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Report on the testing of a downlighter with and without a Tenmat Firefly 120 thermal loft cover, to the principles of BS EN 1026: 2000 Window and doors – Air permeability – test method

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1 Introduction

Chiltern Dynamics was commissioned by Tenmat Limited to undertake testing of a Tenmat Firefly 120 thermal loft cover to the principles of BS EN 1026: 2000 Window and doors – Air permeability – test method

Testing was conducted at the Chiltern Dynamics testing laboratory on 18 March 2009.

2 Objective

To measure the airtightness of a downlighter and of a downlighter with a Tenmat Firefly 120 thermal loft cover fitted, at positive pressures of 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 35 and 50 pascals

3 Description of test specimen

The light was identified as a JCC low voltage eyeball downlighter (Ref. JC3009) fitted with a Dichroic 50W halogen lamp. The Tenmat Firefly 120 thermal loft cover was fitted over the back of the downlighter, and fixed in place with a silicone seal to the plasterboard. A small V was cut out in the bottom of the cover to allow the wires out from the downlighter, this was sealed with silicone.

4 Test preparation

Installation

The test assembly was fitted into weather test rig (Ref. T7.22). The front of the rig was boarded off with a sheet of 12mm thick plasterboard. The roof was constructed from a sheet of 12mm plasterboard fixed with screws to a timber frame of 4" x 2" softwood. A 82mm diameter hole was cut in the plasterboard to allow the installation of the downlighter. The overall dimensions of the roof were 660mm x 1115mm.

5 Test procedure and results

The specimen was sealed with tape and the pressure inside the chamber increased incrementally to 2Pa, 3Pa, 4Pa, 5Pa, 6Pa, 7Pa, 8Pa, 9Pa, 10Pa, 15Pa, 20Pa, 35Pa and 50Pa and then reduced in similar stages to zero.

At each pressure the airflow into the rig was allowed to stabilise and the rate of flow required to achieve a level of pressure and the air pressure was recorded. These readings gave the permeability of the test chamber at the various pressure levels.

The sealing of the downlighter was removed and the pressure within the chamber raised in similar stages to a maximum of 50 Pa and reduced in stages as before. Airflow into the rig and the pressure level was again measured.

The Tenmat Firefly 120 thermal loft cover was then fitted over the downlighter and sealed at the base with silicone. The pressure in the chamber was again raised in similar stages to a maximum of 50Pa and reduced in stages as before. Airflow into the rig and the pressure level was again measured.

These values were plotted on a graph and a best fit curve was calculated and used to give the leakage values of the downlighter with and without the Tenmat Firefly 120 thermal loft cover at the increments given.

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Individual results for the tests are detailed in Appendix 1

The following are values calculated from the best-fit curve characteristics

Downlight description	Air leakage at 2pa (m ³ /h)	Air leakage at 50pa (m ³ /h)
JCC downlighter (Ref. JC3009)	1.906	19.964
JCC downlighter fitted with a Tenmat Firefly 120 thermal loft cover	0.000	7.772

The results only relate to the performance of the samples under the particular conditions of test.

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Appendix 1

Test Pressure (pa) nominal	Chamber Pressure (pa)	Chamber Leakage (m ³ /h)	Chamber Pressure (pa)	Chamber Leakage (m ³ /h)	Chamber Average Pressure (pa)	Chamber Average Leakage (m ³ /h)	Chamber calculated Pressure (pa)	Chamber calculated Leakage (m ³ /h)
2.00	1.9	0.5	2.6	0.4	2.25	0.45	2.00	0.536
3.00	3.0	0.7	3.0	0.5	3	0.6	3.00	0.671
4.00	4.0	0.8	4.0	0.7	4	0.75	4.00	0.804
5.00	4.8	1.0	5.2	0.9	5	0.95	5.00	0.935
6.00	6.1	1.2	6.2	1.1	6.15	1.15	6.00	1.064
7.00	6.9	1.3	7.1	1.2	7	1.25	7.00	1.192
8.00	8.2	1.4	8.1	1.4	8.15	1.4	8.00	1.318
9.00	8.9	1.5	9.2	1.6	9.05	1.55	9.00	1.441
10.00	10.2	1.7	9.9	1.6	10.05	1.65	10.00	1.564
15.00	15.1	2.1	15.4	2.2	15.25	2.15	15.00	2.147
20.00	20	2.6	20.1	2.7	20.05	2.65	20.00	2.686
35.00	34.9	4.0	34.0	3.9	34.45	3.95	35.00	4.031
50.00	50.1	5.1	49.9	5.1	50	5.1	50.00	4.972

Best fit curve calculated $y = -0.0009x^2 + 0.1392x + 0.2615$ $R^2 = 0.9972$

Test Pressure (pa) nominal	Downlighter		Downlighter		Downlighter average		Calculated leakage (less chamber leakage)	
	Pressure (pa)	Leakage (m ³ /h)	Pressure (pa)	Leakage (m ³ /h)	Pressure (pa)	Leakage (m ³ /h)	Pressure (pa)	Leakage (m ³ /h)
2.00	2.0	2.2	2.0	1.8	2.0	2	2.00	1.906
3.00	3.0	3.4	3.1	3.0	3.05	3.2	3.00	2.621
4.00	4.0	4.4	4.1	4.2	4.05	4.3	4.00	3.303
5.00	5.0	5.1	5.1	5.1	5.05	5.1	5.00	3.953
6.00	6.0	5.9	6.1	5.9	6.05	5.9	6.00	4.573
7.00	6.9	6.5	7.0	6.5	6.95	6.5	7.00	5.163
8.00	8.0	7.2	8.0	7.2	8.0	7.2	8.00	5.726
9.00	9.0	7.8	9.1	7.8	9.05	7.8	9.00	6.262
10.00	10.0	8.2	10.0	8.4	10.0	8.3	10.00	6.772
15.00	15.0	10.8	15.0	10.8	15.0	10.8	15.00	8.981
20.00	20.0	12.9	19.4	12.8	19.7	12.85	20.00	10.730
35.00	35.0	18.1	34.1	17.9	34.55	18	35.00	14.717
50.00	50.2	22.5	50.6	22.6	50.4	22.55	50.00	19.964

