

BRE Test Report

JCC Lighting Products Ltd

Sound Insulation Testing of the JC010010 downlight according to BS EN ISO 10140-2:2010 and BS EN ISO 10140-3:2010 for Part E of the Building Regulations

Prepared for: JCC Lighting Products Ltd

Date: 27th July 2020

Report Number: P117842-1000-Issue 1

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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. 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.
- 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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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 proposal P117842.

2 Testing details

2.1 Test dates and personnel

The measurements detailed in this report were made on the 7th and 13th July 2020 by M Coleman, G Timmins and R 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. 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 (Source) | B&K | 4292 | 008003 |
| Loudspeaker (Receive) | NOR | 270H | 26257, 26258 |
| Rotating Boom (Source) | NOR | 212NA | 10417 |
| Rotating Boom (Receive) | NOR | 265 | 29412 |
| Tapping Machine | NOR | 211 | 12927 |

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) |
|-------------|--------------|--------------------------------------|---------------------------------------|-------------------------------|
| L220-001 | Floor | 108.5 | 70.0 | 17.95 |
| L220-002 | | 108.5 | 70.0 | 17.95 |
| L220-003 | Downlight | 108.5 | 70.0 | 17.95 |
| L220-004 | | 108.5 | 70.0 | 17.95 |

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 | L220-001 | Robust Details Limited Appendix F floor: 18 mm OSB (10.9 kg/m ²) fixed to 235 mm x 50 mm joists (3.6 kg/m ²), with 100 mm Isover APR 1200 (10 kg/m ³) between joists, 2 x 15 mm fire rated plasterboard (12 kg/m ²) fixed to underside of joists, joints and perimeter sealed. |
| | L220-002 | |
| Downlight | L220-003 | JCC Lighting Products Ltd downlight, JC010010. |
| | L220-004 | |

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 – L220-001 | 33 | - | - | - |
| 2 – L220-002 | 33 | - | 0 | - |
| 3 – L220-003 | - | 76 | - | - |
| 4 – L220-004 | - | 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**, 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 test specimen positions are also shown. **Figure 2** shows photographs of the product tested.

