

BRE Test Report

Aurora Lighting Sound Insulation Downlight Tests to BS EN ISO 10140-2: 2010 and BS EN ISO 10140-3: 2010 for Part E of the Building Regulations

Prepared for: Aurora Lighting
Date: 14th October 2019
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A handwritten signature in black ink, appearing to read 'Ian West', with a horizontal line underneath.

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A handwritten signature in black ink, appearing to read 'G. Timmins', with a horizontal line underneath.

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Changes since issue 1: Change of address and update to list of applicable products, see section 2.6.



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1 Introduction

BRE Acoustics was commissioned by Aurora Lighting 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 P106509.

2 Testing details

2.1 Test dates and personnel

The measurements detailed in this report were made on 20th September to 19th December 2016 by Ian West of BRE Acoustics.

2.2 Test methods and applicable standards

Measurement of airborne and impact sound insulation was made in accordance with BS EN ISO 10140-2:2010 and BS EN ISO 10140-3:2010+A1:2015. Single number quantities were calculated in accordance with BS EN ISO 717-1:2013 and BS EN ISO 717-2:2013.

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 Robust Details Appendix F floor and the downlights were installed by BRE.



2.4 Instrumentation

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

Equipment description	Manufacturer	Type	serial number
Microphone Calibrator	B&K	4231	2175848
Microphone	GRAS	40AE	37071, 183588
Microphone Preamplifier	GRAS	26CA	43287, 13142
Real Time Analyser	NOR	850	8501142
Loudspeaker	B&K	4224	1126060
Graphic Equaliser	Phonic	PEQ3300	SA107416
Rotating Boom	Norsonic	212NA	10417, 10418
Tapping Machine	Norsonic	211	612

Table 1 Equipment list

The gain of the real time analyser was adjusted to give a reading 93.9dB at 1kHz 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.

Test number	Test element	Source room volume (m ³)	Receive room volume (m ³)	Common area (m ²)
L216-059	Floor	66	61	17.6
L216-060		61	66	17.6
L216-071	Downlight	66	61	17.6
L216-072		61	66	17.6
L216-073		66	61	17.6
L216-074		61	66	17.6
L216-075		66	61	17.6
L216-076		61	66	17.6
L216-077		66	61	17.6
L216-078		61	66	17.6
L216-079		66	61	17.6
L216-080		61	66	17.6
L216-081		66	61	17.6
L216-082		61	66	17.6
L216-083		66	61	17.6
L216-084		61	66	17.6
L216-085		66	61	17.6
L216-086		61	66	17.6
L216-087		66	61	17.6
L216-088		61	66	17.6
L216-089		66	61	17.6
L216-090		61	66	17.6
L216-091		66	61	17.6
L216-092		61	66	17.6

Table 2 Test numbers



2.6 Construction details with test numbers

The construction details are shown in **Table 3**. When construction details are provided by a third party, they are checked by BRE where possible.

Test element	Test number	Construction details
Floor	L216-059 L216-060	Robust Details Limited Appendix F floor: 18mm OSB (10.9 kg/m ²) screwed to 235mm x 50 mm joists (3.6 kg/m ²) mounted in hangers at 450mm centres, 100mm Isover APR 1200 (10kg/m ³) between joists, 1x19mm plasterboard plank (15.0kg/m ²), 1x12.5mm wallboard (8.0kg/m ²) screwed to underside of joists, joints and perimeter sealed
Downlight	L216-071 L216-072	Robust Details Limited Appendix F Floor with Nine Aurora Lighting EN DE52/40 Downlights
	L216-073 L216-074	Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-FRLD 812A/30 Downlights
	L216-075 L216-076	Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM903 Downlights
	L216-077 L216-078	Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM901 Downlights
	L216-079 L216-080	Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM983 Downlights
	L216-081 L216-082	Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM902 Downlights
	L216-083 L216-084	Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-MPR02/30 Downlights
	L216-085 L216-086	Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-FRLD712/30 Downlights
	L216-087 L216-088	Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM982 Downlights
	L216-089 L216-090	Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-FRLD512/30 Downlights
	L216-091 L216-092	Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-FRLD814/30 Downlights

Table 3 Construction details

- Since the issue 1 of this report (6th January 2017): Darren Casey, Product Development Director at Aurora Lighting declares that:
 - the results of AU-MPRO2/xx are equally applicable to AU-MPRO2A/xx as the difference in design is only a change to the colour of the end cap.
 - the results of EN-DE52/xx are equally applicable to AU-A42/xx as the only difference in design, is the end hinged end cap.



3 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.

Robust Details Appendix F, F.3 (October 2014 update) states:

For the purposes of evaluating the influence on performance due to downlights for Robust Detail timber separating floors, four different measurements are required (2 airborne and 2 impact measurements). The following measurements are required:

Airborne

Test 1 Determination of $R_w + C_{tr}$ for the initial timber floor

Test 2 Determination of $R_w + C_{tr}$ for the initial timber floor plus downlights

Impact

Test 3 Determination of $L_{n,w}$ for the initial timber floor

Test 4 Determination of $L_{n,w}$ for the initial timber floor plus downlights

Table 4 contains values of the difference between Test 2 and Test 1 (Test 2 - Test 1) for airborne sound insulation performance and the difference between Test 3 and Test 4 (Test 3 - Test 4) for impact sound transmission performance.



Test number	$R_w + C_{tr}$ (dB)	$L_{n,w}$ (dB)	Test 2 - Test 1 (dB)	Test 3 - Test 4 (dB)
L216-059	32			
L216-060		76		
L216-071	33		+1	
L216-072		77		-1
L216-073	33		+1	
L216-074		76		0
L216-075	33		+1	
L216-076		77		-1
L216-077	33		+1	
L216-078		77		-1
L216-079	33		+1	
L216-080		76		0
L216-081	33		+1	
L216-082		77		-1
L216-083	33		+1	
L216-084		77		-1
L216-085	33		+1	
L216-086		77		-1
L216-087	33		+1	
L216-088		76		0
L216-089	33		+1	
L216-090		76		0
L216-091	33		+1	
L216-092		76		0

Table 4 Test results

Robust Details Appendix F, F.4 (October 2014 update) states:

For airborne sound insulation performance the difference between Test 2 and Test 1 (Test 2 -Test 1) should be no worse than (-1dB)

For impact sound transmission performance the difference between Test 3 and Test 4 (Test 3 -Test 4) should be no worse than (-1dB).

Based on the test results presented in Table 4, it can be seen that the downlights tested satisfy the Robust Details acoustic performance requirements.

4 Installation Details

4.1 Details

The joist installation for the floor is illustrated in **Figure 1**. The ends of the joists are fixed in hangers as specified in Appendix F of Robust Details Part E. The downlight positions are shown in **Figure 2**. **Photographs** show the Aurora Lighting Downlights tested.

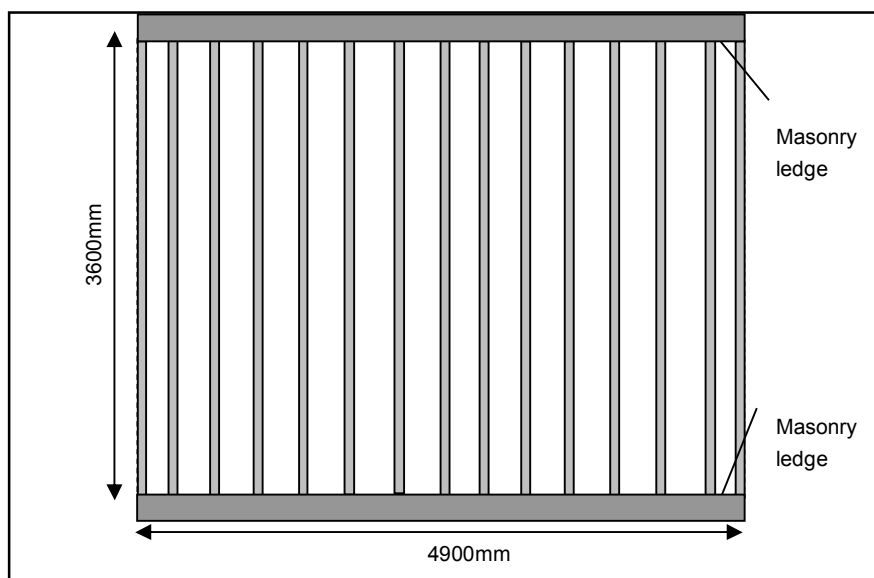


Figure 1 Floor joists at 450mm centres

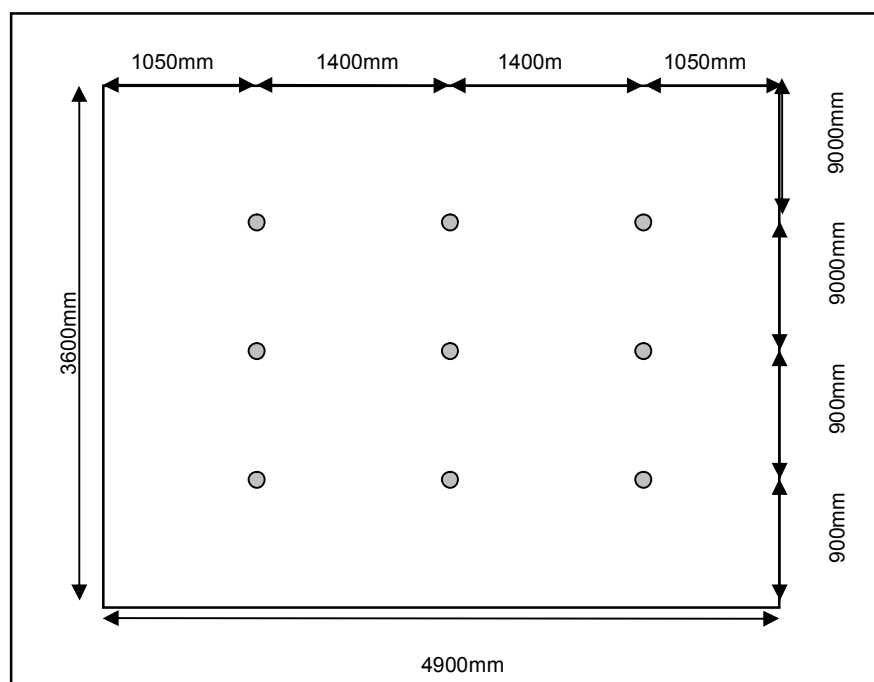


Figure 2 Positions of the downlights in the ceiling of the Robust Details Appendix F floor



Photograph 1 Aurora Lighting EN DE52/40 Downlight

bre



Photograph 2 Aurora Lighting AU-FRLD 812A/30 Downlight



Photograph 3 Aurora Lighting AU-DLM903 Downlight



Photograph 4 Aurora Lighting AU-DLM901 Downlight



Photograph 5 Aurora Lighting AU-DLM983 Downlight

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Photograph 6 Aurora Lighting AU-DLM902 Downlight



Photograph 7 Aurora Lighting AU-MPR02/30 Downlight

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Photograph 8 Aurora Lighting AU-FRLD712/30 Downlight



Photograph 9 Aurora Lighting AU-DLM982 Downlight

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Photograph 10 Aurora Lighting AU-FRLD512/30 Downlight



Photograph 11 Aurora Lighting AU-FRLD814/30 Downlight



5 Appendices

5.1 UKAS test results sheets

Page number	Test number
17	L216-059
19	L216-060
21	L216-071
23	L216-072
25	L216-073
27	L216-074
29	L216-075
31	L216-076
33	L216-077
35	L216-078
37	L216-079
39	L216-080
41	L216-081
43	L216-082
45	L216-083
47	L216-084
49	L216-085
51	L216-086
53	L216-087
55	L216-088
57	L216-089
59	L216-090
61	L216-091
63	L216-092



Level difference according to BS EN ISO 10140-2
Laboratory measurement of sound insulation of building elements

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

0578

Date of test: 20/09/2016

Test Number: L216-059

Rating according to ISO 717-1
 $R_w(C;C_{tr}) = 40 (-3; -8) \text{ dB}$
 $C_{50-3150} = -3 \text{ dB}$ $C_{50-5000} = -2 \text{ dB}$ $C_{100-5000} = -2 \text{ dB}$
 $C_{tr,50-3150} = -9 \text{ dB}$ $C_{tr,50-5000} = -9 \text{ dB}$ $C_{tr,100-5000} = -8 \text{ dB}$
 Evaluation based on laboratory measurements results obtained in one-third-octave bands by an engineering method.

Frequency [Hz]	R [dB]	L1 [dB]	L2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	Bgn status	Ftm status
50	18.6	67.9	53.0	1.29				
63	23.0	74.0	54.6	1.26				
80	24.8	77.0	54.8	1.00				
100	15.9	81.0	68.9	1.34		5.1		
125	23.0	82.4	63.0	1.28		1.0		
160	20.0	84.9	68.1	1.16		7.0		
200	24.3	86.0	65.2	1.24		5.7		
250	30.4	85.9	59.5	1.38		2.6		
315	35.9	85.7	54.1	1.50		0.1		
400	35.1	85.2	54.5	1.54		3.9		
500	36.8	86.1	53.6	1.50		3.2		
630	41.1	86.3	49.3	1.44				
800	43.7	85.5	45.5	1.31				
1000	45.3	84.2	42.4	1.25				
1250	46.0	81.0	38.2	1.17			Correction	
1600	43.6	84.0	43.3	1.09		0.4	Correction	
2000	43.7	84.7	43.7	1.03		0.3	Correction	
2500	46.4	84.0	40.2	1.02			Correction	
3150	52.5	81.0	31.4	1.09			Correction	
4000	58.2	78.7	23.3	1.05			Correction	
5000	61.8	73.7	14.1	0.93			Too high	

Sum of unfavourable deviations: 29.3 dB

Max. unfavourable deviation : 7.0 dB at 160 Hz

Receiving room volume: 61 m³

Air temperature: 20 °C

Source room volume: 65 m³

Relative air humidity: 44 %

Area, S, of test element: 17.6 m²

Static pressure: 101.7 kPa

Description of the specimen: Robust Details Limited Appendix F floor: 18mm OSB (10.9 kg/m²) screwed to 235mm x 50 mm joists (3.6 kg/m²) mounted in hangers at 450mm centres, 100mm Isover APR 1200 (10kg/m³) between joists, 1x19mm plasterboard plank (15.0kg/m²), 1x12.5mm wallboard (8.0kg/m²) screwed to underside of joists, joints and perimeter sealed



Level difference according to BS EN ISO 10140-2
Laboratory measurement of sound insulation of building elements

Test Laboratory: BRE Vertical Transmission Suite (B9)
Client: Aurora Lighting

Date of test: 20/09/2016 **Test Number:** L216-059

0578

Test specimen installed by: BRE

Product identification: Floor

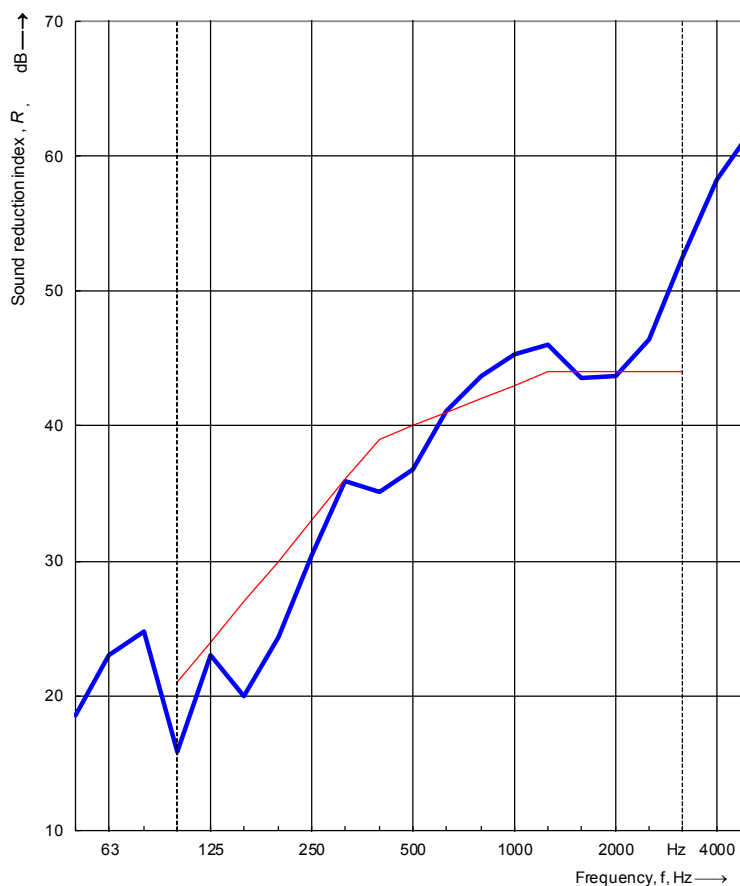
Description of the specimen:

Robust Details Limited Appendix F floor: 18mm OSB (10.9 kg/m²) screwed to 235mm x 50 mm joists (3.6 kg/m²) mounted in hangers at 450mm centres, 100mm Isover APR 1200 (10kg/m³) between joists, 1x19mm plasterboard plank (15.0kg/m²), 1x12.5mm wallboard (8.0kg/m²) screwed to underside of joists, joints and perimeter sealed

Static pressure: 101.7 kPa **Area, S, of test element:** 17.6 m²
Air temperature: 20 °C **Source room volume:** 65 m³
Relative air humidity: 44 % **Receiving room volume:** 61 m³

Frequency f [Hz]	R 1/3 octave [dB]
50	18.6
63	23.0
80	24.8
100	15.9
125	23.0
160	20.0
200	24.3
250	30.4
315	35.9
400	35.1
500	36.8
630	41.1
800	43.7
1000	45.3
1250	46.0
1600	43.6
2000	43.7
2500	46.4
3150	52.5
4000	58.2
5000	61.8

¹ Too high



Rating according to ISO 717-1

$R_w(C;C_{tr}) = 40$ (-3 ; -8) dB

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

$C_{50-3150} = -3$ dB $C_{50-5000} = -2$ dB $C_{100-5000} = -2$ dB

$C_{tr,50-3150} = -9$ dB $C_{tr,50-5000} = -9$ dB $C_{tr,100-5000} = -8$ dB

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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Normalized impact sound pressure levels according to BS EN ISO 10140-3

Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 20/09/2016

Test Number: L216-060

Rating according to BS EN ISO 717-2

$L_{n,w}(C_1) = 76 (0) \text{ dB}$

$C_{150-2500} = 0 \text{ dB}$

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

Frequency [Hz]	L_n [dB]		L_2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	
50	78.0		83.0	3.30	-5.0		
63	75.8		79.6	2.52	-3.8		
80	74.9		77.1	1.75	-2.2		
100	79.3		80.8	1.49	-1.5	1.3	
125	79.0		82.1	2.13	-3.1	1.0	
160	84.7		86.7	1.64	-2.0	6.7	
200	84.8		86.5	1.56	-1.7	6.8	
250	79.3		81.0	1.56	-1.7	1.3	
315	79.2		81.3	1.69	-2.1	1.2	
400	81.7		83.5	1.59	-1.8	4.7	
500	80.2		82.0	1.60	-1.8	4.2	
630	76.2		78.0	1.57	-1.8	1.2	
800	74.4		76.0	1.53	-1.6	0.4	
1000	69.9		71.7	1.59	-1.8		
1250	66.7		68.3	1.50	-1.6		
1600	64.0		65.6	1.52	-1.6		
2000	61.4		62.8	1.43	-1.4		
2500	56.5		57.6	1.35	-1.1		
3150	49.5		50.3	1.27	-0.8		
4000	41.7		42.3	1.20	-0.6		
5000	33.8		34.1	1.12	-0.3		

Sum of unfavourable deviation: 28.8 dB Max. unfavourable deviation: 6.8 dB at 200 Hz

Receiving room volume: 65 m³

Air temperature: 20 °C

Source room volume: 61 m³

Relative air humidity: 44 %

Area, S, of test element: 17.6 m²

Static pressure: 101.7 kPa

Description of the specimen:

Robust Details Limited Appendix F floor: 18mm OSB (10.9 kg/m²) screwed to 235mm x 50 mm joists (3.6 kg/m²) mounted in hangers at 450mm centres, 100mm Isover APR 1200 (10kg/m³) between joists, 1x19mm plasterboard plank (15.0kg/m²), 1x12.5mm wallboard (8.0kg/m²) screwed to underside of joists, joints and perimeter sealed

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0578

Normalized impact sound pressure levels according to BS EN ISO 10140-3

Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 20/09/2016

Test Number: L216-060

Test specimen installed by: BRE

Product identification: Floor

Description of the specimen: Robust Details Limited Appendix F floor: 18mm OSB (10.9 kg/m²) screwed to 235mm x 50 mm joists (3.6 kg/m²) mounted in hangers at 450mm centres, 100mm Isover APR 1200 (10kg/m³) between joists, 1x19mm plasterboard plank (15.0kg/m²), 1x12.5mm wallboard (8.0kg/m²) screwed to underside of joists, joints and perimeter sealed

Static pressure: 101.7 kPa

Source room volume: 61 m³

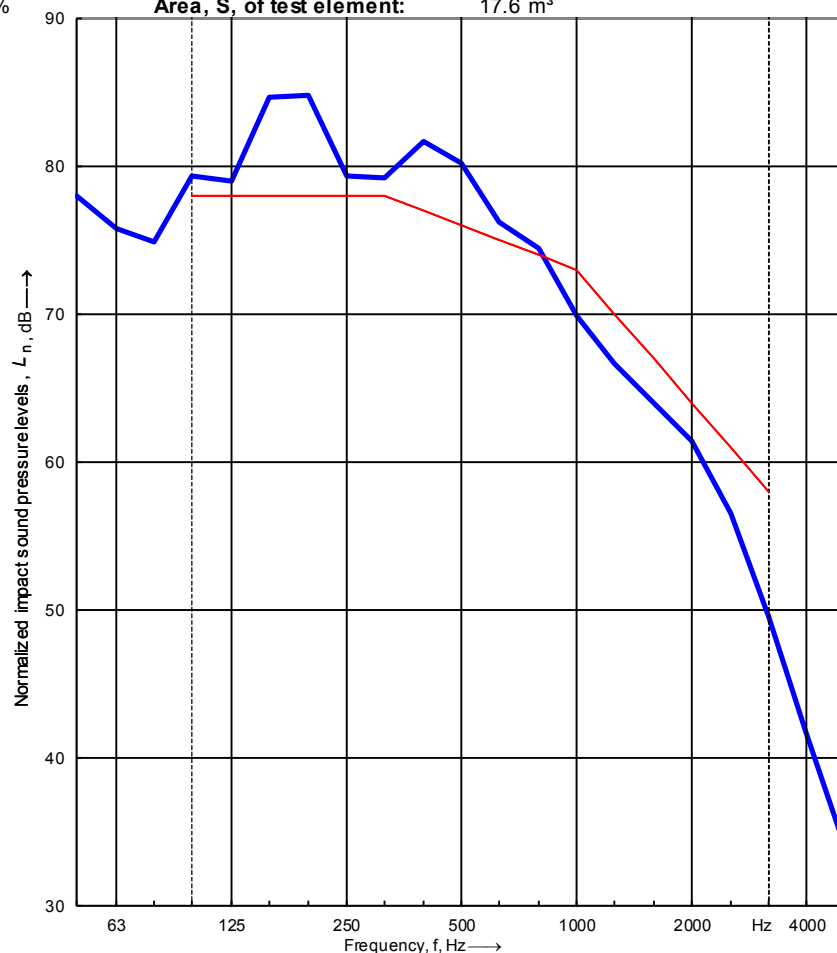
Air temperature: 20 °C

Receiving room volume: 65 m³

Relative air humidity: 44 %

Area, S, of test element: 17.6 m²

Frequency f [Hz]	L _n 1/3 octave [dB]
50	78.0
63	75.8
80	74.9
100	79.3
125	79.0
160	84.7
200	84.8
250	79.3
315	79.2
400	81.7
500	80.2
630	76.2
800	74.4
1000	69.9
1250	66.7
1600	64.0
2000	61.4
2500	56.5
3150	49.5
4000	41.7
5000	33.8



Rating according to BS EN ISO 717-2

L_{n,w}(C₁) = 76 (0) dB

C₁₅₀₋₂₅₀₀ = 0 dB

Evaluation based on laboratory measurement results obtained in one-third-octave bands 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)

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Level difference according to BS EN ISO 10140-2
Laboratory measurement of sound insulation of building elements

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

0578

Date of test: 1/12/16

Test Number: L216-071

Rating according to ISO 717-1

$R_w(C;C_{tr}) = 41 (-3 ; -8) \text{ dB}$

$C_{50-3150} = -3 \text{ dB}$ $C_{50-5000} = -2 \text{ dB}$ $C_{100-5000} = -2 \text{ dB}$

Evaluation based on laboratory measurements results obtained in one-third-octave bands by an engineering method.

$C_{tr,50-3150} = -9 \text{ dB}$ $C_{tr,50-5000} = -9 \text{ dB}$ $C_{tr,100-5000} = -8 \text{ dB}$

Frequency [Hz]	R [dB]	L1 [dB]	L2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	Bgn status	Ftm status
50	19.0	83.3	68.0	1.29				
63	22.4	88.3	69.5	1.26				
80	24.5	93.1	71.2	1.00				
100	19.0	95.6	80.4	1.34		3.0		
125	23.6	97.9	77.9	1.28		1.4		
160	19.2	100.0	84.0	1.16		8.8		
200	25.1	101.4	79.8	1.24		5.9		
250	32.3	103.6	75.3	1.38		1.7		
315	37.4	104.5	71.4	1.50				
400	36.6	103.1	70.9	1.54		3.4		
500	37.8	101.9	68.4	1.50		3.2		
630	41.6	102.1	64.6	1.44		0.4		
800	43.2	103.4	63.9	1.31				
1000	45.3	102.5	60.7	1.25				
1250	45.3	100.4	58.3	1.17				
1600	43.2	102.0	61.7	1.09		1.8		
2000	43.5	102.4	61.6	1.03		1.5		
2500	46.5	102.0	58.1	1.02				
3150	52.5	98.9	49.3	1.09				
4000	57.8	95.5	40.5	1.05				
5000	61.5	89.3	30.0	0.93				

Sum of unfavourable deviations: 31.1 dB

Max. unfavourable deviation : 8.8 dB at 160 Hz

Receiving room volume: 61 m³

Air temperature: 11 °C

Source room volume: 65 m³

Relative air humidity: 64 %

Area, S, of test element: 17.6 m²

Static pressure: 102.2 kPa

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting EN DE52/40 Downlights

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Level difference according to BS EN ISO 10140-2
Laboratory measurement of sound insulation of building elements

Test Laboratory: BRE Vertical Transmission Suite (B9)
Client: Aurora Lighting

Date of test: 1/12/16 **Test Number:** L216-071

0578

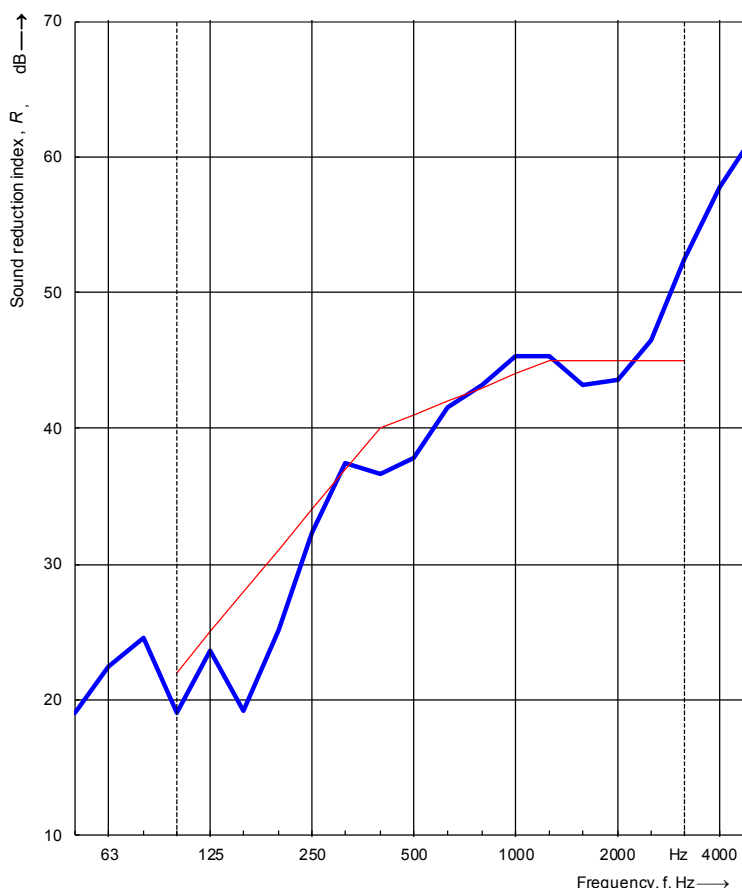
Test specimen installed by: Aurora Lighting

Product identification: Downlight

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting EN DE52/40 Downlights

Static pressure: 102.2 kPa **Area, S, of test element:** 17.6 m²
Air temperature: 11 °C **Source room volume:** 65 m³
Relative air humidity: 64 % **Receiving room volume:** 61 m³

Frequency f [Hz]	R 1/3 octave [dB]
50	19.0
63	22.4
80	24.5
100	19.0
125	23.6
160	19.2
200	25.1
250	32.3
315	37.4
400	36.6
500	37.8
630	41.6
800	43.2
1000	45.3
1250	45.3
1600	43.2
2000	43.5
2500	46.5
3150	52.5
4000	57.8
5000	61.5



Rating according to ISO 717-1

$R_w(C;C_{tr}) = 41$ (-3 ; -8) dB

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

$C_{50-3150} = -3$ dB $C_{50-5000} = -2$ dB $C_{100-5000} = -2$ dB
 $C_{tr,50-3150} = -9$ dB $C_{tr,50-5000} = -9$ dB $C_{tr,100-5000} = -8$ dB

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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Normalized impact sound pressure levels according to BS EN ISO 10140-3

Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 01/12/2016

Test Number: L216-072

Rating according to BS EN ISO 717-2

$L_{n,w}(C_1) = 77 (0) \text{ dB}$

$C_{150-2500} = 0 \text{ dB}$

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

Frequency [Hz]	L_n [dB]		L_2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	
50	81.6		84.5	2.03	-2.9		
63	74.7		78.2	2.32	-3.5		
80	73.3		75.8	1.85	-2.5		
100	76.2		77.7	1.48	-1.5		
125	80.6		82.0	1.46	-1.4	1.6	
160	85.9		86.8	1.29	-0.9	6.9	
200	84.4		86.0	1.51	-1.6	5.4	
250	80.3		82.4	1.69	-2.1	1.3	
315	79.9		81.7	1.60	-1.8	0.9	
400	82.7		84.3	1.50	-1.6	4.7	
500	81.4		83.2	1.57	-1.8	4.4	
630	77.6		79.6	1.66	-2.0	1.6	
800	76.8		78.7	1.61	-1.9	1.8	
1000	72.7		74.3	1.52	-1.6		
1250	69.0		70.6	1.53	-1.6		
1600	67.3		68.7	1.44	-1.4		
2000	64.5		65.6	1.36	-1.1		
2500	58.8		59.7	1.30	-0.9		
3150	51.5		52.2	1.22	-0.7		
4000	44.1		44.4	1.13	-0.3		
5000	39.2		39.0	0.99	0.2		

Sum of unfavourable deviation: 28.6 dB Max. unfavourable deviation: 6.9 dB at 160 Hz

Receiving room volume: 65 m³

Air temperature: 13 °C

Source room volume: 61 m³

Relative air humidity: 52 %

Area, S, of test element: 17.6 m²

Static pressure: 102.9 kPa

Description of the specimen:

Robust Details Limited Appendix F Floor with Nine Aurora Lighting EN DE52/40 Downlights

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0578

Normalized impact sound pressure levels according to BS EN ISO 10140-3

Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 01/12/2016

Test Number: L216-072

Test specimen installed by: BRE

Product identification: Downlight

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting EN DE52/40 Downlights

Static pressure: 102.9 kPa

Air temperature: 13 °C

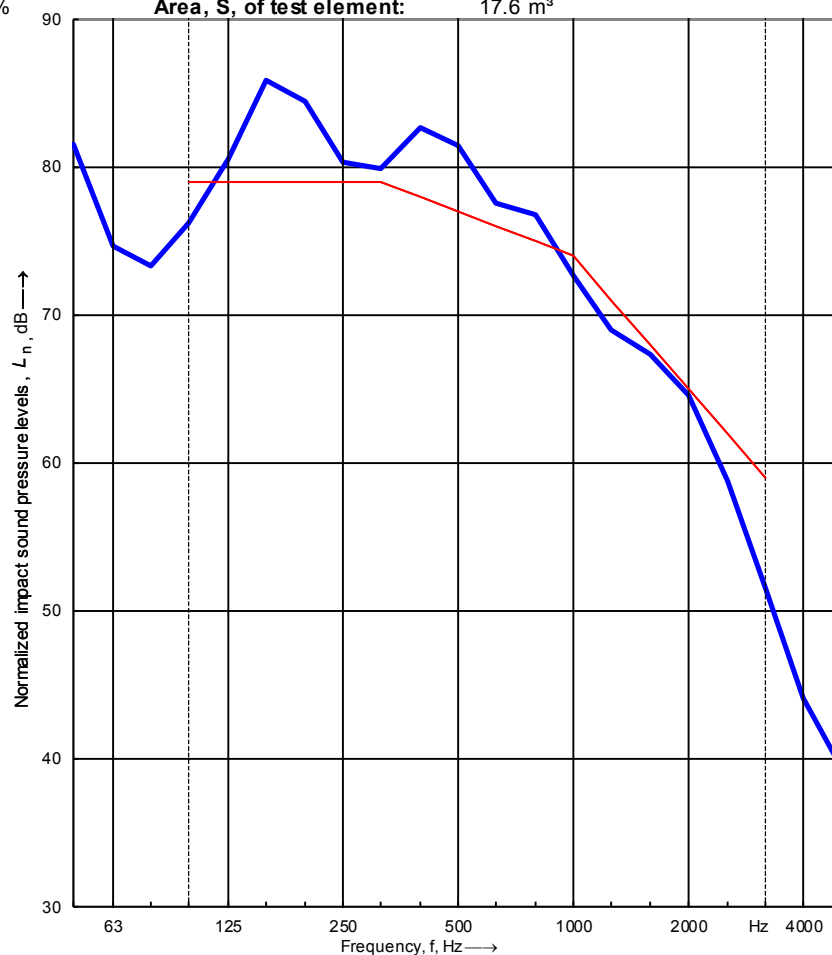
Relative air humidity: 52 %

Source room volume: 61 m³

Receiving room volume: 65 m³

Area, S, of test element: 17.6 m²

Frequency f [Hz]	L_n 1/3 octave [dB]
50	81.6
63	74.7
80	73.3
100	76.2
125	80.6
160	85.9
200	84.4
250	80.3
315	79.9
400	82.7
500	81.4
630	77.6
800	76.8
1000	72.7
1250	69.0
1600	67.3
2000	64.5
2500	58.8
3150	51.5
4000	44.1
5000	39.2



Rating according to BS EN ISO 717-2

$L_{n,w}(C_1) = 77 (0) \text{ dB}$

$C_{150-2500} = 0 \text{ dB}$

Evaluation based on laboratory measurement results obtained in one-third-octave bands 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 ($L_{n,w}$) 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)

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Frequency [Hz]	R [dB]	L1 [dB]	L2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	Bgn status	Ftm status
50	11.1	79.0	71.6	1.29				
63	24.4	86.5	65.7	1.26				
80	23.7	89.2	68.1	1.00				
100	17.5	94.5	80.8	1.34		3.5		
125	22.9	94.2	74.9	1.28		1.1		
160	21.3	97.4	79.3	1.16		5.7		
200	24.7	97.6	76.4	1.24		5.3		
250	31.6	97.3	69.7	1.38		1.4		
315	36.6	97.9	65.6	1.50				
400	36.0	97.7	66.1	1.54		3.0		
500	37.5	98.5	65.3	1.50		2.5		
630	42.0	99.4	61.5	1.44				
800	43.4	98.8	59.1	1.31				
1000	45.5	97.8	55.8	1.25				
1250	45.5	95.1	52.8	1.17				
1600	42.9	98.0	58.0	1.09		1.1		
2000	42.7	98.5	58.5	1.03		1.3		
2500	46.1	97.3	53.8	1.02				
3150	52.4	94.5	45.0	1.09				
4000	58.0	91.9	36.7	1.05				
5000	62.5	86.9	26.6	0.93			Correction	

