

BRE Test Report

JCC Lighting Products Ltd

Sound Insulation Testing of the JCC JC1001 downlight according to BS EN ISO 10140-2 and BS EN ISO 10140-3 for Part E of the Building Regulations

Prepared for: JCC Lighting Products Ltd
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Executive Summary

- JCC Lighting Products Ltd commissioned the Building Research Establishment (BRE) to measure the airborne and impact sound insulation performance of JCC Lighting Products Ltd downlights when installed in Robust Details Limited Appendix F floor.
 - The tests were conducted 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 is a UKAS accredited testing laboratory for testing in accordance with BS EN ISO 10140-2:2010 and BS EN ISO 10140-3:2010+A1:2015.
 - The JCC Lighting Products Ltd downlight tested satisfies the Robust Details Appendix F acoustic performance requirements for use with Approved Document E to The Building Regulations 2010.
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Table of Contents

1	Introduction	4
2	Testing details	4
2.1	Test dates and personnel	4
2.2	Test methods and applicable standards	4
2.3	Test element installation	4
2.4	Instrumentation	5
2.5	Test Numbers	5
2.6	Construction details with test numbers	6
3	Sound insulation test results	7
4	Installation Details	8
4.1	Details	8
5	Appendices	10
5.1	Test results sheets	10



1 Introduction

BRE Acoustics was commissioned by JCC Lighting Products Ltd to carry out airborne and impact sound insulation measurements in the BRE vertical transmission suite (Hall D, Building 14, BRE, Garston, Watford, Hertfordshire, WD25 9XX).

This report details the testing outlined in BRE P113003.

2 Testing details

2.1 Test dates and personnel

The measurements detailed in this report were made on the 3rd and 6th August 2018 by Mark Coleman and Ryan Hinton 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 JCC Lighting Products Ltd downlights were installed by BRE.



2.4 Instrumentation

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

Equipment description	Manufacturer	Type	Serial number
Microphone Calibrator	B&K	4231	2175848
Microphone	GRAS	40AE	37071, 117036
Microphone Preamplifier	GRAS	26CA	13085, 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 94.0 dB at 1 kHz using the B&K Type 4231 calibrator.

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

2.5 Test Numbers

Table 2 lists each test element along with its corresponding test number. The construction details for each test element can be found from **Table 3** by referring to the test number.

Test number	Test element	Source room volume (m ³)	Receive room volume (m ³)	Common area (m ²)
L218-017	Floor	105.4	74.0	17.9
L218-018		105.4	74.0	17.9
L218-019	Downlight	105.4	74.0	17.9
L218-020		105.4	74.0	17.9

Table 2: Test numbers



2.6 Construction details with test numbers

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

Test element	Test number	Construction details
Floor	L218-017	Robust Details Limited Appendix F floor: 18 mm OSB (10.9 kg/m ²) screwed to 235 mm x 50 mm joists (3.6 kg/m ²) mounted in hangers at 450 mm centres, 100 mm Isover APR 1200 (10 kg/m ³) between joists, 1x19 mm plasterboard plank (15.0 kg/m ²), 1x12.5 mm wallboard (8.0 kg/m ²) screwed to underside of joists, joints and perimeter sealed.
	L218-018	
Downlight	L218-019	JCC lighting products Ltd Downlight (JC1001)
	L218-020	

Table 3: Construction and product details



3 Sound insulation test results

The single number quantities for the sound insulation tests are shown in **Table 4**, below. 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 below, 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)
1 – L218-017	34	-	-	-
3 – L218-019	34	-	0	-
2 – L218-018	-	76	-	-
4 – L218-020	-	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 (-1 dB)

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

Based on the test results presented in **Table 4**, 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** and **Figure 3** shows photographs of the product tested.

