

Test Report :

Measurement of rain noise from
roofing with and without Wardle
Storeys Dedpan® DS2020 RDV

Test report number 219329



BRE

...in partnership

Prepared for :

Wardle Storeys

2 September 2004



Tested by

Signature
Name
Position
Date

Prepared by

Signature
Name
Position
Date

Checked by

Signature
Name
Position
Date

Approved on behalf of BRE

Signature
Name
Position
Date

BRE Environment
Bucknalls Lane
Garston
Watford
WD25 9XX

Tel : 01923 664300
Fax : 01923 664088

Email : environment@bre.co.uk
Website : www.bre.co.uk

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

This report is made on behalf of BRE. By receiving the report and action on it, the client – or any third party relying on it – accepts that no individual is personally liable in contract, tort or breach of statutory duty (including negligence).



Contents

1	Introduction	4
2	Testing details	4
2.1	Test dates and personnel	4
2.2	Test method and applicable standards	4
2.3	Instrumentation	5
2.4	Rainfall types	5
2.5	Test numbers	6
2.6	Construction details with test numbers	7
2.7	Sound insulation test results	8
2.8	Drawings	9
2.9	Photos	10
3	Test result sheets	12

1 Introduction

BRE Acoustics was commissioned by Wardle Storeys, Durbar Mill, Hereford Road, Blackburn, Lancashire, BB1 3JU to carry out sound intensity measurements on metal roofing with and without Wardle Storeys Dedpan® DS2020 RDV in the BRE rainfall testing laboratory.

This report details the testing outlined in BRE proposal 112246.

2 Testing details

2.1 Test dates and personnel

The measurements detailed in this report were made on 17 August and 18 August 2004 by Carl Hopkins and James Healey of BRE Acoustics.

2.2 Test method and applicable standards

Measurement of sound intensity of each element and under each rain condition was made in accordance with ISO 15186-1:1997 and ISO/CD 140-18 (ISO TC43/SC2 N 0751 Dated 13-1-2004).

The test specimen was constructed by Wardle Storeys and installed in the laboratory by BRE.

2.3 Instrumentation

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

Table 1 Equipment list

Equipment description	Manufacturer	Type	BRE Identification number
Real Time Analyser	NEAS	840	13/003
Intensity Probe (p - p)	GRAS	50AI	04/017
Microphone Calibrator	NEAS	1253	01/002
Intensity Calibrator	GRAS	51AB	01/010

The gain of the real time analyser was adjusted to give a reading of 124.0 dB at 250 Hz using the Norsonic 1253 calibrator.

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

Sound intensity measurements were taken in the frequency range 100 Hz to 5000 Hz using a 50 mm and an 8 mm microphone spacer.

2.4 Rainfall types

Table 2 lists the types of rainfall conditions simulated by the test rig.

Table 2 Rain conditions used in the tests

Rain type	Source	Fall height to centre of specimen (m)	Rain coverage area (m ²)	Rainfall intensity (l/min/m ²)	Median drop diameter (mm)
(1) 'Heavy' rain (defined in ISO/CD 140-18)	Tank with perforated base	3.22	≈0.84	0.67	5.0
(2) 'Moderate' rain	Nozzle	≈1.4	≈0.79	0.67	≤ 1.0

2.5 Test numbers

Table 3 lists each test along with its corresponding test number. The construction details for each test can be found from Table 4 by referring to the test number.

Table 3 Test numbers

Test number	Rain type	Damping strip width (mm)	Test element area (m ²)
L904-002	Moderate	None	3.705
L904-003	Heavy	None	
L904-004	Heavy	82	
L904-005	Moderate	82	
L904-006	Moderate	164	
L904-007	Heavy	164	
L904-008	Heavy	246	
L904-009	Moderate	246	

2.6 Construction details with test numbers

The construction details are shown in Table 4. Each damping strip was supplied and fitted by Wardle Storeys.

Table 4 Construction details

Test numbers	Construction details
L904-002	5 bays of 400 mm x 2102 mm x 0.9 mm Stucco emboss plain aluminium roofing (3.53 kg/m ²). Each bay fixed to wooden framing with four screws at the top and bottom of the bays with resilient washers on the upper surface of the roofing specimen.
L904-003	
L904-004	5 bays of 400 mm x 2102 mm x 0.9 mm Stucco emboss plain aluminium roofing (3.53 kg/m ²). Each bay fixed to wooden framing with four screws at the top and bottom of the bays with resilient washers on the upper surface of the roofing specimen.
L904-005	
L904-006	5 bays of 400 mm x 2102 mm x 0.9 mm Stucco emboss plain aluminium roofing (3.53 kg/m ²). Each bay fixed to wooden framing with four screws at the top and bottom of the bays with resilient washers on the upper surface of the roofing specimen.
L904-007	
L904-008	5 bays of 400 mm x 2102 mm x 0.9 mm Stucco emboss plain aluminium roofing (3.53 kg/m ²). Each bay fixed to wooden framing with four screws at the top and bottom of the bays with resilient washers on the upper surface of the roofing specimen.
L904-009	

2.7 Sound insulation test results

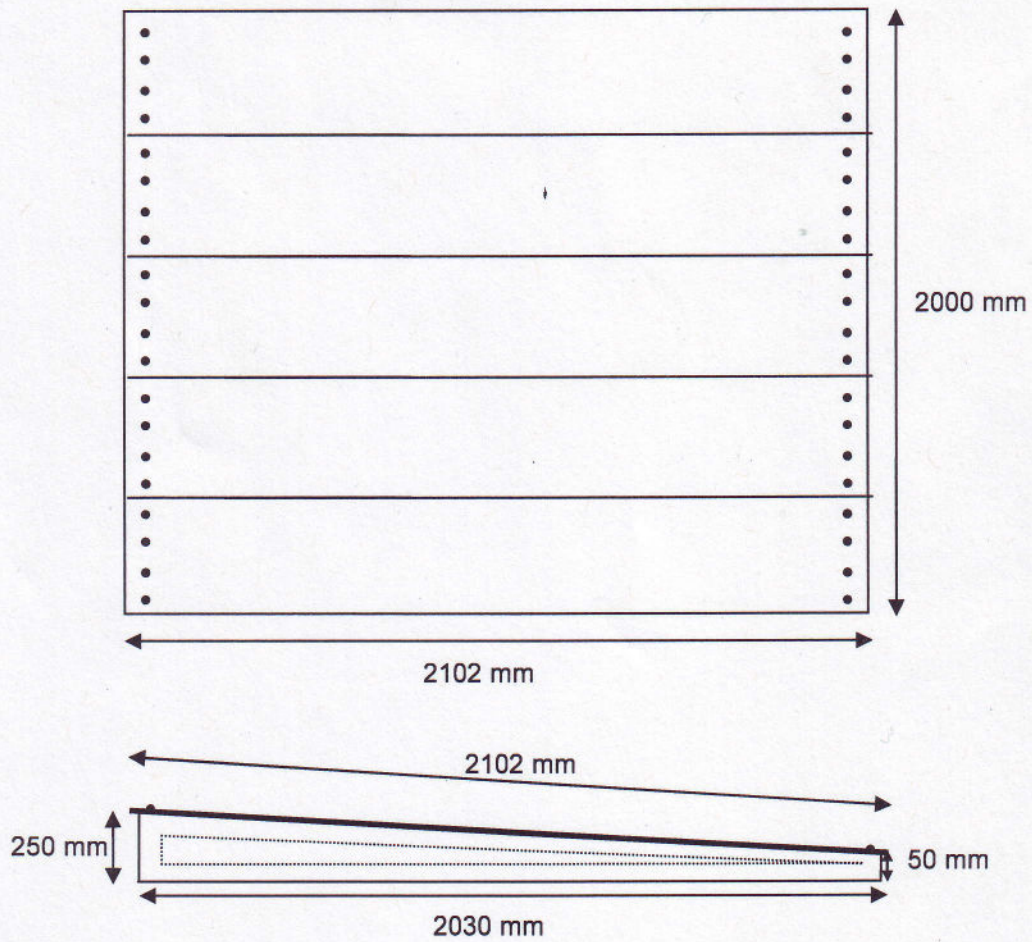
The single number quantities for the sound insulation tests are shown in Table 5. The test result sheets are included in the appendices.

