BS5250 Management of moisture in Buildings - Summary of changes

Introduction

What is BS5250: 2021 – Management of moisture in Buildings

Moisture in buildings is a significant cause of building failures and health issues. BS5250: 2021 – Management of moisture in Buildings provides recommendations on how to manage causes of moisture in buildings through design and construction. BS5250: 2021 – Management of moisture in Buildings, supersedes BS5250:2011+A1:2016 – Code of Practice of Condensation in Buildings.

BS5250: 2021 - Management of moisture in Buildings takes into account how multiple building elements interact with different methods of construction.

As with other British standard for roofing, this is designed for any person involved in : structural design, thermal design, heating equipment, ventilation, mathematical calculations on buildings, condensation, damage prevention, design, surfaces, energy performance/efficiency, building protection, the retrofitting of existing buildings, the health/wellbeing building occupants, moisture design, damp, facilities management. Including architects, surveyors, building contractors, insulation and material manufacturers, and other consultants that deal with the environmental and sustainability.

Why should we use BS5250: 2021 - Management of moisture in Buildings

This standard provides recommendations to the management of moisture in buildings, including surface and interstitial condensation, to high and low internal relative humidity, high levels of ground water and from rain penetration.

The effects of moisture in its various forms, liquid, gas or solid can have considerable impact upon a building, its materials, their performance and health of the occupants.

The latest standard reflects the understanding of moisture risks in buildings, and how some risk has increased through modern methods of construction where air tightness and thermal performance to all building types (except building of sub-zero storage)

What's changed?

There have been some significant changes that have been incorporated into the BS5250: 2021 - Management of moisture in Buildings. Some of the main changes are highlighted within the document.

One of those changes relates to the definition of cold flat roofs.

Cold Flat roof constructions

A cold flat roof construction, where the insulation is placed beneath the structural deck and historically used for domestic extensions has been redefined in line with the guidance within BS6229: 2018- Flat Roofs with continuously supported flexible waterproof coverings - Code of practice. Where it states that:

'*this type of flat roof construction is not now recommended, because of the difficulties with consistently forming and maintaining an effective air and vapour control layer below the insulation and of providing sufficient cross-ventilation beneath the deck'.*

The latter can be particularly difficulty if the flat roof abuts a wall, furthermore the absence of either can lead to a high risk of persistent and harmful interstitial condensation occurring on the underside of the deck or upper surface of the insulation.

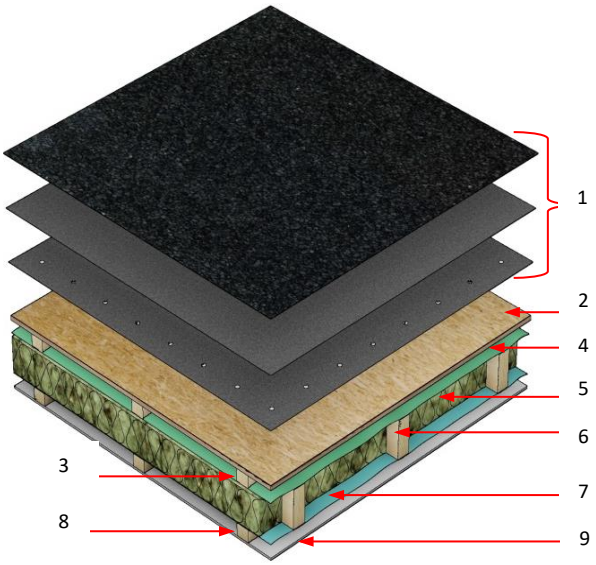
Both BS 6229:2018 and BS 5250:2021 recommend that a minimum 50 mm air gap is maintained between the thermal insulation and cold deck and that cross-ventilation is provided to this roof void via ventilation openings equivalent in area to a continuous opening of not less than 25 mm on each side of the roof void. In addition, the air and vapour control layer is to be installed on the warm side of the thermal insulation which is to be fully sealed at laps, penetrations and abutments.

The reality in practice, is that it is difficult to achieve continuity of an air and vapour control layer in cold flat roof constructions, where the framing and penetrations would make it impractical to effectively seal the air and vapour control layer; this is one of the main reasons why cold flat roof construction is discouraged. BS5250: 2021 in line with BS6229:2018 both now clearly state that cold flat roof constructions where roof voids greater than 5m in span

should not be used which would mean any refurbishment of cold roofs with spans greater than 5m should be converted to either a warm or inverted roof construction.

However, cross-ventilation is now only deemed effective up to a maximum of 5 m spans where the void can be vented at both ends and so BS 5250: 2021 states this type of construction should not be used (this is irrespective of whether being used in new build or refurbishment of existing, where cold insulated flat roof voids are greater than 5 metre in span, or are less than 5 metre in span but can't be ventilated at both ends, or when an AVCL can't be installed on the warm side of the insulation).