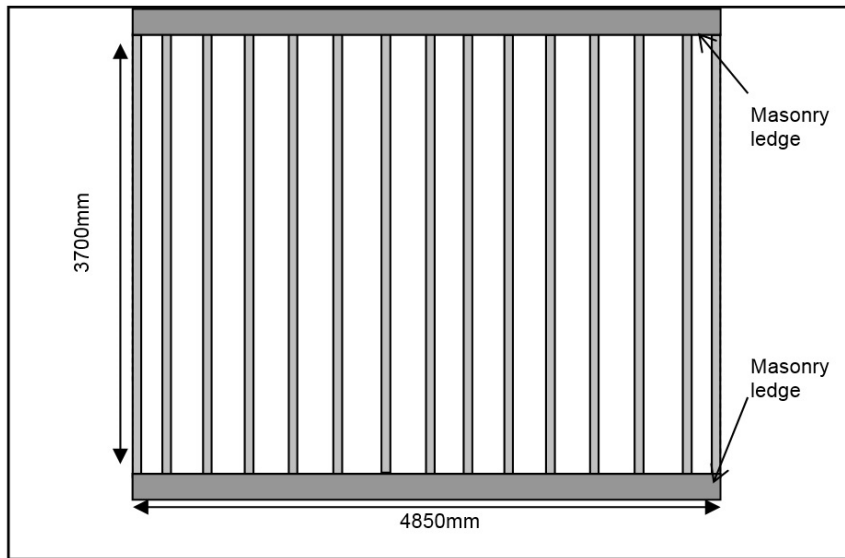


Figure 1: Floor joists at 450 mm centres

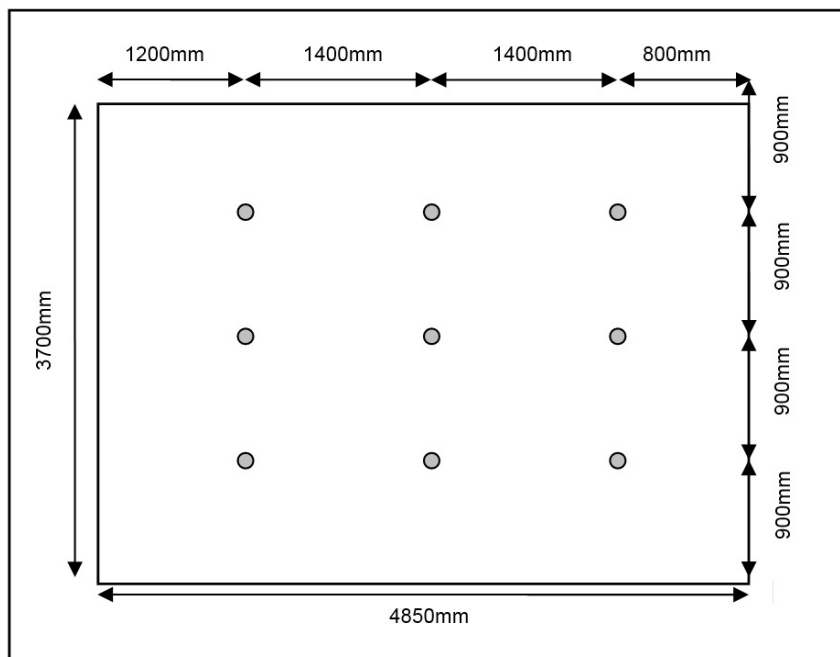


Figure 2: Positions of the downlights in the ceiling of the Robust Details Appendix F floor



Figure 3: Photographs of the test sample: JCC Lighting Products Ltd downlight (JC1001).