Table 5 A-weighted single-number quantities calculated from measurable frequency range between 100 Hz and 5k Hz

Test number	Rain type	Damping strip width (mm)	A-weighted sound intensity level L_{IA} (dB re 10^{-12} W/m ²)
L904-003	Heavy	None	70.5
L904-004	Heavy	82	68.1
L904-007	Heavy	164	66.0
L904-008	Heavy	246	64.3
L904-002	Moderate	None	54.1
L904-005	Moderate	82	50.1
L904-006	Moderate	164	49.4
L904-009	Moderate	246	48.0

2.8 Drawings

Figure 1 Test element: Roof



The roofing has a gradient of 7°.

2.9 Photos



Figure 2 Roof specimen installed in test rig with nozzle used to create 'Moderate' rain



Figure 3 Dedpan® DS2020 RDV self-adhesive strips on underside centre of roofing bays

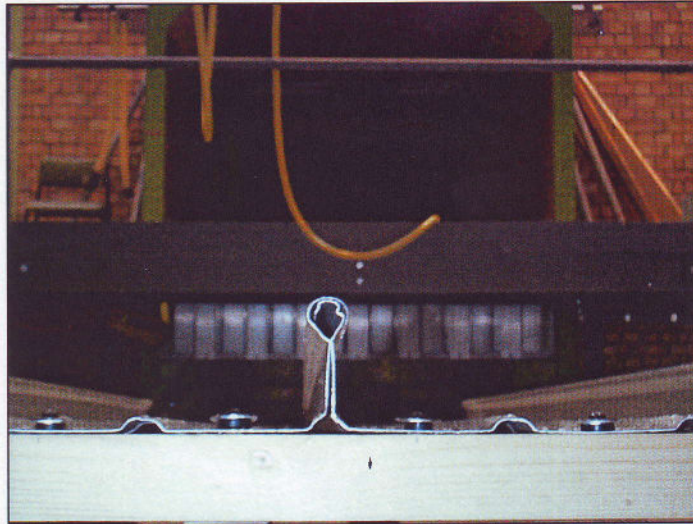


Figure 4 Standing seam between roof bays

3 Test result sheets

Page number	Test number
13	L904-002
15	L904-003
17	L904-004
19	L904-005
21	L904-006
23	L904-007
25	L904-008
27	L904-009

Laboratory measurement of sound generated by rainfall on building elements

Sound intensity measurement according to ISO 15186-1

BRE Rainfall Test Laboratory

Client: Wardle Storeys

Test date: 17/08/2004

Test number: L904-002

Test element: Roof

Test element area: 3.71 m²

Mass per unit area:

3.53 kg/m²

Test element description:

5 bays of 400mm x 2102mm x 0.9mm Stucco emboss plain aluminium roofing (3.53 kg/m²).

Each bay fixed to wooden framing with four screws at the top and bottom of the bays with resilient washers on the upper surface of the roofing specimen.

Rainfall temperature:

18 °C

Air temperature:

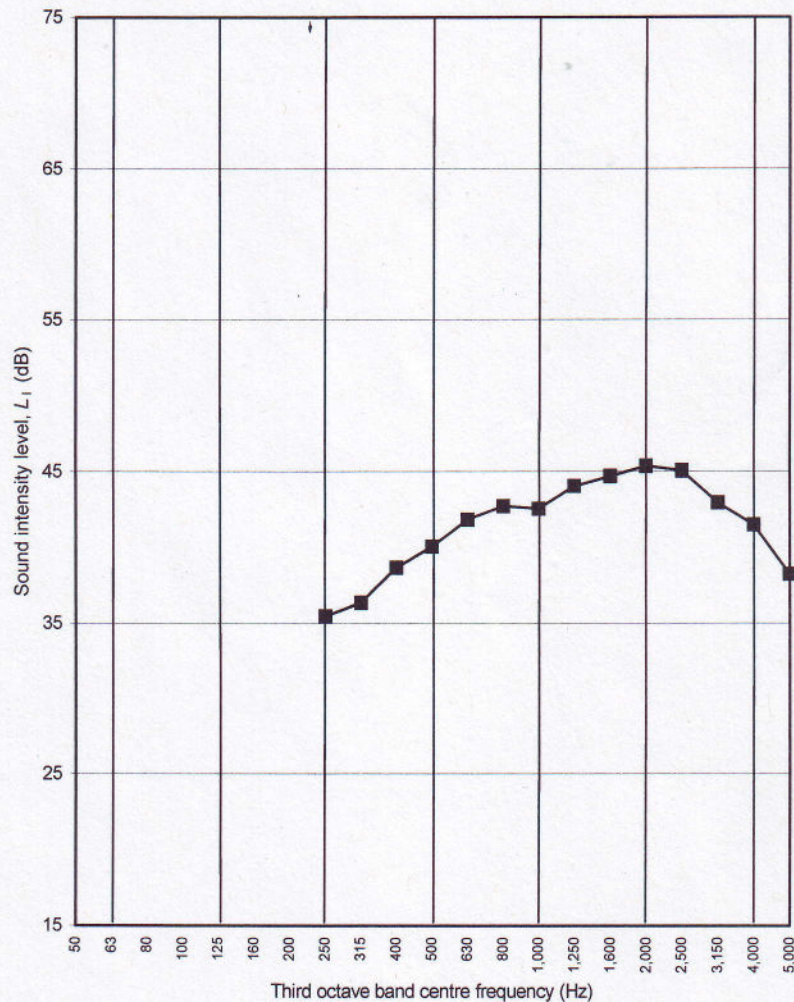
21 °C

Air relative humidity:

70 %

Rain type: Moderate (see Table 2)

Frequency (Hz)	L ₁ One-third octave (dB)
50	-
63	-
80	-
100	-
125	-
160	-
200	-
250	35.5
315	36.4
400	38.7
500	40.0
630	41.8
800	42.7
1,000	42.5
1,250	44.1
1,600	44.7
2,000	45.4
2,500	45.1
3,150	42.9
4,000	41.5
5,000	38.2



A-weighted sound intensity level, L_{IA} = 54.1 dB

This page may only be distributed with the test report in its entirety and in accordance with the terms and conditions of the contract



Laboratory measurement of sound generated by rainfall on building elements

Sound intensity measurement according to ISO 15186-1

BRE Rainfall Test Laboratory

Client: Wardle Storeys

Test date: 17/08/2004 Test number: L904-002 Test element: Roof

Test element area: 3.71 m² Mass per unit area: 3.53 kg/m²

Test element description:

5 bays of 400mm x 2102mm x 0.9mm Stucco emboss plain aluminium roofing (3.53 kg/m²).

