CI/SfB (47)
Uniclass L529
March 2006

BS 5250: 2002
Control of condensation in buildings
Amendment 1
The new roof ventilation provisions explained

- BS 5250: 2002 Amendment 1
- Partners in Innovation Research Project – Improved Thermal and moisture performance of pitched roofs: 2005
- BR 262: 2002 Thermal insulation avoiding risks
- IP 4/06 Airtightness of ceilings - energy loss and condensation risk
- IP 5/06 Modelling condensation and airflows in roofs

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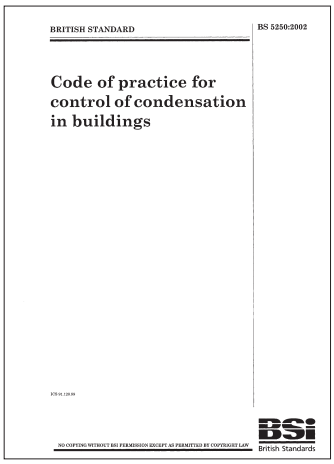
Introduction

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.


Technical Summary of Partners in Innovation Project
Improved Thermal and moisture Performance of Pitched Roofs

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.


BRITISH STANDARD
BS 5250:2002
Code of practice for control of condensation in buildings
BSi
British Standards

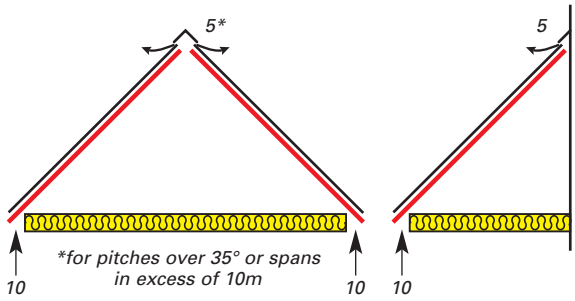
Cold Roofs with large voids above horizontal insulation

Roofs of this type can be split into those with impermeable underlays (type HR) and those with vapour permeable underlays (type LR) .

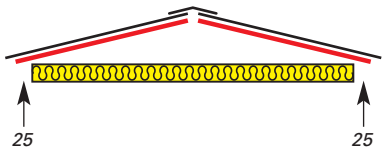
Impermeable underlays (type HR)

In all roof types

For pitches of more than 15° the harmful effects caused by condensation can be controlled by ventilation beneath the underlay (or beneath timber sarking boards or sheets in the case of Scottish practice) of **10,000mm²/m** at eaves or low level. Ventilation at ridge or high level of **5,000mm²/m** should be provided where the pitch exceeds 35°, where the construction is mono-pitch or lean-to or where the span of the roof exceeds 10m.



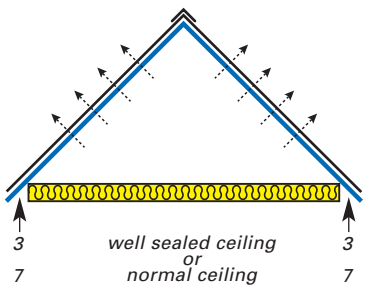
For pitches of 15° or less the harmful effects caused by condensation can be controlled by ventilation beneath the underlay (or beneath timber sarking boards or sheets in the case of Scottish practice) of **25,000mm²/m** at eaves or low level. In the case of cold flat roofs **25,000mm²/m** should be provided at two opposite roof edges.

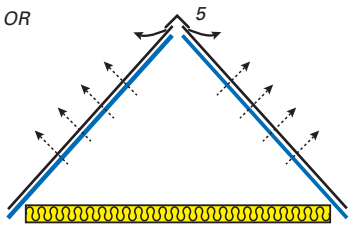


Vapour permeable underlays (type LR)

In dwelling size roofs

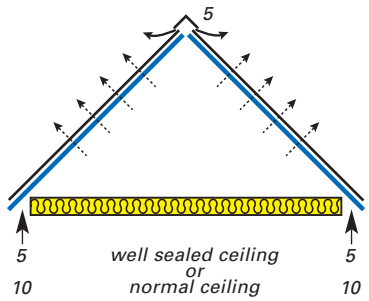
For all pitches, the harmful effects caused by condensation can be controlled by ventilation beneath a vapour permeable underlay (or beneath sarking boards such as 150mm planks in the case of Scottish practice) of **3,000mm²/m** at eaves or low level.
This is on the condition that the ceiling is ***'well sealed'*** as defined by clause 8.4.1.2 of BS 5250.
If the ceiling is not well sealed (likely in re-roof situations) then the ventilation at eaves or low level should be increased to **7,000mm²/m**.
An alternative solution is to provide **5,000mm²/m** at ridge or high level.
This reduction in ventilation provision is possible due to the diffusion properties of the vapour permeable underlay contributing to the overall condensation control.





