

# BRE Test Report

## JCC Lighting Products Ltd

Sound Insulation Testing of recessed downlights in accordance with BS EN ISO 10140-2 and BS EN ISO 10140-3 for Part E of the Building Regulations

Prepared for: JCC Lighting Products Ltd  
Date: 3<sup>rd</sup> April 2024  
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0578


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Date 28th March 2024

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## Executive Summary

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- JCC Lighting Products Ltd commissioned the Building Research Establishment (BRE) to measure the airborne and impact sound insulation performance of Fixed Downlight JC1101 with compatible bezels (JC1107/ ANTH/BLK/BN/BR/CH/WH) and Tilt Downlight JC1102/CH/BN/WH/ANTH when installed in Robust Details Limited Appendix F floor.
- The tests were conducted in accordance with BS EN ISO 10140-2:2021 and BS EN ISO 10140 3:2021. Single number quantities were calculated in accordance with BS EN ISO 717-1:2020 and BS EN ISO 717-2:2020. BRE is a UKAS accredited testing laboratory for testing in accordance with BS EN ISO 10140-2:2021 and BS EN ISO 10140-3:2021.
- The Fixed Downlight JC1101 with compatible bezels (JC1107/ ANTH/BLK/BN/BR/CH/WH) and Tilt Downlight JC1102/CH/BN/WH/ANTH tested satisfy the Robust Details Appendix F acoustic performance requirements for use with Approved Document E to The Building Regulations 2010.

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## 1 Introduction

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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 proposal P127259.

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## 2 Testing details

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### 2.1 Test dates and personnel

The measurements detailed in this report were completed on 27<sup>th</sup> March 2024 by Jason Haynes and Mark Coleman 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 10140-2:2021 and BS EN ISO 10140-3:2021. Single number quantities were calculated in accordance with BS EN ISO 717-1:2020 and BS EN ISO 717-2:2020.

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.

Instrument number	Equipment description	Manufacturer	Type	Serial number	Calibrate date
3110	Microphone Calibrator	B&K	4231	2175848	11/2024
5165	Microphone	GRAS	40AE	37071, 117036	11/2024
5167/5168	Microphone Preamplifier	GRAS	26CA	13085, 13142	11/2024
5165	Real Time Analyser	NOR	850	8501142	11/2024
6206/6207	Loudspeaker (Source)	B&K	4292	008003	N/A
3214/3216	Loudspeaker (Receive)	NOR	270H	26257, 26258	N/A
3225	Rotating Boom (Source)	NOR	212NA	10417	N/A
5169	Rotating Boom (Receive)	NOR	265	29412	N/A
3201	Tapping Machine	NOR	211	12927	12/2025

**Table 1:** Equipment list

The gain of the real time analyser was adjusted to give a reading 113.9 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 <sup>3</sup> )	Receive room. volume (m <sup>3</sup> )	Common area (m <sup>2</sup> )
L223-032	Appendix F Floor	112.0	72.0	17.9
L223-033		112.0	72.0	17.9
L223-034	Fixed Downlight - JC1101 with compatible bezels (JC1107/ ANTH/BLK/BN/BR/CH/WH)	112.0	72.0	17.9
L223-035		112.0	72.0	17.9
L223-036	Tilt Downlight - JC1102/CH/BN/WH/ANTH	112.0	72.0	17.9
L223-037		112.0	72.0	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
Appendix F Floor	L223-032	Robust Details Limited Appendix F floor: 18 mm OSB (10.9 kg/m <sup>2</sup> ) fixed to 235 mm x 50 mm joists (3.6 kg/m <sup>2</sup> ), 100 mm Isover APR 1200 (10 kg/m <sup>3</sup> ) between joists, 2 x 15 mm Fire rated plasterboard (23.4 kg/m <sup>2</sup> ) fixed to underside of joists, joints and perimeter sealed.
	L223-033	
Downlight	L223-034	Fixed Downlight - JC1101 with compatible bezels (JC1107/ ANTH/BLK/BN/BR/CH/WH)
	L223-035	
	L223-036	Tilt Downlight - JC1102/CH/BN/WH/ANTH
	L223-037	

**Table 3:** Construction and product details

### 3 Sound insulation test results

The single number quantities for the sound insulation tests are shown in **Tables 4 & 5**, 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

**Tables 4 & 5** below, contain 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 - L223-032	34	-	0	-
2 - L223-034	34	-		-
3 - L223-033	-	76	-	0
4 - L223-035	-	76	-	