Each bay fixed to wooden framing with four screws at the top and bottom of the bays with resilient washers on the upper surface of the roofing specimen.

Rainfall temperature: 18 °C

Air temperature: 21 °C

Rain type: Moderate (see Table 2)

Air relative humidity: 70 %

Frequency (Hz)	δ_{pl0} (dB)	F_{pl} (dB)	L_1 One-third octave (dB)
50	-	-	-
63	-	-	-
80	-	-	-
100	-	-	-
125	-	-	-
160	-	-	-
200	-	-	-
250	26.2	6.1	35.5
315	29.6	5.3	36.4
400	36.8	4.8	38.7
500	33.1	5.2	40.0
630	30.8	5.0	41.8
800	25.2	4.6	42.7
1,000	22.3	5.0	42.5
1,250	20.1	5.2	44.1
1,600	19.8	4.9	44.7
2,000	20.4	4.9	45.4
2,500	20.8	4.6	45.1
3,150	21.3	4.3	42.9
4,000	22.5	4.2	41.5
5,000	23.1	4.9	38.2
A			54.1
L			53.8

This page may only be distributed with the test report in its entirety and in accordance with the terms and conditions of the contract

Laboratory measurement of sound generated by rainfall on building elements

Sound intensity measurement according to ISO 15186-1

BRE Rainfall Test Laboratory

Client: Wardle Storeys

Test date: 17/08/2004 Test number: L904-003 Test element: Roof

Test element area: 3.71 m² Mass per unit area: 3.53 kg/m²

Test element description:

5 bays of 400mm x 2102mm x 0.9mm Stucco emboss plain aluminium roofing (3.53 kg/m²).

Each bay fixed to wooden framing with four screws at the top and bottom of the bays with resilient washers on the upper surface of the roofing specimen.

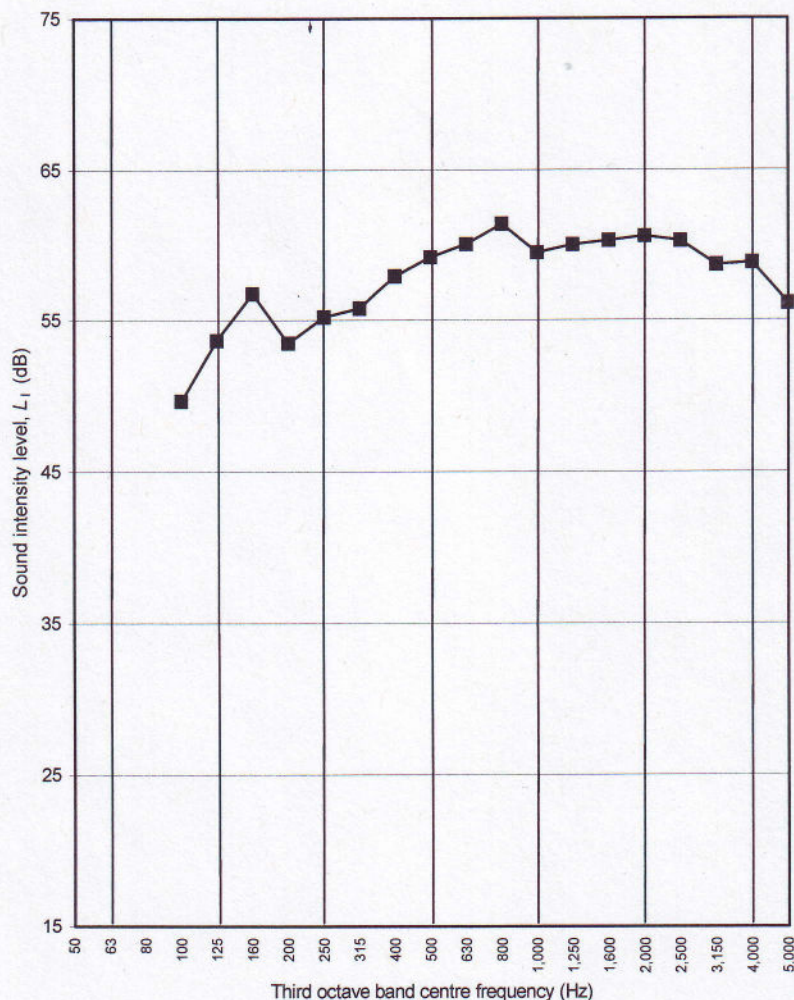
Rainfall temperature: 18 °C

Air temperature: 22 °C

Air relative humidity: 70 %

Rain type: Heavy (see Table 2)

Frequency (Hz)	L ₁ One-third octave (dB)
50	-
63	-
80	-
100	49.7
125	53.7
160	56.7
200	53.5
250	55.2
315	55.8
400	57.9
500	59.2
630	60.0
800	61.4
1,000	59.5
1,250	60.0
1,600	60.3
2,000	60.6
2,500	60.3
3,150	58.6
4,000	58.8
5,000	56.1



A-weighted sound intensity level, L_{IA} = 70.5 dB

This page may only be distributed with the test report in its entirety and in accordance with the terms and conditions of the contract



Laboratory measurement of sound generated by rainfall on building elements

Sound intensity measurement according to ISO 15186-1

BRE Rainfall Test Laboratory

Client: Wardle Storeys

Test date: 17/08/2004 Test number: L904-003 Test element: Roof

Test element area: 3.71 m² Mass per unit area: 3.53 kg/m²

Test element description:

5 bays of 400mm x 2102mm x 0.9mm Stucco emboss plain aluminium roofing (3.53 kg/m²).

Each bay fixed to wooden framing with four screws at the top and bottom of the bays with resilient washers on the upper surface of the roofing specimen.

