

BS 5250: 2002

Control of condensation in buildings

Amendment 1

Well sealed ceilings explained

- BS 5250: 2002 Amendment 1
- Partners in innovation Research Project – Improved Thermal and moisture performance of pitched roofs: 2005
- BR262: 2002 Thermal insulation avoiding risks
- BRE IP 4/06 Airtightness of ceilings - energy loss and condensation risk
- BRE IP 5/06 Modelling condensation and airflows in roofs

Introduction

The last six years have seen some heated debate regarding the need for roofspace ventilation in both warm (insulation at rafter line) and cold (insulation at joist level) pitched roofs, especially when vapour permeable/breathable (type

LR) underlays are used. In 2001 this debate prompted the start of the Partners in Innovation (PiI) research project entitled 'Thermal & moisture performance of pitched roofs' funded by Dti and industry which concluded in April 2005. One of its outputs was to provide amendments to the roofing section of BS 5250: 2002 Control of condensation in buildings. This amendment

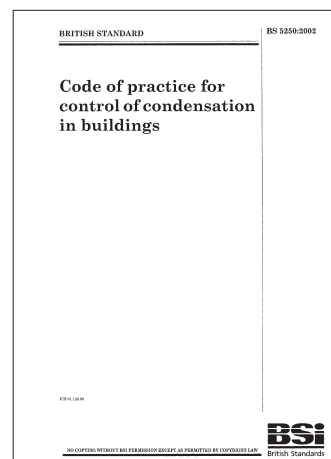
became increasingly important in England and Wales with the demise of Approved Document Part F2 Condensation in Roofs, being replaced by Approved Document C2 2004 edition which specifically refers to BS 5250 as means of compliance. BS 5250 has always been the means of compliance in the equivalent Scotland, Northern Ireland and Eire Regulations.

BS 5250: 2002 Amendment 1

BS 5250: 2002 'Control of condensation' Section 8.4 is now the main means of complying with the regulatory requirements and is subdivided into cold roofs with large voids above horizontal insulation and warm roofs with small or no voids above sloping insulation. The

effectiveness of how well sealed the ceiling is constructed will determine the condensation risk, ventilation requirements and energy efficiency of the building.

Air leakage through ceilings transfers more moisture into the roof by convection than passes through the ceiling materials by diffusion. In colder conditions, this air movement also takes with it heat from the building. Sealing the ceiling will reduce both moisture transfer and heat loss, thus minimising the risk of condensation whilst at the same time improving the energy efficiency of the building.

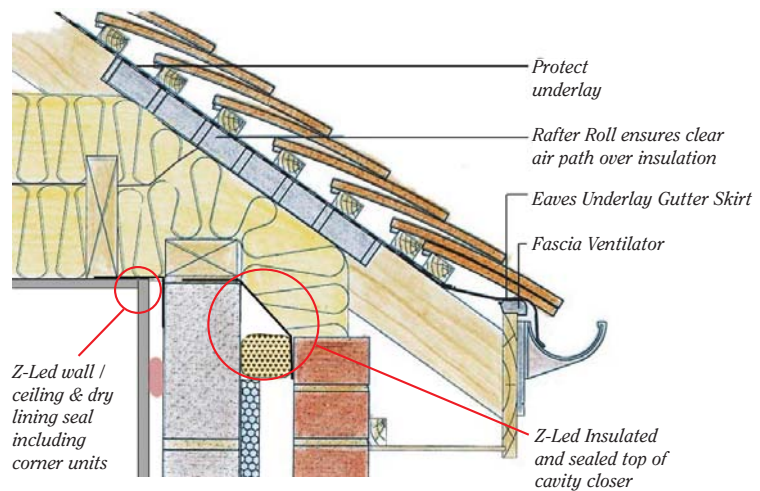


Well Sealed Ceilings

Clause 8.4.1.2 in the new BS 5250: 2002 (AMD 1) recognises that a totally airtight (convection tight) ceiling is extremely difficult to achieve in practice but provides very specific advice on how to construct what has been termed a "well sealed ceiling"

A well sealed ceiling requires the following;

- The ceiling should avoid gaps, especially at the wall/ceiling junction with dry lining (plaster on dabs) constructions and holes in the ceiling.
- The ceiling should be sealed to the external walls to limit any leakage through cracks.
- The top of any cavity in any wall or partition should be sealed to prevent transfer of warm moist air into the loft.



