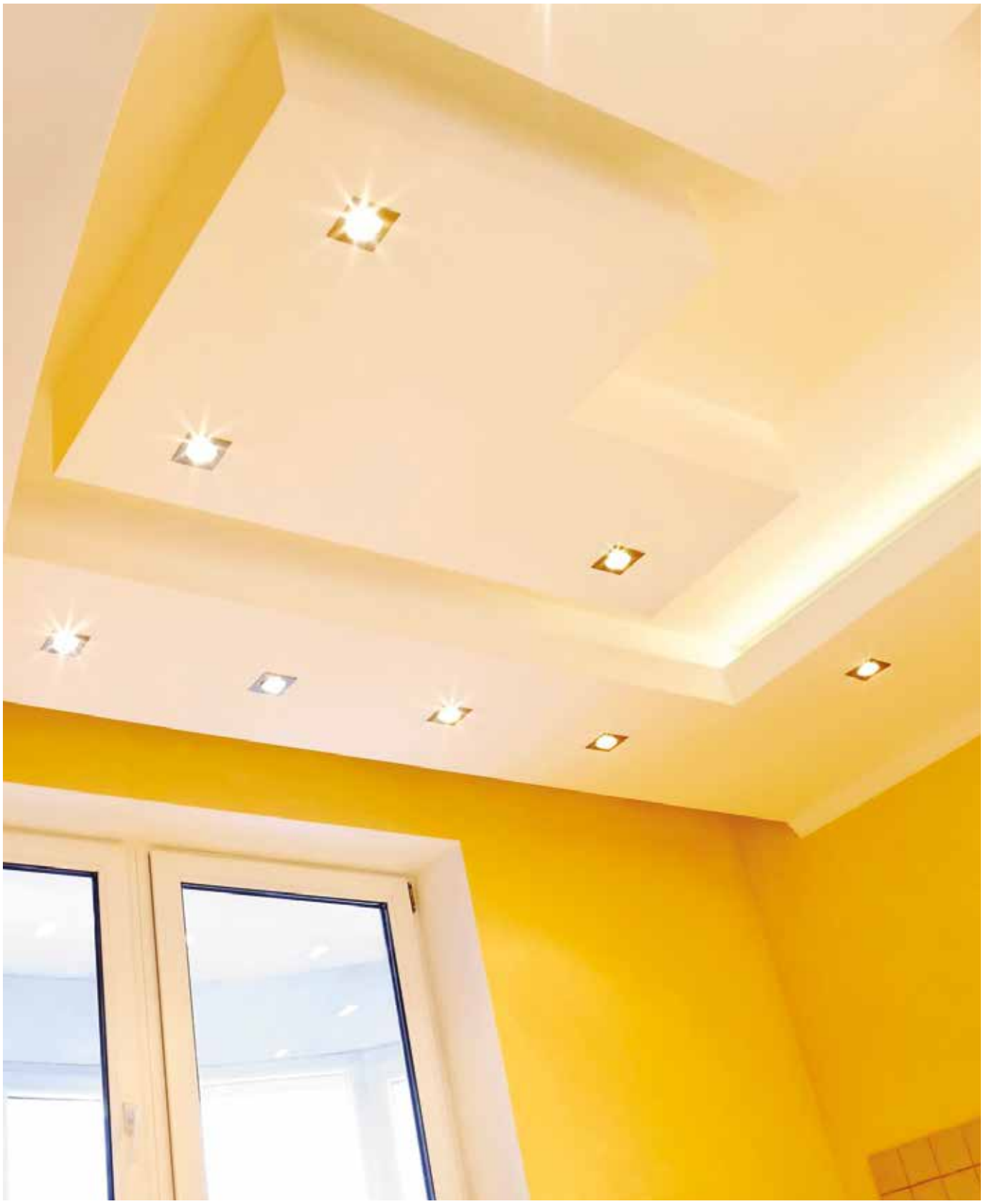
Guide to the safe installation of downlighters in dwellings

Technical guidance for designers and installers

LABC
Delivering building control through local authorities



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Introduction

This best practice guide advises on the safe installation of downlighters in dwellings and domestic extensions. It informs how these lights can be specified so they comply with the requirements of the building regulations. It covers fire safety, sound insulation, conservation of fuel and power and potential condensation issues.

When using these fittings it is essential the lighting designer and installer follow the manufacturers' guidance on issues relating to health and safety.

Fire safety

Fire resistance of floors

Approved Document B Volume 1 of the Building Regulations sets out the fire resistance for the floor which is normally 30 minutes for low-rise buildings, providing the floor is not a compartment floor.