5 Appendices

5.1 Test results sheets

Page Number	Test Number
11	L218-017
12	L218-018
13	L218-019
14	L218-020



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

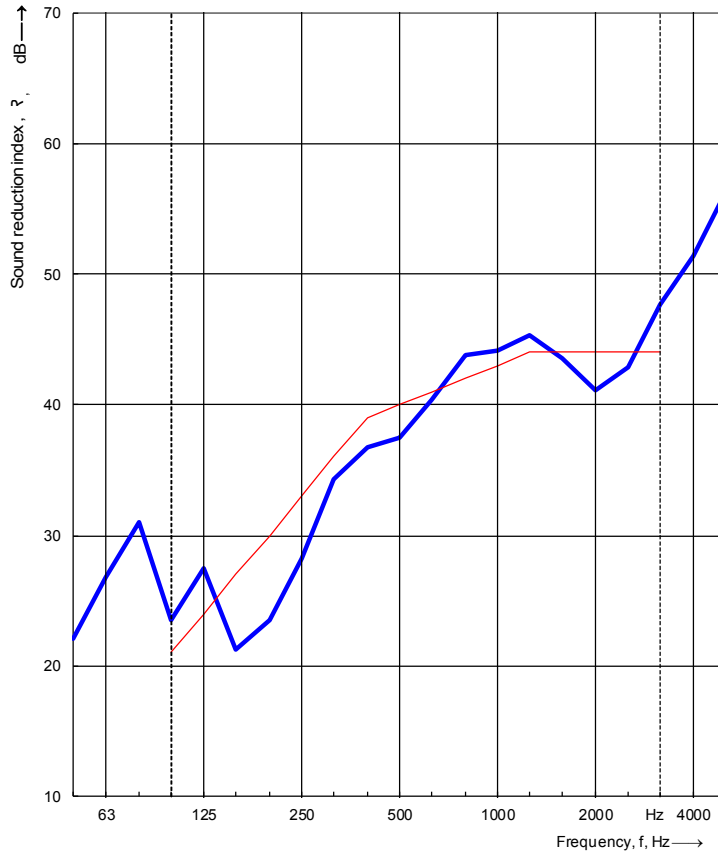
Test Laboratory: BRE Transmission Suite (Hall D)
Client: JCC Lighting products Ltd
Date of test: 03/08/2018 **Test Number:** L218-017

Test specimen installed by: BRE
Product identification: Robust Details Limited Appendix F floor

Description of the specimen: 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: 102.6 kPa **Area, S, of test element:** 17.9 m²
Air temperature: 22 °C **Source room volume:** 114 m³
Relative air humidity: 53 % **Receiving room volume:** 72 m³

Frequency f [Hz]	R 1/3 octave [dB]
50	22.1
63	26.8
80	31.0
100	23.5
125	27.5
160	21.3
200	23.5
250	28.2
315	34.3
400	36.8
500	37.5
630	40.4
800	43.8
1000	44.1
1250	45.3
1600	43.6
2000	41.1
2500	42.9
3150	47.7
4000	51.4
5000	56.3



Rating according to ISO 717-1
R_w(C;C_{tr}) = 40 (-2 ; -6) dB
 Evaluation based on laboratory measurement results obtained in one-third-octave bands by an engineering method.
 C₅₀₋₃₁₅₀ = -2 dB C₅₀₋₅₀₀₀ = -1 dB C₁₀₀₋₅₀₀₀ = -1 dB
 C_{tr,50-3150} = -7 dB C_{tr,50-5000} = -7 dB C_{tr,100-5000} = -6 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

Test Laboratory: BRE Transmission Suite (Hall D)
Client: JCC lighting products Ltd

Date of test: 03/08/2018 **Test Number:** L218-018

0578

Test specimen installed by: BRE

Product identification: Robust Details Limited Appendix F floor

Description of the specimen: 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: 102.6 kPa

