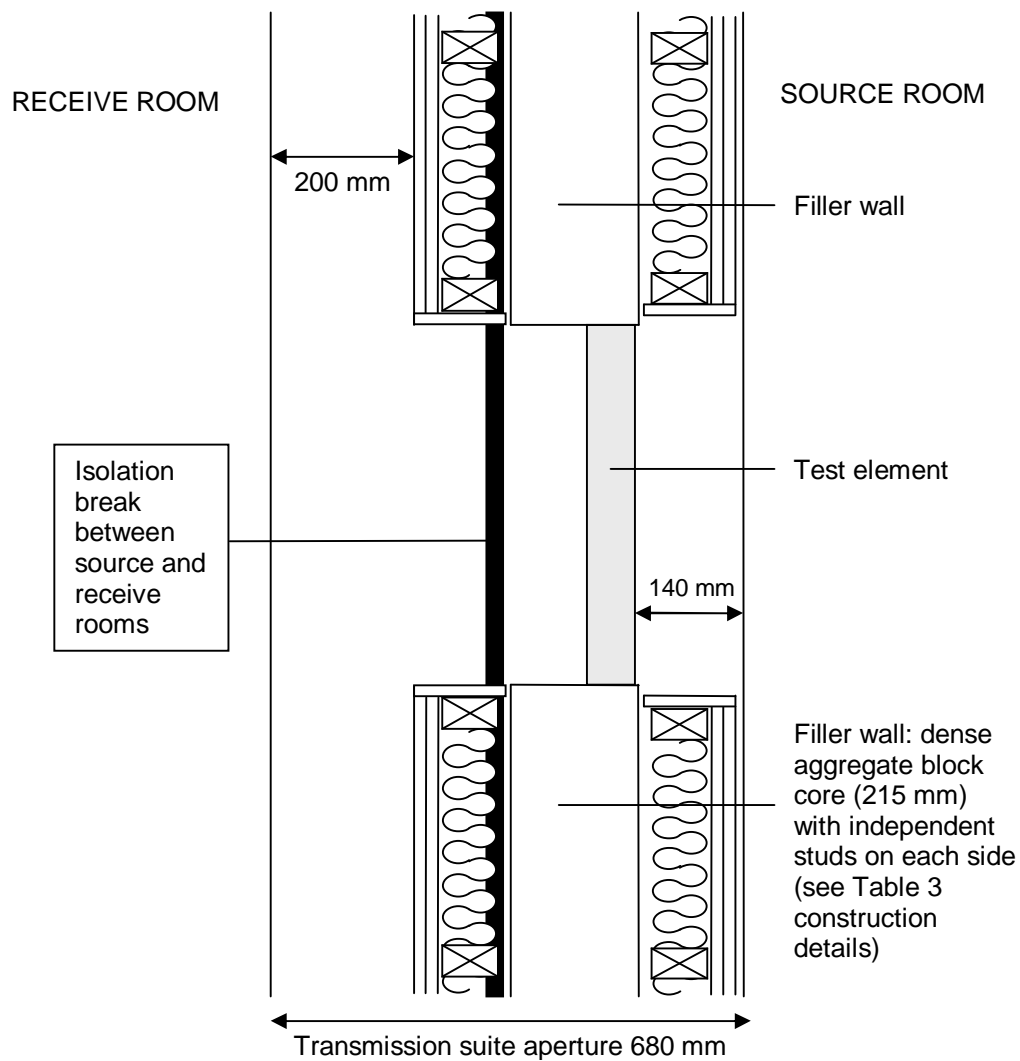
Test number	$R_w$ (C; $C_{tr}$ ) (dB)
L103-024	40 (-2;-7)
L103-025	40 (-2;-6)
L103-026	26 (-1;-4)
L103-032	73 (-3;-9)



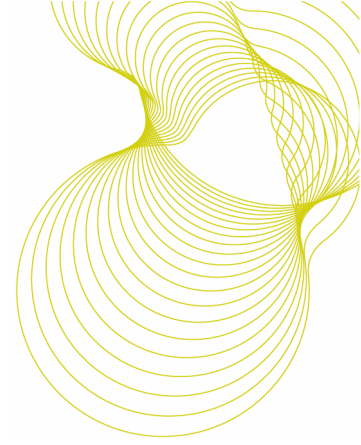


## 2.8 Plans

The position of the test element and filler wall construction in the transmission suite aperture is indicated in Figure 1.