**Table 4:** Test results for Fixed Downlight - JC1101 with compatible bezels (JC1107/ ANTH/BLK/BN/BR/CH/WH)

Test number	$R_w + C_{tr}$ (dB)	$L_{n,w}$ (dB)	Test 2 - Test 1 (dB)	Test 3 - Test 4 (dB)
1 - L223-032	34	-	0	-
2 - L223-036	34	-		-
3 - L223-033	-	76	-	0
4 - L223-037	-	76	-	

**Table 5:** Test results for Tilt Downlight - JC1102/CH/BN/WH/ANTH





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)

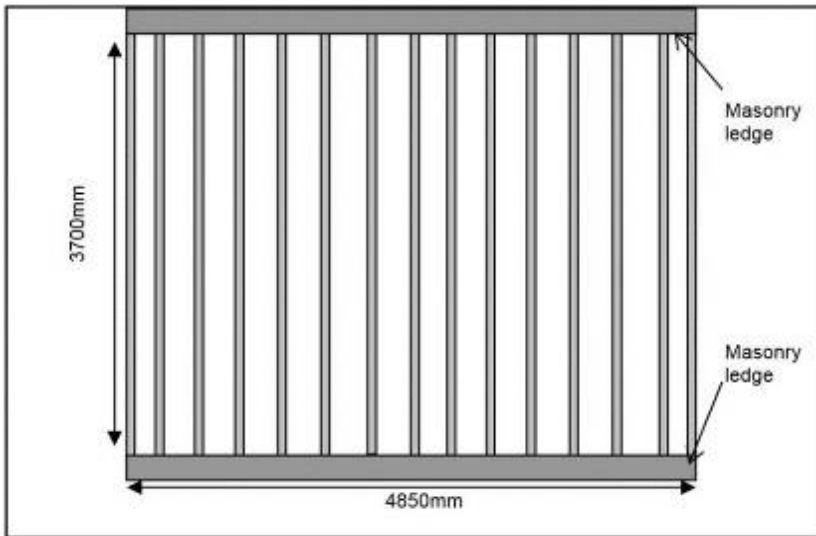
For impact sound transmission performance, the difference between Test 3 and Test 4 (Test 3 -Test 4) should be no worse than (-1dB).

Based on the test results presented in **Tables 4 & 5**, the downlights tested satisfy the Robust Details acoustic performance requirements.

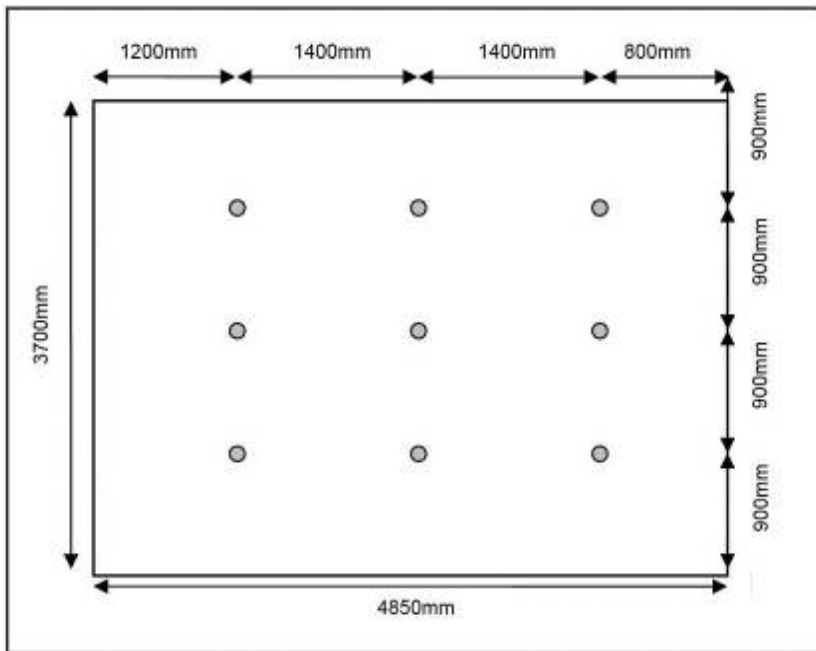
4 Installation Details

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 450mm centres.



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

## 5 Photographs



**Figure 3:** Photographs of Fixed Downlight JC1101 with compatible bezels (JC1107/ ANTH/BLK/BN/BR/CH/WH) and associated packaging.