Sum of unfavourable deviations: 24.9 dB
 Max. unfavourable deviation : 5.7 dB at 160 Hz

Receiving room volume: 61 m³
 Source room volume: 65 m³
 Area, S, of test element: 17.6 m²

Air temperature: 11 °C
 Relative air humidity: 64 %
 Static pressure: 102.2 kPa

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-FRLD 812A/30 Downlights

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Level difference according to BS EN ISO 10140-2
Laboratory measurement of sound insulation of building elements

Test Laboratory: BRE Vertical Transmission Suite (B9)
Client: Aurora Lighting

Date of test: 1/12/16 **Test Number:** L216-073

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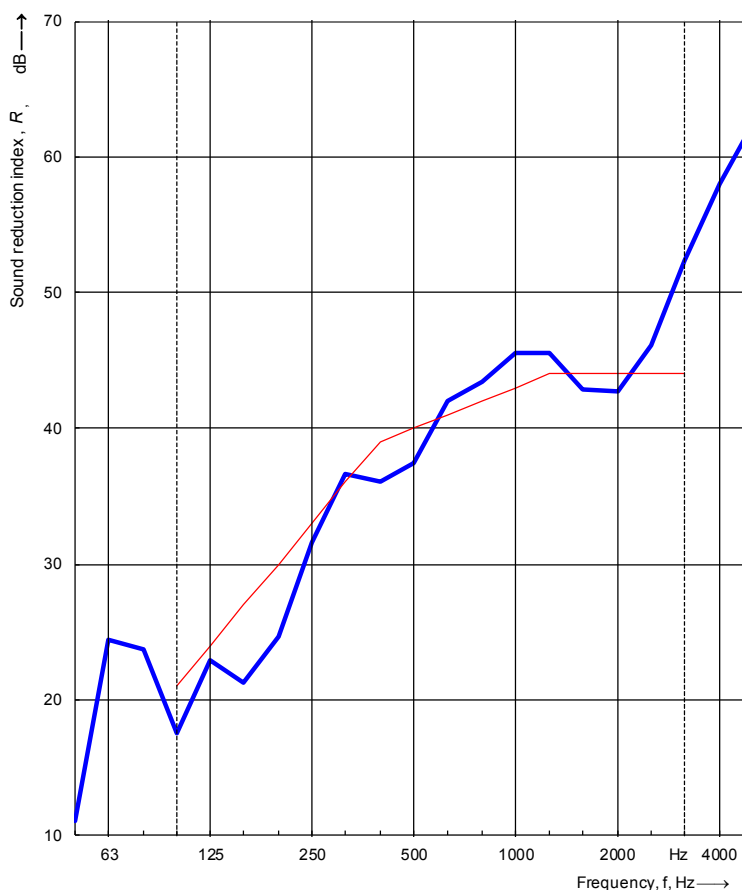
Test specimen installed by: Aurora Lighting

Product identification: Downlight

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-FRLD 812A/30 Downlights

Static pressure: 102.2 kPa **Area, S, of test element:** 17.6 m²
Air temperature: 11 °C **Source room volume:** 65 m³
Relative air humidity: 64 % **Receiving room volume:** 61 m³

Frequency f [Hz]	R 1/3 octave [dB]
50	11.1
63	24.4
80	23.7
100	17.5
125	22.9
160	21.3
200	24.7
250	31.6
315	36.6
400	36.0
500	37.5
630	42.0
800	43.4
1000	45.5
1250	45.5
1600	42.9
2000	42.7
2500	46.1
3150	52.4
4000	58.0
5000	62.5



Rating according to ISO 717-1

$R_w(C;C_{tr}) = 40$ (-2 ; -7) dB

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

$C_{50-3150} = -2$ dB $C_{50-5000} = -1$ dB $C_{100-5000} = -1$ dB
 $C_{tr,50-3150} = -9$ dB $C_{tr,50-5000} = -9$ dB $C_{tr,100-5000} = -7$ dB

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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Normalized impact sound pressure levels according to BS EN ISO 10140-3

Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 02/12/2016

Test Number: L216-074

Rating according to BS EN ISO 717-2

$L_{n,w}(C_1) = 76 (0) \text{ dB}$

$C_{150-2500} = 0 \text{ dB}$

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

Frequency [Hz]	L_n [dB]		L_2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	
50	76.4		79.3	2.03	-2.9		
63	71.9		75.4	2.32	-3.5		
80	70.7		73.2	1.85	-2.5		
100	77.9		79.4	1.48	-1.5		
125	80.6		82.0	1.46	-1.4	2.6	
160	86.0		86.9	1.29	-0.9	8.0	
200	83.3		84.9	1.51	-1.6	5.3	
250	77.4		79.5	1.69	-2.1		
315	79.9		81.7	1.60	-1.8	1.9	
400	81.7		83.3	1.50	-1.6	4.7	
500	80.9		82.7	1.57	-1.8	4.9	
630	76.8		78.8	1.66	-2.0	1.8	
800	76.0		77.9	1.61	-1.9	2.0	
1000	71.5		73.1	1.52	-1.6		
1250	68.5		70.1	1.53	-1.6		
1600	66.4		67.8	1.44	-1.4		
2000	64.5		65.6	1.36	-1.1	0.5	
2500	59.0		59.9	1.30	-0.9		
3150	51.7		52.4	1.22	-0.7		
4000	44.5		44.8	1.13	-0.3		
5000	37.4		37.2	0.99	0.2		

Sum of unfavourable deviation: 31.7 dB Max. unfavourable deviation: 8.0 dB at 160 Hz

Receiving room volume: 65 m³

Air temperature: 13 °C

Source room volume: 61 m³

Relative air humidity: 56 %

Area, S, of test element: 17.6 m²

Static pressure: 102.7 kPa

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-FRLD 812A/30 Downlights

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Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 02/12/2016

Test Number: L216-074

Test specimen installed by: BRE

Product identification: Downlight

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-FRLD 812A/30 Downlights

Static pressure: 102.7 kPa

Air temperature: 13 °C

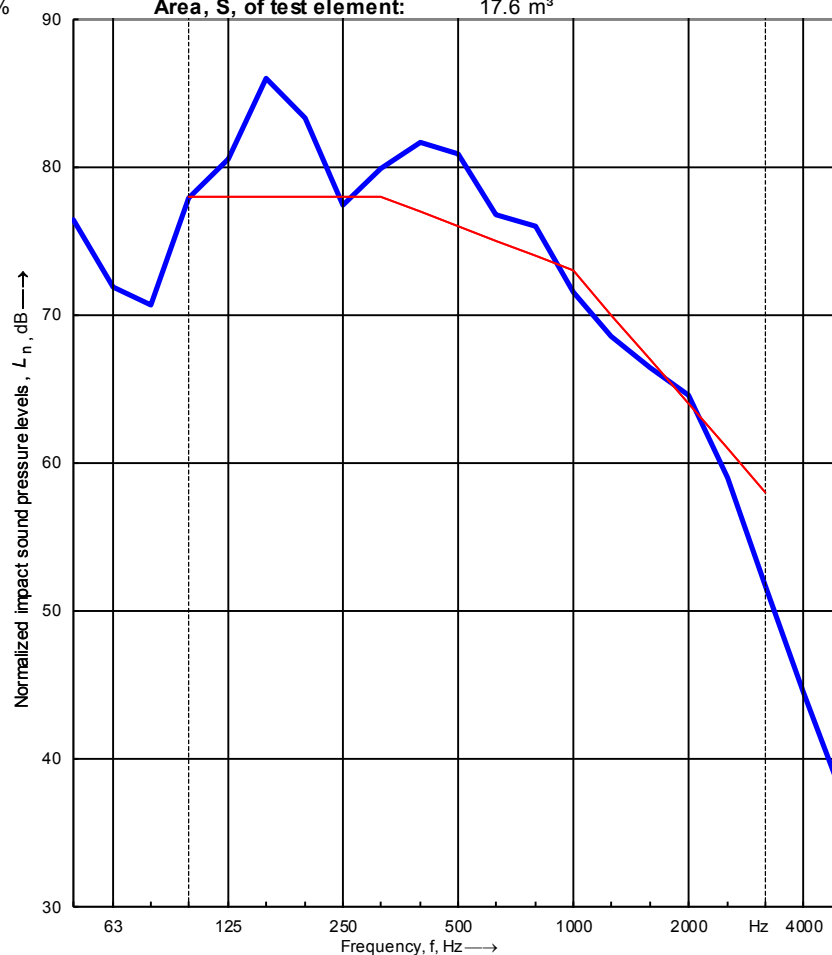
Relative air humidity: 56 %

Source room volume: 61 m³

Receiving room volume: 65 m³

Area, S, of test element: 17.6 m²

Frequency f [Hz]	L_n 1/3 octave [dB]
50	76.4
63	71.9
80	70.7
100	77.9
125	80.6
160	86.0
200	83.3
250	77.4
315	79.9
400	81.7
500	80.9
630	76.8
800	76.0
1000	71.5
1250	68.5
1600	66.4
2000	64.5
2500	59.0
3150	51.7
4000	44.5
5000	37.4



Rating according to BS EN ISO 717-2

$L_{n,w}(C_1) = 76 (0) \text{ dB}$

$C_{150-2500} = 0 \text{ dB}$

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

Based on the data provided in BS EN 10140-2:1993 it is estimated that the measurement uncertainty should not exceed $\pm 1 \text{ dB}$ for the single-number quantity ($L_{n,w}$) and should not exceed the values in Table A1 of BS EN 10140-2:1993 for the data in the individual third octaves (L_n)

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Frequency [Hz]	R [dB]	L1 [dB]	L2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	Bgn status	Ftm status
50	12.3	78.2	69.6	1.29				
63	26.0	87.6	65.2	1.26				
80	23.5	89.6	68.7	1.00				
100	18.3	91.7	77.2	1.34		3.7		
125	24.2	94.7	74.1	1.28		0.8		
160	21.4	97.5	79.3	1.16		6.6		
200	25.3	98.4	76.6	1.24		5.7		
250	32.1	99.4	71.3	1.38		1.9		
315	35.9	100.6	69.0	1.50		1.1		
400	35.5	100.4	69.3	1.54		4.5		
500	37.8	102.1	68.6	1.50		3.2		
630	42.0	103.0	65.1	1.44				
800	43.4	103.0	63.3	1.31				
1000	45.6	102.3	60.2	1.25				
1250	45.3	100.5	58.4	1.17				
1600	43.0	103.3	63.2	1.09		2.0		
2000	42.8	103.9	63.8	1.03		2.2		
2500	46.6	102.8	58.8	1.02				
3150	52.6	99.4	49.7	1.09				
4000	58.3	96.3	40.8	1.05				
5000	62.1	89.6	29.7	0.93				

Sum of unfavourable deviations: 31.7 dB
 Max. unfavourable deviation : 6.6 dB at 160 Hz

Receiving room volume: 61 m³ Air temperature: 11 °C
 Source room volume: 65 m³ Relative air humidity: 64 %
 Area, S, of test element: 17.6 m² Static pressure: 102.2 kPa

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM903 Downlights

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Level difference according to BS EN ISO 10140-2 **Laboratory measurement of sound insulation of building elements**

Test Laboratory: BRE Vertical Transmission Suite (B9)
Client: Aurora Lighting

Date of test: 1/12/16 **Test Number:** L216-075

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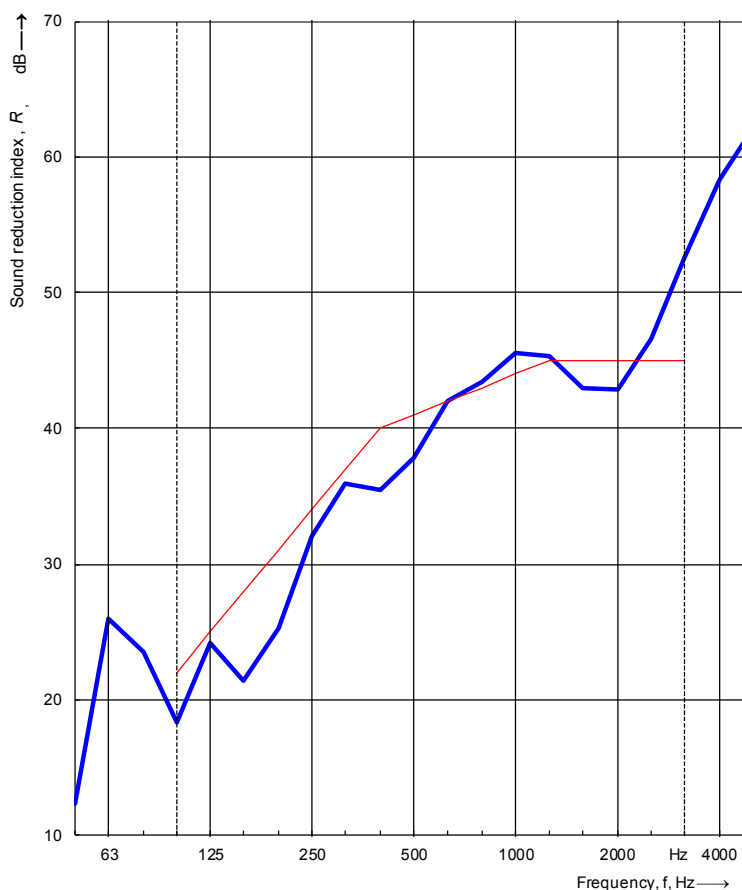
Test specimen installed by: Aurora Lighting

Product identification: Downlight

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM903 Downlights

Static pressure: 102.2 kPa **Area, S, of test element:** 17.6 m²
Air temperature: 11 °C **Source room volume:** 65 m³
Relative air humidity: 64 % **Receiving room volume:** 61 m³

Frequency f [Hz]	R 1/3 octave [dB]
50	12.3
63	26.0
80	23.5
100	18.3
125	24.2
160	21.4
200	25.3
250	32.1
315	35.9
400	35.5
500	37.8
630	42.0
800	43.4
1000	45.6
1250	45.3
1600	43.0
2000	42.8
2500	46.6
3150	52.6
4000	58.3
5000	62.1



Rating according to ISO 717-1

$R_w(C;C_{tr}) = 41$ (-3 ; -8) dB

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

$C_{50-3150} = -3$ dB $C_{50-5000} = -2$ dB $C_{100-5000} = -2$ dB
 $C_{tr,50-3150} = -9$ dB $C_{tr,50-5000} = -9$ dB $C_{tr,100-5000} = -8$ dB

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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Normalized impact sound pressure levels according to BS EN ISO 10140-3

Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 02/12/2016

Test Number: L216-076

Rating according to BS EN ISO 717-2

$L_{n,w}(C_1) = 77 (0) \text{ dB}$

$C_{150-2500} = 0 \text{ dB}$

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

Frequency [Hz]	L_n [dB]		L_2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	
50	78.3		81.2	2.03	-2.9		
63	71.0		74.5	2.32	-3.5		
80	71.4		73.9	1.85	-2.5		
100	78.8		80.3	1.48	-1.5		
125	84.0		85.4	1.46	-1.4	5.0	
160	86.2		87.1	1.29	-0.9	7.2	
200	82.9		84.5	1.51	-1.6	3.9	
250	77.7		79.8	1.69	-2.1		
315	79.6		81.4	1.60	-1.8	0.6	
400	81.7		83.3	1.50	-1.6	3.7	
500	80.0		81.8	1.57	-1.8	3.0	
630	76.2		78.2	1.66	-2.0	0.2	
800	74.9		76.8	1.61	-1.9		
1000	71.2		72.8	1.52	-1.6		
1250	67.4		69.0	1.53	-1.6		
1600	65.0		66.4	1.44	-1.4		
2000	63.1		64.2	1.36	-1.1		
2500	57.1		58.0	1.30	-0.9		
3150	49.9		50.6	1.22	-0.7		
4000	42.6		42.9	1.13	-0.3		
5000	35.6		35.4	0.99	0.2		

Sum of unfavourable deviation: 23.6 dB Max. unfavourable deviation: 7.2 dB at 160 Hz

Receiving room volume: 65 m³

Air temperature: 13 °C

Source room volume: 61 m³

Relative air humidity: 56 %

Area, S, of test element: 17.6 m²

Static pressure: 102.7 kPa

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM903 Downlights

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Normalized impact sound pressure levels according to BS EN ISO 10140-3

Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 02/12/2016

Test Number: L216-076

Test specimen installed by: BRE

Product identification: Downlight

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM903 Downlights

Static pressure: 102.7 kPa

Air temperature: 13 °C

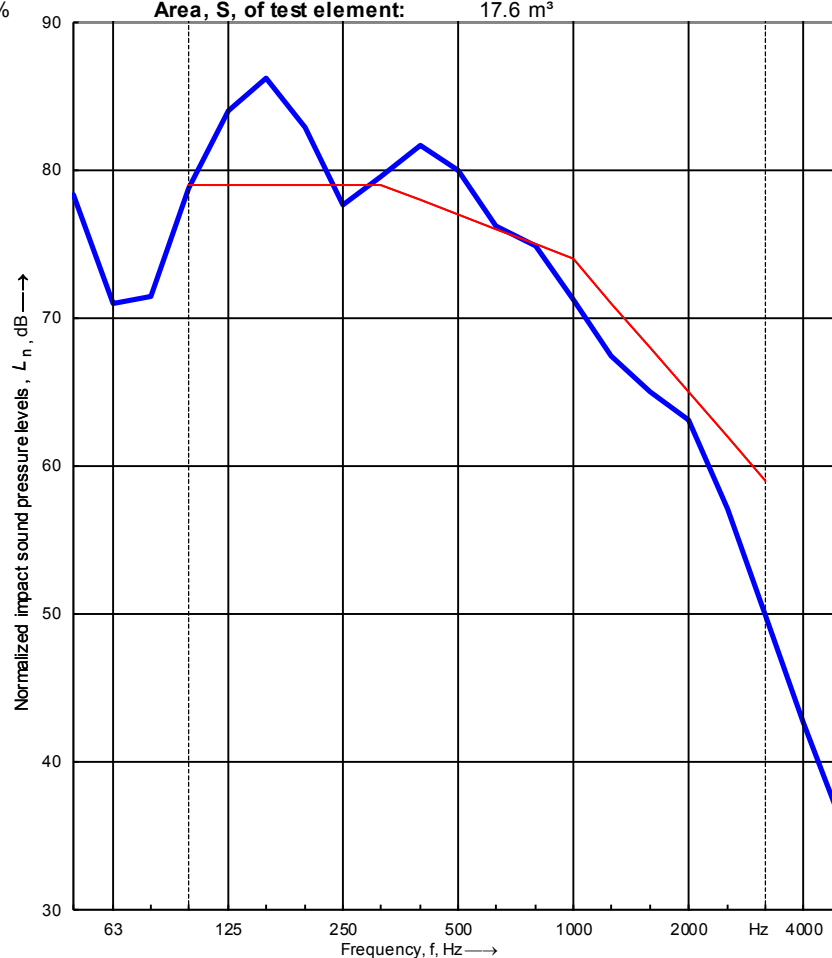
Relative air humidity: 56 %

Source room volume: 61 m³

Receiving room volume: 65 m³

Area, S, of test element: 17.6 m²

Frequency f [Hz]	L _n 1/3 octave [dB]
50	78.3
63	71.0
80	71.4
100	78.8
125	84.0
160	86.2
200	82.9
250	77.7
315	79.6
400	81.7
500	80.0
630	76.2
800	74.9
1000	71.2
1250	67.4
1600	65.0
2000	63.1
2500	57.1
3150	49.9
4000	42.6
5000	35.6



