

Guidance on ceiling penetrations in separating timber floor constructions

(including those for downlighters, ceiling speakers and sprinklers) on the fire resistance of timber separating floor constructions in residential premises

BD 2551

Building Research Establishment

July 2008

Communities and Local Government: London

The authors of this report are employed by the Building Research Establishment (BRE). The work reported herein was carried out under contract placed by the Department for Communities and Local Government. Any views expressed are not necessarily those of the Department.

Department for Communities and Local Government
Eland House
Bressenden Place
London
SW1E 5DU
Telephone: 020 7944 4400
Website: www.communities.gov.uk

© Crown Copyright, 2008

Copyright in the typographical arrangement rests with the Crown.

This publication, excluding logos, may be reproduced free of charge in any format or medium for research, private study or for internal circulation within an organisation. This is subject to it being reproduced accurately and not used in a misleading context. The material must be acknowledged as Crown copyright and the title of the publication specified.

Any other use of the contents of this publication would require a copyright licence. Please apply for a Click-Use Licence for core material at www.opsi.gov.uk/click-use/system/online/pLogin.asp, or by writing to the Office of Public Sector Information, Information Policy Team, St Clements House, 2-16 Colegate, Norwich, NR3 1BQ. Fax: 01603 723000 or email: HMSOlicensing@cabinet-office.x.gsi.gov.uk

If you require this publication in an alternative format please email alternativeformats@communities.gsi.gov.uk

Communities and Local Government Publications
PO Box 236
Wetherby
West Yorkshire
LS23 7NB
Tel: 08701 226 236
Fax: 08701 226 237
Textphone: 08701 207 405
Email: communities@twoten.com
or online via the Communities and Local Government website: www.communities.gov.uk

July 2008

Product Code: 07HP05157/Guidance

Chapter 1

Introduction

The fire resistance of timber intermediate floors in residential premises is primarily achieved by the provision of a gypsum plasterboard ceiling. However, the fire performance of a floor depends on several factors. It will not only depend on using the correct type and thickness of plasterboard, but also on the type of joist and flooring. For example, engineered joists will behave differently from solid joists.

Services that are built into the floor construction and which penetrate the ceiling could adversely affect its fire resistance. For instance, where downlighters, ceiling speakers, sprinklers and other electrical accessories are installed, additional protection may be required to retain the integrity of the floor. Additional protection may be in the form of fire-rated hoods or plasterboard enclosures installed above the ceiling line, boxing-in the service or fitting. Alternatively, the installed items may be specially designed to improve their fire performance. Consideration should be given to the effect of these installations on the fire resistance of the floor and any protective measures that are employed should be compatible with their safe use.



Figure 1: Compartment fire test

There was a lack of information on a range of commonly used services and the influence that penetrations cut into a ceiling for such services may have on the integrity of separating timber floors required for fire compartmentation. In recognition of this, Communities and Local Government commissioned BRE to undertake a project to address some of the issues identified. A description of the work undertaken and results found are given in BRE report number 231136. A series of experiments was conducted on a number of floor constructions and service installations, see Figure 1. These experiments included domestic-scale compartment fires and fire resistance furnace tests. Additionally, tests were conducted to investigate the influence of protective measures (boxing-in) on the performance characteristics of concealed residential sprinkler heads.

This guidance provides advice on some of the more common situations and solutions that may need to be considered. It is intended for building control bodies, fire and rescue services, installers and those charged with making judgements on the acceptability of the fire resistance of separating timber floor constructions.

The effect of ceiling penetrations

The effect of ceiling penetrations on the fire resistance of a timber floor is influenced by many factors, some of which are as follows:

- size of each opening
- number of openings
- proximity of openings to one another and to the floor joists
- design and construction of the service or fitting
- the load that the service or fitting will apply to the ceiling during fire conditions
- fixing method for the service or fitting
- floor construction, including the type of joist and the ceiling specification
- the size of open void space above a penetration
- the integrity of a void space (ie a sealed or ventilated void space).

Small variations in details such as described above can significantly affect the fire resistance.

Any test evidence used to substantiate the fire resistance of a construction, fitting or protective measure should be carefully checked to ensure that it is applicable to the intended use.

Additional protective measures for ceiling penetrations (for example, downlighters and ceiling speakers)

Some products are available that have been tested as part of a construction and may not need to be provided with any additional protection.

Where no test evidence is available, or where that evidence is not representative of the intended use, then additional protection measures should be incorporated. These either can take the form of proprietary products or be constructed in-situ at the time of installation.

Where an additional protective measure is deemed necessary, see Figure 2, the manufacturer's guidance should be sought to ensure that there is no adverse effect on the safe use of the service or fitting. For example, enclosing a light fitting without adequate space around it may lead to the fitting becoming over-heated. Care should also be taken to ensure that the test evidence for the protective measure is relevant to the service or fitting in question. Methods employed should be supported by adequate fire testing and/or assessment by an independent body.



Downlighter fire hood



Plasterboard boxing-in construction

Figure 2: Examples of boxing-in construction

Protective measures for concealed residential sprinklers

The following guidance relates to constructions where it has been deemed necessary to have both concealed sprinklers installed and a compartmentation floor.

Owing to the limited number (one or two per room) and size of openings resulting from the installation of concealed residential sprinklers, it is not normally necessary to provide any additional protective measures for floors with a period of fire resistance of up to 60 minutes. However, it is important that sprinklers are fitted with an exact size hole in accordance with the manufacturer's guidelines.

For periods of fire resistance of more than 60 minutes, and in the absence of any test evidence, then protective measures should be provided which have been shown by independent tests and/or assessments to be suitable.

Many concealed pattern sprinklers have ventilation openings (see Figure 3) which allow air movement past their thermal element. Boxing-in of concealed residential sprinklers has been shown to detrimentally affect their thermal sensitivity, when compared to sprinklers tested with no restrictions to the flow of air through the sprinkler vent holes. Therefore, where fire protective measures are thought to be necessary, consideration should be given to selecting sprinklers without vent holes.



Figure 3: Example of concealed sprinkler ventilation holes