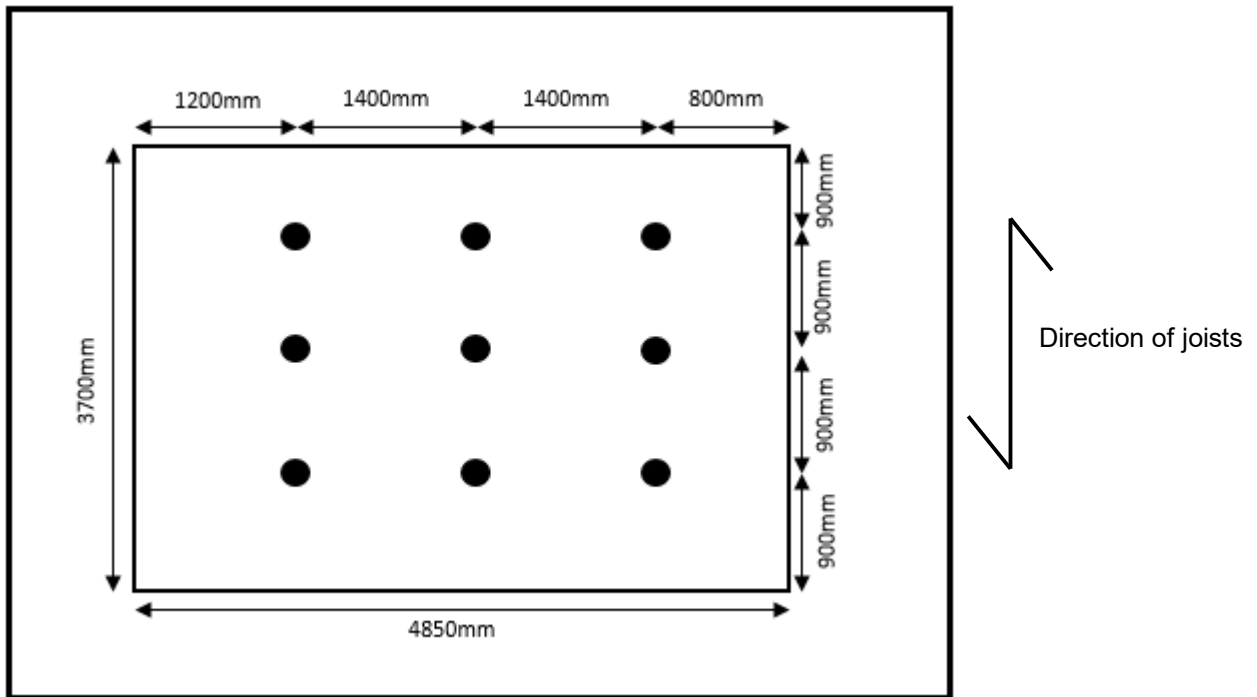


Figure 1: Positions of test specimens in the ceiling of the Robust Details Appendix F floor and direction of joists



Figure 2: Photographs of JCC Lighting Products Ltd, JC010010 downlight and associated packaging.



5 Appendices

5.1 Test results sheets

| Page Number | Test Number |
|--------------------|--------------------|
| 11 | L220-001 |
| 12 | L220-002 |
| 13 | L220-003 |
| 14 | L220-004 |



| | 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0578 | Date of test: 07/07/2020 | Test Number: L220-001 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Test specimen installed by: BRE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Product identification: Robust Details Limited Appendix F floor | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description of the specimen: 18 mm OSB (10.9 kg/m ²) fixed to 235 mm x 50 mm joists (3.6 kg/m ²), with 100 mm Isover APR 1200 (10 kg/m ³) between joists, 2 x 15 mm fire rated plasterboard (12 kg/m ²) fixed to underside of joists, joints and perimeter sealed. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Static pressure: 101.0 kPa Air temperature: 20 °C Relative air humidity: 77 % | Area, S, of test element: 17.9 m ² Source room volume: 112 m ³ Receiving room volume: 72 m ³ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th>Frequency f [Hz]</th> <th>R 1/3 octave [dB]</th> </tr> </thead> <tbody> <tr><td>50</td><td>22.8</td></tr> <tr><td>63</td><td>23.6</td></tr> <tr><td>80</td><td>29.2</td></tr> <tr><td>100</td><td>21.8</td></tr> <tr><td>125</td><td>26.1</td></tr> <tr><td>160</td><td>21.4</td></tr> <tr><td>200</td><td>23.9</td></tr> <tr><td>250</td><td>27.6</td></tr> <tr><td>315</td><td>32.1</td></tr> <tr><td>400</td><td>34.2</td></tr> <tr><td>500</td><td>34.6</td></tr> <tr><td>630</td><td>35.9</td></tr> <tr><td>800</td><td>39.9</td></tr> <tr><td>1000</td><td>41.3</td></tr> <tr><td>1250</td><td>42.3</td></tr> <tr><td>1600</td><td>41.1</td></tr> <tr><td>2000</td><td>39.5</td></tr> <tr><td>2500</td><td>42.0</td></tr> <tr><td>3150</td><td>46.2</td></tr> <tr><td>4000</td><td>48.4</td></tr> <tr><td>5000</td><td>51.3</td></tr> </tbody> </table> | Frequency f [Hz] | R 1/3 octave [dB] | 50 | 22.8 | 63 | 23.6 | 80 | 29.2 | 100 | 21.8 | 125 | 26.1 | 160 | 21.4 | 200 | 23.9 | 250 | 27.6 | 315 | 32.1 | 400 | 34.2 | 500 | 34.6 | 630 | 35.9 | 800 | 39.9 | 1000 | 41.3 | 1250 | 42.3 | 1600 | 41.1 | 2000 | 39.5 | 2500 | 42.0 | 3150 | 46.2 | 4000 | 48.4 | 5000 | 51.3 | | | |
| Frequency f [Hz] | R 1/3 octave [dB] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 50 | 22.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 63 | 23.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 80 | 29.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 100 | 21.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 125 | 26.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 160 | 21.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 200 | 23.9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 250 | 27.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 315 | 32.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 400 | 34.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 500 | 34.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 630 | 35.9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 800 | 39.9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1000 | 41.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1250 | 42.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1600 | 41.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2000 | 39.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2500 | 42.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3150 | 46.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4000 | 48.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5000 | 51.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rating according to ISO 717-1 $R_w(C;C_{tr}) = 38$ (-1 ; -5) dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Evaluation based on laboratory measurement results obtained in one-third-octave bands by an engineering method. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $C_{50-3150} = -1$ dB $C_{50-5000} = -1$ dB $C_{100-5000} = 0$ dB $C_{tr,50-3150} = -5$ dB $C_{tr,50-5000} = -5$ dB $C_{tr,100-5000} = -5$ 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: 07/07/2020 **Test Number:** L220-002