**Figure 1** Plan view of the test construction and filler wall in the transmission suite aperture



## 2.9 Manufacturer's product information and drawings

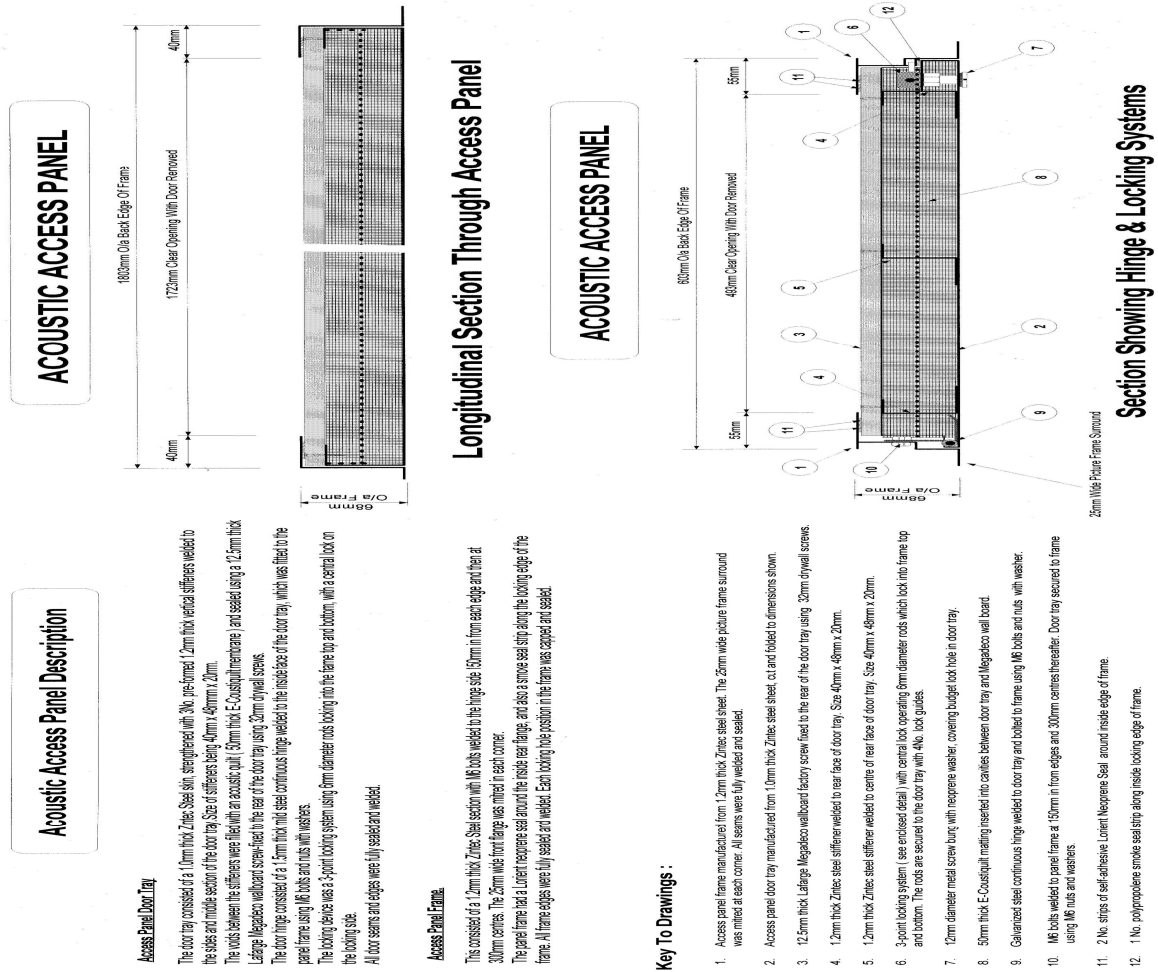
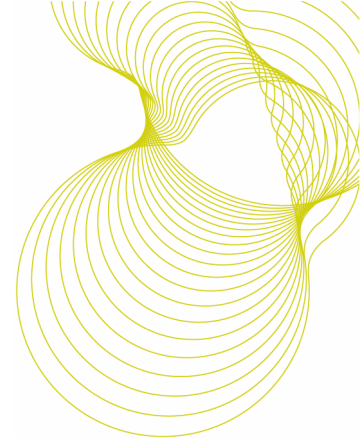
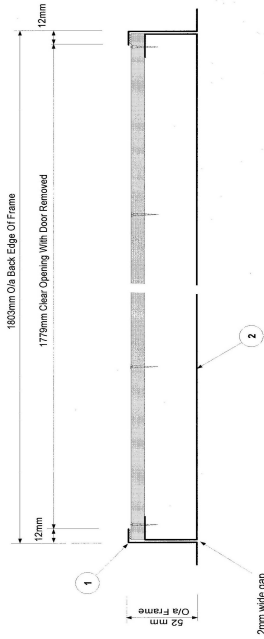