Source room volume: 114 m³

Air temperature: 22 °C

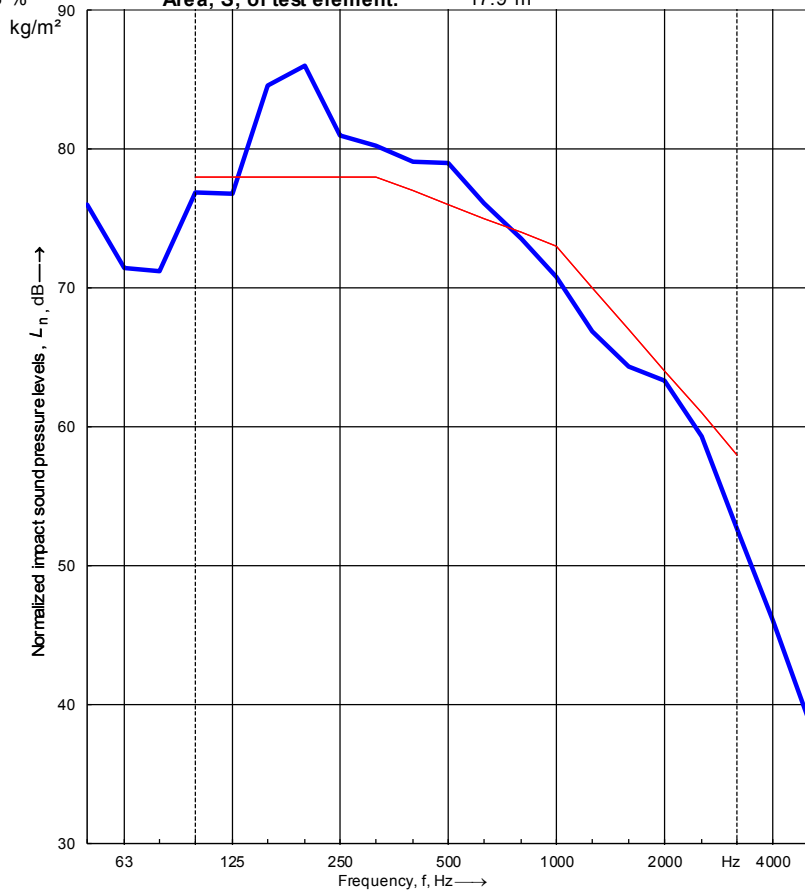
Receiving room volume: 72 m³

Relative air humidity: 53 %

Area, S, of test element: 17.9 m²

Mass per unit area:

Frequency f [Hz]	L _n 1/3 octave [dB]
50	76.0
63	71.4
80	71.2
100	76.9
125	76.8
160	84.6
200	86.0
250	81.0
315	80.2
400	79.1
500	79.0
630	76.1
800	73.5
1000	70.8
1250	66.9
1600	64.3
2000	63.3
2500	59.3
3150	52.7
4000	46.1
5000	38.7



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

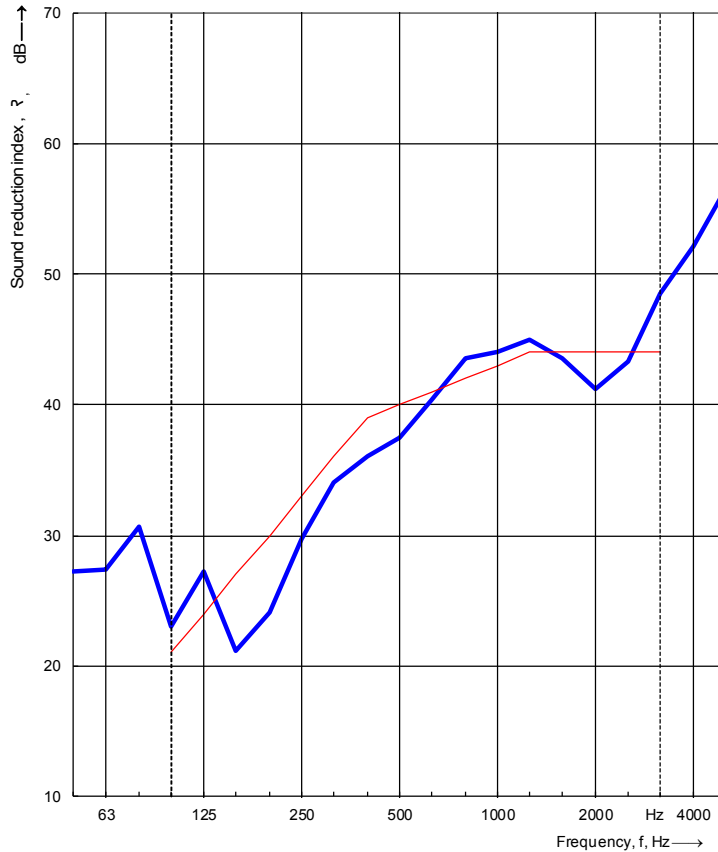
Test Laboratory: BRE Transmission Suite (Hall D)
Client: JCC lighting products Ltd
Date of test: 06/08/2018 **Test Number:** L218-019

0578

Test specimen installed by: BRE
Product identification: Downlight
Description of the specimen: JCC lighting products Ltd Downlight (JC1001)