Rating according to BS EN ISO 717-2

$L_{n,w}(C_1) = 77 (0) \text{ dB}$

$C_{150-2500} = 0 \text{ dB}$

Evaluation based on laboratory measurement results obtained in one-third-octave bands 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 ($L_{n,w}$) 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)

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Level difference according to BS EN ISO 10140-2
Laboratory measurement of sound insulation of building elements

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

0578

Date of test: 5/12/16

Test Number: L216-077

Rating according to ISO 717-1							
$R_w(C;C_{tr}) = 40$	(-2 ;	-7	) dB	$C_{50-3150} =$	-2 dB	$C_{50-5000} =$	-1 dB
Evaluation based on laboratory measurements results obtained in one-third-octave bands by an engineering method.				$C_{tr,50-3150} =$	-9 dB	$C_{tr,50-5000} =$	-9 dB
				$C_{tr,100-5000} =$	-7 dB		

Frequency [Hz]	R [dB]	L1 [dB]	L2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	Bgn status	Ftm status
50	10.5	73.9	67.1	1.29				
63	25.1	84.2	62.7	1.26				
80	23.5	86.5	65.6	1.00				
100	17.5	88.7	75.0	1.34		3.5		
125	24.2	92.3	71.7	1.28				
160	21.5	95.4	77.1	1.16		5.5		
200	25.2	95.8	74.1	1.24		4.8		
250	32.1	97.0	68.9	1.38		0.9		
315	36.2	98.4	66.5	1.50				
400	35.6	98.5	67.3	1.54		3.4		
500	37.5	99.5	66.3	1.50		2.5		
630	41.7	100.3	62.7	1.44				
800	43.2	100.1	60.6	1.31				
1000	45.5	99.6	57.6	1.25				
1250	45.3	97.7	55.6	1.17				
1600	42.7	100.2	60.4	1.09		1.3		
2000	42.6	100.9	61.0	1.03		1.4		
2500	46.0	99.7	56.3	1.02				
3150	52.2	96.4	47.1	1.09				
4000	57.6	93.0	38.2	1.05				
5000	62.0	86.6	26.8	0.93			Correction	

Sum of unfavourable deviations: 23.3 dB

Max. unfavourable deviation : 5.5 dB at 160 Hz

Receiving room volume: 61 m³

Air temperature: 14 °C

Source room volume: 65 m³

Relative air humidity: 49 %

Area, S, of test element: 17.6 m²

Static pressure: 102.4 kPa

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM901 Downlights



Level difference according to BS EN ISO 10140-2 **Laboratory measurement of sound insulation of building elements**

Test Laboratory: BRE Vertical Transmission Suite (B9)
Client: Aurora Lighting

Date of test: 5/12/16 **Test Number:** L216-077

0578

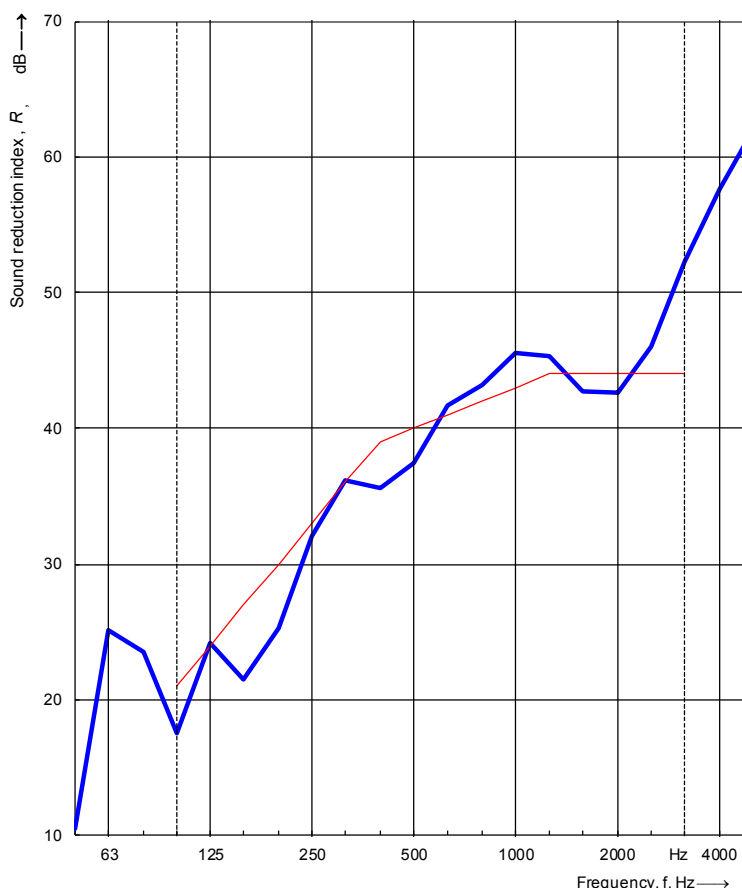
Test specimen installed by: Aurora Lighting

Product identification: Downlight

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM901 Downlights

Static pressure: 102.4 kPa **Area, S, of test element:** 17.6 m²
Air temperature: 14 °C **Source room volume:** 65 m³
Relative air humidity: 49 % **Receiving room volume:** 61 m³

Frequency f [Hz]	R 1/3 octave [dB]
50	10.5
63	25.1
80	23.5
100	17.5
125	24.2
160	21.5
200	25.2
250	32.1
315	36.2
400	35.6
500	37.5
630	41.7
800	43.2
1000	45.5
1250	45.3
1600	42.7
2000	42.6
2500	46.0
3150	52.2
4000	57.6
5000	62.0



Rating according to ISO 717-1

$R_w(C;C_{tr}) = 40$ (-2 ; -7) dB

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

$C_{50-3150} = -2$ dB $C_{50-5000} = -1$ dB $C_{100-5000} = -1$ dB
 $C_{tr,50-3150} = -9$ dB $C_{tr,50-5000} = -9$ dB $C_{tr,100-5000} = -7$ dB

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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Normalized impact sound pressure levels according to BS EN ISO 10140-3

Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 05/12/2016

Test Number: L216-078

0578

Rating according to BS EN ISO 717-2

$L_{n,w}(C_1) = 77 (0) \text{ dB}$

$C_{150-2500} = 0 \text{ dB}$

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

Frequency [Hz]	L_n [dB]		L_2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	
50	75.5		78.4	2.03	-2.9		
63	69.2		72.7	2.32	-3.5		
80	72.6		75.1	1.85	-2.5		
100	78.4		79.9	1.48	-1.5		
125	79.7		81.1	1.46	-1.4	0.7	
160	85.9		86.8	1.29	-0.9	6.9	
200	85.7		87.3	1.51	-1.6	6.7	
250	78.5		80.6	1.69	-2.1		
315	79.9		81.7	1.60	-1.8	0.9	
400	82.2		83.8	1.50	-1.6	4.2	
500	80.8		82.6	1.57	-1.8	3.8	
630	76.9		78.9	1.66	-2.0	0.9	
800	75.0		76.9	1.61	-1.9		
1000	71.7		73.3	1.52	-1.6		
1250	67.4		69.0	1.53	-1.6		
1600	65.6		67.0	1.44	-1.4		
2000	63.4		64.5	1.36	-1.1		
2500	57.9		58.8	1.30	-0.9		
3150	50.2		50.9	1.22	-0.7		
4000	43.2		43.5	1.13	-0.3		
5000	36.5		36.3	0.99	0.2		

Sum of unfavourable deviation: 24.1 dB Max. unfavourable deviation: 6.9 dB at 160 Hz

Receiving room volume: 65 m³

Air temperature: 14 °C

Source room volume: 61 m³

Relative air humidity: 49 %

Area, S, of test element: 17.6 m²

Static pressure: 102.4 kPa

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM901 Downlights

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Normalized impact sound pressure levels according to BS EN ISO 10140-3

Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 05/12/2016

Test Number: L216-078

Test specimen installed by: BRE

Product identification: Downlight

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM901 Downlights

Static pressure: 102.4 kPa

Air temperature: 14 °C

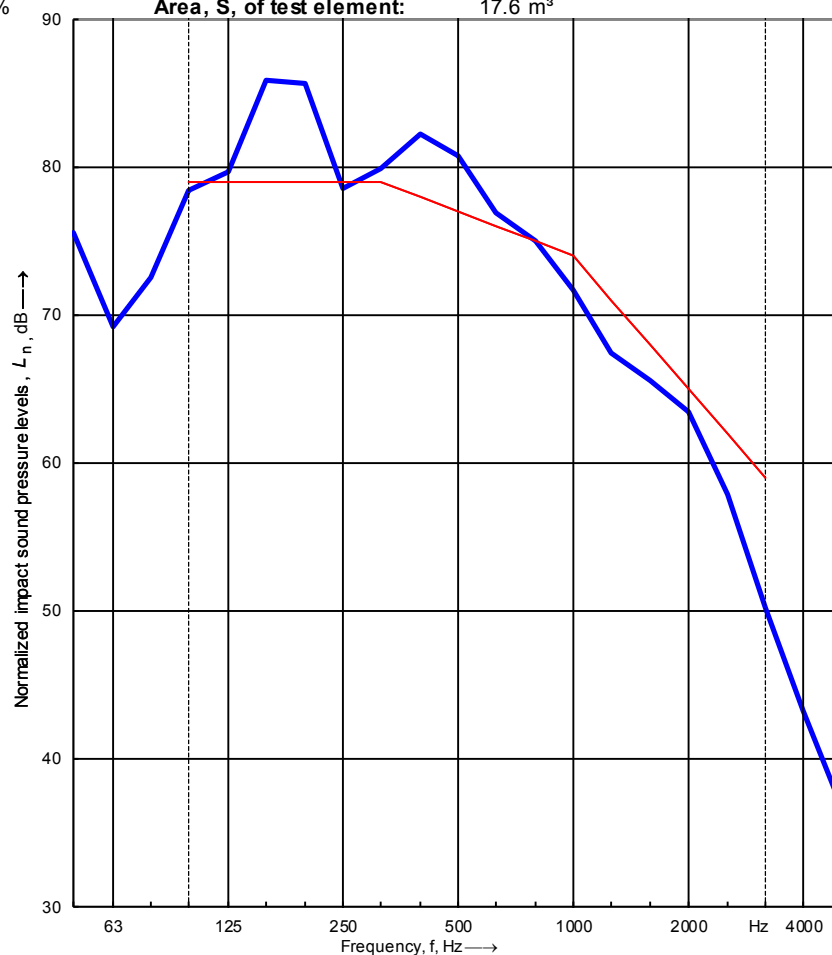
Relative air humidity: 49 %

Source room volume: 61 m³

Receiving room volume: 65 m³

Area, S, of test element: 17.6 m²

Frequency f [Hz]	L_n 1/3 octave [dB]
50	75.5
63	69.2
80	72.6
100	78.4
125	79.7
160	85.9
200	85.7
250	78.5
315	79.9
400	82.2
500	80.8
630	76.9
800	75.0
1000	71.7
1250	67.4
1600	65.6
2000	63.4
2500	57.9
3150	50.2
4000	43.2
5000	36.5



Rating according to BS EN ISO 717-2

$L_{n,w}(C_1) = 77 (0) \text{ dB}$

$C_{150-2500} = 0 \text{ dB}$

Evaluation based on laboratory measurement results obtained in one-third-octave bands 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 ($L_{n,w}$) 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)

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Level difference according to BS EN ISO 10140-2
Laboratory measurement of sound insulation of building elements

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

0578

Date of test: 8/12/16

Test Number: L216-079

Rating according to ISO 717-1

$R_w(C;C_{tr}) = 40 (-2; -7) \text{ dB}$

$C_{50-3150} = -2 \text{ dB}$ $C_{50-5000} = -1 \text{ dB}$ $C_{100-5000} = -1 \text{ dB}$

Evaluation based on laboratory measurements results obtained in one-third-octave bands by an engineering method.

$C_{tr,50-3150} = -9 \text{ dB}$ $C_{tr,50-5000} = -9 \text{ dB}$ $C_{tr,100-5000} = -7 \text{ dB}$

Frequency [Hz]	R [dB]	L1 [dB]	L2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	Bgn status	Ftm status
50	11.2	78.5	71.0	1.29				
63	24.6	86.6	65.6	1.26				
80	23.7	89.1	68.0	1.00				
100	17.7	94.5	80.6	1.34		3.3		
125	23.2	94.2	74.6	1.28		0.8		
160	21.5	97.6	79.3	1.16		5.5		
200	24.7	97.6	76.4	1.24		5.3		
250	31.8	97.5	69.7	1.38		1.2		
315	36.6	97.9	65.6	1.50				
400	36.2	97.8	66.0	1.54		2.8		
500	37.7	98.6	65.2	1.50		2.3		
630	41.9	99.3	61.5	1.44				
800	43.4	98.8	59.1	1.31				
1000	45.6	97.8	55.7	1.25				
1250	45.5	95.1	52.8	1.17				
1600	42.9	98.0	58.0	1.09		1.1		
2000	42.7	98.5	58.5	1.03		1.3		
2500	46.1	97.3	53.8	1.02				
3150	52.4	94.5	45.0	1.09				
4000	57.9	91.8	36.7	1.05				
5000	62.5	86.9	26.6	0.93			Correction	

Sum of unfavourable deviations: 23.6 dB

Max. unfavourable deviation : 5.5 dB at 160 Hz

Receiving room volume: 61 m³

Air temperature: 16 °C

Source room volume: 65 m³

Relative air humidity: 51 %

Area, S, of test element: 17.6 m²

Static pressure: 102.4 kPa

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM983 Downlights

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Level difference according to BS EN ISO 10140-2 **Laboratory measurement of sound insulation of building elements**

Test Laboratory: BRE Vertical Transmission Suite (B9)
Client: Aurora Lighting

Date of test: 8/12/16 **Test Number:** L216-079

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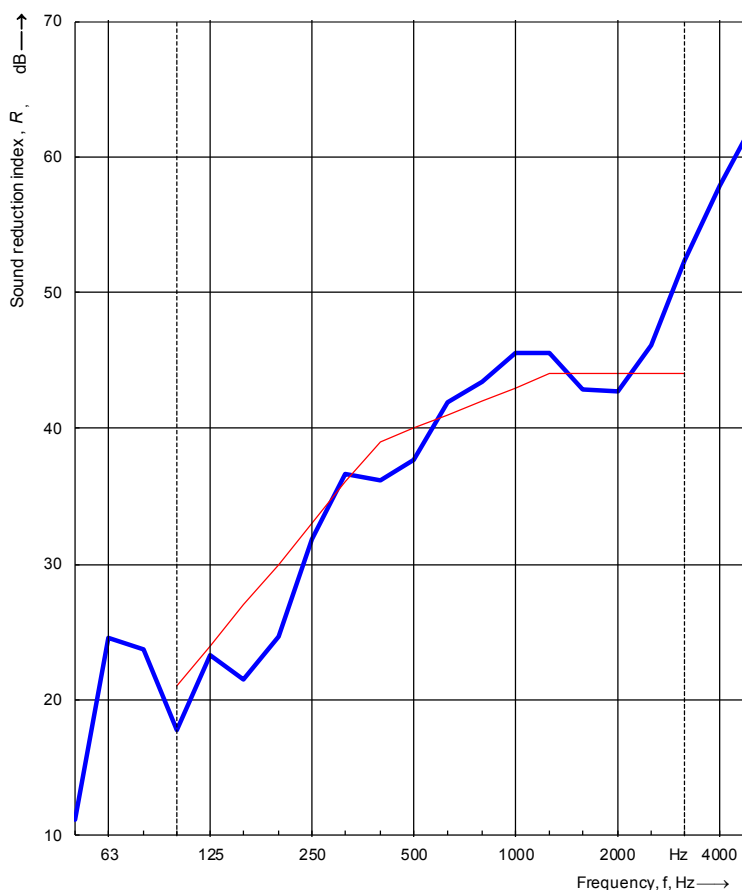
Test specimen installed by: Aurora Lighting

Product identification: Downlight

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM983 Downlights

Static pressure: 102.4 kPa **Area, S, of test element:** 17.6 m²
Air temperature: 16 °C **Source room volume:** 65 m³
Relative air humidity: 51 % **Receiving room volume:** 61 m³

Frequency f [Hz]	R 1/3 octave [dB]
50	11.2
63	24.6
80	23.7
100	17.7
125	23.2
160	21.5
200	24.7
250	31.8
315	36.6
400	36.2
500	37.7
630	41.9
800	43.4
1000	45.6
1250	45.5
1600	42.9
2000	42.7
2500	46.1
3150	52.4
4000	57.9
5000	62.5