Figure 2 Acoustic access panel product information and drawings

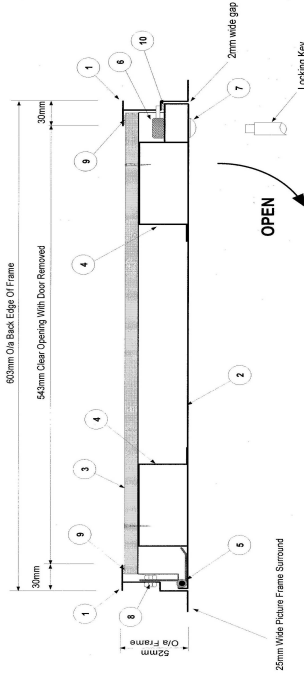


### 1 HOUR FIRE RATED ACCESS PANEL



### Longitudinal Section Through Access Panel

### 1 HOUR FIRE RATED ACCESS PANEL



### Section Showing Hinge & Locking Systems

#### PANEL DESCRIPTION

##### 1 Hour Fire Rated Access Panel

###### Access Panel Door Tray

The door tray consisted of a 1.0mm thick Ziniec Steel skin, strengthened with 2No. pre-formed, 1.2mm thick vertical stiffeners welded to the sides of the door tray. Size of stiffeners being 35mm x 100mm x 35mm x 20mm.  
 A 12.5mm thick Lafarge Megateco wallboard was screw-fixed to the rear of the door tray using 32mm drywall screws.  
 The door hinge consisted of a 1.5mm thick mild steel continuous hinge welded to the inside face of the door tray, which was fitted to the panel frame using M6 bolts and nuts with washers.  
 The panel door was locked by 3No. standard budget locks situated approx. 200mm in from each end top & bottom with one lock central.  
 The lock holes in the front of the door were each covered by a white plastic collar & dome plug.

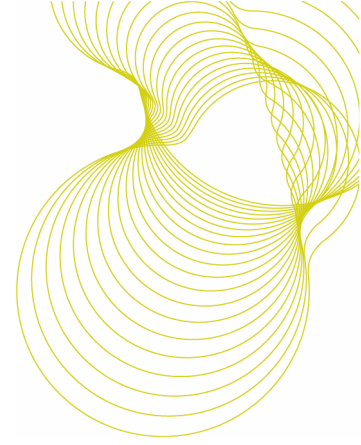
###### Access Panel Frame

This consisted of a 1.2mm thick Ziniec Steel section with M6 bolts welded to the hinge side 150mm in from each edge and then at 300mm centres. The 25mm wide front flange was milled in each corner.  
 The panel frame had a fire retardant smoke seal around the inside rear flange, and also a smoke seal strip along the locking edge of the frame.

#### Key To Drawings :

1. Access panel frame manufactured from 1.2mm thick Ziniec steel sheet. The 25mm wide picture frame surround was milled at each corner. All seams were fully welded and sealed.
2. Access panel door tray manufactured from 1.0mm thick Ziniec steel sheet, cut and folded to dimensions shown.
3. 12.5mm thick Lafarge Megateco wallboard factory screw fixed to the rear of the door tray using 32mm drywall screws.
4. 1.2mm thick Ziniec steel stiffener welded to rear face of door tray. Size 35mm x 100mm x 35mm x 20mm.
5. Galvanized steel continuous hinges welded to door tray and bolted to frame using M6 bolts and nuts with washer.
6. Standard Budget Lock (3No. Total). One lock positioned approx 200mm in from each end top & bottom, with one lock central.
7. 16mm diameter plastic dome plug with collar, covering budget lock holes in door tray.
8. M6 bolts welded to panel frame at 150mm in from edges and 300mm centres thereafter. Door tray secured to frame using M6 nuts and washers.
9. Self adhesive fire retardant smoke seal fixed to inside edge of rear flange on frame.
10. Self adhesive fire retardant smoke seal along locking edge of frame.

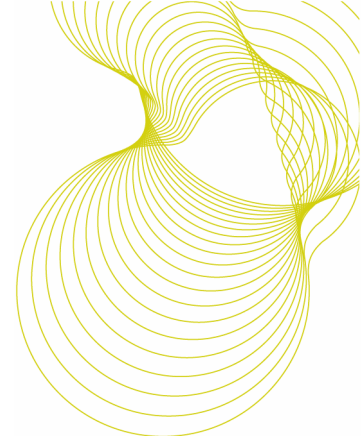
Figure 3 One hour fire rated access panel product information and drawings



## Appendices

### 2.10 UKAS test result sheets

Page number	Test number
14	L103-024
16	L103-025
18	L103-026
20	L103-032





**Laboratory measurement of airborne sound insulation of building elements**  
**Sound reduction index according to BS EN ISO 140-3:1995**  
**BRE horizontal transmission suite (B9 051-053)**

Client: Fire Proofing Services

Test date: 19/11/2003

Test number: L103-024

Test element: Access hatch

0578

Test element area: 1.1 m<sup>2</sup>

Mass per unit area:

37 kg/m<sup>2</sup>

**Description:**

Acoustic access panel (37 kg/m<sup>2</sup>) with Xetal/E-coustiquilt

Source room volume: 130 m<sup>3</sup>

Air temperature:

17 °C

Receive room volume: 115 m<sup>3</sup>

Air relative humidity:

65 %

Frequency (Hz)	Reverberation time (s)	Background level (dB)	Source level (dB)	Receive level (dB)	R (dB)
50	3.80	27.3	84.1	54.2	23.7
63	3.63	25.5	90.9	58.2	26.0
80	2.88	19.8	92.6	55.1	29.9
100	1.86	28.1	92.1	61.0	21.6
125	1.69	20.2	95.4	65.7	19.7
160	1.73	11.9	94.6	63.7	21.0
200	1.62	9.0	95.1	57.8	27.1
250	1.48	7.2	94.9	53.5	30.9
315	1.39	7.1	96.8	54.7	31.3
400	1.37	12.6	98.0	51.8	35.3
500	1.31	13.0	98.7	49.3	38.3
630	1.26	14.0	99.4	48.5	39.6
800	1.30	7.2	98.9	46.0	41.9
1,000	1.27	9.1	95.6	41.0	43.5
1,250	1.34	9.2	94.5	36.0	47.5
1,600	1.41	7.5	98.1	37.4	50.0
2,000	1.41	5.0	98.5	38.2	49.6
2,500	1.42	5.1	96.7	38.3	47.7
3,150	1.42	5.5	92.3	36.1	45.5
4,000	1.32	5.9	91.9	33.6	47.3
5,000	1.22	6.1	87.8	26.6	49.8