Rainfall temperature: 18 °C

Air temperature: 22 °C

Rain type: Heavy (see Table 2)

Air relative humidity: 70 %

Frequency (Hz)	δ_{pl0} (dB)	F_{pl} (dB)	L_1 One-third octave (dB)
50	-	-	-
63	-	-	-
80	-	-	-
100	19.3	9.1	49.7
125	20.1	7.7	53.7
160	22.2	6.1	56.7
200	24.2	5.7	53.5
250	26.2	5.2	55.2
315	29.6	5.0	55.8
400	36.8	4.5	57.9
500	33.1	5.0	59.2
630	30.8	5.2	60.0
800	25.2	4.4	61.4
1,000	22.3	4.8	59.5
1,250	20.1	5.3	60.0
1,600	19.8	5.2	60.3
2,000	20.4	4.9	60.6
2,500	20.8	4.5	60.3
3,150	21.3	4.2	58.6
4,000	22.5	4.1	58.8
5,000	23.1	5.0	56.1
A			70.5
L			71.0

Laboratory measurement of sound generated by rainfall on building elements

Sound intensity measurement according to ISO 15186-1

BRE Rainfall Test Laboratory

Client: Wardle Storeys

Test date: 17/08/2004

Test number: L904-004

Test element: Roof

Test element area: 3.71 m²

Mass per unit area:

3.53 kg/m²

Test element description:

5 bays of 400mm x 2102mm x 0.9mm Stucco emboss plain aluminium roofing (3.53 kg/m²).

Each bay fixed to wooden framing with four screws at the top and bottom of the bays with resilient

washers on the upper surface of the roofing specimen. 1 x 82mm wide Dedpan® DS2020 RDV self-adhesive strip stuck to underside centre of each bay.

Rainfall temperature:

18 °C

Air temperature:

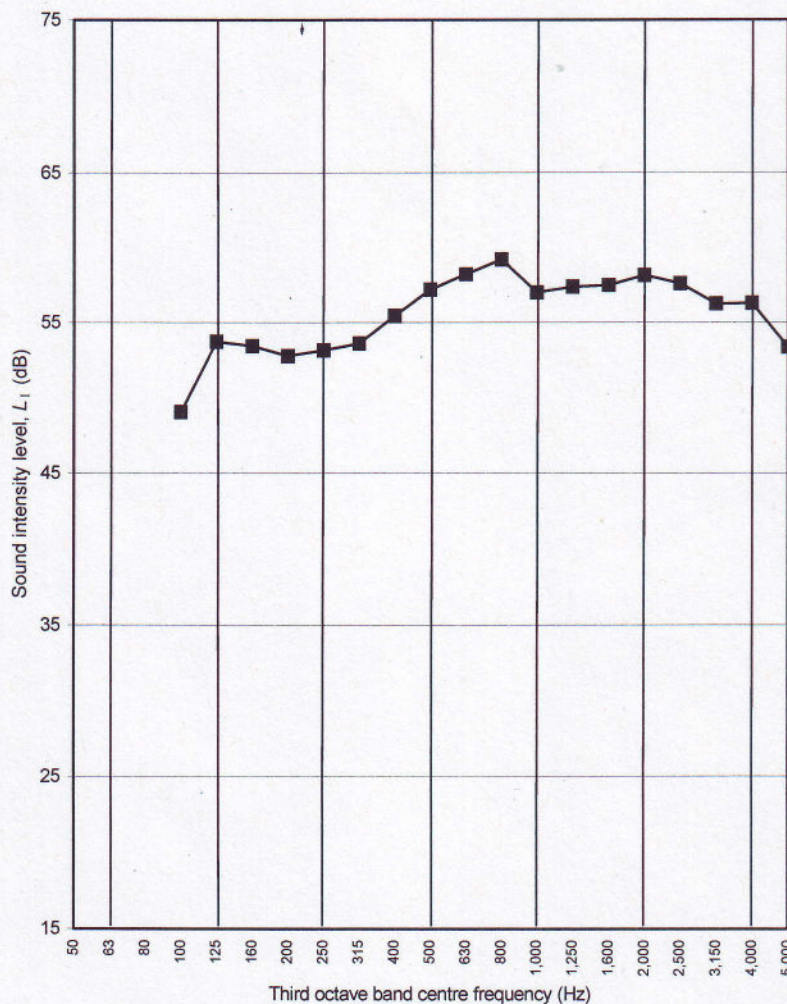
22 °C

Air relative humidity:

70 %

Rain type: Heavy (see Table 2)

Frequency (Hz)	L ₁ One-third octave (dB)
50	-
63	-
80	-
100	49.1
125	53.8
160	53.4
200	52.8
250	53.2
315	53.6
400	55.4
500	57.2
630	58.2
800	59.2
1,000	57.0
1,250	57.4
1,600	57.5
2,000	58.1
2,500	57.6
3,150	56.2
4,000	56.3
5,000	53.4



A-weighted sound intensity level, L_{IA} = 68.1 dB

This page may only be distributed with the test report in its entirety and in accordance with the terms and conditions of the contract



Laboratory measurement of sound generated by rainfall on building elements

Sound intensity measurement according to ISO 15186-1

BRE Rainfall Test Laboratory

Client: Wardle Storeys

Test date: 17/08/2004 Test number: L904-004 Test element: Roof

Test element area: 3.71 m² Mass per unit area: 3.53 kg/m²

Test element description:

5 bays of 400mm x 2102mm x 0.9mm Stucco emboss plain aluminium roofing (3.53 kg/m²).

Each bay fixed to wooden framing with four screws at the top and bottom of the bays with resilient washers on the upper surface of the roofing specimen. 1 x 82mm wide Dedpan® DS2020 RDV self-adhesive

Rainfall temperature: 18 °C

Air temperature: 22 °C

Rain type: Heavy (see Table 2)

Air relative humidity: 70 %

Frequency (Hz)	δ_{pl0} (dB)	F_{pl} (dB)	L_1 One-third octave (dB)
50	-	-	-
63	-	-	-
80	-	-	-
100	19.3	8.7	49.1
125	20.1	7.8	53.8
160	22.2	6.2	53.4
200	24.2	5.7	52.8
250	26.2	5.3	53.2
315	29.6	5.1	53.6
400	36.8	4.7	55.4
500	33.1	4.9	57.2
630	27.6	4.7	58.2
800	25.2	4.3	59.2
1,000	22.3	4.8	57.0
1,250	20.1	5.3	57.4
1,600	19.8	5.3	57.5
2,000	20.4	4.9	58.1
2,500	20.8	4.6	57.6
3,150	21.3	4.2	56.2
4,000	22.5	4.2	56.3
5,000	23.1	5.2	53.4
A			68.1
L			68.7

This page may only be distributed with the test report in its entirety and in accordance with the terms and conditions of the contract



Laboratory measurement of sound generated by rainfall on building elements

Sound intensity measurement according to ISO 15186-1

BRE Rainfall Test Laboratory

Client: Wardle Storeys

Test date: 17/08/2004 Test number: L904-005 Test element: Roof

Test element area: 3.71 m² Mass per unit area: 3.53 kg/m²

Test element description:

5 bays of 400mm x 2102mm x 0.9mm Stucco emboss plain aluminium roofing (3.53 kg/m²).

Each bay fixed to wooden framing with four screws at the top and bottom of the bays with resilient washers on the upper surface of the roofing specimen. 1 x 82mm wide Dedpan® DS2020 RDV self-adhesive strip stuck to underside centre of each bay.