**Figure 4:** Photographs of Tilt Downlight JC1102/CH/BN/WH/ANTH and associated packaging.

## 5 Appendices

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### 5.1 Test results sheets

<b>Page Number</b>	<b>Test Number</b>
12	L223-032
13	L223-033
14	L223-034
15	L223-035
16	L223-036
17	L223-037



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

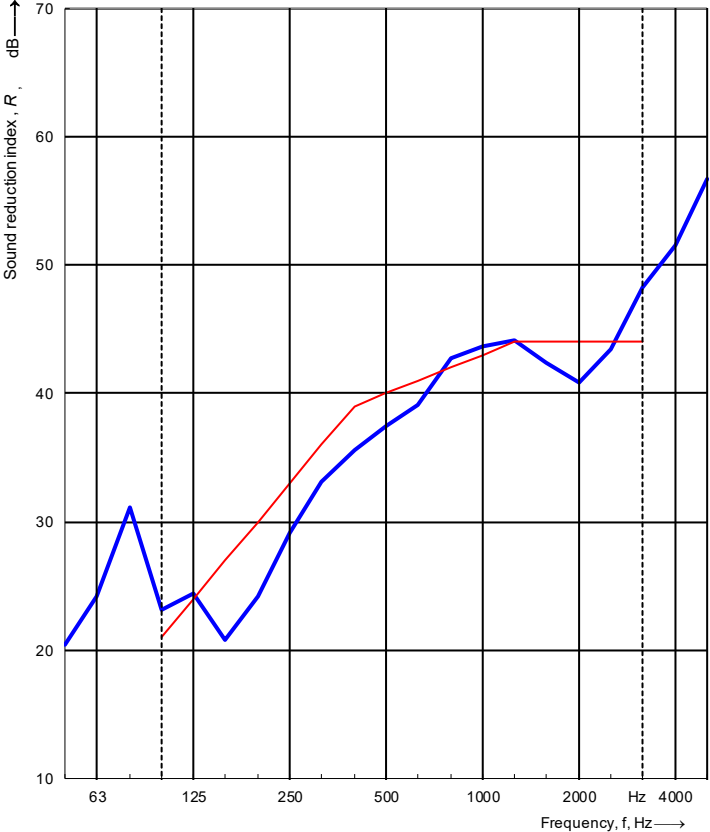
**Test Laboratory:** BRE Transmission Suite (Hall D)  
**Client:** JCC Lighting Products Ltd

**Date of test:** 27/03/2024      **Test Number:** L223-032

**0578**  
**Test specimen installed by:** BRE  
**Product identification:** Cassette Floor  
**Description of the specimen:** Appendix F Floor - Airborne

**Static pressure:** 97.3 kPa      **Area, S, of test element:** 17.9 m<sup>2</sup>  
**Air temperature:** 12 °C      **Source room volume:** 112 m<sup>3</sup>  
**Relative air humidity:** 67 %      **Receiving room volume:** 71 m<sup>3</sup>

Frequency <i>f</i> [Hz]	<i>R</i> 1/3 octave [dB]
50	20.4
63	24.2
80	31.1
100	23.1
125	24.4
160	20.8
200	24.2
250	29.1
315	33.1
400	35.6
500	37.5
630	39.1
800	42.7
1000	43.7
1250	44.2
1600	42.4
2000	40.8
2500	43.4
3150	48.2
4000	51.5
5000	56.7



Rating according to ISO 717-1

**$R_w(C;C_{tr}) = 40$  ( -2 ; -6 ) dB**

$C_{50-3150} = -3$  dB     $C_{50-5000} = -2$  dB     $C_{100-5000} = -1$  dB  
 $C_{tr,50-3150} = -7$  dB     $C_{tr,50-5000} = -7$  dB     $C_{tr,100-5000} = -6$  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 (*R<sub>w</sub>*) and should not exceed the values in Table A1 of BS EN 20140-2:1993 for the data in the individual third octaves (*R*)

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**Normalized impact sound pressure levels according to BS EN ISO 10140-3**  
**Laboratory measurements of impact sound insulation**