Rating according to BS EN ISO 717-1:1997

**$R_w (C; C_{tr}) = 40 (-2; -7) \text{ dB}$**       $C_{50-3150} = -2 \text{ dB}$       $C_{50-5000} = -1 \text{ dB}$       $C_{100-5000} = -1 \text{ dB}$   
 $C_{tr,50-3150} = -7 \text{ dB}$       $C_{tr,50-5000} = -7 \text{ dB}$       $C_{tr,100-5000} = -7 \text{ dB}$

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)

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**Laboratory measurement of airborne sound insulation of building elements**  
**Sound reduction index according to BS EN ISO 140-3:1995**  
**BRE horizontal transmission suite (B9 051-053)**

Client: Fire Proofing Services  
 Test date: 19/11/2003      Test number: L103-024      Test element: Access hatch

0578

Test element area: 1.1 m<sup>2</sup>      Mass per unit area: 37 kg/m<sup>2</sup>

**Description:**

Acoustic access panel (37 kg/m<sup>2</sup>) with Xetal/E-coustiquit

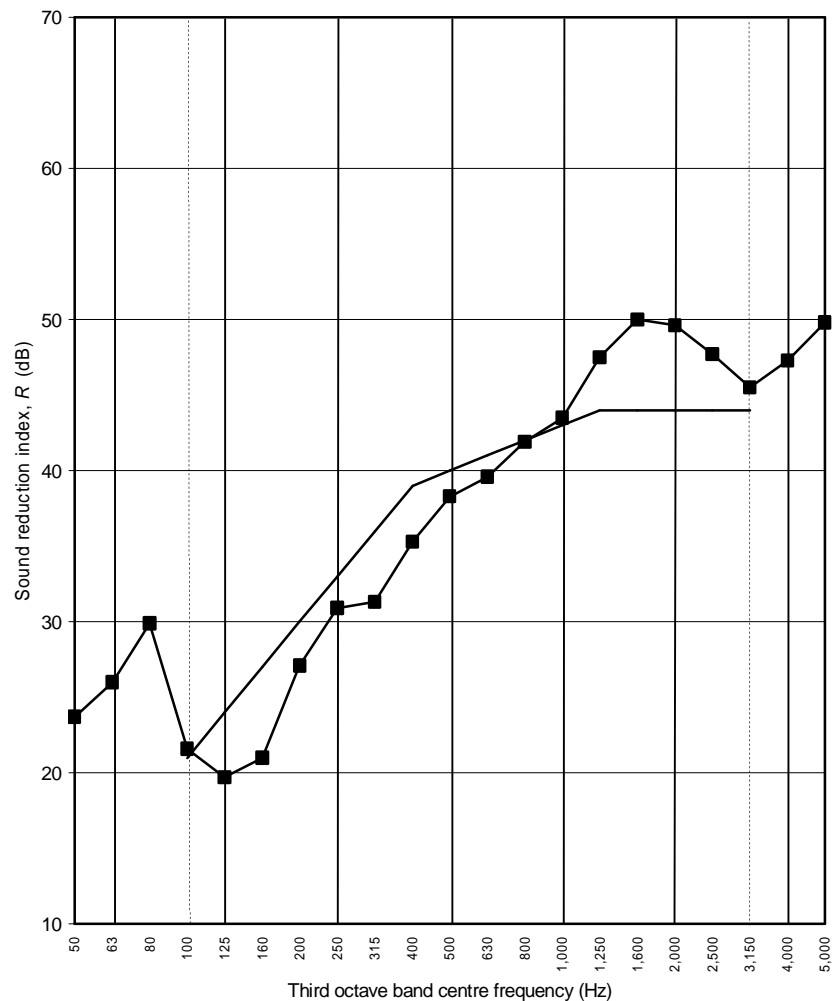
Source room volume: 130 m<sup>3</sup>

Air temperature: 17 °C

Receive room volume: 115 m<sup>3</sup>

Air relative humidity: 65 %

Frequency (Hz)	R One-third octave (dB)
50	23.7
63	26.0
80	29.9
100	21.6
125	19.7
160	21.0
200	27.1
250	30.9
315	31.3
400	35.3
500	38.3
630	39.6
800	41.9
1,000	43.5
1,250	47.5
1,600	50.0
2,000	49.6
2,500	47.7
3,150	45.5
4,000	47.3
5,000	49.8



Rating according to BS EN ISO 717-1:1997

**$R_w (C; C_{tr}) = 40 (-2; -7) \text{ dB}$**        $C_{50-3150} = -2 \text{ dB}$        $C_{50-5000} = -1 \text{ dB}$        $C_{100-5000} = -1 \text{ dB}$   
 $C_{tr,50-3150} = -7 \text{ dB}$        $C_{tr,50-5000} = -7 \text{ dB}$        $C_{tr,100-5000} = -7 \text{ dB}$