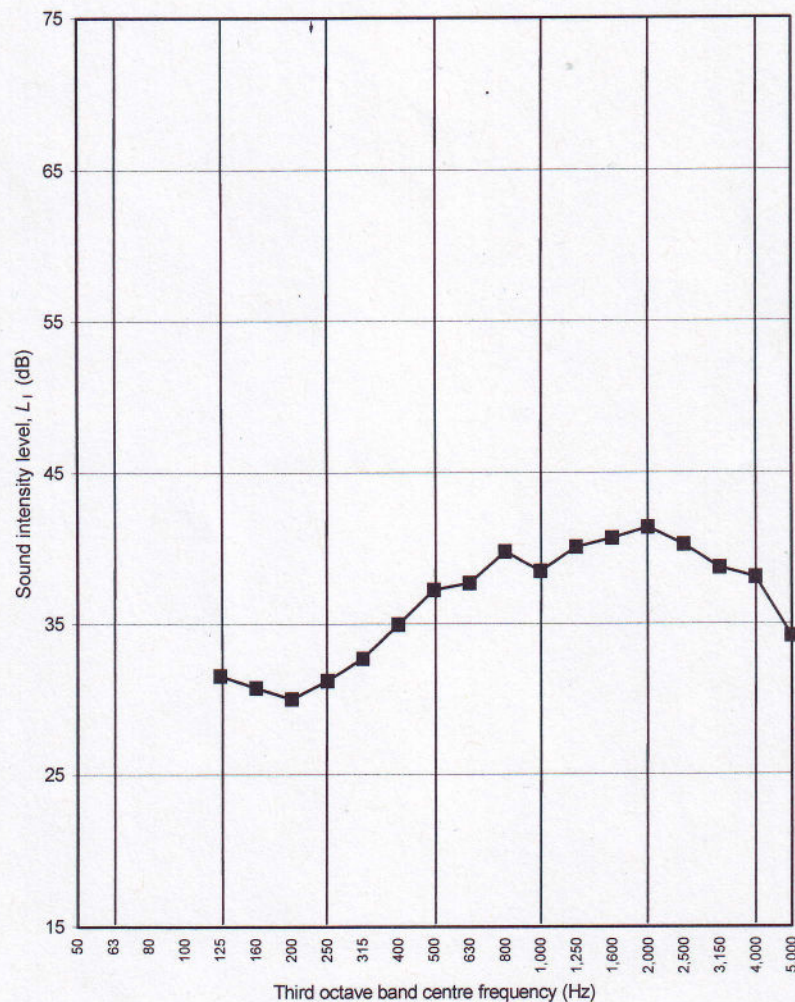
Rainfall temperature: 18 °C

Air temperature: 22 °C

Air relative humidity: 70 %

Rain type: Moderate (see Table 2)

Frequency (Hz)	L ₁ One-third octave (dB)
50	-
63	-
80	-
100	-
125	31.5
160	30.8
200	30.0
250	31.2
315	32.7
400	34.9
500	37.2
630	37.7
800	39.8
1,000	38.5
1,250	40.1
1,600	40.7
2,000	41.4
2,500	40.2
3,150	38.7
4,000	38.1
5,000	34.2



A-weighted sound intensity level, L_{IA} = 50.1 dB

This page may only be distributed with the test report in its entirety and in accordance with the terms and conditions of the contract



Laboratory measurement of sound generated by rainfall on building elements

Sound intensity measurement according to ISO 15186-1

BRE Rainfall Test Laboratory

Client: Wardle Storeys

Test date: 17/08/2004 Test number: L904-005 Test element: Roof

Test element area: 3.71 m² Mass per unit area: 3.53 kg/m²

Test element description:

5 bays of 400mm x 2102mm x 0.9mm Stucco emboss plain aluminium roofing (3.53 kg/m²).

Each bay fixed to wooden framing with four screws at the top and bottom of the bays with resilient washers on the upper surface of the roofing specimen. 1 x 82mm wide Dedpan® DS2020 RDV self-adhesive

Rainfall temperature: 18 °C

Air temperature: 22 °C

Rain type: Moderate (see Table 2)

Air relative humidity: 70 %

Frequency (Hz)	δ_{pl0} (dB)	F_{pl} (dB)	L_1 One-third octave (dB)
50	-	-	-
63	-	-	-
80	-	-	-
100	-	-	-
125	20.1	8.9	31.5
160	22.2	8.3	30.8
200	24.2	8.3	30.0
250	26.2	6.6	31.2
315	29.6	5.6	32.7
400	36.8	5.5	34.9
500	33.1	5.5	37.2
630	30.8	5.3	37.7
800	29.5	4.6	39.8
1,000	22.3	4.8	38.5
1,250	20.1	4.8	40.1
1,600	19.8	4.7	40.7
2,000	20.4	5.0	41.4
2,500	20.8	4.9	40.2
3,150	21.3	4.4	38.7
4,000	22.5	4.4	38.1
5,000	23.1	5.0	34.2
A			50.1
L			50.0

This page may only be distributed with the test report in its entirety and in accordance with the terms and conditions of the contract



Laboratory measurement of sound generated by rainfall on building elements

Sound intensity measurement according to ISO 15186-1

BRE Rainfall Test Laboratory

Client: Wardle Storeys

Test date: 18/08/2004 Test number: L904-006 Test element: Roof

Test element area: 3.71 m² Mass per unit area: 3.53 kg/m²

Test element description:

5 bays of 400mm x 2102mm x 0.9mm Stucco emboss plain aluminium roofing (3.53 kg/m²).

Each bay fixed to wooden framing with four screws at the top and bottom of the bays with resilient washers on the upper surface of the roofing specimen. 1 x 82mm and 2 x 41mm wide Dedpan® DS2020 RDV self-adhesive strips stuck to underside centre of each bay.