Vapour permeable underlays (type LR)
in larger than dwelling size roofs

For all pitches the harmful effects caused by condensation can be controlled by ventilation beneath the vapour permeable underlay (or beneath sarking boards such as 150mm planks in the case of Scottish practice) of **5,000mm²/m** at eaves or low level. This is on the condition that the ceiling is ***'well sealed'*** as defined by clause 8.4.1.2 of BS5250. If the ceiling is not well sealed (likely in re-roof or suspended ceiling situations) then the ventilation at eaves or low level should be increased to **10,000mm²/m**. **5,000mm²/m** should be provided at ridge or high level, irrespective of ceiling tightness.

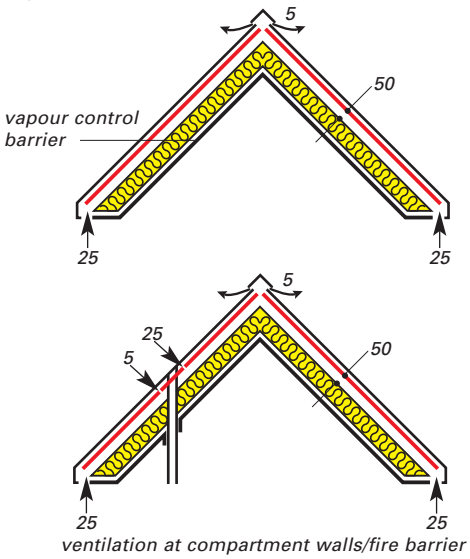


Warm Roofs with small or no voids above sloping insulation

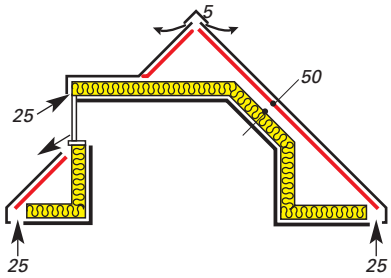
Roofs of this type can be split into those with impermeable underlays (type HR) and those with vapour permeable underlays (type LR) .

Impermeable underlays (type HR) in all roof types

For all pitches the harmful effects caused by condensation can be controlled by ventilation beneath the underlay and above the insulation of **25,000mm²/m** at eaves or low level and **5,000mm²/m** at ridge or high level. The space between the underlay and insulation should be at least 50mm deep with a minimum of 25mm at the centre of underlay drape. In addition to a well sealed ceiling, a separate vapour control layer should be used on the warm side of the insulation. Obstructions such as dormers, valleys, roof windows, compartment walls, fire barriers or changes in pitch create separate voids in the roof slope. Ventilation openings should be provided to each void at both low and high level as shown in examples below.



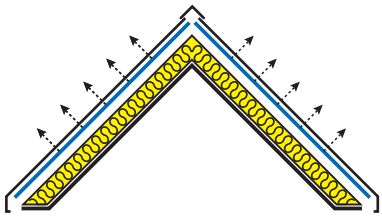
ventilation at compartment walls/fire barrier



room in the roof

Vapour permeable underlays (type LR)
in all roof types with a continuous and effectively sealed vapour control layer

For all pitches the harmful effects caused by condensation can be controlled by the use of a vapour permeable underlay without ventilation which can either be laid fully supported on insulation or draped unsupported. A well sealed ceiling is essential as is a separate vapour control layer used on the warm side of the insulation. If there is any doubt about the ability to provide and maintain an effectively sealed vapour control layer then ventilation should be provided as if the underlay were impermeable.