Static pressure: 102.6 kPa **Area, S, of test element:** 17.9 m²
Air temperature: 22 °C **Source room volume:** 114 m³
Relative air humidity: 53 % **Receiving room volume:** 72 m³

Frequency f [Hz]	R 1/3 octave [dB]
50	27.2
63	27.4
80	30.6
100	23.0
125	27.2
160	21.2
200	24.1
250	29.7
315	34.1
400	36.0
500	37.5
630	40.4
800	43.6
1000	44.0
1250	45.0
1600	43.5
2000	41.2
2500	43.3
3150	48.5
4000	52.1
5000	56.6



Rating according to ISO 717-1
 $R_w(C;C_{tr}) = 40$ (-2 ; -6) 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
 $C_{tr,50-3150} = -6$ dB $C_{tr,50-5000} = -6$ dB $C_{tr,100-5000} = -6$ 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

Test Laboratory: BRE Transmission Suite (Hall D)
Client: JCC lighting products Ltd

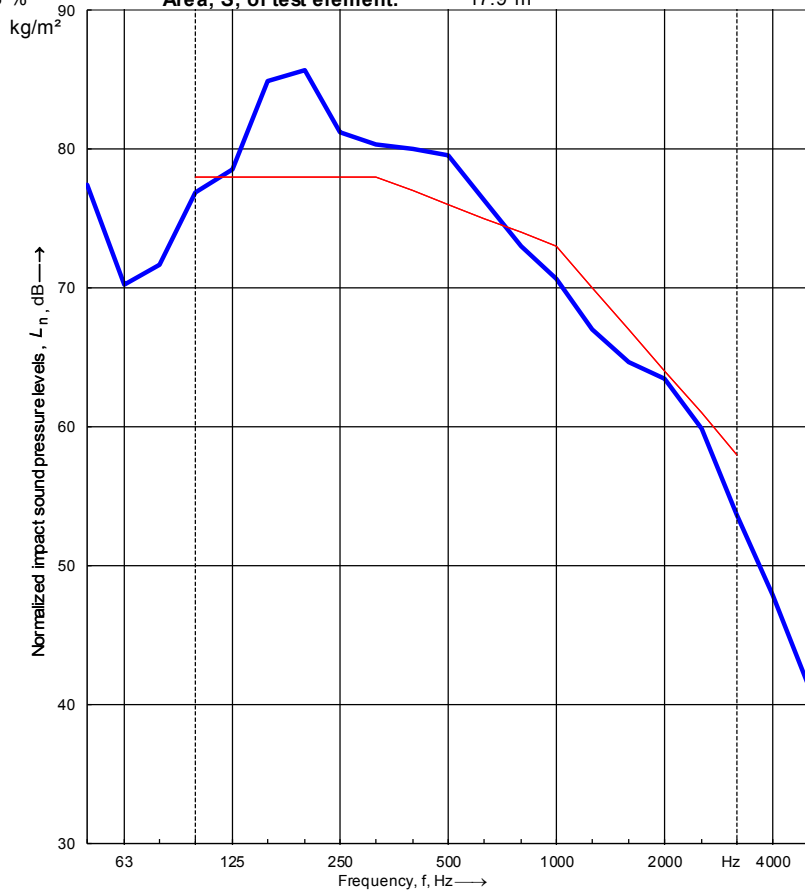
Date of test: 06/08/2018 **Test Number:** L218-020

0578

Test specimen installed by: BRE
Product identification: Downlight
Description of the specimen: JCC lighting products Ltd Downlight (JC1001)

Static pressure: 102.6 kPa **Source room volume:** 114 m³
Air temperature: 22 °C **Receiving room volume:** 72 m³
Relative air humidity: 53 % **Area, S, of test element:** 17.9 m²
Mass per unit area: kg/m²

Frequency f [Hz]	L _n 1/3 octave [dB]
50	77.4
63	70.2
80	71.7
100	76.9
125	78.5
160	84.9
200	85.7
250	81.2
315	80.3
400	80.0
500	79.6
630	76.3
800	73.0
1000	70.7
1250	67.0
1600	64.7
2000	63.4
2500	59.9
3150	53.7
4000	47.9
5000	41.1



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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