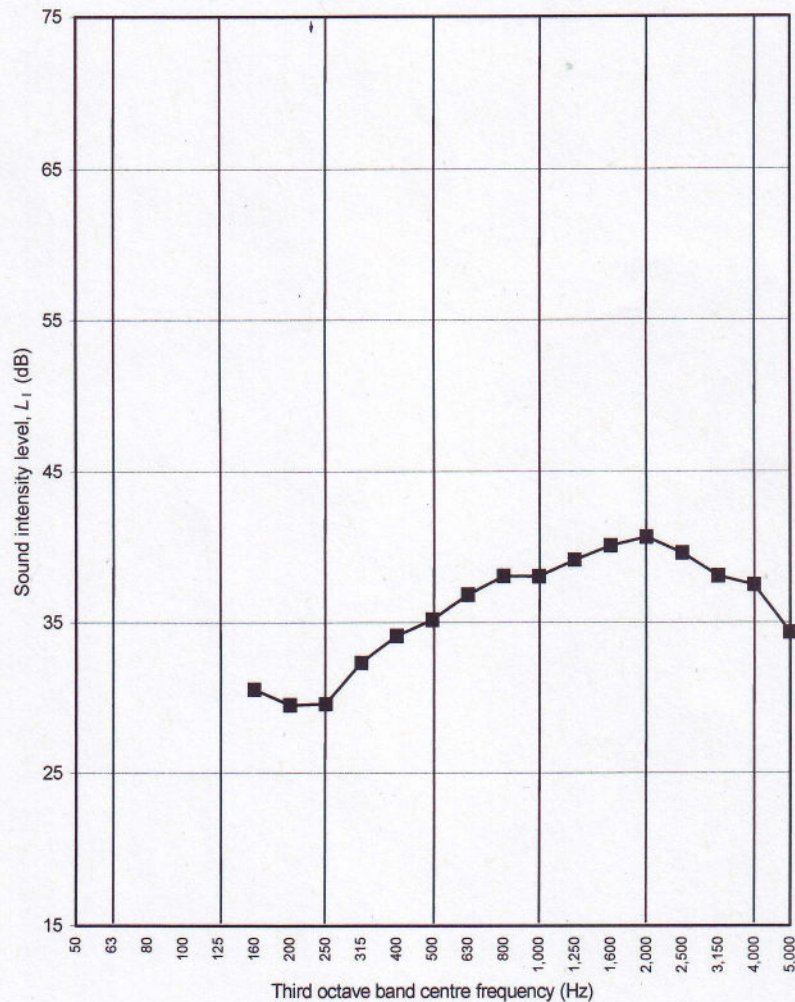
Rainfall temperature: 18 °C

Air temperature: 20 °C

Rain type: Moderate (see Table 2)

Air relative humidity: 72 %

Frequency (Hz)	L ₁ One-third octave (dB)
50	-
63	-
80	-
100	-
125	-
160	30.6
200	29.5
250	29.6
315	32.3
400	34.1
500	35.2
630	36.8
800	38.1
1,000	38.0
1,250	39.1
1,600	40.1
2,000	40.7
2,500	39.6
3,150	38.1
4,000	37.5
5,000	34.3



A-weighted sound intensity level, L_{IA} = 49.4 dB

This page may only be distributed with the test report in its entirety and in accordance with the terms and conditions of the contract



Laboratory measurement of sound generated by rainfall on building elements

Sound intensity measurement according to ISO 15186-1

BRE Rainfall Test Laboratory

Client: Wardle Storeys

Test date: 18/08/2004 Test number: L904-006 Test element: Roof

Test element area: 3.71 m² Mass per unit area: 3.53 kg/m²

Test element description:

5 bays of 400mm x 2102mm x 0.9mm Stucco emboss plain aluminium roofing (3.53 kg/m²).

Each bay fixed to wooden framing with four screws at the top and bottom of the bays with resilient washers on the upper surface of the roofing specimen. 1 x 82mm and 2 x 41mm wide Dedpan® DS2020 RDV

Rainfall temperature: 18 °C

Air temperature: 20 °C

Rain type: Moderate (see Table 2)

Air relative humidity: 72 %

Frequency (Hz)	δ_{pl0} (dB)	F_{pl} (dB)	L_1 One-third octave (dB)
50	-	-	-
63	-	-	-
80	-	-	-
100	-	-	-
125	-	-	-
160	22.2	9.9	30.6
200	24.2	8.4	29.5
250	26.2	7.8	29.6
315	29.6	6.1	32.3
400	36.8	5.4	34.1
500	33.1	5.4	35.2
630	30.8	5.3	36.8
800	29.5	5.2	38.1
1,000	22.3	5.4	38.0
1,250	20.1	5.2	39.1
1,600	19.8	5.2	40.1
2,000	20.4	5.7	40.7
2,500	20.8	5.6	39.6
3,150	21.3	5.2	38.1
4,000	22.5	5.0	37.5
5,000	23.1	5.4	34.3
A			49.4
L			49.1

This page may only be distributed with the test report in its entirety and in accordance with the terms and conditions of the contract



Laboratory measurement of sound generated by rainfall on building elements

Sound intensity measurement according to ISO 15186-1

BRE Rainfall Test Laboratory

Client: Wardle Storeys

Test date: 18/08/2004

Test number: L904-007

Test element: Roof

Test element area: 3.71 m²

Mass per unit area:

3.53 kg/m²

Test element description:

5 bays of 400mm x 2102mm x 0.9mm Stucco emboss plain aluminium roofing (3.53 kg/m²).

Each bay fixed to wooden framing with four screws at the top and bottom of the bays with resilient

washers on the upper surface of the roofing specimen. 1 x 82mm and 2 x 41mm wide Dedpan® DS2020 RDV self-adhesive strips stuck to underside centre of each bay.

Rainfall temperature:

18 °C

Air temperature:

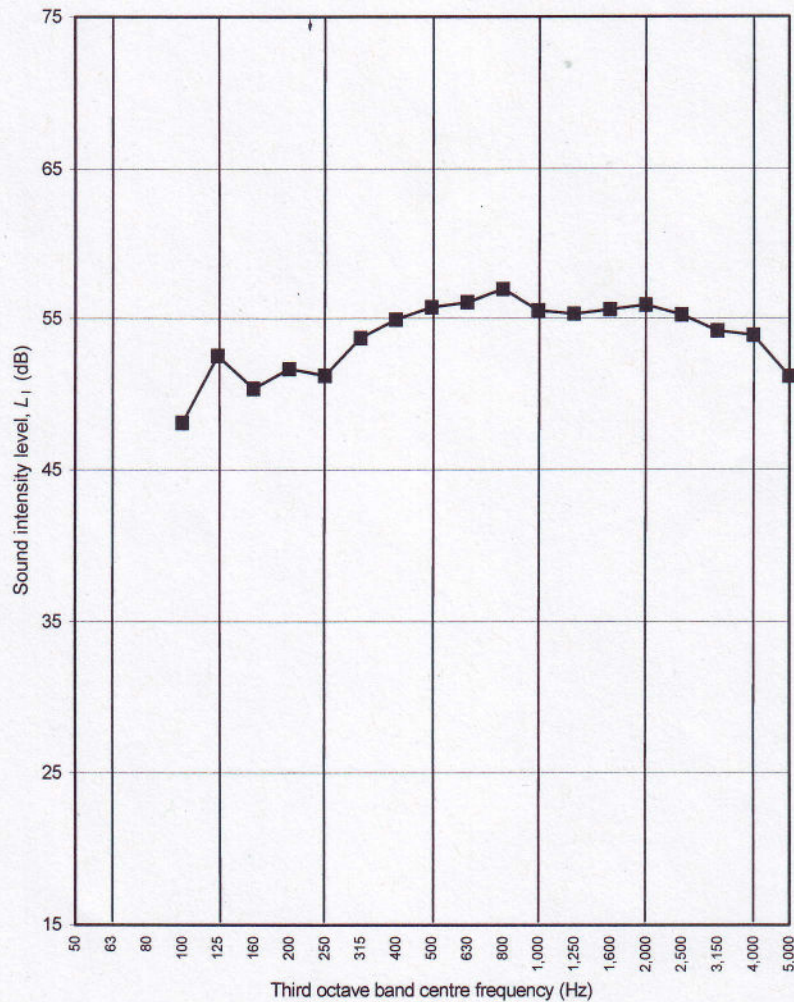
20 °C

Air relative humidity:

72 %

Rain type: Heavy (see Table 2)

Frequency (Hz)	L ₁ One-third octave (dB)
50	-
63	-
80	-
100	48.1
125	52.5
160	50.4
200	51.7
250	51.2
315	53.7
400	54.9
500	55.7
630	56.1
800	56.9
1,000	55.5
1,250	55.3
1,600	55.6
2,000	55.9
2,500	55.2
3,150	54.2
4,000	53.9
5,000	51.1



A-weighted sound intensity level, L_{IA} = 66.0 dB

This page may only be distributed with the test report in its entirety and in accordance with the terms and conditions of the contract



Laboratory measurement of sound generated by rainfall on building elements

Sound intensity measurement according to ISO 15186-1

BRE Rainfall Test Laboratory

Client: Wardle Storeys

Test date: 18/08/2004 Test number: L904-007 Test element: Roof

Test element area: 3.71 m² Mass per unit area: 3.53 kg/m²

Test element description:

5 bays of 400mm x 2102mm x 0.9mm Stucco emboss plain aluminium roofing (3.53 kg/m²).

Each bay fixed to wooden framing with four screws at the top and bottom of the bays with resilient washers on the upper surface of the roofing specimen. 1 x 82mm and 2 x 41mm wide Dedpan® DS2020 RDV

Rainfall temperature: 18 °C

Air temperature: 20 °C

Rain type: Heavy (see Table 2)

Air relative humidity: 72 %

Frequency (Hz)	δ_{pl0} (dB)	F_{pl} (dB)	L_1 One-third octave (dB)
50	-	-	-
63	-	-	-
80	-	-	-
100	19.3	7.2	48.1
125	20.1	7.3	52.5
160	22.2	6.1	50.4
200	24.2	4.9	51.7
250	26.2	5.1	51.2
315	29.6	4.7	53.7
400	36.8	4.3	54.9
500	33.1	4.7	55.7
630	30.8	4.4	56.1
800	25.2	4.7	56.9
1,000	22.3	5.1	55.5
1,250	20.1	5.2	55.3
1,600	19.8	5.0	55.6
2,000	20.4	5.3	55.9
2,500	20.8	5.1	55.2
3,150	21.3	4.6	54.2
4,000	22.5	4.4	53.9
5,000	23.1	5.2	51.1
A			66.0
L			66.9

This page may only be distributed with the test report in its entirety and in accordance with the terms and conditions of the contract



Laboratory measurement of sound generated by rainfall on building elements

Sound intensity measurement according to ISO 15186-1

BRE Rainfall Test Laboratory

Client: Wardle Storeys

Test date: 18/08/2004

Test number: L904-008

Test element: Roof

Test element area: 3.71 m²

Mass per unit area:

3.53 kg/m²

Test element description:

5 bays of 400mm x 2102mm x 0.9mm Stucco emboss plain aluminium roofing (3.53 kg/m²).

Each bay fixed to wooden framing with four screws at the top and bottom of the bays with resilient

washers on the upper surface of the roofing specimen. 1 x 82mm and 4 x 41mm wide Dedpan® DS2020 RDV

self-adhesive strips stuck to underside centre of each bay.

Rainfall temperature:

18 °C

Air temperature:

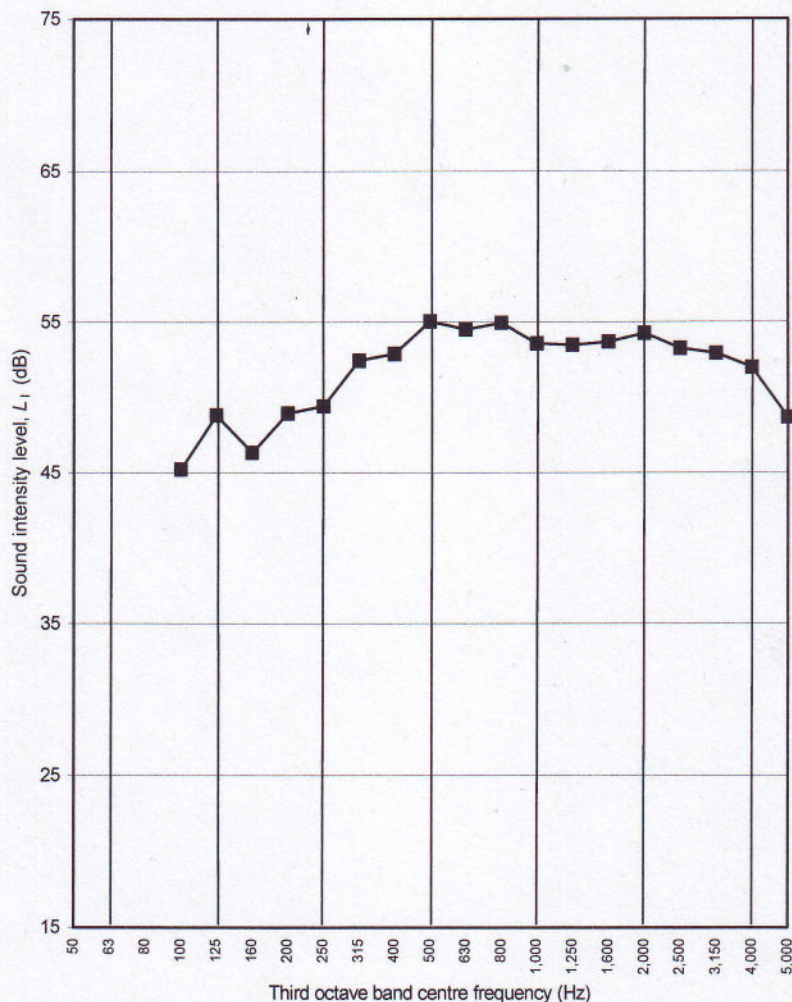
21 °C

Rain type: Heavy (see Table 2)

Air relative humidity:

72 %

Frequency (Hz)	L ₁ One-third octave (dB)
50	-
63	-
80	-
100	45.2
125	48.8
160	46.3
200	49.0
250	49.5
315	52.5
400	52.9
500	55.0
630	54.5
800	55.0
1,000	53.6
1,250	53.5
1,600	53.7
2,000	54.3
2,500	53.3
3,150	52.9
4,000	52.0
5,000	48.7



A-weighted sound intensity level, L_{IA} = 64.3 dB

This page may only be distributed with the test report in its entirety and in accordance with the terms and conditions of the contract



Laboratory measurement of sound generated by rainfall on building elements

Sound intensity measurement according to ISO 15186-1

BRE Rainfall Test Laboratory

Client: Wardle Storeys

Test date: 18/08/2004

Test number: L904-008

Test element: Roof

Test element area: 3.71 m²

Mass per unit area:

3.53 kg/m²

Test element description:

5 bays of 400mm x 2102mm x 0.9mm Stucco emboss plain aluminium roofing (3.53 kg/m²).