Tests sponsored by the Department of the Environment, Transport and the Regions (now DCLG) and carried out by The Timber Research and Development Association (TRADA)* provide useful guidance on the performance of these fittings. The tests were carried out on typical timber joisted floors (measuring 3.2 x 4.2m) fitted with up to 24 plastic and metal-clipped fittings of various diameters. All fittings were unprotected and did not cause premature failure in terms of load bearing capacity, insulation or integrity. Similar tests were carried out by the BRE on downlighter and sprinkler head penetrations in various timber floor types, which reached similar conclusions to the TRADA research.

TRADA also carried out tests on a 60-minute fire-resisting floor and found there was no premature failure of fittings without additional fire protection. However, due to the very limited scope of the testing it was considered there was still a need for downlighter protection in 60-minute floors.

These tests cannot be seen as being representative of floor types that may incorporate engineered 'I beam' or open steel web joists. This is due to them having little 'sacrificial' timber and so they may rely almost entirely on the integrity of the ceiling lining to prevent failure in fire. Tests by one manufacturer** have indicated that a similar performance to traditional joists can be achieved as did the BRE tests which also included these floor types. But due to the limited nature of the tests they cannot be regarded as conclusive and protective measures may still be needed in this type of floor.

Clearance to combustible material

Downlighters can generate significant levels of heat when they incorporate halogen fittings, it is therefore essential that a safe clearance is maintained from any combustible materials. This may preclude the use of downlighters in sloping ceilings where adequate clearance cannot be achieved without creating unacceptable levels of cold bridging. In such situations it may be possible to design a compliant arrangement by using insulating enclosures or making use of CFL (compact fluorescent) or LED lamps.

Downlighters can generate significant heat when fitted with halogen lamps

Where the downlighter is exposed within a loft space used for storage, combustible materials may accidentally be laid over it and so pose a risk for the outbreak of a fire. In such situations good practice is to fit clearly visible protective covers as a precaution.

Sound insulation

Internal floors within dwellings

Building Regulation Part E 2003 introduced new controls on the sound insulating properties of floor construction within dwellings which revised requirements for separating floors in existing dwellings. The new standard requires floors to achieve a sound reduction of 40 R w dB and raises the question as to

whether the installation of downlighters could adversely affect the performance of floors.

Advice from experienced acoustic consultants confirms the installation of these fittings has relatively negligible effects on sound insulation, with tests suggesting they will only reduce levels by 1– 2 dB. It would therefore seem reasonable that downlighters can be used on internal floors without any additional measures being necessary.

Separating floors between dwellings

The use of downlighters in separating floor constructions is covered in the Robust Details guide, which states a minimum ceiling void of 75mm is needed. Installation should be in accordance with manufacturers' recommendations and include the following:

- No more than one light per $2m^2$ of ceiling area in each room
- At centres not less than 750mm
- Openings in the lining should not exceed 100mm diameter or 100 x 100mm if square.
- Only downlighters that have been assessed in accordance with the procedure described in the Robust Details guide Appendix F are acceptable.

Separating floors not covered by Robust Details should not be used unless satisfactory evidence is provided of compliance with the Building Regulations.

Thermal insulation

Cold bridging

It is commonly noted that newly built extensions and dwellings have a significant number of uninsulated patches around the downlighter fittings in the ceilings. The cumulative effect of this in terms of heat loss can be substantial.

Diagram 1: Unprotected fittings are not suitable for use

BR443 2006 (conventions for U-Value Calculations) makes provision for assessing uninsulated areas to give an area weighted average U-value for a roof or floor. This may result in an increase in the insulation thickness elsewhere to compensate for the gaps around the fittings. Calculations are rarely available when assessing smaller projects and other measures may be more appropriate to demonstrate compliance. The detail shown in diagram 1 is an acceptable solution to most local authorities. The BS EN 60958-1 symbol below is often used to show that unprotected fittings are not suitable for use.

Most commonly available low voltage or halogen spot lights (Dichroic lamps) allow much of the radiated heat to dissipate through the back of the lamp and can cause significant heat build-up problems unless they are fully protected. However, there are some aluminium lamps that direct heat through the lens of the lamp and so need a smaller pocket of insulation to safely accommodate the fitting. Unfortunately there is no way of ensuring that bulbs are not interchanged and so cause potential future heat build-up problems if changed from one type to the other.

Light emitting diode (LED) models do have the advantage of creating very little heat (see 'efficient lighting' below) making it possible to cover the unprotected fittings with insulation and eliminate cold bridging entirely.