0578

Test specimen installed by: BRE

Product identification: Robust Details Limited Appendix F floor

Description of the specimen: 18 mm OSB (10.9 kg/m²) fixed to 235 mm x 50 mm joists (3.6 kg/m²), with 100 mm Isover APR 1200 (10 kg/m³) between joists, 2 x 15 mm fire rated plasterboard (12 kg/m²) fixed to underside of joists, joints and perimeter sealed.

Static pressure: 101.0 kPa

Air temperature: 20 °C

Relative air humidity: 77 %

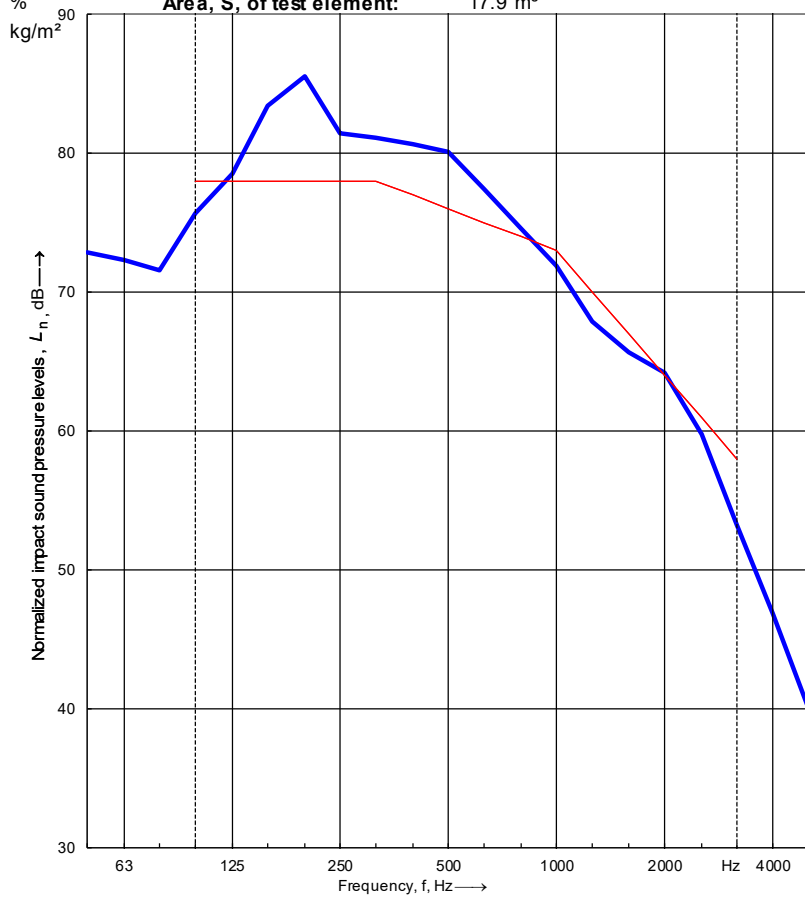
Mass per unit area:

Source room volume: 112 m³

Receiving room volume: 72 m³

Area, S, of test element: 17.9 m²

| Frequency f [Hz] | L _n 1/3 octave [dB] |
|------------------------|--------------------------------------|
| 50 | 72.9 |
| 63 | 72.3 |
| 80 | 71.6 |
| 100 | 75.7 |
| 125 | 78.5 |
| 160 | 83.4 |
| 200 | 85.5 |
| 250 | 81.4 |
| 315 | 81.1 |
| 400 | 80.7 |
| 500 | 80.1 |
| 630 | 77.4 |
| 800 | 74.6 |
| 1000 | 71.9 |
| 1250 | 67.9 |
| 1600 | 65.7 |
| 2000 | 64.2 |
| 2500 | 59.8 |
| 3150 | 53.2 |
| 4000 | 46.9 |
| 5000 | 39.8 |



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 Transmission Suite (Hall D)
Client: JCC Lighting Products Ltd

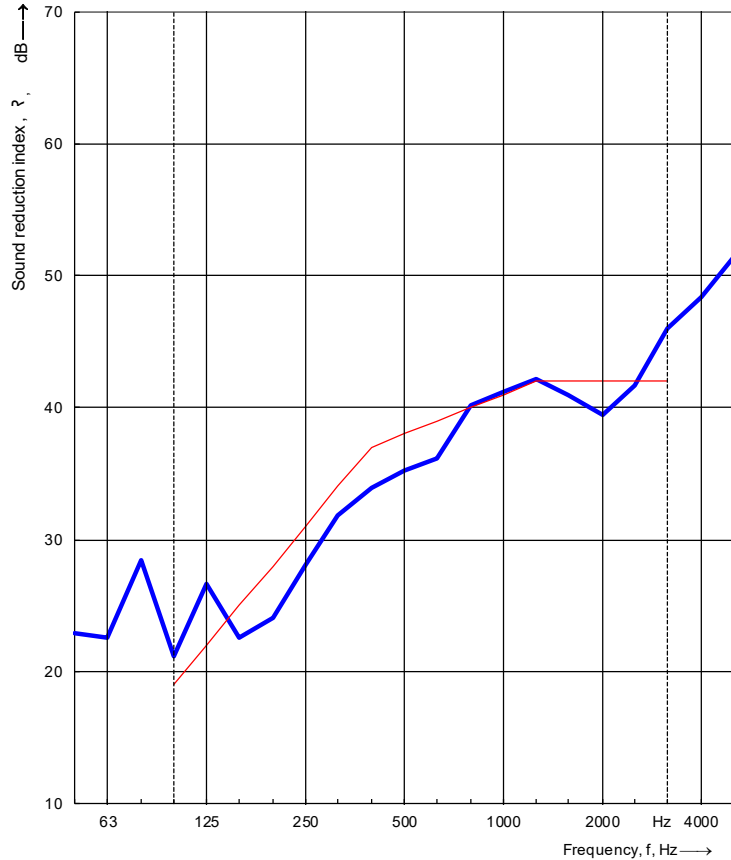
0578

Date of test: 13/07/2020 **Test Number:** L220-003

Test specimen installed by: BRE
Product identification: JCC Lighting Products Ltd Downlight
Description of the specimen: JC010010

Static pressure: 100.0 kPa **Area, S, of test element:** 17.9 m²
Air temperature: 18 °C **Source room volume:** 112 m³
Relative air humidity: 74 % **Receiving room volume:** 72 m³

| Frequency f [Hz] | R 1/3 octave [dB] |
|------------------------|-------------------------|
| 50 | 22.9 |
| 63 | 22.5 |
| 80 | 28.4 |
| 100 | 21.1 |
| 125 | 26.7 |
| 160 | 22.5 |
| 200 | 24.1 |
| 250 | 28.1 |
| 315 | 31.8 |
| 400 | 33.9 |
| 500 | 35.2 |
| 630 | 36.2 |
| 800 | 40.1 |
| 1000 | 41.2 |
| 1250 | 42.1 |
| 1600 | 41.0 |
| 2000 | 39.4 |
| 2500 | 41.7 |
| 3150 | 46.0 |
| 4000 | 48.4 |
| 5000 | 51.4 |