Best fit curve calculated $y = 0.0002x^3 - 0.0191x^2 + 0.6353$ $R^2 = 0.9986$

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Test Pressure (pa) nominal	Downlighter with Tenmat Firefly 120 thermal loft cover		Downlighter with Tenmat Firefly 120 thermal loft cover		Downlighter with Tenmat Firefly 120 thermal loft cover average		Calculated leakage(less chamber leakage)	
	Pressure (pa)	Leakage (m ³ /h)	Pressure (pa)	Leakage (m ³ /h)	Pressure (pa)	Leakage (m ³ /h)	Pressure (pa)	Leakage (m ³ /h)
2.00	2.5	0.5	2.6	0.5	2.55	0.5	2.00	0.000
3.00	2.9	0.6	3.0	0.6	2.95	0.6	3.00	0.026
4.00	3.9	1.0	4.1	1.0	4.0	1.0	4.00	0.223
5.00	5.0	1.3	5.0	1.3	5.0	1.3	5.00	0.419
6.00	6.0	1.7	6.1	1.7	6.05	1.7	6.00	0.613
7.00	7.1	2.1	7.0	2.0	7.05	2.05	7.00	0.806
8.00	8.0	2.4	7.5	2.2	7.75	2.3	8.00	0.997
9.00	9.0	2.7	8.8	2.7	8.9	2.7	9.00	1.187
10.00	10.0	3.0	10.0	2.9	10.0	2.95	10.00	1.376
15.00	15.3	4.6	15.0	4.5	15.15	4.55	15.00	2.298
20.00	20.1	5.9	20.1	5.9	20.1	5.9	20.00	3.185
35.00	35.0	9.5	35.2	9.5	35.1	9.5	35.00	5.636
50.00	50.0	12.8	49.9	12.7	49.95	12.75	50.00	7.772

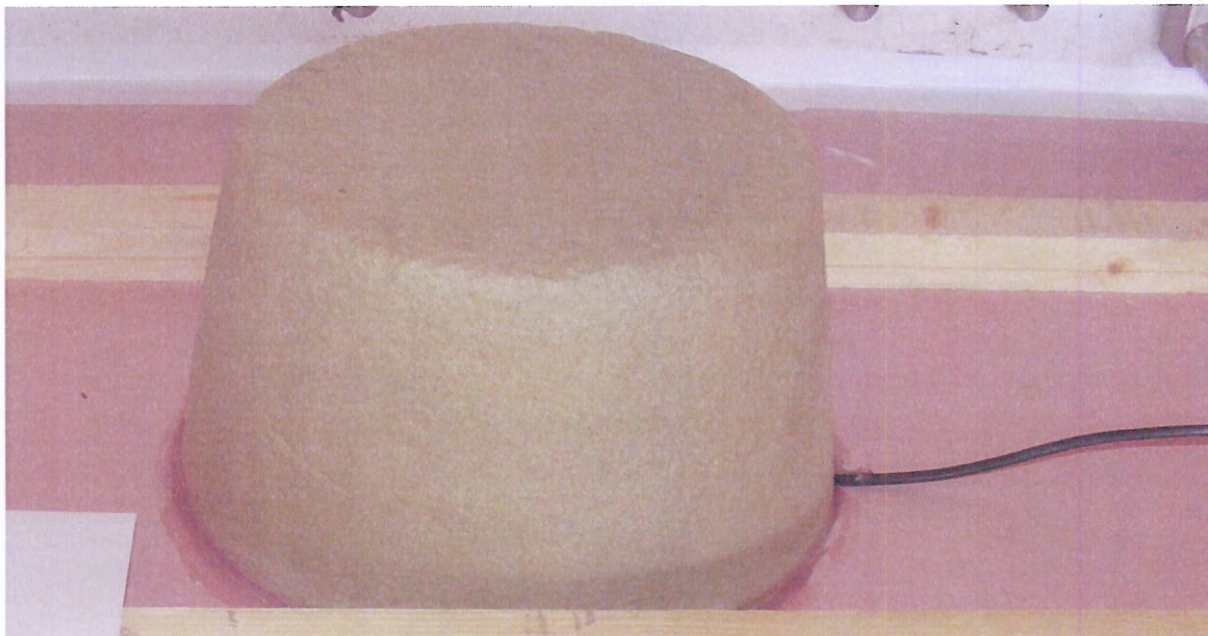
Best fit curve calculated $y = -0.0016x^2 + 0.3411x - 0.3115$ $R^2 = 0.9996$

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Appendix 2



JCC Downlighter (Ref. JC3009)



Tenmat Firefly 120 thermal loft cover

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Appendix 3

List of testing apparatus

Ref. No	Description
T7.22	Weathertightness testing rig
T5.149	Measuring tape
T6-53	0-100pa pressure transducer
T6-54	0-50M3/hr air flow meter

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