CONTROL OF CONDENSATION IN PITCHED ROOFS

1. INTRODUCTION
As levels of insulation continually increase with our need to improve the thermal performance of buildings to conserve energy, the risk of excessive condensation can also increase, which, if not properly controlled, can result in mould growth and damage to the building fabric.

One way to control condensation within the roof structure is through a combination of limiting airflow from within the living spaces into the roof space, providing controlled airflow from outside and the use of suitable roof underlays. This Technical Bulletin (TB) deals with pitched roof space ventilation products and their application, so for the purposes of this TB, a pitched roof is defined as having a pitch greater than 10 degrees and less than 75 degrees from horizontal.

Building Regulation approved document C2 states that:

‘The floors, walls and roof of the building shall adequately protect the building and the people who use the building from harmful effects caused by:

A) Ground moisture
B) Precipitation including wind – driven spray
C) Interstitial and surface condensation and
D) Spillages of water from or associated with sanitary fittings or fixed appliances’

The Approved Document refers to BS 5250 ‘Code of Practice for Control of Condensation in Buildings’, as a means of compliance with the Building Regulation requirements.

Alternatively, other methods for controlling condensation can be considered for example, through the use of air permeable underlays, however, the product must have third party certification by a UKAS accredited body and the design and application recommendations provided in the product certificate must be followed.

2. VENTILATION PRODUCT REQUIREMENTS
Currently there are no British or European Standards for roof ventilation products. However, there is a draft British Standard entitled ‘Dry-fixed Ridge, Hip, and Verge Systems for slating and tiling – Specification’.

2.1 Durability
Roof ventilation products must be manufactured to remain durable under normal exposure conditions and without loss of performance for the stated design life of the product. Colour-fastness would normally be excluded from the manufacturer’s durability and performance guarantees.

2.2 Strength
Roof ventilation products are not normally designed to withstand pedestrian loads. Product strength and that of its fixings must be adequate to withstand anticipated wind and snow loads for its design life.

2.3 Rain/snow Resistance
Roof ventilation products must adequately resist the ingress of driving rain and snow both through the product and through the fit with surrounding tiles and slates. The wind-driven rain and snow performance between the product and surrounding tiles and slates must be at least comparable with that of the tile or slate array. The product manufacturer should declare details of the test method, test parameters and the product’s performance.

2.4 Airflow Resistance
The airflow resistance of the product, measured at defined airflow rates, should be declared by the manufacturer.

2.5 Free Ventilation Airspace
The geometric free airspace, measured at the product aperture’s narrowest point, should be declared by the manufacturer.
Ventilation products must be installed appropriately to provide the required level of ventilation as described below in ‘Roof Ventilation Requirements’.

2.6 Roof Underlays
Roof underlays are covered in greater detail in NFRC TB 06, but for the purpose of this TB the following classifications are used:

2.7 High Resistance (HR) Underlays
These have a high resistance to the passage of water vapour (>0.25 MNs/g). Also commonly referred to as ‘non-breather’ or ‘impermeable’ underlays. A typical example is traditional under tile/slate bitumen felt (formerly known as 1F).

2.8 Low Resistance (LR) Underlays
These have a low resistance to the passage of water vapour (<0.25 MNs/g). The use of these underlays (commonly referred to as ‘breather’ or ‘vapour permeable’ underlays) can reduce or even eliminate the need for roof space ventilation when used in roof constructions.

2.9 Well-sealed’ Ceilings
The following roof ventilation details refer to a ‘well-sealed’ ceiling. This is defined as one where the ceiling is designed to limit the passage of air through its structure by avoiding construction gaps at wall/ceiling junctions, those around pipe and cable penetrations and air leakage through loft hatches and down-lighters etc. Recommendations for the construction of a well-sealed ceiling are given in BS 9250: Code of Practice for Design of the Airtightness in Pitched Roofs.

3. ROOF VENTILATION REQUIREMENTS
The following pages illustrate how a roofspace should be ventilated in accordance with BS 5250.

Cold Roof with HR (non-breather) underlay

Fig. 3.1
If a building is less than 10 metres wide and the roof pitch is less than 35 degrees then 10 mm eaves ventilation is required.