Cold Roof build up



Key

1. Waterproofing layer with optional surface protection
2. Supporting structure/deck
3. Firrings to provide vented void (min 50mm deep)
4. Breather membrane
5. Thermal insulation
6. Structural frame
7. Air and Vapour Control Layer (AVCL)
8. Firrings to provide service void (min 25mm deep)
9. Internal finish

Another key change within BS5250: 2021 is the redefined humidity classes.

Humidity classes.

One section that has always caused some confusion is the humidity class table and building types. Some of the main changes is the inclusion in the BS5250: 2021 table 12 is the inclusion of schools and hospitals as well as the redefined classes for dwelling with high and low occupancy, and something you will need to be aware of when undertaken calculations.

BS5250:2011+A1:2016 – Code of Practice of Condensation in Buildings. Superseded

Humidity class table D7 Internal humidity classes: building types and limiting relative humidities at T_3 = 0C

Humidity Class	Building type	Relative humidity at internal temperature		
		15 C	20 C	25 C
1	Storage areas	≤50	≤35	≤25
2	Offices, shops	50 - 65	35 - 50	25 - 35
3	Dwellings with low occupancy	65 - 80	50 - 60	35 - 45
4	Dwellings with high occupancy, sports halls, kitchens, canteens, buildings heated with unflued gas heaters	80 - 95	60 - 70	45 - 55
5	Special buildings e.g. swimming pool, laundry, brewery.	≥95	≥70	≥55

BS5250: 2021 - Management of moisture in Buildings.

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1	Storage areas	≤50	≤35	≤25
2	Offices, shops and Dwellings with low occupancy	50 - 65	35 - 50	25 - 35
3	Dwellings with high occupancy, and other buildings with unknown occupancy.	65 - 80	50 - 60	35 - 45
4	sports halls, kitchens, canteens, school classrooms, hospitals, buildings heated with unflued gas heaters	80 - 95	60 - 70	45 - 55
5	Special buildings e.g. swimming pool, laundry, brewery.	≥95	≥70	≥55

You will notice class 1 and 5 are unchanged. However 2, 3 and 4 have realigned low and high occupancy class, and also now added school classrooms and hospitals into class 4.

This obviously complicates the categories in Build desk, which would be better to become 1-5.

Condensation - risk design.

Another significant change to BS5250:2021 is the calculation method for different roof types and when a detailed condensation risk analysis should be undertaken or not. The table is more simplified for the user to follow than the previous version.

Material properties in calculations

Within the updated version of BS5250: 2021 now states that independently certified values from manufacturers' literature should always be used when available. If such data is unavailable, the values in table B1 in BS5250:2021 may be used although their use should recognise the uncertainty of the results.

Pitched roofs

Designs should take into consideration where the insulation is within a pitched roof construction.

BS 5250: 2021 has not made any significant changes to how warm pitched, cold pitched or hybrid pitched roofs should be ventilated leaving current guidance essentially unchanged from the BS 5250:2011+A1:2016 standard, however provides further clarity on the key points:

- Advice on the design and use of Low resistance and high resistance membranes as well as air and vapour control layers when they are used within air permeable and air impermeable roof coverings.
- Greater focus on sealing openings and penetrations to maintain air tightness, especially into cold roof voids.
  It is very difficult to create an air tight seal, so allowance in the design must provide a minimum level of ventilation to the roof void. In conjunction with a vapour permeable underlay and open air roof coverings to ensure the risk of condensation is minimal within the roof build up.
- Greater focus on minimising thermal bridging at eaves.
- Design to minimise surface condensation of an occupied space by ensuring the thermal insulation is continuous and cold brides are minimal.
- Calculation methods of assessing moisture risk in pitched and flat roofs as both theory and as built conditions.

Cold pitch roofs

However further clarity has been provided on cold pitched roofs utilising a low resistance (LR) underlay with an external roof covering that is classified as air-tight such as profiled metal sheet.

BS 5250:2011+A1:2016 recommended the designers either ventilate the batten space or the loft space, the new guidance states that the loft space should be ventilated, as a minimum, and subject to the advice of the manufacturer of the external roof covering, the batten space may also need to be ventilated.

This makes it more difficult in practice to ventilate cold pitched roofs with LR membranes with air tight roof coverings, and that additional ventilation may be necessary to vent both the loft space and the batten space, so may well be more practical to use the HR membrane so only the loft space needs to be ventilated.

Air permeability of outer waterproof covering

The outer weatherproofing covering is deemed to allow sufficient air movement and be air permeable if the airflow in m^3h at a differential at 10Pa is greater than 17.4*Ar* where *Ar* is the area of the outer weatherproof covering under test in m^2 (as defined in BS 5534: 2014+A2: 2018 , Annex L.

