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BRE Test Report

Airtightness test according to Part C of the Building Regulations on a JCC Lighting Products Ltd downlight product

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Date: 31st July 2020

Report Number: P117842-1005 Issue: 1

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1 Introduction

At the request of Michael Rickwood, on behalf of JCC Lighting Products Ltd, Innovation Centre, Beeding Close, Southern Cross Trading Est, Bognor Regis, West Sussex, PO22 9TS. BRE issued the proposal P117842. The client accepted this and BRE airtightness tested the sample provided on the 22nd July 2020.
The test assesses the airtightness of the specimen light fitting installed in a mock-up ceiling, by using the method in BS EN 13141-1:2004 and criteria set in BS 5250:2002. Part C of the Building Regulations 2010 Site Preparation and resistance to contaminants and moisture, refers to BS 5250:2002 and describes designs that are resistant to moisture transfer into roof and other voids that can, for example, occur in the form of leakage of warm moist air via light fittings.

The tests were carried out by C Manescu under the BRE Standard Terms and Conditions of Business for testing as part of BRE project and work order number P117842-1005.

2 Test programme

Part C of the Building Regulations refers to *BS 5250:2002: Code of practice for the control of condensation in building.* It should be noted that BS 5250:2002 has been superseded by BS 5250:2011+A1:2016. This latest version of BS 5250 includes the same criteria for downlighters as in earlier editions.

The current and previous versions of BS 5250 refer to the test method given in *BS EN 13141-1:2004*[1] for assessing the air tightness of recessed light fittings

The airtightness test is performed by application of a series of air pressure differentials across the specimen with measurement of the air leakage through it at each pressure step. The maximum pressure differential was 100 Pa reached in pressure steps of 1, 2, 4, 8, 10, 15, 20, 30, 40, 60, 80 and 100 Pascals.

Measurement of the airtightness of the light fitting was carried out with the air pressure as positive on the room side of the fitting. This causes air to flow through and around the light fitting into the space above the ceiling. The values measured can therefore include air leakage through the light assembly and through the ceiling to light assembly joint when this occurs.

[1] *BS EN 13141-1:2004 Ventilation for buildings – Performance testing of components/products for residential ventilation – Part 1: Externally and internally mounted air transfer devices*.

3 Air leakage criterion

BS 5250:2002, Clause 8.4.1.2 calls for designers to minimise the amount of moisture entering the roof (or other spaces above ceilings) by providing well sealed ceilings. The airtightness of ceilings is described in Clause 8.4.1.2 of that standard.

The paragraph about downlighters states; 'Recessed light fittings should either comply with BS EN 60529 and be rated IP60 to IP65 (depending on room use) or incorporate an appropriate sealed hood or box which meets the following test criteria. The total leakage through downlighters should not exceed 0.06 $m^3/h.m^2$ of ceiling at 2 Pa. The leakage of individual downlighters can be tested using the method specified in 4.3 of BS EN 13141-1: 2004'.

BRE information Paper IP4/06 2006 Airtightness of ceilings describes the possible energy losses and condensation risks when ceilings are not 'well sealed'.

Note, as previously mentioned, Part C of the Building Regulations refers to BS 5250:2002, this standard has been superseded by BS 5250:2011+A1:2016. BS 5250:2011+A1:2016 Clause H.4.2 refers to the same test method and criteria as given in BS 5250:2002.

4 Test specimen

Figures 1 and 2, and Table 1 below show the general arrangement and design of downlight tested.

Test Specimen	Details	Cut-out size in ceiling (mm)	Diameter of bezel (mm)	Area of ceiling face (mm^2)
JC010023	Downlight with a rubber gasket	84	100	7853.98

Table 1 Test Specimen JC010023.

Figure 1: Photographs of JCC Lighting Products Ltd, JC010023 downlight.

5 Test rig and preparation

The light fitting was installed into a square piece of 18 mm thick MDF board to simulate a stiff ceiling panel. This panel was sealed in to a 0.5 x 0.5 x 0.5 m welded aluminium welded box.

The test specimen was conditioned before testing commenced for at least 4 hours within the temperature range specified in the test standard of 20 +/-5°C.

BS EN 13141-1:2004 requires that the test rig has a background leakage rate lower than 1 litre per second at 100 Pa. This equates to 3.6 m^3/h at 100 Pa. The background leakage of the test rig was measured after first sealing off the specimen light fitting. This background leakage was subtracted from all measured test results.

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6 Summary of test results

The test results for the JC010023 is summarised in the table shown below. Detailed results are given in Appendix A.

BS 5250 test criteria: At 2 Pa (Pascals) air leakage through recessed light fitting should not exceed 0.06 m³/h per m² of ceiling.