Rating according to ISO 717-1

$R_w(C;C_{tr}) = 40$ (-2 ; -7) dB

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

$C_{50-3150} = -2$ dB $C_{50-5000} = -1$ dB $C_{100-5000} = -1$ dB
 $C_{tr,50-3150} = -9$ dB $C_{tr,50-5000} = -9$ dB $C_{tr,100-5000} = -7$ dB

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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Normalized impact sound pressure levels according to BS EN ISO 10140-3

Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 08/12/2016

Test Number: L216-080

Rating according to BS EN ISO 717-2

$L_{n,w}(C_1) = 76 (0) \text{ dB}$

$C_{150-2500} = 0 \text{ dB}$

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

Frequency [Hz]	L_n [dB]		L_2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	
50	77.0		79.9	2.03	-2.9		
63	70.1		73.6	2.32	-3.5		
80	72.1		74.6	1.85	-2.5		
100	77.6		79.1	1.48	-1.5		
125	80.8		82.2	1.46	-1.4	2.8	
160	85.1		86.0	1.29	-0.9	7.1	
200	83.6		85.2	1.51	-1.6	5.6	
250	78.7		80.8	1.69	-2.1	0.7	
315	79.1		80.9	1.60	-1.8	1.1	
400	81.4		83.0	1.50	-1.6	4.4	
500	80.1		81.9	1.57	-1.8	4.1	
630	77.2		79.2	1.66	-2.0	2.2	
800	75.3		77.2	1.61	-1.9	1.3	
1000	72.0		73.6	1.52	-1.6		
1250	68.0		69.6	1.53	-1.6		
1600	66.1		67.5	1.44	-1.4		
2000	64.0		65.1	1.36	-1.1		
2500	58.1		59.0	1.30	-0.9		
3150	50.3		51.0	1.22	-0.7		
4000	42.9		43.2	1.13	-0.3		
5000	35.6		35.4	0.99	0.2		

Sum of unfavourable deviation: 29.3 dB Max. unfavourable deviation: 7.1 dB at 160 Hz

Receiving room volume: 65 m³

Air temperature: 61 °C

Source room volume: 61 m³

Relative air humidity: 51 %

Area, S, of test element: 17.6 m²

Static pressure: 102.4 kPa

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM983 Downlights

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Normalized impact sound pressure levels according to BS EN ISO 10140-3

Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 08/12/2016

Test Number: L216-080

Test specimen installed by: BRE

Product identification: Downlight

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM983 Downlights

Static pressure: 102.4 kPa

Air temperature: 61 °C

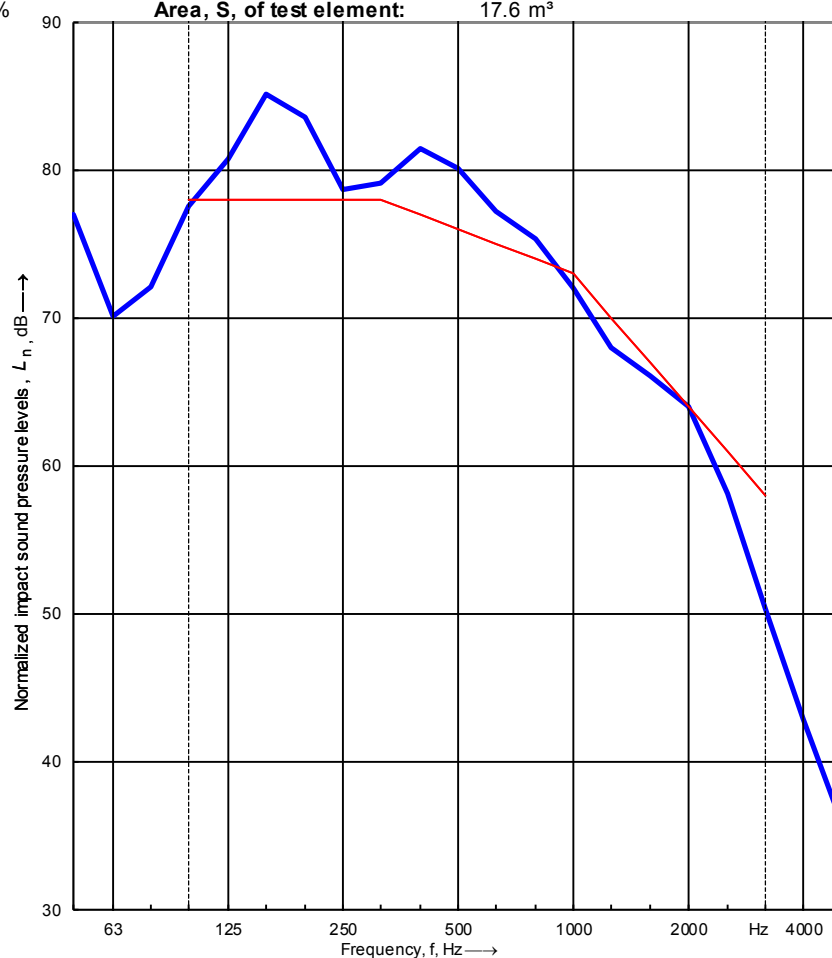
Relative air humidity: 51 %

Source room volume: 61 m³

Receiving room volume: 65 m³

Area, S, of test element: 17.6 m²

Frequency f [Hz]	L_n 1/3 octave [dB]
50	77.0
63	70.1
80	72.1
100	77.6
125	80.8
160	85.1
200	83.6
250	78.7
315	79.1
400	81.4
500	80.1
630	77.2
800	75.3
1000	72.0
1250	68.0
1600	66.1
2000	64.0
2500	58.1
3150	50.3
4000	42.9
5000	35.6



Rating according to BS EN ISO 717-2

$L_{n,w}(C_1) = 76 (0) \text{ dB}$

$C_{150-2500} = 0 \text{ dB}$

Evaluation based on laboratory measurement results obtained in one-third-octave bands 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 ($L_{n,w}$) 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)

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Level difference according to BS EN ISO 10140-2
Laboratory measurement of sound insulation of building elements

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

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Date of test: 08/12/2016

Test Number: L216-081

Rating according to ISO 717-1

$R_w(C;C_{tr}) = 41 (-3 ; -8) \text{ dB}$

$C_{50-3150} = -3 \text{ dB}$ $C_{50-5000} = -2 \text{ dB}$ $C_{100-5000} = -2 \text{ dB}$

Evaluation based on laboratory measurements results obtained in one-third-octave bands by an engineering method.

$C_{tr,50-3150} = -10 \text{ dB}$ $C_{tr,50-5000} = -10 \text{ dB}$ $C_{tr,100-5000} = -8 \text{ dB}$

Frequency [Hz]	R [dB]	L1 [dB]	L2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	Bgn status	Ftm status
50	12.4	80.7	72.0	1.29				
63	25.2	87.9	66.3	1.26				
80	24.2	90.6	69.0	1.00				
100	17.0	94.2	81.0	1.34		5.0		
125	22.5	94.7	75.8	1.28		2.5		
160	20.9	98.0	80.3	1.16		7.1		
200	26.1	99.3	76.7	1.24		4.9		
250	31.8	98.3	70.5	1.38		2.2		
315	37.1	99.0	66.2	1.50				
400	36.5	99.0	66.9	1.54		3.5		
500	38.3	99.7	65.7	1.50		2.7		
630	42.2	100.5	62.4	1.44				
800	43.9	100.1	59.9	1.31				
1000	45.5	98.8	56.8	1.25				
1250	45.6	96.3	53.9	1.17				
1600	43.0	99.1	59.0	1.09		2.0		
2000	42.9	99.7	59.5	1.03		2.1		
2500	46.1	98.4	54.9	1.02				
3150	52.6	95.8	46.1	1.09				
4000	57.8	93.3	38.3	1.05				
5000	61.7	88.1	28.6	0.93				

Sum of unfavourable deviations: 32.0 dB

Max. unfavourable deviation : 7.1 dB at 160 Hz

Receiving room volume: 61 m³

Air temperature: 16 °C

Source room volume: 65 m³

Relative air humidity: 51 %

Area, S, of test element: 17.6 m²

Static pressure: 102.4 kPa

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM902 Downlights

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Level difference according to BS EN ISO 10140-2 **Laboratory measurement of sound insulation of building elements**

Test Laboratory: BRE Vertical Transmission Suite (B9)
Client: Aurora Lighting

Date of test: 08/12/2016 **Test Number:** L216-081

0578

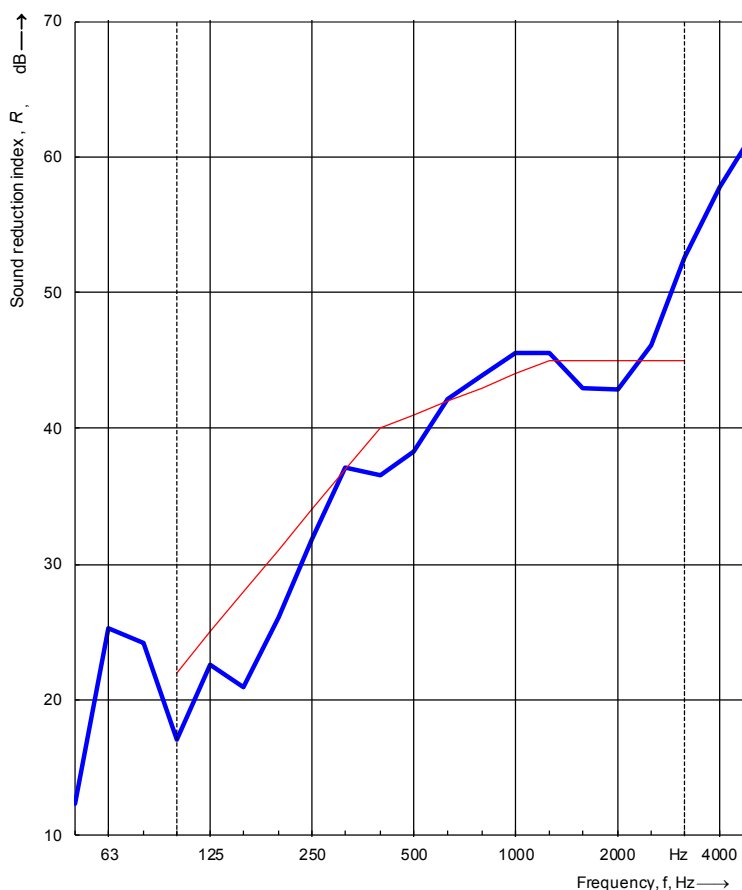
Test specimen installed by: Aurora Lighting

Product identification: Downlight

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM902 Downlights

Static pressure: 102.4 kPa **Area, S, of test element:** 17.6 m²
Air temperature: 16 °C **Source room volume:** 65 m³
Relative air humidity: 51 % **Receiving room volume:** 61 m³

Frequency f [Hz]	R 1/3 octave [dB]
50	12.4
63	25.2
80	24.2
100	17.0
125	22.5
160	20.9
200	26.1
250	31.8
315	37.1
400	36.5
500	38.3
630	42.2
800	43.9
1000	45.5
1250	45.6
1600	43.0
2000	42.9
2500	46.1
3150	52.6
4000	57.8
5000	61.7



Rating according to ISO 717-1

$R_w(C;C_{tr}) = 41$ (-3 ; -8) dB

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

$C_{50-3150} = -3$ dB $C_{50-5000} = -2$ dB $C_{100-5000} = -2$ dB
 $C_{tr,50-3150} = -10$ dB $C_{tr,50-5000} = -10$ dB $C_{tr,100-5000} = -8$ dB

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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Normalized impact sound pressure levels according to BS EN ISO 10140-3

Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 08/12/2016

Test Number: L216-082

Rating according to BS EN ISO 717-2

$L_{n,w}(C_1) = 77 (0) \text{ dB}$

$C_{150-2500} = 0 \text{ dB}$

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

Frequency [Hz]	L_n [dB]		L_2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	
50	82.1		85.0	2.03	-2.9		
63	71.4		74.9	2.32	-3.5		
80	71.8		74.3	1.85	-2.5		
100	78.5		80.0	1.48	-1.5		
125	81.0		82.4	1.46	-1.4	2.0	
160	84.5		85.4	1.29	-0.9	5.5	
200	85.6		87.2	1.51	-1.6	6.6	
250	80.4		82.5	1.69	-2.1	1.4	
315	79.7		81.5	1.60	-1.8	0.7	
400	81.8		83.4	1.50	-1.6	3.8	
500	81.3		83.1	1.57	-1.8	4.3	
630	76.3		78.3	1.66	-2.0	0.3	
800	74.9		76.8	1.61	-1.9		
1000	71.7		73.3	1.52	-1.6		
1250	67.4		69.0	1.53	-1.6		
1600	65.7		67.1	1.44	-1.4		
2000	63.2		64.3	1.36	-1.1		
2500	57.6		58.5	1.30	-0.9		
3150	51.0		51.7	1.22	-0.7		
4000	43.7		44.0	1.13	-0.3		
5000	37.0		36.8	0.99	0.2		

Sum of unfavourable deviation: 24.6 dB Max. unfavourable deviation: 6.6 dB at 200 Hz

Receiving room volume: 65 m³

Air temperature: 61 °C

Source room volume: 61 m³

Relative air humidity: 51 %

Area, S , of test element: 17.6 m²

Static pressure: 102.4 kPa

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU- DLM902 Downlights

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Normalized impact sound pressure levels according to BS EN ISO 10140-3

Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 08/12/2016

Test Number: L216-082

Test specimen installed by: BRE

Product identification: Downlight

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM902 Downlights

Static pressure: 102.4 kPa

Air temperature: 61 °C

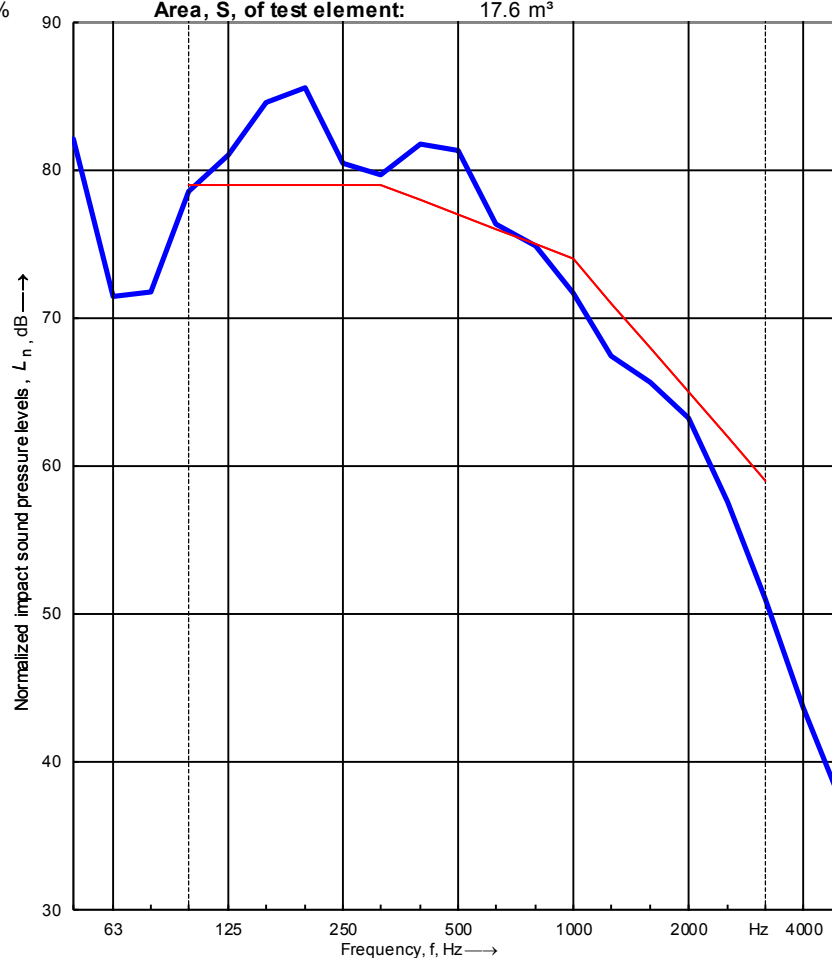
Relative air humidity: 51 %

Source room volume: 61 m³

Receiving room volume: 65 m³

Area, S, of test element: 17.6 m²

Frequency f [Hz]	L_n 1/3 octave [dB]
50	82.1
63	71.4
80	71.8
100	78.5
125	81.0
160	84.5
200	85.6
250	80.4
315	79.7
400	81.8
500	81.3
630	76.3
800	74.9
1000	71.7
1250	67.4
1600	65.7
2000	63.2
2500	57.6
3150	51.0
4000	43.7
5000	37.0



Rating according to BS EN ISO 717-2

$L_{n,w}(C_1) = 77 (0) \text{ dB}$

$C_{150-2500} = 0 \text{ dB}$

Evaluation based on laboratory measurement results obtained in one-third-octave bands 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 ($L_{n,w}$) 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)

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Level difference according to BS EN ISO 10140-2
Laboratory measurement of sound insulation of building elements

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

0578

Date of test: 08/12/2016

Test Number: L216-083

Rating according to ISO 717-1

$R_w(C;C_{tr}) = 41 (-3 ; -8) \text{ dB}$

$C_{50-3150} = -3 \text{ dB}$ $C_{50-5000} = -2 \text{ dB}$ $C_{100-5000} = -2 \text{ dB}$

Evaluation based on laboratory measurements results obtained in one-third-octave bands by an engineering method.