Each bay fixed to wooden framing with four screws at the top and bottom of the bays with resilient

washers on the upper surface of the roofing specimen. 1 x 82mm and 4 x 41mm wide Dedpan® DS2020 RDV

Rainfall temperature: 18 °C

Air temperature: 21 °C

Rain type: Heavy (see Table 2)

Air relative humidity: 72 %

Frequency (Hz)	δ_{pl0} (dB)	F_{pl} (dB)	L_1 One-third octave (dB)
50	-	-	-
63	-	-	-
80	-	-	-
100	19.3	7.7	45.2
125	20.1	6.3	48.8
160	22.2	5.9	46.3
200	24.2	4.6	49.0
250	26.2	5.0	49.5
315	29.6	4.3	52.5
400	36.8	4.3	52.9
500	33.1	4.3	55.0
630	30.8	4.2	54.5
800	29.5	4.2	55.0
1,000	22.3	4.8	53.6
1,250	20.1	4.8	53.5
1,600	19.8	4.7	53.7
2,000	20.4	4.9	54.3
2,500	20.8	5.0	53.3
3,150	21.3	4.3	52.9
4,000	22.5	4.3	52.0
5,000	23.1	5.2	48.7
A			64.3
L			65.1

This page may only be distributed with the test report in its entirety and in accordance with the terms and conditions of the contract



Laboratory measurement of sound generated by rainfall on building elements

Sound intensity measurement according to ISO 15186-1

BRE Rainfall Test Laboratory

Client: Wardle Storeys

Test date: 18/08/2004 Test number: L904-009 Test element: Roof

Test element area: 3.71 m² Mass per unit area: 3.53 kg/m²

Test element description:

5 bays of 400mm x 2102mm x 0.9mm Stucco emboss plain aluminium roofing (3.53 kg/m²).

Each bay fixed to wooden framing with four screws at the top and bottom of the bays with resilient washers on the upper surface of the roofing specimen. 1 x 82mm and 4 x 41mm wide Dedpan® DS2020 RDV self-adhesive strips stuck to underside centre of each bay.

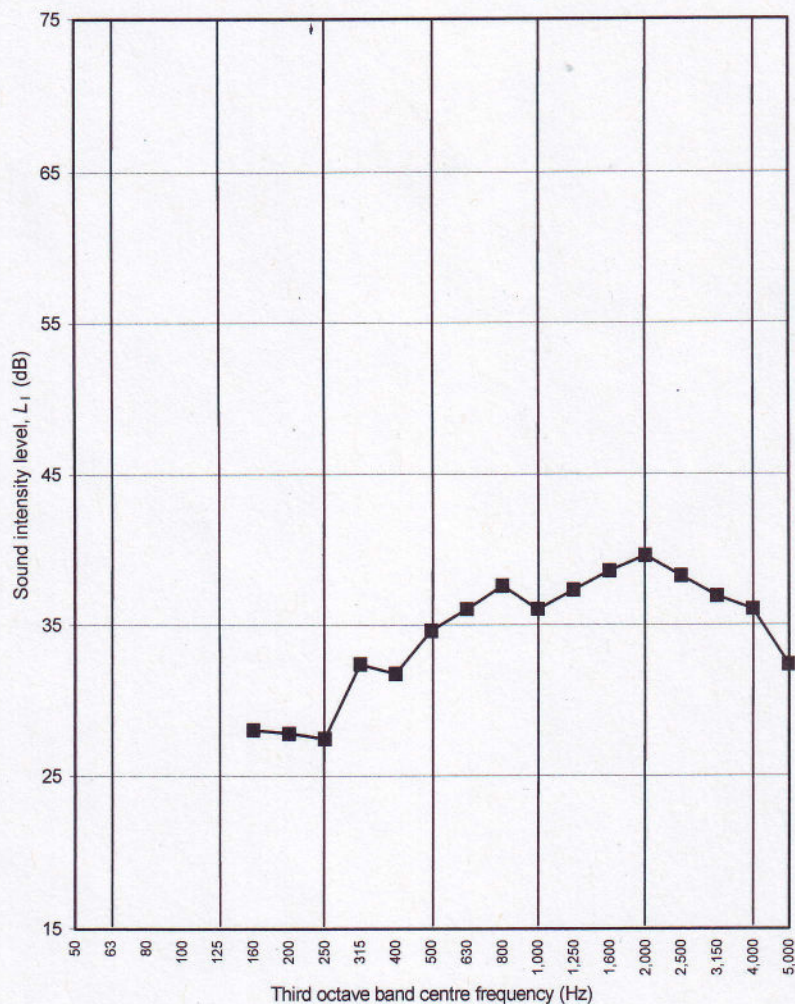
Rainfall temperature: 18 °C

Air temperature: 21 °C

Air relative humidity: 70 %

Rain type: Moderate (see Table 2)

Frequency (Hz)	L ₁ One-third octave (dB)
50	-
63	-
80	-
100	-
125	-
160	28.0
200	27.8
250	27.4
315	32.4
400	31.8
500	34.6
630	36.0
800	37.6
1,000	36.0
1,250	37.3
1,600	38.6
2,000	39.6
2,500	38.3
3,150	36.9
4,000	36.0
5,000	32.4



A-weighted sound intensity level, L_{1A} = 48.0 dB

This page may only be distributed with the test report in its entirety and in accordance with the terms and conditions of the contract



Laboratory measurement of sound generated by rainfall on building elements

Sound intensity measurement according to ISO 15186-1

BRE Rainfall Test Laboratory

Client: Wardle Storeys

Test date: 18/08/2004 Test number: L904-009 Test element: Roof

Test element area: 3.71 m² Mass per unit area: 3.53 kg/m²

Test element description:

5 bays of 400mm x 2102mm x 0.9mm Stucco emboss plain aluminium roofing (3.53 kg/m²).

Each bay fixed to wooden framing with four screws at the top and bottom of the bays with resilient washers on the upper surface of the roofing specimen. 1 x 82mm and 4 x 41mm wide Dedpan® DS2020 RDV

Rainfall temperature: 18 °C

Air temperature: 21 °C

Rain type: Moderate (see Table 2)

Air relative humidity: 70 %

Frequency (Hz)	δ_{pl0} (dB)	F_{pl} (dB)	L_1 One-third octave (dB)
50	-	-	-
63	-	-	-
80	-	-	-
100	-	-	-
125	-	-	-
160	22.2	9.9	28.0
200	24.2	8.9	27.8
250	26.2	8.2	27.4
315	29.6	5.1	32.4
400	36.8	5.6	31.8
500	33.1	5.1	34.6
630	30.8	4.4	36.0
800	25.2	4.6	37.6
1,000	22.3	4.9	36.0
1,250	20.1	4.8	37.3
1,600	19.8	4.7	38.6
2,000	20.4	5.0	39.6
2,500	20.8	5.2	38.3
3,150	21.3	4.6	36.9
4,000	22.5	4.5	36.0
5,000	23.1	4.9	32.4
A			48.0
L			47.8

This page may only be distributed with the test report in its entirety and in accordance with the terms and conditions of the contract

=====REPORT ENDS=====