Fig. 3.2
If a building is 10 metres wide or more or the roof pitch is 35 degrees or above then 10 mm eaves ventilation is required together with 5 mm ridge ventilation.

Fig. 3.3
If a roof pitch is 15 degrees or less, then 25 mm eaves ventilation is required.
Fig. 3.4
For a monopitch or lean-to roof, 10 mm eaves ventilation is required together with 5 mm ridge or top edge ventilation.

Fig. 3.5
For a monopitch or lean-to roof 15 degrees or less, 25 mm eaves ventilation is required together with 5 mm ridge or top edge ventilation.

Fig. 3.6
If a building has a well-sealed ceiling then 3 mm eaves ventilation is required. In practice standard eaves construction i.e. fascia and soffit boards with mineral fibre roof insulation generally provides a fortuitous ventilation gap or 3 mm without the need for proprietary ventilators.

For buildings larger than dwellings or with more complex roof shapes additional high level ventilation should be considered.

If a building has a normal ceiling, then 7 mm eaves ventilation is required. In practice, a commercially available 10 mm eaves ventilation system would normally be used.

**Cold Roof with LR (breather type) underlay**

**NOTE**

- UKAS Accredited vapour permeable membranes are available that can be used without eaves or ridge ventilation.
- Where the external covering of the roof consists of fully supported sheet metal or tight fitting tiles e.g. man-made slate, which are considered relatively airtight and would resist the free movement of water vapour to outside air, the roof should be fully ventilated in the same manner as with an HR underlay. Natural slates, clay and concrete tiles are generally considered air-open and suitable for this type of installation.
Fig. 3.7
Alternatively, 5 mm ridge (or other high level) ventilation can be used if the building has a well-sealed ceiling.

Fig. 3.8
For buildings larger than dwellings, 5 mm eaves ventilation is required with a well-sealed ceiling or 10 mm eaves ventilation with a normal ceiling in addition to 5 mm ridge ventilation.

Fig. 3.9
A well-sealed ceiling with an air and vapour control layer (AVCL) should be installed. There should be a 50 mm gap between the underlay and insulation, to ensure a minimum 25 mm gap, allowing for the drape of the underlay 25 mm eaves ventilation and 5 mm ridge ventilation is required.

Fig. 3.10
Where there are obstructions to the air flow, such as at firewalls, dormers, roof windows or valleys, etc. additional ventilation gaps of 5 mm below and 25 mm above the obstructions are required.

NOTE
- High level ventilation is a mandatory requirement by NHBC.
- Where the external covering of the roof consists of fully supported sheet metal or tight fitting tiles e.g. Man-made slate, which are considered relatively airtight and would resist the free movement of water vapour to outside air, the roof should be fully ventilated in the same manner as with an HR underlay. Naturally slates, clay and concrete tiles are generally considered air-open and suitable for this type of installation.

Warm Roof with HR (non-breather) underlay
Where the insulation only partially follows the roof slope, such as with room-in-roof construction, 25 mm eaves ventilation and 5 mm ridge ventilation is required.

In a warm roof with LR underlay an AVCL should be installed at ceiling level. If it’s not possible to install an efficient AVCL then a ventilated roof void should be installed as shown in Fig. 3.9.

If the building has a normal ceiling then 25 mm eaves ventilation and 5 mm ridge ventilation is required, unless the underlay has a relevant UKAS Accredited non-ventilated certificate.

Some LR underlays may be used in direct contact with the insulation material, if a suitable counter batten is used to create a drainage zone.
3. ROOF VENTILATION REQUIREMENTS

This Technical Bulletin should be read in conjunction with;

- BS 5534 - Code of Practice for Slating and Tiling for Pitched Roofs and Vertical Cladding
- BS 5250 - Code of Practice for Control of Condensation in Buildings
- BS 9250 - Code of Practice for the Design of the Airtightness of Ceilings in Pitched Roofs

When using proprietary products, independent UKAS Accredited third-party certification should be sought and the particular performance characteristics and installation guidelines strictly adhered to.