$C_{tr,50-3150} = -9 \text{ dB}$ $C_{tr,50-5000} = -9 \text{ dB}$ $C_{tr,100-5000} = -8 \text{ dB}$

Frequency [Hz]	R [dB]	L1 [dB]	L2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	Bgn status	Ftm status
50	12.1	80.9	72.5	1.29				
63	23.3	86.2	66.5	1.26				
80	24.2	90.3	68.7	1.00				
100	19.1	96.7	81.4	1.34		2.9		
125	23.2	95.1	75.5	1.28		1.8		
160	20.6	97.9	80.5	1.16		7.4		
200	25.6	98.5	76.4	1.24		5.4		
250	32.5	97.5	69.0	1.38		1.5		
315	37.0	99.1	66.4	1.50				
400	36.8	98.9	66.5	1.54		3.2		
500	38.6	99.7	65.4	1.50		2.4		
630	42.4	100.3	62.0	1.44				
800	44.5	100.3	59.5	1.31				
1000	46.3	98.7	55.9	1.25				
1250	46.5	96.1	52.8	1.17				
1600	43.6	99.1	58.4	1.09		1.4		
2000	43.0	99.6	59.3	1.03		2.0		
2500	46.5	98.5	54.6	1.02				
3150	52.9	95.8	45.8	1.09				
4000	58.6	93.2	37.4	1.05				
5000	62.5	88.0	27.7	0.93				

Sum of unfavourable deviations: 28.0 dB

Max. unfavourable deviation : 7.4 dB at 160 Hz

Receiving room volume: 61 m³

Air temperature: 16 °C

Source room volume: 65 m³

Relative air humidity: 51 %

Area, S, of test element: 17.6 m²

Static pressure: 102.4 kPa

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-MPR02/30 Downlights

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Level difference according to BS EN ISO 10140-2 **Laboratory measurement of sound insulation of building elements**

Test Laboratory: BRE Vertical Transmission Suite (B9)
Client: Aurora Lighting

Date of test: 08/12/2016 **Test Number:** L216-083

0578

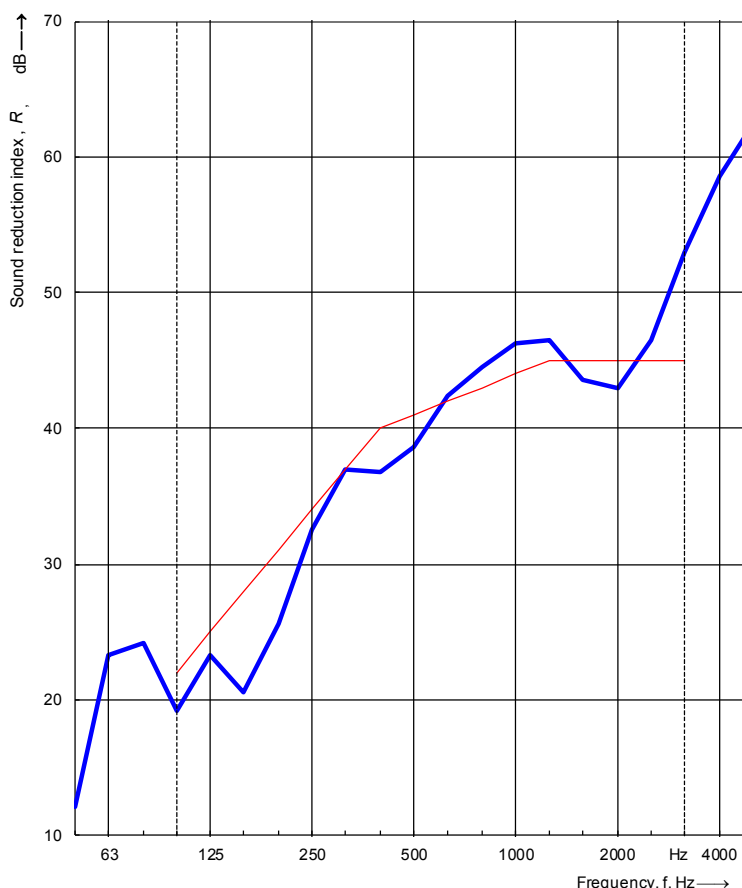
Test specimen installed by: Aurora Lighting

Product identification: Downlight

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-MPR02/30 Downlights

Static pressure: 102.4 kPa **Area, S, of test element:** 17.6 m²
Air temperature: 16 °C **Source room volume:** 65 m³
Relative air humidity: 51 % **Receiving room volume:** 61 m³

Frequency f [Hz]	R 1/3 octave [dB]
50	12.1
63	23.3
80	24.2
100	19.1
125	23.2
160	20.6
200	25.6
250	32.5
315	37.0
400	36.8
500	38.6
630	42.4
800	44.5
1000	46.3
1250	46.5
1600	43.6
2000	43.0
2500	46.5
3150	52.9
4000	58.6
5000	62.5



Rating according to ISO 717-1

$R_w(C;C_{tr}) = 41$ (-3 ; -8) dB

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

$C_{50-3150} = -3$ dB $C_{50-5000} = -2$ dB $C_{100-5000} = -2$ dB
 $C_{tr,50-3150} = -9$ dB $C_{tr,50-5000} = -9$ dB $C_{tr,100-5000} = -8$ dB

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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Normalized impact sound pressure levels according to BS EN ISO 10140-3

Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 08/12/2016

Test Number: L216-084

Rating according to BS EN ISO 717-2

$L_{n,w}(C_1) = 77 (0) \text{ dB}$

$C_{150-2500} = 0 \text{ dB}$

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

Frequency [Hz]	L_n [dB]		L_2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	
50	79.3		82.2	2.03	-2.9		
63	73.7		77.2	2.32	-3.5		
80	72.7		75.2	1.85	-2.5		
100	79.8		81.3	1.48	-1.5	0.8	
125	81.8		83.2	1.46	-1.4	2.8	
160	86.0		86.9	1.29	-0.9	7.0	
200	85.2		86.8	1.51	-1.6	6.2	
250	79.7		81.8	1.69	-2.1	0.7	
315	79.3		81.1	1.60	-1.8	0.3	
400	82.3		83.9	1.50	-1.6	4.3	
500	80.6		82.4	1.57	-1.8	3.6	
630	76.4		78.4	1.66	-2.0	0.4	
800	74.2		76.1	1.61	-1.9		
1000	70.7		72.3	1.52	-1.6		
1250	66.6		68.2	1.53	-1.6		
1600	64.6		66.0	1.44	-1.4		
2000	62.6		63.7	1.36	-1.1		
2500	56.4		57.3	1.30	-0.9		
3150	49.1		49.8	1.22	-0.7		
4000	41.5		41.8	1.13	-0.3		
5000	34.0		33.8	0.99	0.2		

Sum of unfavourable deviation: 26.1 dB Max. unfavourable deviation: 7.0 dB at 160 Hz

Receiving room volume: 65 m³

Air temperature: 61 °C

Source room volume: 61 m³

Relative air humidity: 51 %

Area, S, of test element: 17.6 m²

Static pressure: 102.4 kPa

Description of the specimen:

Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-MPR02/30 Downlights

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Normalized impact sound pressure levels according to BS EN ISO 10140-3

Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 08/12/2016

Test Number: L216-084

Test specimen installed by: BRE

Product identification: Downlight

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-MPR02/30 Downlights

Static pressure: 102.4 kPa

Air temperature: 61 °C

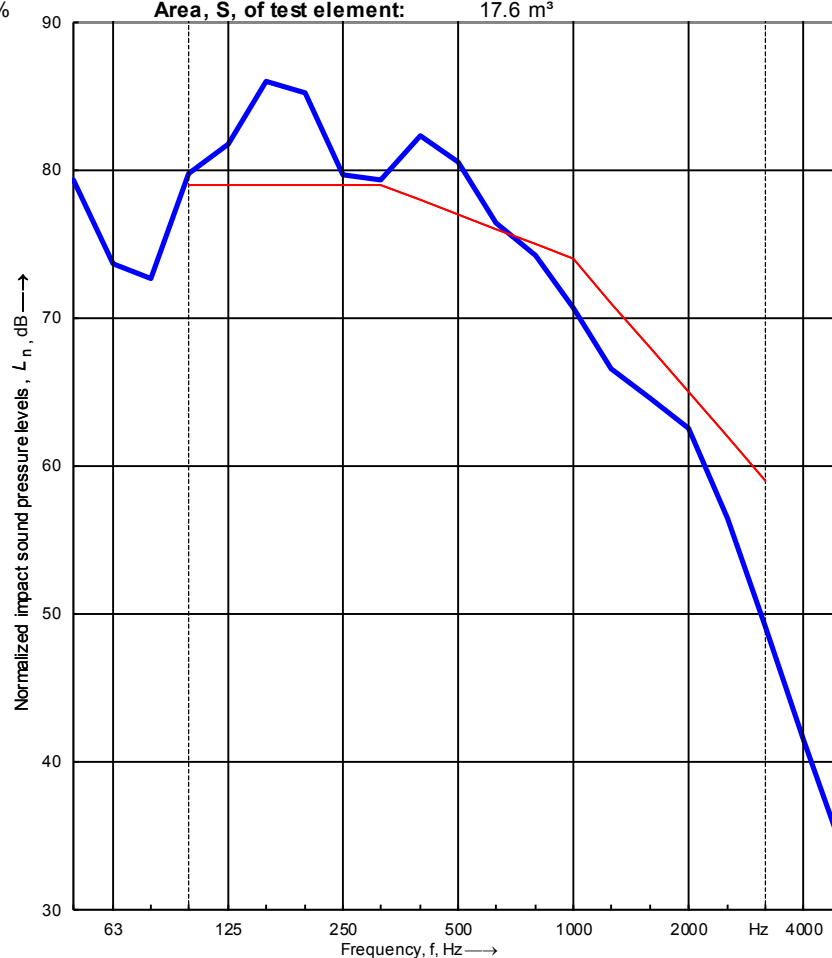
Relative air humidity: 51 %

Source room volume: 61 m³

Receiving room volume: 65 m³

Area, S , of test element: 17.6 m²

Frequency f [Hz]	L_n 1/3 octave [dB]
50	79.3
63	73.7
80	72.7
100	79.8
125	81.8
160	86.0
200	85.2
250	79.7
315	79.3
400	82.3
500	80.6
630	76.4
800	74.2
1000	70.7
1250	66.6
1600	64.6
2000	62.6
2500	56.4
3150	49.1
4000	41.5
5000	34.0



Rating according to BS EN ISO 717-2

$L_{n,w}(C_1) = 77 (0) \text{ dB}$

$C_{150-2500} = 0 \text{ dB}$

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

Based on the data provided in BS EN 10140-2:1993 it is estimated that the measurement uncertainty should not exceed $\pm 1 \text{ dB}$ for the single-number quantity ($L_{n,w}$) and should not exceed the values in Table A1 of BS EN 10140-2:1993 for the data in the individual third octaves (L_n)

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Level difference according to BS EN ISO 10140-2
Laboratory measurement of sound insulation of building elements

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 09/12/2016

Test Number: L216-085

Rating according to ISO 717-1

$R_w(C;C_{tr}) = 41 (-3 ; -8) \text{ dB}$

$C_{50-3150} = -3 \text{ dB}$ $C_{50-5000} = -2 \text{ dB}$ $C_{100-5000} = -2 \text{ dB}$

$C_{tr,50-3150} = -9 \text{ dB}$ $C_{tr,50-5000} = -9 \text{ dB}$ $C_{tr,100-5000} = -8 \text{ dB}$

Evaluation based on laboratory measurements results obtained in one-third-octave bands by an engineering method.

Frequency [Hz]	R [dB]	L1 [dB]	L2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	Bgn status	Ftm status
50	12.5	80.4	71.6	1.29				
63	24.9	87.7	66.4	1.26				
80	24.0	91.1	69.7	1.00				
100	19.0	96.1	80.9	1.34		3.0		
125	23.1	95.4	75.9	1.28		1.9		
160	20.7	98.1	80.6	1.16		7.3		
200	25.2	98.9	77.2	1.24		5.8		
250	31.5	98.4	70.9	1.38		2.5		
315	37.0	99.1	66.4	1.50				
400	36.4	99.0	67.0	1.54		3.6		
500	38.1	99.9	66.1	1.50		2.9		
630	42.1	100.6	62.6	1.44				
800	43.9	100.6	60.4	1.31				
1000	45.5	99.0	57.0	1.25				
1250	45.5	96.5	54.2	1.17				
1600	42.8	99.3	59.4	1.09		2.2		
2000	42.8	100.0	59.9	1.03		2.2		
2500	46.1	98.7	55.2	1.02				
3150	52.6	96.1	46.4	1.09				
4000	58.1	93.5	38.2	1.05				
5000	62.2	88.4	28.4	0.93				

Sum of unfavourable deviations: 31.4 dB

Max. unfavourable deviation : 7.3 dB at 160 Hz

Receiving room volume: 61 m³

Air temperature: 18 °C

Source room volume: 65 m³

Relative air humidity: 51 %

Area, S, of test element: 17.6 m²

Static pressure: 102.5 kPa

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-FRLD712/30 Downlights



Level difference according to BS EN ISO 10140-2 **Laboratory measurement of sound insulation of building elements**

Test Laboratory: BRE Vertical Transmission Suite (B9)
Client: Aurora Lighting

Date of test: 09/12/2016 **Test Number:** L216-085

0578

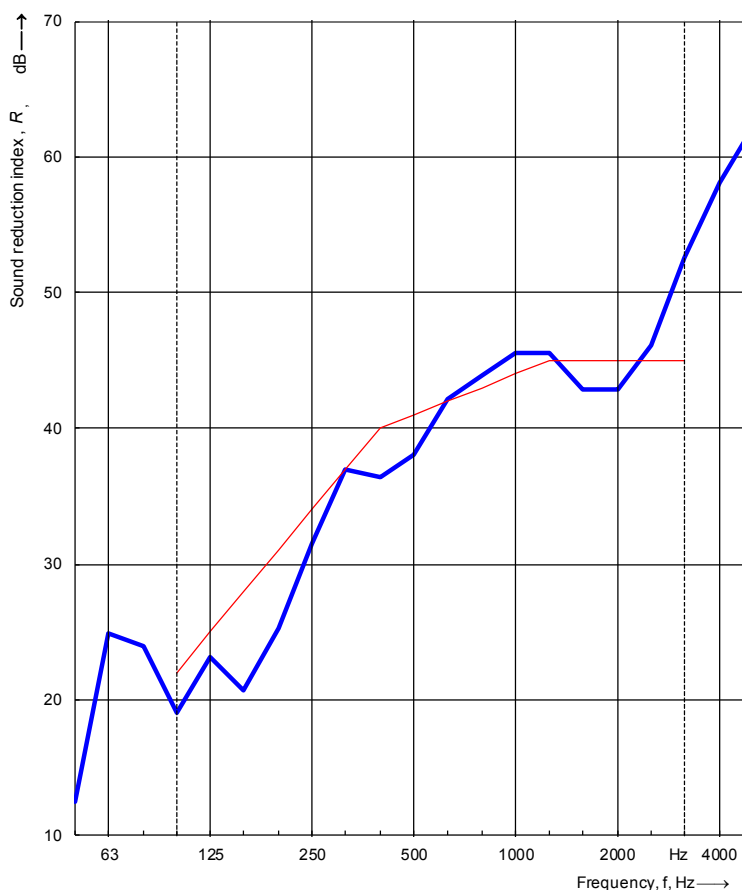
Test specimen installed by: Aurora Lighting

Product identification: Downlight

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-FRLD712/30 Downlights

Static pressure: 102.5 kPa **Area, S, of test element:** 17.6 m²
Air temperature: 18 °C **Source room volume:** 65 m³
Relative air humidity: 51 % **Receiving room volume:** 61 m³

Frequency f [Hz]	R 1/3 octave [dB]
50	12.5
63	24.9
80	24.0
100	19.0
125	23.1
160	20.7
200	25.2
250	31.5
315	37.0
400	36.4
500	38.1
630	42.1
800	43.9
1000	45.5
1250	45.5
1600	42.8
2000	42.8
2500	46.1
3150	52.6
4000	58.1
5000	62.2



Rating according to ISO 717-1

$R_w(C;C_{tr}) = 41$ (-3 ; -8) dB

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

$C_{50-3150} = -3$ dB $C_{50-5000} = -2$ dB $C_{100-5000} = -2$ dB
 $C_{tr,50-3150} = -9$ dB $C_{tr,50-5000} = -9$ dB $C_{tr,100-5000} = -8$ dB

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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Normalized impact sound pressure levels according to BS EN ISO 10140-3

Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 09/12/2016

Test Number: L216-086

Rating according to BS EN ISO 717-2

$L_{n,w}(C_1) = 77 (0) \text{ dB}$

$C_{150-2500} = 0 \text{ dB}$

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

Frequency [Hz]	L_n [dB]		L_2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	
50	76.2		79.1	2.03	-2.9		
63	71.2		74.7	2.32	-3.5		
80	72.4		74.9	1.85	-2.5		
100	79.6		81.1	1.48	-1.5	0.6	
125	82.2		83.6	1.46	-1.4	3.2	
160	86.8		87.7	1.29	-0.9	7.8	
200	83.5		85.1	1.51	-1.6	4.5	
250	78.4		80.5	1.69	-2.1		
315	79.8		81.6	1.60	-1.8	0.8	
400	81.7		83.3	1.50	-1.6	3.7	
500	80.1		81.9	1.57	-1.8	3.1	
630	76.3		78.3	1.66	-2.0	0.3	
800	75.1		77.0	1.61	-1.9	0.1	
1000	71.3		72.9	1.52	-1.6		
1250	67.8		69.4	1.53	-1.6		
1600	65.5		66.9	1.44	-1.4		
2000	63.7		64.8	1.36	-1.1		
2500	57.9		58.8	1.30	-0.9		
3150	50.2		50.9	1.22	-0.7		
4000	42.4		42.7	1.13	-0.3		
5000	34.4		34.2	0.99	0.2		

Sum of unfavourable deviation: 24.1 dB Max. unfavourable deviation: 7.8 dB at 160 Hz

Receiving room volume: 65 m³

Air temperature: 61 °C

Source room volume: 61 m³

Relative air humidity: 51 %

Area, S, of test element: 17.6 m²

Static pressure: 102.4 kPa

Description of the specimen:

Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-FRLD712/30 Downlights

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Normalized impact sound pressure levels according to BS EN ISO 10140-3

Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 09/12/2016

Test Number: L216-086

Test specimen installed by: BRE

Product identification: Downlight

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-FRLD712/30 Downlights

Static pressure: 102.4 kPa

Air temperature: 61 °C

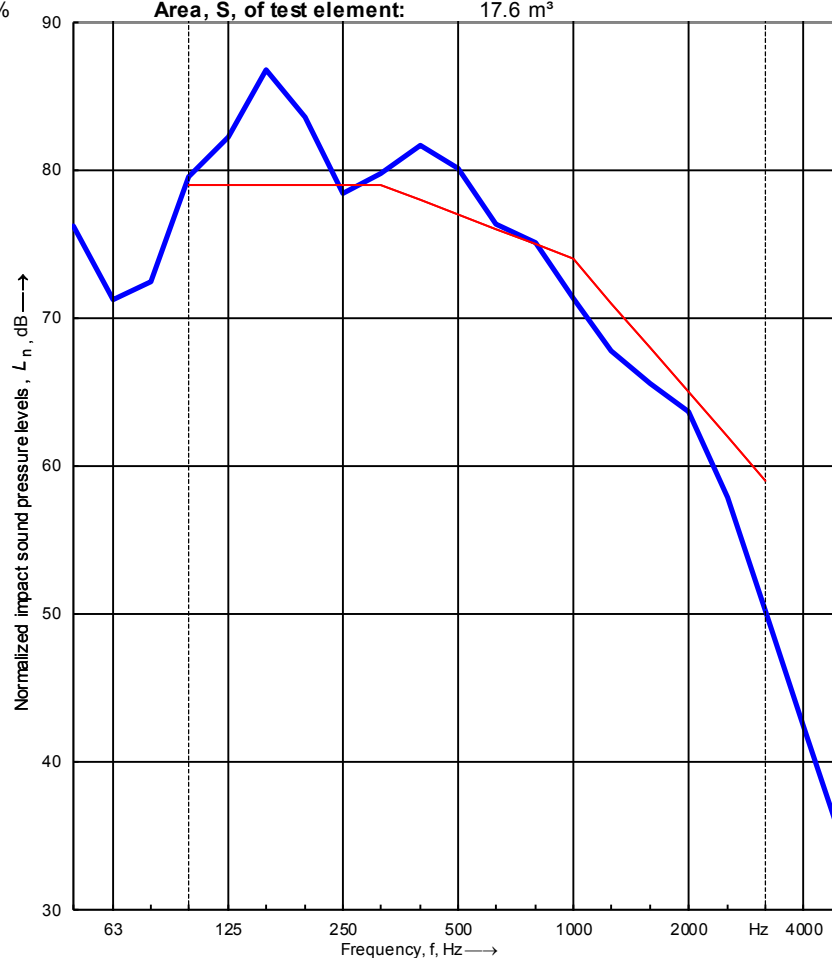
Relative air humidity: 51 %

Source room volume: 61 m³

Receiving room volume: 65 m³

Area, S , of test element: 17.6 m²

Frequency f [Hz]	L_n 1/3 octave [dB]
50	76.2
63	71.2
80	72.4
100	79.6
125	82.2
160	86.8
200	83.5
250	78.4
315	79.8
400	81.7
500	80.1
630	76.3
800	75.1
1000	71.3
1250	67.8
1600	65.5
2000	63.7
2500	57.9
3150	50.2
4000	42.4
5000	34.4



Rating according to BS EN ISO 717-2

$L_{n,w}(C_1) = 77 (0) \text{ dB}$

$C_{150-2500} = 0 \text{ dB}$

Evaluation based on laboratory measurement results obtained in one-third-octave bands 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 ($L_{n,w}$) 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)

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Level difference according to BS EN ISO 10140-2
Laboratory measurement of sound insulation of building elements

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

0578

Date of test: 09/12/2016

Test Number: L216-087

Rating according to ISO 717-1

$R_w(C;C_{tr}) = 41 (-3 ; -8) \text{ dB}$

$C_{50-3150} = -3 \text{ dB}$ $C_{50-5000} = -2 \text{ dB}$ $C_{100-5000} = -2 \text{ dB}$

Evaluation based on laboratory measurements results obtained in one-third-octave bands by an engineering method.

$C_{tr,50-3150} = -10 \text{ dB}$ $C_{tr,50-5000} = -10 \text{ dB}$ $C_{tr,100-5000} = -8 \text{ dB}$

Frequency [Hz]	R [dB]	L1 [dB]	L2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	Bgn status	Ftm status
50	11.8	81.2	73.1	1.29				
63	26.4	89.4	66.6	1.26				
80	24.5	92.3	70.4	1.00				
100	18.3	96.0	81.5	1.34		3.7		
125	23.0	96.1	76.7	1.28		2.0		
160	20.7	99.2	81.7	1.16		7.3		
200	25.7	99.8	77.6	1.24		5.3		
250	32.0	99.7	71.7	1.38		2.0		
315	37.1	100.4	67.6	1.50				
400	36.4	99.9	67.9	1.54		3.6		
500	38.4	101.0	66.9	1.50		2.6		
630	42.7	101.9	63.3	1.44				
800	43.9	101.2	61.0	1.31				
1000	45.6	99.8	57.7	1.25				
1250	46.0	97.5	54.7	1.17				
1600	43.7	100.8	60.0	1.09		1.3		
2000	43.1	101.3	60.9	1.03		1.9		
2500	46.5	100.3	56.4	1.02				
3150	52.9	97.5	47.5	1.09				
4000	58.0	95.0	39.8	1.05				
5000	62.1	89.9	30.0	0.93				

Sum of unfavourable deviations: 29.7 dB

Max. unfavourable deviation : 7.3 dB at 160 Hz

Receiving room volume: 61 m³

Air temperature: 18 °C

Source room volume: 65 m³

Relative air humidity: 51 %

Area, S, of test element: 17.6 m²

Static pressure: 102.5 kPa

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM982 Downlights

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Level difference according to BS EN ISO 10140-2 **Laboratory measurement of sound insulation of building elements**

Test Laboratory: BRE Vertical Transmission Suite (B9)
Client: Aurora Lighting

Date of test: 09/12/2016 **Test Number:** L216-087

0578

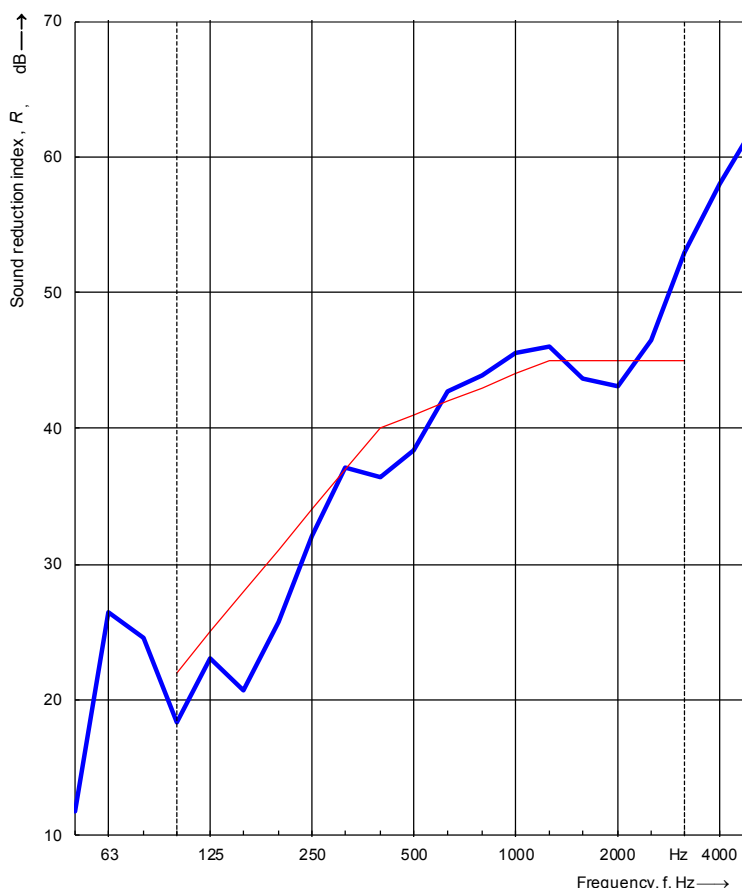
Test specimen installed by: Aurora Lighting

Product identification: Downlight

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM982 Downlights

Static pressure: 102.5 kPa **Area, S, of test element:** 17.6 m²
Air temperature: 18 °C **Source room volume:** 65 m³
Relative air humidity: 51 % **Receiving room volume:** 61 m³

Frequency f [Hz]	R 1/3 octave [dB]
50	11.8
63	26.4
80	24.5
100	18.3
125	23.0
160	20.7
200	25.7
250	32.0
315	37.1
400	36.4
500	38.4
630	42.7
800	43.9
1000	45.6
1250	46.0
1600	43.7
2000	43.1
2500	46.5
3150	52.9
4000	58.0
5000	62.1



Rating according to ISO 717-1

$R_w(C;C_{tr}) = 41$ (-3 ; -8) dB

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

$C_{50-3150} = -3$ dB $C_{50-5000} = -2$ dB $C_{100-5000} = -2$ dB
 $C_{tr,50-3150} = -10$ dB $C_{tr,50-5000} = -10$ dB $C_{tr,100-5000} = -8$ dB

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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Normalized impact sound pressure levels according to BS EN ISO 10140-3

Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 09/12/2016

Test Number: L216-088

Rating according to BS EN ISO 717-2

$L_{n,w}(C_1) = 76 (0) \text{ dB}$

$C_{150-2500} = 0 \text{ dB}$

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

Frequency [Hz]	L_n [dB]		L_2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	
50	77.9		80.8	2.03	-2.9		
63	70.7		74.2	2.32	-3.5		
80	71.9		74.4	1.85	-2.5		
100	78.6		80.1	1.48	-1.5	0.6	
125	81.5		82.9	1.46	-1.4	3.5	
160	85.1		86.0	1.29	-0.9	7.1	
200	83.8		85.4	1.51	-1.6	5.8	
250	78.3		80.4	1.69	-2.1	0.3	
315	79.7		81.5	1.60	-1.8	1.7	
400	81.3		82.9	1.50	-1.6	4.3	
500	79.8		81.6	1.57	-1.8	3.8	
630	76.2		78.2	1.66	-2.0	1.2	
800	74.5		76.4	1.61	-1.9	0.5	
1000	71.0		72.6	1.52	-1.6		
1250	67.3		68.9	1.53	-1.6		
1600	65.4		66.8	1.44	-1.4		
2000	64.0		65.1	1.36	-1.1		
2500	58.0		58.9	1.30	-0.9		
3150	49.9		50.6	1.22	-0.7		
4000	42.1		42.4	1.13	-0.3		
5000	34.9		34.7	0.99	0.2		

Sum of unfavourable deviation: 28.8 dB Max. unfavourable deviation: 7.1 dB at 160 Hz

Receiving room volume: 65 m³

Air temperature: 61 °C

Source room volume: 61 m³

Relative air humidity: 51 %

Area, S, of test element: 17.6 m²

Static pressure: 102.4 kPa

Description of the specimen:

Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM982 Downlights

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Normalized impact sound pressure levels according to BS EN ISO 10140-3

Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 09/12/2016

Test Number: L216-088

Test specimen installed by: BRE

Product identification: Downlight

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-DLM982 Downlights

Static pressure: 102.4 kPa

Air temperature: 61 °C

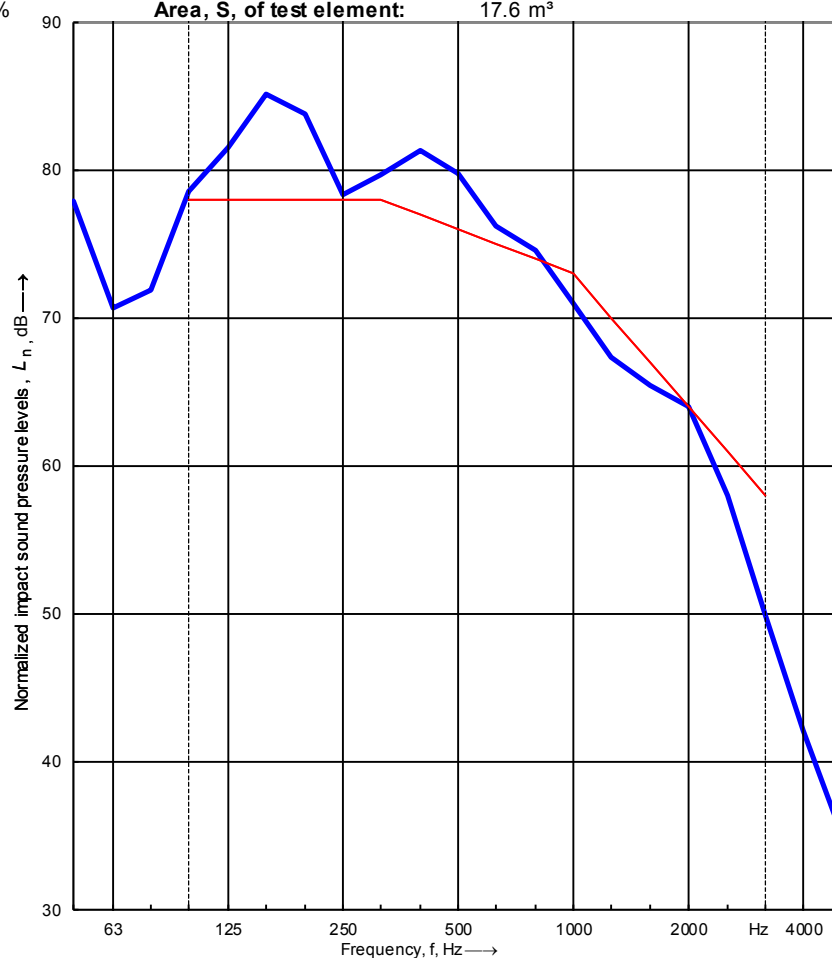
Relative air humidity: 51 %

Source room volume: 61 m³

Receiving room volume: 65 m³

Area, S , of test element: 17.6 m²

Frequency f [Hz]	L_n 1/3 octave [dB]
50	77.9
63	70.7
80	71.9
100	78.6
125	81.5
160	85.1
200	83.8
250	78.3
315	79.7
400	81.3
500	79.8
630	76.2
800	74.5
1000	71.0
1250	67.3
1600	65.4
2000	64.0
2500	58.0
3150	49.9
4000	42.1
5000	34.9



Rating according to BS EN ISO 717-2

$L_{n,w}(C_1) = 76 (0) \text{ dB}$

$C_{150-2500} = 0 \text{ dB}$

Evaluation based on laboratory measurement results obtained in one-third-octave bands 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 ($L_{n,w}$) 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)

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Level difference according to BS EN ISO 10140-2

Laboratory measurement of sound insulation of building elements

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 19/12/2016

Test Number: L216-089

0578

Rating according to ISO 717-1

$R_w(C;C_{tr}) = 40 (-2 ; -7) \text{ dB}$

$C_{50-3150} = -3 \text{ dB}$ $C_{50-5000} = -2 \text{ dB}$ $C_{100-5000} = -1 \text{ dB}$

Evaluation based on laboratory measurements results obtained in one-third-octave bands by an engineering method.

$C_{tr,50-3150} = -8 \text{ dB}$ $C_{tr,50-5000} = -8 \text{ dB}$ $C_{tr,100-5000} = -7 \text{ dB}$

Frequency [Hz]	R [dB]	L1 [dB]	L2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	Bgn status	Ftm status
50	15.7	84.2	72.2	1.29				
63	25.0	89.1	67.7	1.26				
80	23.2	92.0	71.4	1.00				
100	18.9	97.7	82.6	1.34		2.1		
125	22.0	95.5	77.1	1.28		2.0		
160	20.7	100.4	82.9	1.16		6.3		
200	23.7	99.4	79.2	1.24		6.3		
250	30.5	98.9	72.4	1.38		2.5		
315	35.8	98.7	67.2	1.50		0.2		
400	36.1	98.9	67.2	1.54		2.9		
500	37.4	98.7	65.6	1.50		2.6		
630	41.6	98.4	60.9	1.44				
800	43.1	97.7	58.3	1.31				
1000	45.2	96.9	55.2	1.25				
1250	45.3	95.0	52.9	1.17				
1600	42.8	98.5	58.6	1.09		1.2		
2000	42.3	98.9	59.3	1.03		1.7		
2500	46.2	98.3	54.7	1.02				
3150	52.0	95.3	46.2	1.09				
4000	58.2	93.6	38.2	1.05				
5000	61.9	88.7	29.0	0.93				

Sum of unfavourable deviations: 27.8 dB

Max. unfavourable deviation : 6.3 dB at 160 Hz

Receiving room volume: 61 m³

Air temperature: 13 °C

Source room volume: 65 m³

Relative air humidity: 61 %

Area, S, of test element: 17.6 m²

Static pressure: 101.9 kPa

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-FRLD512/30 Downlights

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Level difference according to BS EN ISO 10140-2 **Laboratory measurement of sound insulation of building elements**

Test Laboratory: BRE Vertical Transmission Suite (B9)
Client: Aurora Lighting

Date of test: 19/12/2016 **Test Number:** L216-089

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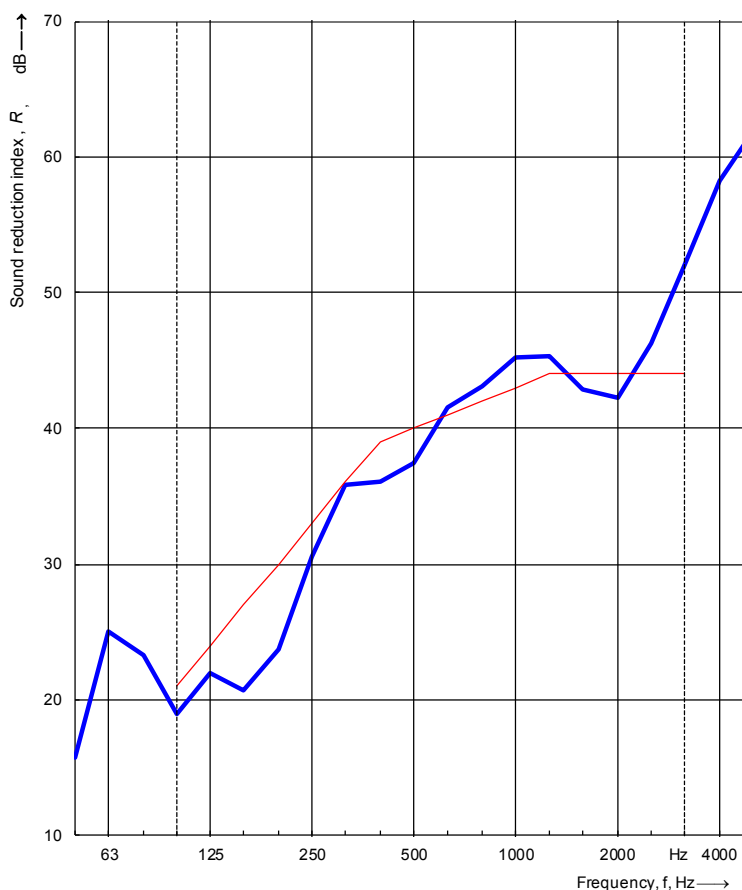
Test specimen installed by: Aurora Lighting