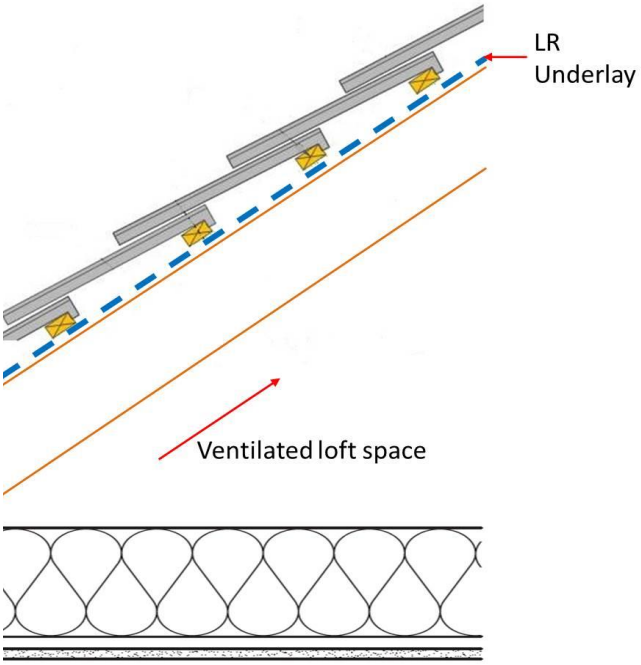
If the airflow is not greater than 17.4 *Ar*, then the outer weatherproof covering is deemed air impermeable.

When an air impermeable outer weatherproofing is used on a cold pitched roof with a Low resistant membrane, there is a risk of moisture accumulating on the underside of the outer weatherproof covering that may lead to damage to the building fabric, as such the following should be undertaken:

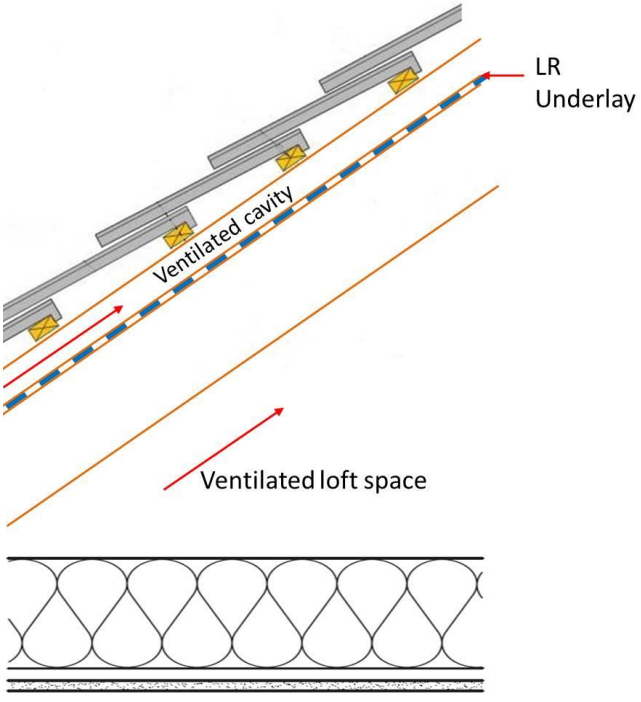
1. Ventilation openings to the roof void
2. Subject to the outer weatherproofing covering manufacturers recommendations, ventilation openings to the batten space above the LR membrane, created using 25mm deep counter battens, having a minimum free area of not less than 25000mm^2/m at eaves or low level 5000mm^2/m at ridge or high levels.

If the batten space ventilation is not provided in accordance with point 2, then the LR membrane should be treated as a HR membrane when determining the levels of ventilation to the roof void.

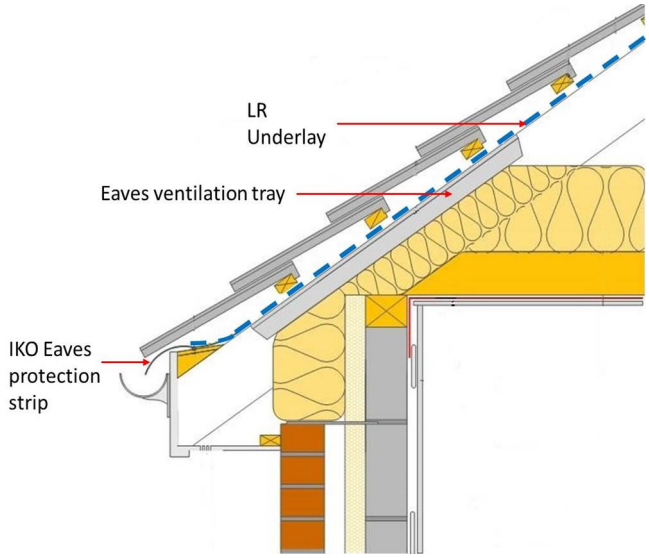
Cold pitched roof – Low Resistance underlay – Air permeable outer weatherproof covering



Cold pitched roof – Low Resistance underlay – Air impermeable outer weatherproof covering



Eaves detail - Cold pitched roof – Low Resistance underlay – Air permeable outer weatherproof covering



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