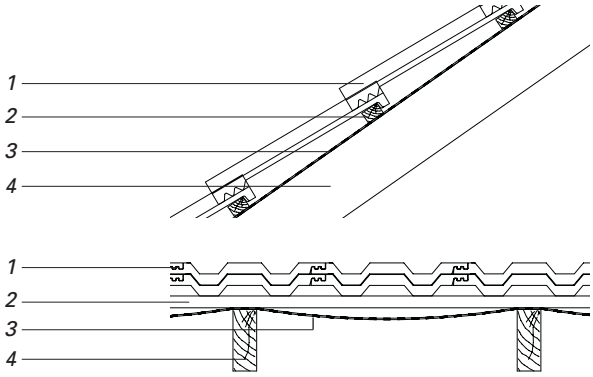


Roof coverings and batten space ventilation
when using vapour permeable underlays (type LR)

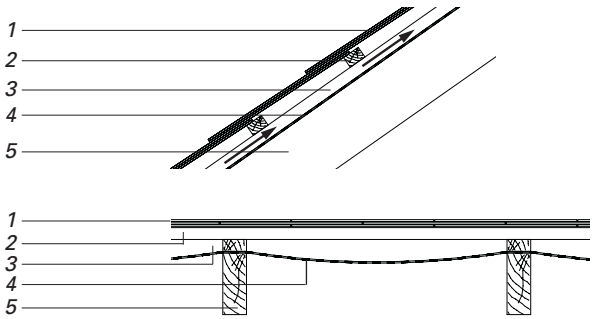
Where vapour permeable underlays (type LR) are used in both cold and warm roofs to contribute to the control of condensation, they do so by allowing water vapour to escape through the material by diffusion. It is important that this water vapour can escape to atmosphere from the batten space. BS 5250: 2002 defines the test method and level of air openness required through the roof covering. For roof coverings that are less air open, additional batten space ventilation and counterbattens will be necessary (see drawings overleaf).

The ventilation should be **25,000mm²/m** at eaves or low level and **5,000mm²/m** at ridge or high level in the counterbatten space which should be at least 25mm deep. This ventilation is in addition to the provisions already described for cold and warm roofs.

This requirement is unnecessary with impermeable underlays (type HR) as there will be relatively little moisture transfer from within the building to the batten space. Traditional concrete and clay tiles should be sufficiently air open, but advice should be sought from the roof covering manufacturer/supplier.



1. Sufficiently air open roof covering
2. Battens
3. Vapour permeable (Type LR) underlay
4. Rafters



1. Roof covering insufficiently air open
2. Battens
3. Ventilated counterbatten space
4. Vapour permeable (Type LR) underlay
5. Rafters

Other Recommendations

1) To achieve good air circulation within any ventilated large void in a roof, openings should be placed on the longer sides of a roof or by some equivalent openings on the shorter sides that will allow good through ventilation, avoiding stagnant air pockets.

2) The entry of rain, snow, birds and large insects is prevented. The latter can be achieved by a nominal mesh / grill size of 4mm which will also avoid excessive airflow resistance.

3) Any ventilation openings should provide a continuous weatherproof path between the loft and outside atmosphere without compromising the weatherproof function of the underlay or of the roof covering.

4) Sealing the ceiling of any building will reduce both moisture transfer and heat loss, thus minimising the risk of condensation in the roof, however a totally airtight ceiling is extremely difficult to achieve in practice.

A well sealed ceiling is more possible but requires high standards of workmanship by the trades involved installing plasterboard, plumbing and electrical services. It is important to consider at design stage how construction details can be achieved that are robust over the lifetime of the building. For more detailed information on well sealed ceilings please refer to the Glidevale White Paper on the subject. When existing buildings are being refurbished or reroofed, the advantages of improving the existing ceiling should be considered. It may, however, not be possible to achieve a well sealed ceiling and that should be borne in mind when determining the form of construction and ventilation provision.

5) Both vapour permeable (Type LR) and impermeable (Type HR) underlays with a smooth underside can cause problems with condensate run off. Underlays which can hold or absorb moisture on their undersides, and re-evaporate it when conditions are more favourable, are beneficial.

Vapour permeable underlay (Type LR) with smooth underside showing condensate run off and dripping

Impermeable (Type HR) underlay with flocked underside showing condensate being held

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