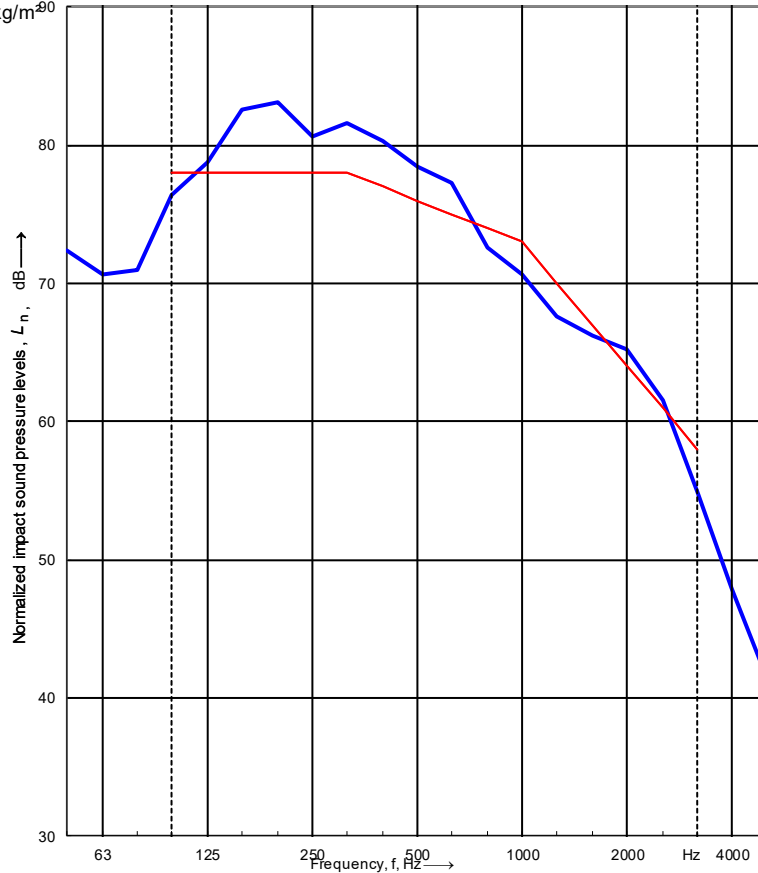
**Test Laboratory:** BRE Transmission Suite (Hall D)  
**Client:** JCC Lighting Products Ltd  
**Date of test:** 27/03/2024 **Test Number:** L223-033

**0578**

**Test specimen installed by:** BRE  
**Product identification:** Cassette Floor  
**Description of the specimen:** Appendix F Floor - Impact

**Static pressure:** 97.3 kPa **Source room volume:** 112 m<sup>3</sup>  
**Air temperature:** 12 °C **Receiving room volume:** 71 m<sup>3</sup>  
**Relative air humidity:** 67 % **Area, S, of test element:** 17.9 m<sup>2</sup>  
**Mass per unit area:** kg/m<sup>20</sup>

Frequency <i>f</i> [Hz]	<i>L<sub>n</sub></i> 1/3 octave [dB]
50	72.4
63	70.6
80	71.0
100	76.4
125	78.8
160	82.6
200	83.1
250	80.6
315	81.6
400	80.3
500	78.4
630	77.2
800	72.6
1000	70.6
1250	67.6
1600	66.2
2000	65.2
2500	61.6
3150	54.9
4000	47.9
5000	41.3



Rating according to BS EN ISO 717-2  
 $L_{n,w}(C_1) = 76 ( -1 ) \text{ dB}$   $C_{150-2500} = -1 \text{ dB}$

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 ±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**

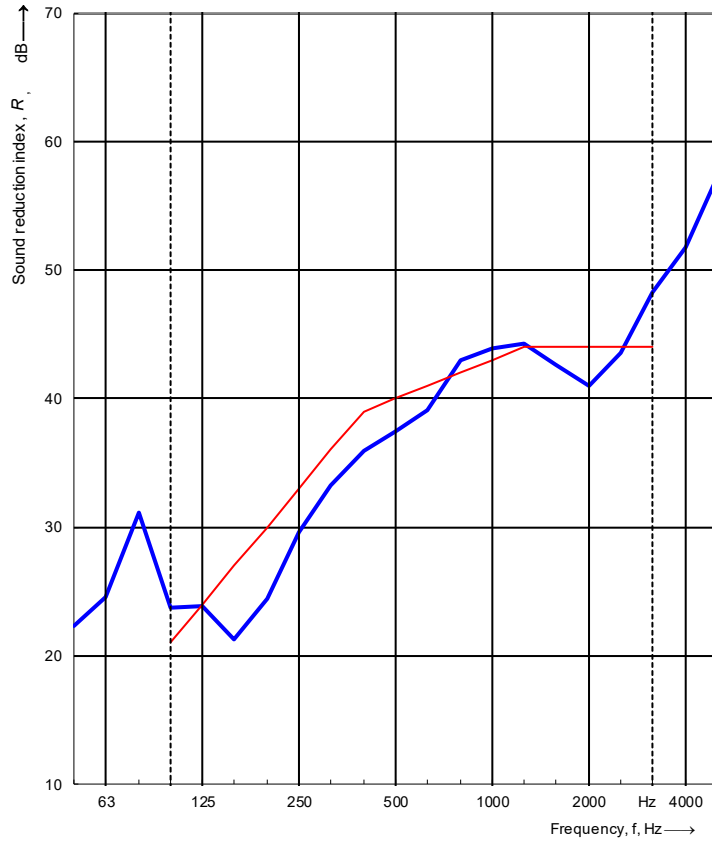
**Test Laboratory:** BRE Transmission Suite (Hall D)  
**Client:** JCC Lighting Products Ltd  
**Date of test:** 27/03/2024      **Test Number:** L223-034