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  $\pm 1 \text{ dB}$  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)

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**Laboratory measurement of airborne sound insulation of building elements**  
**Sound reduction index according to BS EN ISO 140-3:1995**  
**BRE horizontal transmission suite (B9 051-053)**

Client: Fire Proofing Services  
 Test date: 19/11/2003      Test number: L103-025      Test element: Access hatch

0578

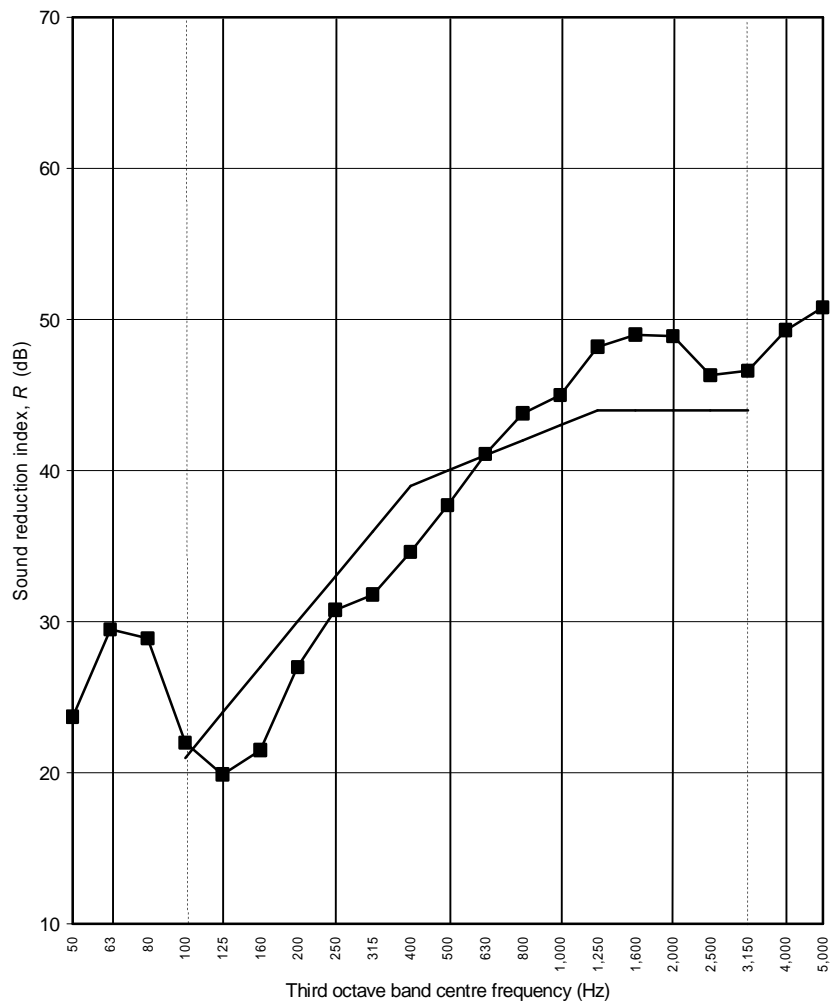
Test element area: 1.1 m<sup>2</sup>      Mass per unit area: 37 kg/m<sup>2</sup>

**Description:**

Acoustic access panel (37 kg/m<sup>2</sup>) with Xetal/E-coustiquit with 45 mm x 35 mm timber batten frame butted to inner frame

Source room volume: 130 m<sup>3</sup>      Air temperature: 17 °C  
 Receive room volume: 115 m<sup>3</sup>      Air relative humidity: 64 %

Frequency (Hz)	R One-third octave (dB)
50	23.7
63	29.5
80	28.9
100	22.0
125	19.9
160	21.5
200	27.0
250	30.8
315	31.8
400	34.6
500	37.7
630	41.1
800	43.8
1,000	45.0
1,250	48.2
1,600	49.0
2,000	48.9
2,500	46.3
3,150	46.6
4,000	49.3
5,000	50.8



Rating according to BS EN ISO 717-1:1997

**R<sub>w</sub> (C; C<sub>tr</sub>) = 40 (-2; -6) dB**      C<sub>50-3150</sub> = -2 dB      C<sub>50-5000</sub> = -1 dB      C<sub>100-5000</sub> = -1 dB  
 C<sub>tr,50-3150</sub> = -7 dB      C<sub>tr,50-5000</sub> = -7 dB      C<sub>tr,100-5000</sub> = -6 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<sub>w</sub>) and should not exceed the values in Table A1 of BS EN 20140-2:1993 for the data in the individual third octaves (R)

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**Laboratory measurement of airborne sound insulation of building elements**  
**Sound reduction index according to BS EN ISO 140-3:1995**  
**BRE horizontal transmission suite (B9 051-053)**

Client: Fire Proofing Services

Test date: 19/11/2003

Test number: L103-026

Test element: Access hatch

0578

Test element area: 1.1 m<sup>2</sup>

Mass per unit area: 30 kg/m<sup>2</sup>

**Description:**

Standard fire rated access panel (30 kg/m<sup>2</sup>)