Air leakage

The energy efficiency of a new dwelling or extension is reliant on the quality of the construction to minimise the loss of heat due to uncontrolled air leakage, with most new dwellings undergoing air leakage testing on completion. Proper specification of downlighters, where they penetrate ceilings to insulated roofs, is important to ensure a reasonably airtight seal. This may be by using an integrally sealed unit or fitting a hood or boxing over the fitting. An example is shown in diagram 2. (see also sections on compatibility with roof underlays and clearance to combustible materials)

Efficient lighting

Building Regulations Approved Documents L.1A and L.1B give guidance on the minimum provision of energy efficient lighting. They advise that at least three out of four light fittings should be a low energy type i.e. have luminous efficacy of not less than 45 lumens per circuit-watt and total output greater than 400 lamp lumens. Light fittings supplied of less than five watts can be excluded from the overall count. Standard fittings with low energy lamps are acceptable.

Condensation issues

The introduction of high performance 'vapour permeable' roofing underlays permits designers to reduce or omit provisions for cross ventilation as a precaution against the build-up of interstitial condensation in the roof void. To comply with the building regulations the design and installation of this type of underlay must accord with BS: 5250:2002 or the installation details in BRE and BBA certificates. The ceiling to the roof must be properly sealed to minimise the passage of water vapour to the roof space.

Standard open downlighters are unlikely to be able to meet this requirement; therefore fittings that are specifically designed for this use must be used. Alternatively a sealed box or hood as detailed above will also meet the requirements of the Building Regulations, but it should be noted standard 'fire hoods' are not likely to be suitable for this purpose.

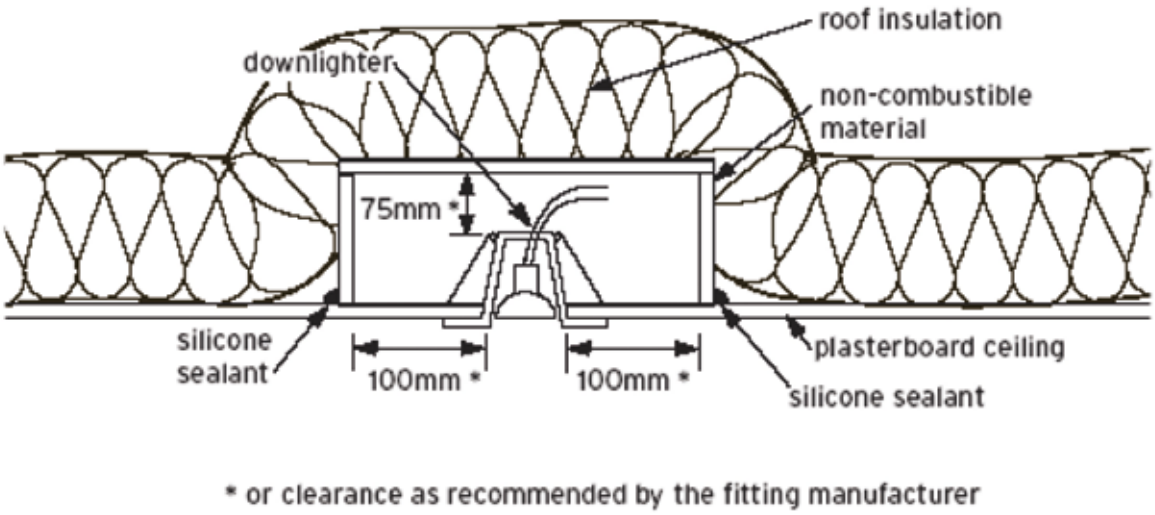

Diagram 2: Typical arrangement for an enclosed downlighter in a roof space

Key points to consider

- Downlighters can generate significant heat when fitted with halogen lamps. Maintain a safe clearance from any combustible materials
- Use Robust Details when installing lights in separating floors
- Heat loss in roofs can be substantial. Ensure fittings are suitable for this location
- Use light emitting diode (LED) lamps wherever possible to minimise energy use and heat build up
- Carefully specify downlighters where they penetrate ceilings to insulated roofs to prevent air leakage
- Properly seal light fittings to minimise the passage of water vapour to the roof space

Further guidance

* Trada Technology Report 1/2001
Timber frame walls and floors: Fire resistance of service penetrations ISBN 900510 28 6
www.trada.co.uk

** Chiltern International fire assessment FEA/F97099 Rev C TJM Europe TJI/PRO 150,250,350 and 550 series Floor Joist System
www.chilternfire.co.uk

Produced with assistance from the LABC Herts Technical Group

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