Loft Access Hatches

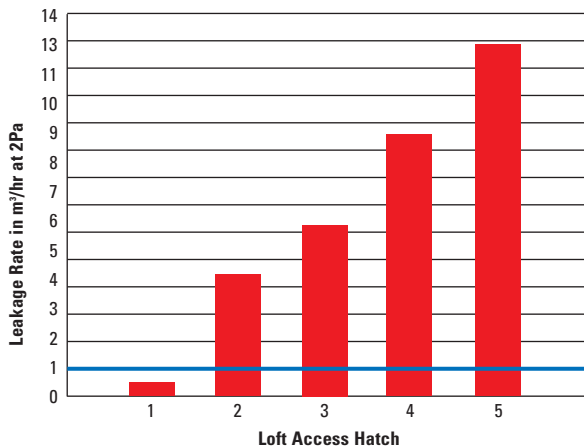
- No access door or hatch should be located in rooms where large amounts of moisture are produced including kitchens or bathrooms.
- The air leakage rate through an access hatch including its frame when tested to BS EN 13141-1:2004 is to be less than 1.0m³/hr at 2Pa.



- Hatch covers should either be heavy enough to compress a seal or be clamped, with a closed cell compressible seal or 'O' ring between it and the frame.
- Drop down hatch covers are more difficult to seal; it is recommended that proprietary units with a supplied hatch cover in a frame are used. Manufacturers can provide third party evidence that the leakage criterion is met.

This is the first time that loft access hatches have had to achieve an air leakage performance in addition to the minimum thermal performance of Part L. BS 5250 is now the means to comply with the requirements of Part C2, therefore this performance requirement takes on even more importance.

BS 5250: 2002 does not require air/convection tightness of loft access hatches as that is almost impossible short of having a submarine air lock! From testing of commercially available loft traps, many are a long way from the maximum leakage levels set.



All Glidevale loft traps are designed to meet the level of air leakage set in BS 5250: 2002. All Glidevale loft traps also have closed cell compressible seals and latches as standard.

It is important to note that there is not a convection tight loft access hatch available in the marketplace despite such products being one of the conditions of use of BBA Technical Approvals for unventilated cold pitched roofs.

Recessed Downlighters

- Recessed light fittings should be rated IP60 to 65 or incorporate an appropriate sealed hood or box. The total leakage through all downlighters should not exceed 0.06m³/hr/m² of ceiling at 2Pa when tested to BS EN 13141-1:2004.

Many recessed or downlighter type fittings have been shown to be a major source of water vapour escape into loft spaces. As a general rule, IP65 fixed types have been shown to be sufficiently well sealed but other types can have a wide range of performance. Testing has shown the swivel or moveable types to provide the poorest performance. The BS 5250: 2002 performance level is not asking for air/convection tightness but a level where a well sealed ceiling can be achieved. The NHBC have provided advice on downlighters in Standards Extra 31 December 2004. Their recommendations, which are in agreement with BS 5250: 2002, are that if the performance of products is not known, then a sealed box or hood should be installed above the unit.

Downlighters in ceilings below roof spaces

The installation of open downlighters in ceilings under roof spaces has become very fashionable. Unfortunately their installation involves cutting a hole in the ceiling which creates a route for air to flow from the rooms into the roof space above. This air flow leads to a loss of useful heat and the movement of water vapour from the rooms into the roof space. The movement of water vapour can lead to condensation in the roof, particularly when the rooms below are wet areas such as bathrooms and shower rooms.

Many downlighters are fitted with lamps which are designed to transmit much of the heat generated by the lamp out through the back of the lamp and lamp fitting. To avoid the lamp and fitting being damaged by overheating, the manufacturer's installation instructions state a minimum air gap that should be provided around and over the fitting.

Correctly installed downlighters should not create an air path between the rooms and roof space and should meet the recommended air space around and above the fitting to allow for the safe dispersal of heat. Sealed downlighters are available which maintain the airtightness of the ceiling and these are particularly useful in wet rooms such as bathrooms and shower rooms. Depending on their location, these may be required in order to meet electrical regulations.

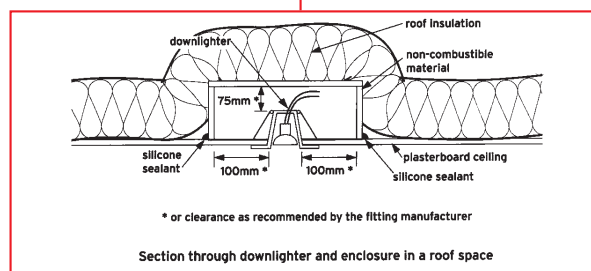
Where sealed downlighters are used it is still important to maintain the recommended air space around and over the fitting as a hood, boxing or other suitable housing should be provided to support the roof insulation over of the fitting.