Product identification: Downlight

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-FRLD512/30 Downlights

Static pressure: 101.9 kPa **Area, S, of test element:** 17.6 m²
Air temperature: 13 °C **Source room volume:** 65 m³
Relative air humidity: 61 % **Receiving room volume:** 61 m³

Frequency f [Hz]	R 1/3 octave [dB]
50	15.7
63	25.0
80	23.2
100	18.9
125	22.0
160	20.7
200	23.7
250	30.5
315	35.8
400	36.1
500	37.4
630	41.6
800	43.1
1000	45.2
1250	45.3
1600	42.8
2000	42.3
2500	46.2
3150	52.0
4000	58.2
5000	61.9



Rating according to ISO 717-1

$R_w(C;C_{tr}) = 40$ (-2 ; -7) dB

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

$C_{50-3150} = -3$ dB $C_{50-5000} = -2$ dB $C_{100-5000} = -1$ dB
 $C_{tr,50-3150} = -8$ dB $C_{tr,50-5000} = -8$ dB $C_{tr,100-5000} = -7$ dB

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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Normalized impact sound pressure levels according to BS EN ISO 10140-3

Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 09/12/2016

Test Number: L216-090

Rating according to BS EN ISO 717-2

$L_{n,w}(C_1) = 76 (0) \text{ dB}$

$C_{150-2500} = 1 \text{ dB}$

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

Frequency [Hz]	L_n [dB]		L_2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	
50	79.5		82.4	2.03	-2.9		
63	71.5		75.0	2.32	-3.5		
80	71.1		73.6	1.85	-2.5		
100	78.7		80.2	1.48	-1.5	0.7	
125	81.2		82.6	1.46	-1.4	3.2	
160	86.3		87.2	1.29	-0.9	8.3	
200	84.2		85.8	1.51	-1.6	6.2	
250	78.4		80.5	1.69	-2.1	0.4	
315	79.3		81.1	1.60	-1.8	1.3	
400	81.7		83.3	1.50	-1.6	4.7	
500	80.2		82.0	1.57	-1.8	4.2	
630	76.4		78.4	1.66	-2.0	1.4	
800	74.5		76.4	1.61	-1.9	0.5	
1000	71.2		72.8	1.52	-1.6		
1250	67.6		69.2	1.53	-1.6		
1600	65.8		67.2	1.44	-1.4		
2000	63.2		64.3	1.36	-1.1		
2500	56.8		57.7	1.30	-0.9		
3150	49.8		50.5	1.22	-0.7		
4000	42.4		42.7	1.13	-0.3		
5000	35.1		34.9	0.99	0.2		

Sum of unfavourable deviation: 30.9 dB Max. unfavourable deviation: 8.3 dB at 160 Hz

Receiving room volume: 65 m³

Air temperature: 13 °C

Source room volume: 61 m³

Relative air humidity: 61 %

Area, S, of test element: 17.6 m²

Static pressure: 101.9 kPa

Description of the specimen:

Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-FRLD512/30 Downlights

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Normalized impact sound pressure levels according to BS EN ISO 10140-3

Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 09/12/2016

Test Number: L216-090

Test specimen installed by: BRE

Product identification: Downlight

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-FRLD512/30 Downlights

Static pressure: 101.9 kPa

Air temperature: 13 °C

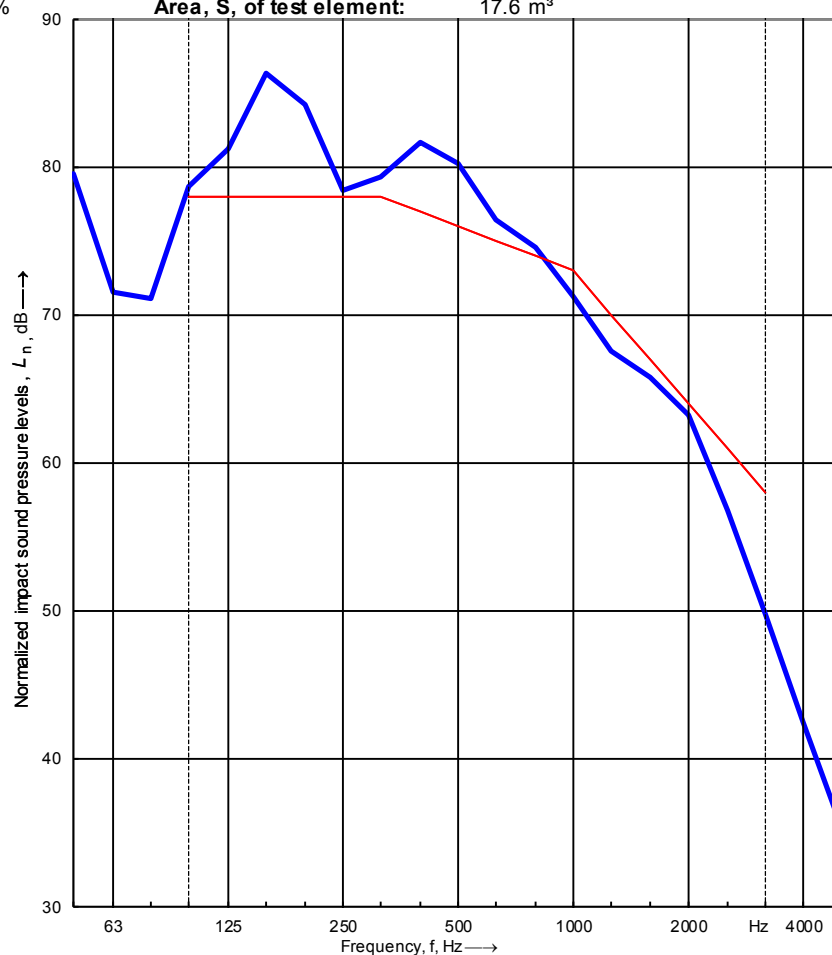
Relative air humidity: 61 %

Source room volume: 61 m³

Receiving room volume: 65 m³

Area, S, of test element: 17.6 m²

Frequency f [Hz]	L_n 1/3 octave [dB]
50	79.5
63	71.5
80	71.1
100	78.7
125	81.2
160	86.3
200	84.2
250	78.4
315	79.3
400	81.7
500	80.2
630	76.4
800	74.5
1000	71.2
1250	67.6
1600	65.8
2000	63.2
2500	56.8
3150	49.8
4000	42.4
5000	35.1



Rating according to BS EN ISO 717-2

$L_{n,w}(C_1) = 76 (0) \text{ dB}$

$C_{150-2500} = 1 \text{ dB}$

Evaluation based on laboratory measurement results obtained in one-third-octave bands 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 ($L_{n,w}$) 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)

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Level difference according to BS EN ISO 10140-2
Laboratory measurement of sound insulation of building elements

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

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Date of test: 19/12/2016

Test Number: L216-091

Rating according to ISO 717-1

$R_w(C;C_{tr}) = 40 (-2; -7) \text{ dB}$

$C_{50-3150} = -2 \text{ dB}$ $C_{50-5000} = -1 \text{ dB}$ $C_{100-5000} = -1 \text{ dB}$

Evaluation based on laboratory measurements results obtained in one-third-octave bands by an engineering method.

$C_{tr,50-3150} = -8 \text{ dB}$ $C_{tr,50-5000} = -8 \text{ dB}$ $C_{tr,100-5000} = -7 \text{ dB}$

Frequency [Hz]	R [dB]	L1 [dB]	L2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	Bgn status	Ftm status
50	15.2	83.8	72.3	1.29				
63	24.8	89.1	67.9	1.26				
80	23.0	92.0	71.6	1.00				
100	18.5	97.4	82.7	1.34		2.5		
125	22.2	95.6	77.0	1.28		1.8		
160	20.9	100.6	82.9	1.16		6.1		
200	23.8	99.6	79.3	1.24		6.2		
250	30.9	99.4	72.5	1.38		2.1		
315	35.9	98.9	67.3	1.50		0.1		
400	36.4	99.1	67.1	1.54		2.6		
500	37.5	98.9	65.7	1.50		2.5		
630	41.7	98.5	60.9	1.44				
800	43.3	98.0	58.4	1.31				
1000	45.3	97.0	55.2	1.25				
1250	45.2	94.9	52.9	1.17				
1600	42.8	98.5	58.6	1.09		1.2		
2000	42.3	98.9	59.3	1.03		1.7		
2500	46.0	98.2	54.8	1.02				
3150	52.0	95.3	46.2	1.09				
4000	58.0	93.5	38.3	1.05				
5000	62.0	88.8	29.0	0.93				

Sum of unfavourable deviations: 26.8 dB

Max. unfavourable deviation : 6.2 dB at 200 Hz

Receiving room volume: 61 m³

Air temperature: 13 °C

Source room volume: 65 m³

Relative air humidity: 61 %

Area, S, of test element: 17.6 m²

Static pressure: 101.9 kPa

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-FRLD814/30 Downlights

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Level difference according to BS EN ISO 10140-2 **Laboratory measurement of sound insulation of building elements**

Test Laboratory: BRE Vertical Transmission Suite (B9)
Client: Aurora Lighting

Date of test: 19/12/2016 **Test Number:** L216-091

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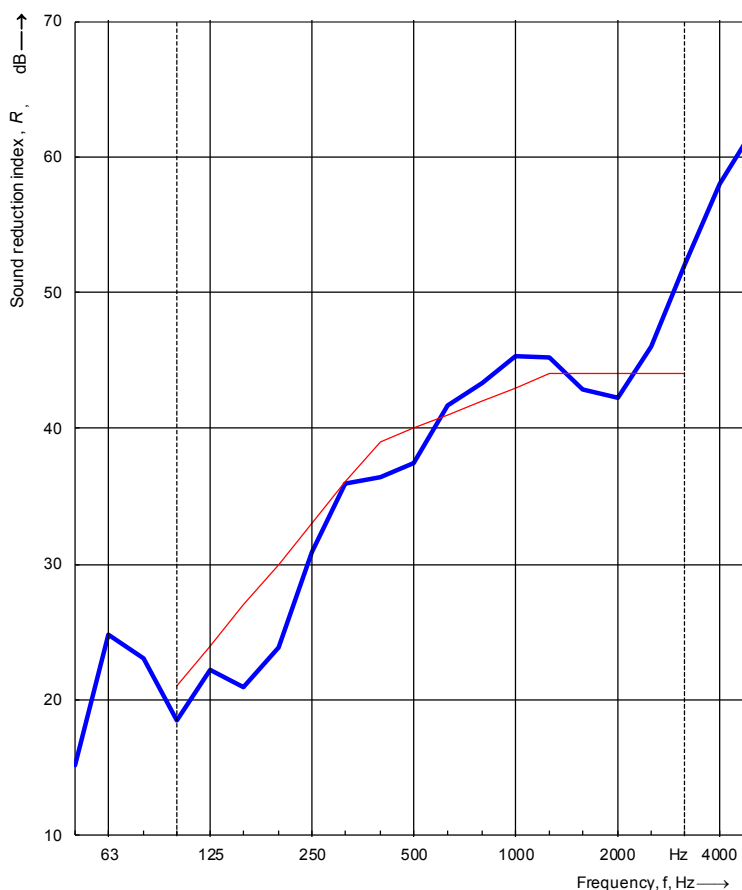
Test specimen installed by: Aurora Lighting

Product identification: Downlight

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-FRLD814/30 Downlights

Static pressure: 101.9 kPa **Area, S, of test element:** 17.6 m²
Air temperature: 13 °C **Source room volume:** 65 m³
Relative air humidity: 61 % **Receiving room volume:** 61 m³

Frequency f [Hz]	R 1/3 octave [dB]
50	15.2
63	24.8
80	23.0
100	18.5
125	22.2
160	20.9
200	23.8
250	30.9
315	35.9
400	36.4
500	37.5
630	41.7
800	43.3
1000	45.3
1250	45.2
1600	42.8
2000	42.3
2500	46.0
3150	52.0
4000	58.0
5000	62.0



Rating according to ISO 717-1

$R_w(C;C_{tr}) = 40$ (-2 ; -7) dB

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

$C_{50-3150} = -2$ dB $C_{50-5000} = -1$ dB $C_{100-5000} = -1$ dB
 $C_{tr,50-3150} = -8$ dB $C_{tr,50-5000} = -8$ dB $C_{tr,100-5000} = -7$ dB

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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Normalized impact sound pressure levels according to BS EN ISO 10140-3

Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 19/12/2016

Test Number: L216-092

Rating according to BS EN ISO 717-2

$L_{n,w}(C_1) = 76 (0) \text{ dB}$

$C_{150-2500} = 1 \text{ dB}$

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

Frequency [Hz]	L_n [dB]		L_2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	
50	78.6		81.5	2.03	-2.9		
63	71.5		75.0	2.32	-3.5		
80	71.5		74.0	1.85	-2.5		
100	79.5		81.0	1.48	-1.5	1.5	
125	81.7		83.1	1.46	-1.4	3.7	
160	86.3		87.2	1.29	-0.9	8.3	
200	83.9		85.5	1.51	-1.6	5.9	
250	78.0		80.1	1.69	-2.1		
315	79.5		81.3	1.60	-1.8	1.5	
400	81.7		83.3	1.50	-1.6	4.7	
500	80.2		82.0	1.57	-1.8	4.2	
630	76.3		78.3	1.66	-2.0	1.3	
800	74.5		76.4	1.61	-1.9	0.5	
1000	71.2		72.8	1.52	-1.6		
1250	67.8		69.4	1.53	-1.6		
1600	66.0		67.4	1.44	-1.4		
2000	63.3		64.4	1.36	-1.1		
2500	56.9		57.8	1.30	-0.9		
3150	49.9		50.6	1.22	-0.7		
4000	42.5		42.8	1.13	-0.3		
5000	35.2		35.0	0.99	0.2		

Sum of unfavourable deviation: 31.6 dB Max. unfavourable deviation: 8.3 dB at 160 Hz

Receiving room volume: 65 m³

Air temperature: 13 °C

Source room volume: 61 m³

Relative air humidity: 61 %

Area, S, of test element: 17.6 m²

Static pressure: 101.9 kPa

Description of the specimen:

Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-FRLD814/30 Downlights

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Normalized impact sound pressure levels according to BS EN ISO 10140-3

Laboratory measurements of impact sound insulation of floors

Test Laboratory: BRE Vertical Transmission Suite (B9)

Client: Aurora Lighting

Date of test: 19/12/2016

Test Number: L216-092

Test specimen installed by: BRE

Product identification: Downlight

Description of the specimen: Robust Details Limited Appendix F Floor with Nine Aurora Lighting AU-FRLD814/30 Downlights

Static pressure: 101.9 kPa

Air temperature: 13 °C

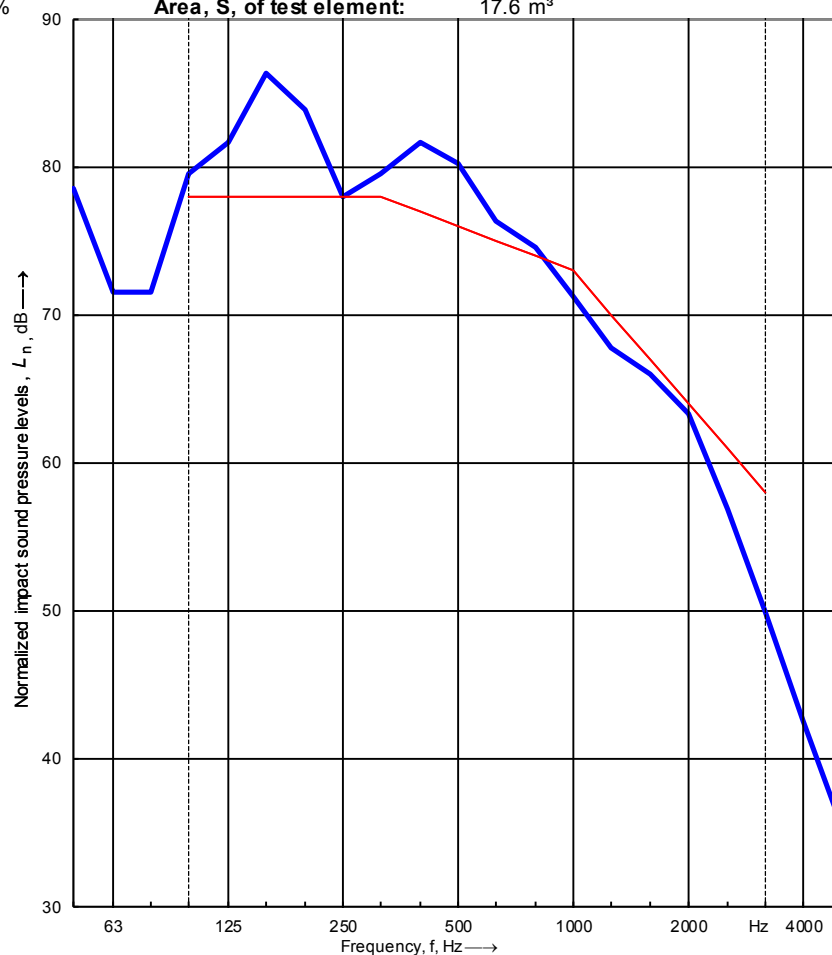
Relative air humidity: 61 %

Source room volume: 61 m³

Receiving room volume: 65 m³

Area, S, of test element: 17.6 m²

Frequency f [Hz]	L_n 1/3 octave [dB]
50	78.6
63	71.5
80	71.5
100	79.5
125	81.7
160	86.3
200	83.9
250	78.0
315	79.5
400	81.7
500	80.2
630	76.3
800	74.5
1000	71.2
1250	67.8
1600	66.0
2000	63.3
2500	56.9
3150	49.9
4000	42.5
5000	35.2



Rating according to BS EN ISO 717-2

$L_{n,w}(C_1) = 76 (0) \text{ dB}$

$C_{150-2500} = 1 \text{ dB}$

Evaluation based on laboratory measurement results obtained in one-third-octave bands 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 ($L_{n,w}$) 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)

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