**0578**  
**Test specimen installed by:** BRE  
**Product identification:** Fixed Downlight - JC1101 with compatible bezels (JC1107/ ANTH/BLK/BN/BR/CH/WH)

**Description of the specimen:** Recessed Downlight

**Static pressure:** 97.3 kPa      **Area, S, of test element:** 17.9 m<sup>2</sup>  
**Air temperature:** 12 °C      **Source room volume:** 112 m<sup>3</sup>  
**Relative air humidity:** 67 %      **Receiving room volume:** 71 m<sup>3</sup>

Frequency f [Hz]	R 1/3 octave [dB]
50	22.3
63	24.5
80	31.1
100	23.7
125	23.8
160	21.3
200	24.4
250	29.6
315	33.2
400	35.9
500	37.4
630	39.1
800	43.0
1000	43.9
1250	44.3
1600	42.6
2000	41.0
2500	43.5
3150	48.3
4000	51.8
5000	57.3



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

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<sub>w</sub>) and should not exceed the values in Table A1 of BS EN 20140-2:1993 for the data in the individual third octaves (R)

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**Normalized impact sound pressure levels according to BS EN ISO 10140-3**  
**Laboratory measurements of impact sound insulation**

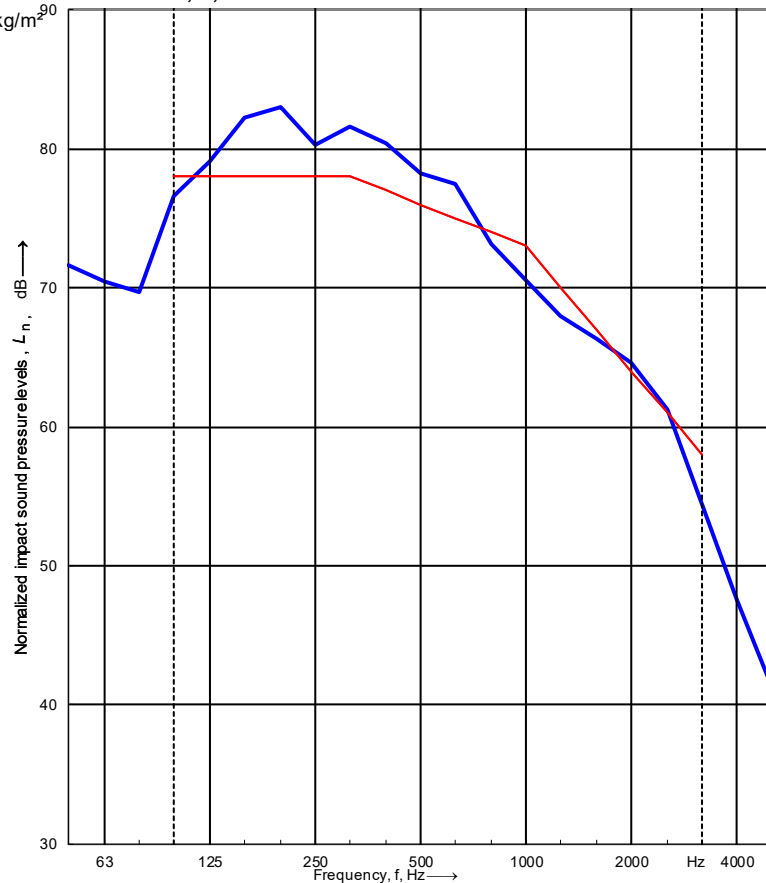
**Test Laboratory:** BRE Transmission Suite (Hall D)  
**Client:** JCC Lighting Products Ltd  
**Date of test:** 27/03/2024 **Test Number:** L223-035