Test Specimen	Measured air flow at 2 Pa	Performance against criteria
JC010023	Flow through one JC010023 downlight = 0.549 m^3/h at 2 Pa	At 2 Pa, a flow rate through one downlight was measured at 0.549 m^3/h. The criteria given by BS 5250 per m^2 of ceiling is 0.06 m^3/h, therefore, allowing one JC010023 downlight every 9.15m^2 of ceiling. Results are shown in full in Table A1.

Table 2 Summary of airtightness results for a JC010023 Downlight.

Conclusions

The JC010023, JCC Lighting Products Ltd downlight, as described in Section 4 of this report, was tested in the manner and to the standard described herein. The results give the measured rate of air leakage as 0.549 m^3/h.

To comply with the air leakage requirement of BS 5250, the JC010023, JCC Lighting Products Ltd downlight can be installed at a density of one downlight per 9.15 m^2 of ceiling.

7 References

1. BS EN 13141-1:2004 Ventilation for buildings – Performance testing of components/products for residential ventilation – Part 1: Externally and internally mounted air transfer devices. BSI London
2. BS 5250:2002 Code of practice for control of condensation in buildings. BSI London
3. BS 5250:2011+A1:2016 Code of practice for control of condensation in buildings, BSI London
4. Part C of the Building Regulations 2010. Site Preparation and resistance to contaminants and moisture. ODPM London. 2004 Edition.
5. BRE IP4/06 Airtightness of ceilings. BRE March 2006.

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Appendix A Test Results

Airtightness Results for a JC010023, JCC Lighting Products Ltd downlight

Test pressure Pa	Air flow through a JCC Lighting Products Ltd- JC010023 Downlight m^3/h
1 (±0.5)	0.444
2 (±0.5)	**0.549**
4 (±1)	0.755
8 (±1)	1.137
10 (±1)	1.315
15 (±1)	1.723
20 (±1)	2.083
30 (±2)	2.676
40 (±2)	3.129
60 (±2)	3.766
80 (±2)	4.285
100 (±2)	4.979

Table A1 Air flow through a JC010023, JCC Lighting Products Ltd Downlight.

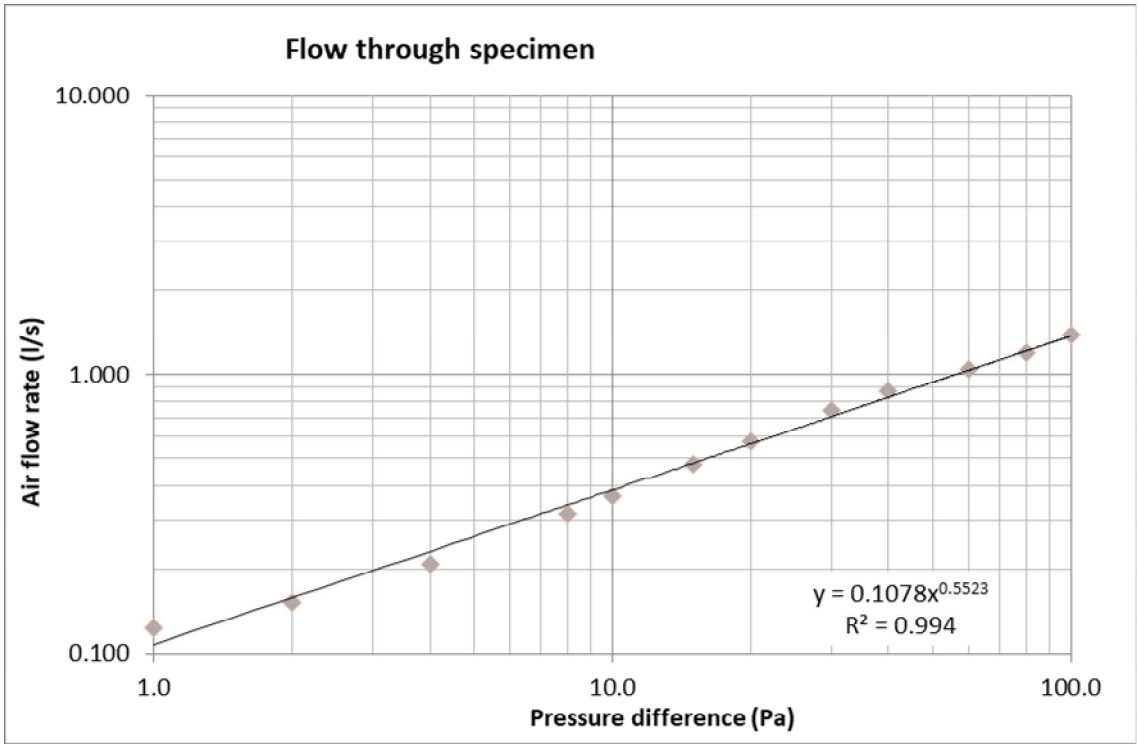

Figure A1 Graph of air flow readings

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