Source room volume: 130 m<sup>3</sup>

Air temperature: 17 °C

Receive room volume: 115 m<sup>3</sup>

Air relative humidity: 67 %

Frequency (Hz)	Reverberation time (s)	Background level (dB)	Source level (dB)	Receive level (dB)	R (dB)
50	3.71	27.0	84.2	57.4	20.3
63	3.74	25.4	90.8	59.8	24.5
80	2.92	21.8	92.2	60.6	24.1
100	1.82	28.8	93.0	67.1	16.3
125	1.68	19.8	95.5	68.0	17.5
160	1.78	14.8	94.4	71.8	12.9
200	1.74	8.8	94.5	71.7	13.0
250	1.42	6.6	94.9	68.5	15.7
315	1.46	6.7	96.5	65.5	20.4
400	1.39	9.5	97.8	64.0	23.0
500	1.35	11.4	98.6	63.4	24.3
630	1.31	13.4	99.0	64.8	23.1
800	1.26	7.4	98.4	63.2	23.9
1,000	1.27	8.2	95.2	59.2	24.8
1,250	1.31	10.3	93.9	56.0	26.9
1,600	1.39	8.2	97.3	56.2	30.3
2,000	1.37	4.9	97.6	57.1	29.6
2,500	1.43	5.1	96.5	56.2	29.6
3,150	1.41	5.4	93.4	50.1	32.5
4,000	1.35	5.8	92.5	47.8	33.7
5,000	1.23	6.1	88.9	45.4	32.1

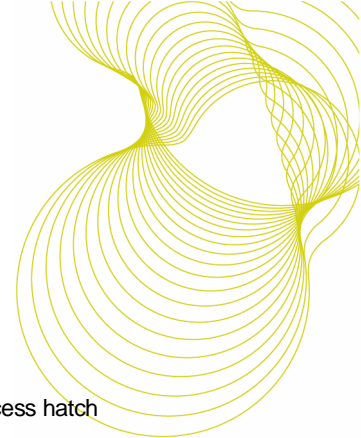
Rating according to BS EN ISO 717-1:1997

**$R_w (C; C_{tr}) = 26 (-1; -4) \text{ dB}$**      $C_{50-3150} = -1 \text{ dB}$      $C_{50-5000} = 0 \text{ dB}$      $C_{100-5000} = 0 \text{ dB}$   
 $C_{tr,50-3150} = -4 \text{ dB}$      $C_{tr,50-5000} = -4 \text{ dB}$      $C_{tr,100-5000} = -4 \text{ dB}$

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  $\pm 1 \text{ dB}$  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)

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**Laboratory measurement of airborne sound insulation of building elements**  
**Sound reduction index according to BS EN ISO 140-3:1995**  
**BRE horizontal transmission suite (B9 051-053)**

Client: Fire Proofing Services

Test date: 19/11/2003

Test number: L103-026

Test element: Access hatch

0578

Test element area: 1.1 m<sup>2</sup>

Mass per unit area:

30 kg/m<sup>2</sup>

**Description:**

Standard fire rated access panel (30 kg/m<sup>2</sup>)

Source room volume: 130 m<sup>3</sup>

Air temperature:

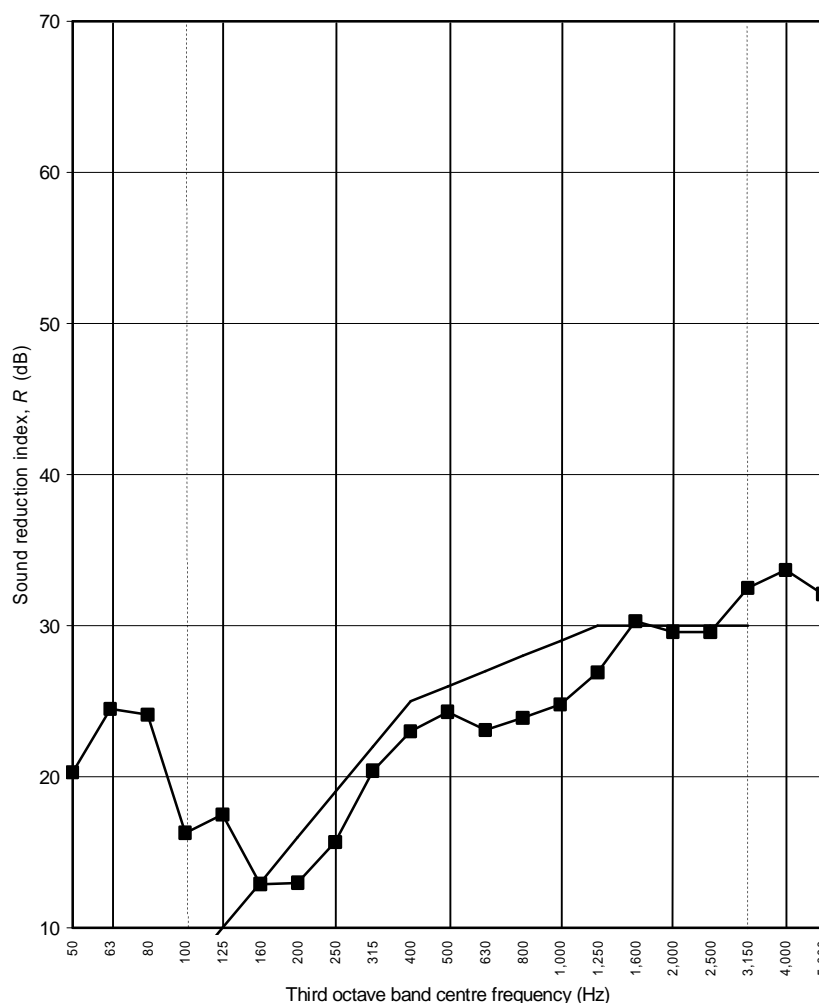
17 °C

Receive room volume: 115 m<sup>3</sup>

Air relative humidity:

67 %

Frequency (Hz)	R One-third octave (dB)
50	20.3
63	24.5
80	24.1
100	16.3
125	17.5
160	12.9
200	13.0
250	15.7
315	20.4
400	23.0
500	24.3
630	23.1
800	23.9
1,000	24.8
1,250	26.9
1,600	30.3
2,000	29.6
2,500	29.6
3,150	32.5
4,000	33.7
5,000	32.1



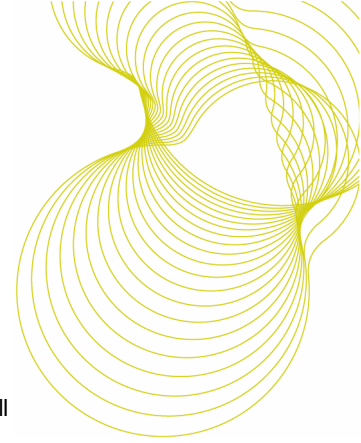
Rating according to BS EN ISO 717-1:1997

**$R_w (C; C_{tr}) = 26 (-1; -4) \text{ dB}$**      $C_{50-3150} = -1 \text{ dB}$      $C_{50-5000} = 0 \text{ dB}$      $C_{100-5000} = 0 \text{ dB}$   
 $C_{tr,50-3150} = -4 \text{ dB}$      $C_{tr,50-5000} = -4 \text{ dB}$      $C_{tr,100-5000} = -4 \text{ dB}$

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  $\pm 1 \text{ dB}$  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)

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**Laboratory measurement of airborne sound insulation of building elements**  
**Sound reduction index according to BS EN ISO 140-3:1995**  
**BRE horizontal transmission suite (B9 051-053)**

**Client:** Fire Proofing Services

**Test date:** 25/11/2003

**Test number:** L103-032

**Test element:** Wall

0578

**Test element area:** 9.9 m<sup>2</sup>                      **Mass per unit area:** 497 kg/m<sup>2</sup>

**Description:**

2 x 15 mm Knauf Soundshield (14 kg/m<sup>2</sup>) screwed to 45 mm x 70 mm independent timber studs at 400 mm centres  
 100 mm cavity with 100 mm Knauf Crown combi-roll (10 kg/m<sup>3</sup>) between studs, 215 mm Tarmac dense aggregate  
 block wall (430 kg/m<sup>2</sup>) painted with two coats of masonry paint on each side, 100 mm cavity with 100 mm Knauf combi-roll  
 between 45 mm x 70 mm independent timber studs at 400 mm centres, 2 x 15 mm Knauf Soundshield screwed to studs

**Source room volume:** 130 m<sup>3</sup>                      **Air temperature:** 16 °C

**Receive room volume:** 115 m<sup>3</sup>                      **Air relative humidity:** 62 %

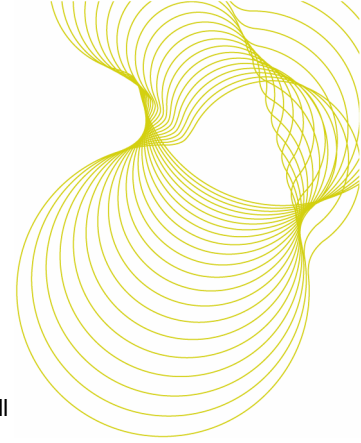
Frequency (Hz)	Reverberation time (s)	Background level (dB)	Source level (dB)	Receive level (dB)	R (dB)
50	3.96	30.0	95.5	62.1	36.7
63	3.32	25.8	101.3	62.1	41.7
80	2.95	24.0	102.5	56.1	48.5
100	1.76	32.0	103.8	57.1	46.5
125	1.64	24.9	102.7	51.8	50.3
160	1.79	19.4	103.2	44.7	58.4
200	1.75	15.1	105.3	46.5	58.5
250	1.45	11.0	105.7	42.1	62.6
315	1.45	13.4	107.1	39.8	66.2
400	1.33	17.1	107.6	37.8	68.3
500	1.32	15.5	108.0	35.2	71.3
630	1.30	14.8	108.6	30.6	76.4
800	1.28	10.1	108.6	28.8	78.2
1,000	1.32	7.6	105.6	20.8	83.3
1,250	1.33	7.7	105.2	17.0	86.7
1,600	1.33	4.3	108.6	19.0	88.2
2,000	1.39	4.3	109.9	19.6	89.1
2,500	1.41	4.7	109.5	18.7	89.6
3,150	1.37	5.2	106.3	9.5	95.6
4,000	1.30	5.6	106.8	6.9	98.3
5,000	1.20	6.0	100.0	5.1	93.1