**0578**

**Test specimen installed by:** BRE  
**Product identification:** Fixed Downlight - JC1101 with compatible bezels (JC1107/ANTH/BLK/BN/BR/CH/WH)  
**Description of the specimen:** Recessed Downlight

**Static pressure:** 97.3 kPa **Source room volume:** 112 m<sup>3</sup>  
**Air temperature:** 12 °C **Receiving room volume:** 71 m<sup>3</sup>  
**Relative air humidity:** 67 % **Area, S, of test element:** 17.9 m<sup>2</sup>  
**Mass per unit area:** kg/m<sup>2</sup>

Frequency <i>f</i> [Hz]	<i>L<sub>n</sub></i> 1/3 octave [dB]
50	71.6
63	70.5
80	69.7
100	76.6
125	79.1
160	82.3
200	83.0
250	80.3
315	81.6
400	80.4
500	78.2
630	77.5
800	73.2
1000	70.6
1250	68.0
1600	66.3
2000	64.6
2500	61.2
3150	54.4
4000	47.6
5000	41.1



Rating according to BS EN ISO 717-2  
 $L_{n,w}(C_1) = 76 ( -1 )$  dB  $C_{150-2500} = -1$  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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**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: 27/03/2024

Test Number: L223-037

**0578**

Test specimen installed by: BRE

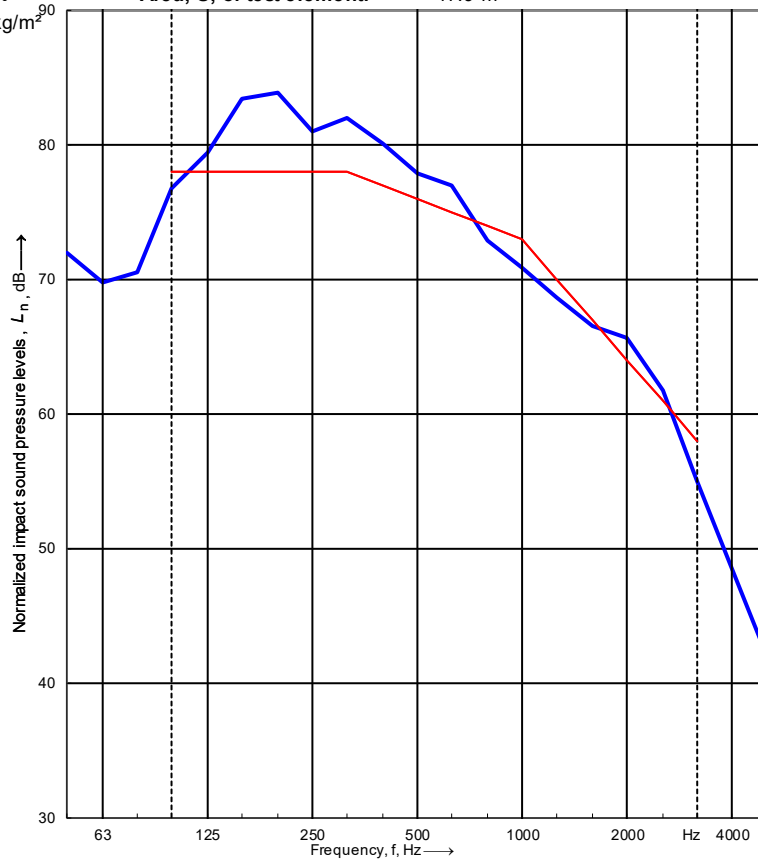
Product identification: Tilt Downlight - JC1102/CH/BN/WH/ANTH

Description of the specimen: Recessed Downlight

Static pressure: 97.3 kPa  
 Air temperature: 12 °C  
 Relative air humidity: 67 %  
 Mass per unit area: kg/m<sup>2</sup><sup>90</sup>

Source room volume: 112 m<sup>3</sup>  
 Receiving room volume: 71 m<sup>3</sup>  
 Area, S, of test element: 17.9 m<sup>2</sup>

Frequency f [Hz]	L <sub>n</sub> 1/3 octave [dB]
50	72.0
63	69.7
80	70.5
100	76.7
125	79.4
160	83.4
200	83.9
250	81.0
315	82.0
400	80.1
500	77.8
630	77.0
800	72.9
1000	70.8
1250	68.6
1600	66.5
2000	65.6
2500	61.7
3150	55.0
4000	48.5
5000	41.8



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 ±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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