Where open downlighters are used, they should be installed with a suitable hood or boxing which completely encloses the fitting within the roof space. The hood or boxing should be sealed to the back of the ceiling to stop air leakage into the roof space. It is important that the hood or boxing is large enough to ensure the minimum air space is maintained around the fitting to allow for the safe dissipation of heat from the lamp. The hood or boxing should be made of materials that are not affected by heat from the enclosed lamp.

Where roof insulation is installed at ceiling level it should be taken over any hood/boxing without gaps in the insulation to avoid cold bridging.

Action
When installing downlighters ensure that the airtightness of the ceiling is maintained and that the manufacturer's minimum recommended air gap is maintained around and above the fittings to avoid heat from the lamp causing a potential fire hazard.

Section through downlighter and enclosure in a roof space



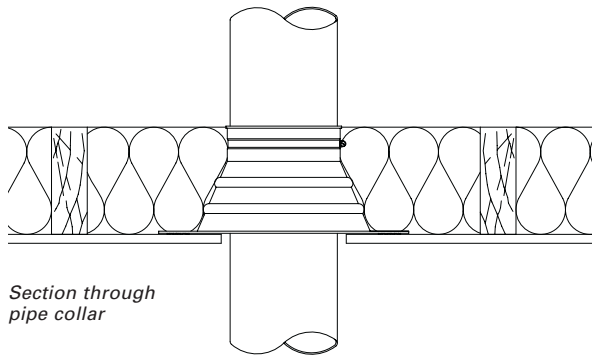
The performance figure in BS 5250 is per m² of ceiling and the individual performance of any downlighter quoted by manufacturers has to be converted to determine the number of units which can be used. Further information can be obtained from the Lighting Association at www.lightingassociation.com

Electric & Plumbing Services, Extracts and Rooflights

- Penetrations, such as those for services (pipes, electrical services, extracts for fans or PSV outlets) and rooflights (skylight, tubular and modular) should be permanently sealed with suitable proprietary products.

Any service or product which penetrates the ceiling is a potential route for water vapour and heat to escape. It is important that once installed, such penetrations are suitably sealed. Pipe seals for plumbing services are available in both flexible "overboot" and two part semi-rigid types in a range of sizes that can be clamped to pipes and then sealed to the ceiling. Generally they work best with single pipe penetrations with clearance all round the pipe. This is sometimes not the case with many pipe penetrations being multiple in nature and close together in corners of the rooms.

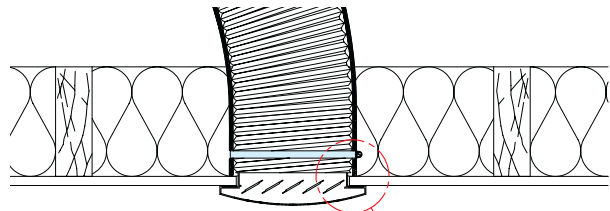
In such circumstances, careful cutting of the plasterboard around the pipes is required with remaining gaps filled with a suitable flexible long life sealant which can withstand a range of temperatures.



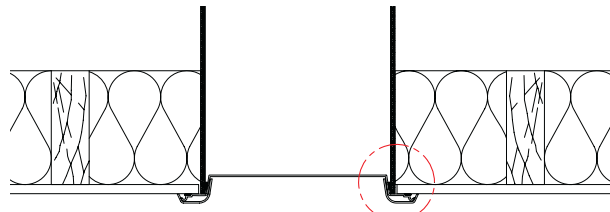
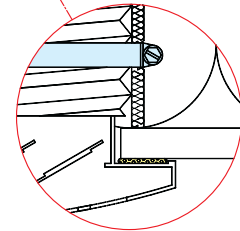
Electrical services which penetrate ceilings are usually behind light fittings and ceiling roses. The mains cables that penetrate the ceiling should be sealed with a suitable flexible sealant ensuring that the sheathing or casing is unaffected by such sealants.

Proprietary products such as extraction outlets or tubular rooflight diffusers should be sealed to the ceiling to prevent water vapour and heat escape into the loft space. The pipes or ducts which connect to the extract or diffuser should also be sealed otherwise the former sealing will be ineffective.

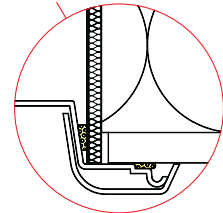
As it is often necessary to remove extracts or diffusers for periodic cleaning and maintenance, the most effective form of sealing is by means of closed cell foam strips or 'O' ring type gaskets.



Section through extract unit showing seals to ceiling and pipe



Section through tubular rooflight showing seals



Designers should ensure that the sealing details are robust over the lifetime of the building. A well sealed ceiling requires high standards of workmanship by the trades involved in installing plasterboard or other ceilings, plumbing or electrical services. It may not be possible to achieve a well sealed ceiling in refurbishment or re-roofing of existing buildings.

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