+ Receiving room level adjusted for background

\* Receiving room level within 6 dB of background

Rating according to BS EN ISO 717-1:1997					
<b>R<sub>w</sub> (C; C<sub>tr</sub>) = 73 (-3;-9) dB</b>	C <sub>50-3150</sub> = -4 dB	C <sub>50-5000</sub> = -3 dB	C <sub>100-5000</sub> = -2 dB		
	C <sub>tr,50-3150</sub> = -15 dB	C <sub>tr,50-5000</sub> = -15 dB	C <sub>tr,100-5000</sub> = -9 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 <sub>w</sub> ) and should not exceed the values in Table A1 of BS EN 20140-2:1993 for the data in the individual third octaves (R)					

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**Sound reduction index according to BS EN ISO 140-3:1995**  
**BRE horizontal transmission suite (B9 051-053)**

**Client:** Fire Proofing Services  
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 between 45 mm x 70 mm independent timber studs at 400 mm centres, 2 x 15 mm Knauf Soundshield screwed to studs

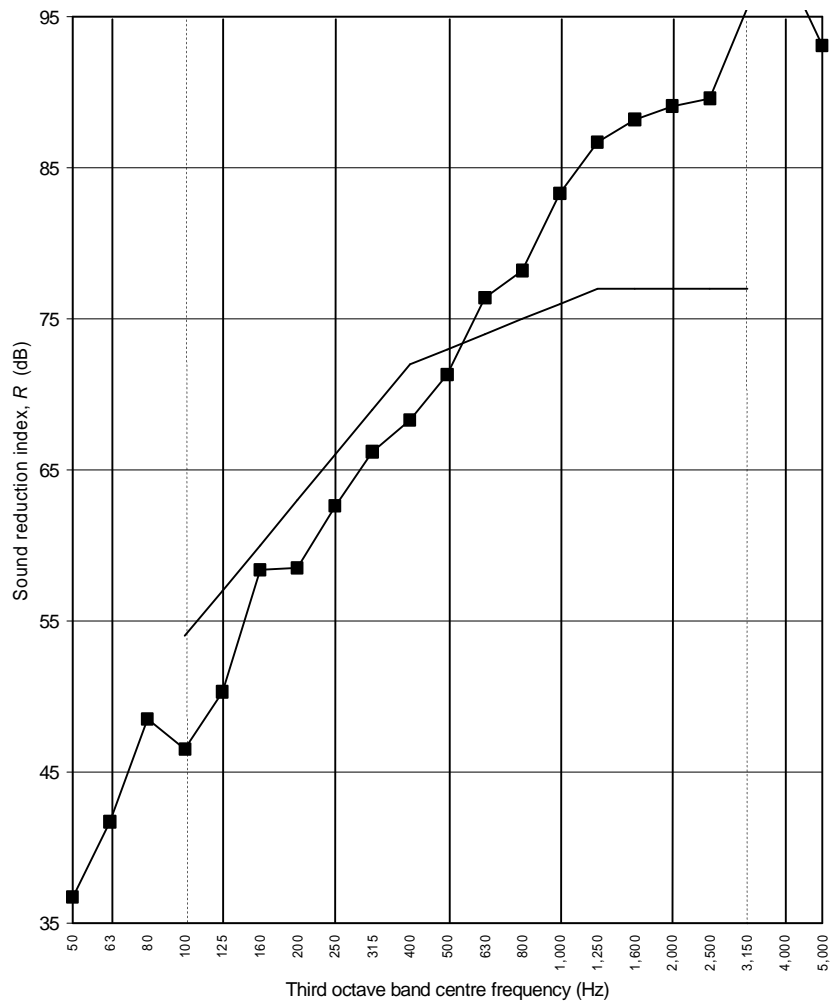
**Source room volume:** 130 m<sup>3</sup>      **Air temperature:** 16 °C

**Receive room volume:** 115 m<sup>3</sup>      **Air relative humidity:** 62 %

Frequency (Hz)	R One-third octave (dB)
50	36.7
63	41.7
80	48.5
100	46.5
125	50.3
160	58.4
200	58.5
250	62.6
315	66.2
400	68.3
500	71.3
630	76.4
800	78.2
1,000	83.3 +
1,250	86.7 +
1,600	88.2 +
2,000	89.1 +
2,500	89.6 +
3,150	95.6 *
4,000	98.3 *
5,000	93.1 *

+ Receiving room level adjusted for background

\* Receiving room level within 6 dB of background



Rating according to BS EN ISO 717-1:1997

<b>R<sub>w</sub> (C; C<sub>tr</sub>) = 73 (-3;-9) dB</b>	C <sub>50-3150</sub> = -4 dB	C <sub>50-5000</sub> = -3 dB	C <sub>100-5000</sub> = -2 dB
	C <sub>tr,50-3150</sub> = -15 dB	C <sub>tr,50-5000</sub> = -15 dB	C <sub>tr,100-5000</sub> = -9 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<sub>w</sub>) and should not exceed the values in Table A1 of BS EN 20140-2:1993 for the data in the individual third octaves (R)

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