Rating according to ISO 717-1
 $R_w(C;C_{tr}) = 38 (-1 ; -5) \text{ dB}$ $C_{50-3150} = -1 \text{ dB}$ $C_{50-5000} = 0 \text{ dB}$ $C_{100-5000} = 0 \text{ dB}$
 Evaluation based on laboratory measurement results obtained in one-third-octave bands by an engineering method. $C_{tr,50-3150} = -5 \text{ dB}$ $C_{tr,50-5000} = -5 \text{ dB}$ $C_{tr,100-5000} = -5 \text{ dB}$

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_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

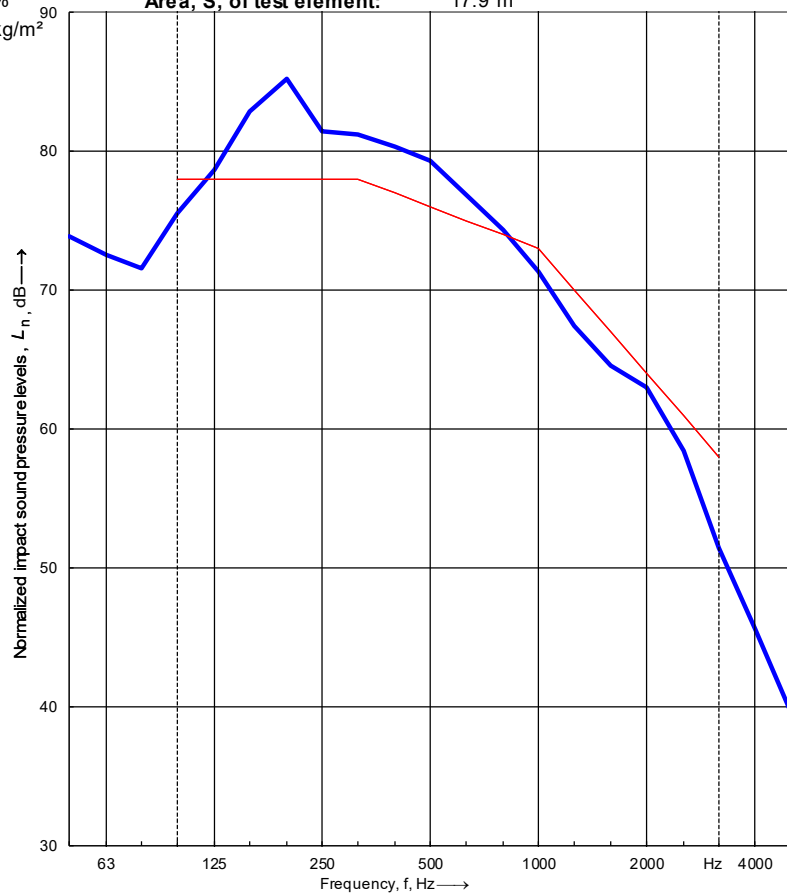
Date of test: 13/07/2020 **Test Number:** L220-004

0578

Test specimen installed by: BRE
Product identification: JCC Lighting Products Ltd Downlight
Description of the specimen: JC010010

Static pressure: 100.0 kPa **Source room volume:** 112 m³
Air temperature: 18 °C **Receiving room volume:** 72 m³
Relative air humidity: 74 % **Area, S, of test element:** 17.9 m²
Mass per unit area: kg/m²

| Frequency f [Hz] | L _n 1/3 octave [dB] |
|------------------------|--------------------------------------|
| 50 | 73.9 |
| 63 | 72.5 |
| 80 | 71.5 |
| 100 | 75.5 |
| 125 | 78.7 |
| 160 | 82.9 |
| 200 | 85.2 |
| 250 | 81.4 |
| 315 | 81.2 |
| 400 | 80.3 |
| 500 | 79.3 |
| 630 | 76.9 |
| 800 | 74.3 |
| 1000 | 71.3 |
| 1250 | 67.4 |
| 1600 | 64.6 |
| 2000 | 63.0 |
| 2500 | 58.4 |
| 3150 | 51.4 |
| 4000 | 45.6 |
| 5000 | 39.4 |



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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