DRYZONE®

MOULD AND CONDENSATION GUIDE

Causes and Prevention

SAFEGUARD® | BUILT TO PROTECT

What is Condensation?

The Science of Condensation

Water vapour is always present in household air. When air is warm it has the capacity to hold more water vapour than cold air. This leads to a situation where the air temperature drops and warm, moisture-laden air comes into contact with cold surfaces. The air is cooled until liquid water is deposited on the cold surface. This is known as *'condensation'*.

On impervious surfaces like glass and paint, water collects as beads or film. On permeable surfaces like wallpaper and porous plaster, the condensing water is absorbed into the material. If this happens, the problem is not always obvious.

Water that absorbs into permeable surfaces can lead to problems:

- *Surface damage*
- *Mould and fungi growth. This can lead to further surface damage and is hazardous to human health.*

For more information regarding these health concerns, refer to the *Homes (Fitness for Human Habitation) Act 2018,* which puts a responsibility on landlords to reduce condensation problems.

Where Does Water Vapour Come From?

There are 3 main sources of moisture in a new house:

Construction: typically 4000 litres of water are used to build a house which are present in the wet concrete, mortar and plaster. This high initial moisture content disappears over time as the house dries out.

Natural Water Vapour: there is a significant amount of water vapour naturally present in the air – roughly 5 litres per house depending on the season and size of the house.

Occupants: two occupants may generate 9 – 12 litres of water per day (see table below). Increasing the number of occupants, particularly in a small space, increases water vapour concentration. Overoccupancy always leads to greater condensation problems.

ACTIVITY	MOISTURE GENERATED
People present	1.2 kg/person/day
Cooking (using electricity)	2 kg/day
Cooking (using gas)	3 kg/day
Dishwashing	0.4 kg/day
Bathing	0.2 kg/person/day
Washing clothes	0.5 kg/day
Drying clothes indoors	1.5 kg/person/day

Source: Understanding Dampness – BRE Guide (2004)

Other factors such as the existence of penetrating or rising damp can add to the moisture load.

Consider the movement of water from room to room in a house. A higher concentration in one room balances with a lower concentration in another. In the diagram above, the higher water vapour in the kitchen condenses on the cold surface of the bedroom window.

Bathrooms often generate more water vapour. It is good practice to open a window to release water vapour outside the home, which is usually at a lower water vapour pressure. Even on a damp day in winter, there is generally less water outside the house than inside.

The following terms all describe the amount of water in the air. They are interchangeable from one to the other:

Relative Humidity: the amount of water vapour present divided by the maximum amount necessary for saturation (%RH). Tip: imagine a box which can hold 10 litres of water. If you added 5 litres of water it would be 50% filled – or you can say, 50 %RH.

Vapour Pressure: the amount of pressure provided by the water vapour in the air (KiloPascals or KPa). Pressure is a good indicator of how water will move from one area to another.

Concentration: the amount of moisture in the air expressed as a concentration (g/m³ air).

Moisture, Materials and Mould

Moisture Buffering

Materials in a house absorb water to different extents. Natural materials generally absorb more water than man-made materials. The relationship between relative humidity in the air and the moisture content of a material can be plotted on a graph. This is called the *Water Absorption Isotherm,* as seen below. As the relative humidity increases in the air, the amount of water present in the material also increases.

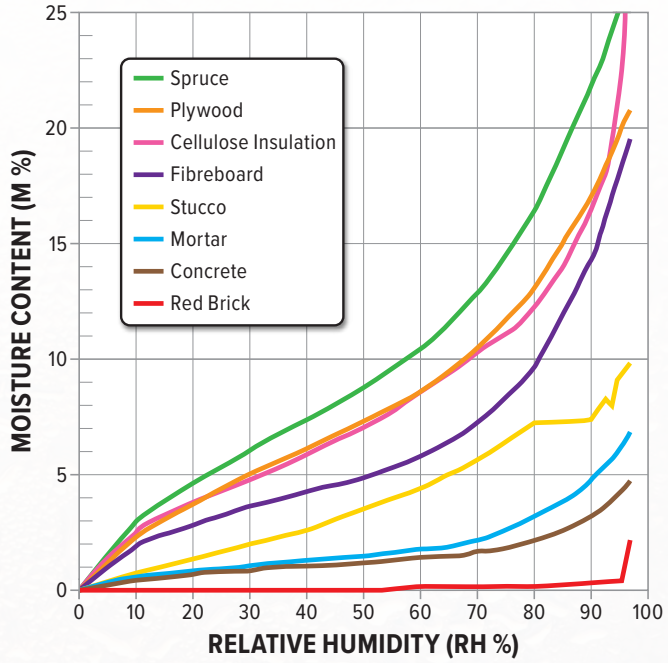


Figure: Sorption Isotherms of Building Materials from Building Science Digest 138 – J.Straube (2006)

Some materials, like softwoods, have a sharp increase in moisture content as RH increases. Others, like brick, do not. These graphs can be used to work out which relative humidity level is required to stop mould or rot from growing in a house.

Materials that absorb a high degree of moisture are called moisture buffering materials. They can stop large peaks in RH by absorbing air moisture at peak times and slowly releasing it once the air dries out. Examples of moisture-buffering materials are books, carpets and curtains. This can be an important consideration as changes to furnishings can have an influence.

Mould and Health

Mould will grow in damp conditions and some of these can have a detrimental influence on human health. A study by the *UK Centre for Moisture in Buildings* has reviewed the relationship between mould and health. A causal link to asthma has been established.

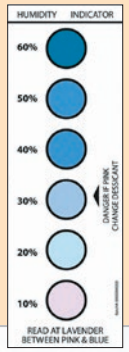
The 2021 *Housing Ombudsman Spotlight on: Damp and Mould* stresses a zero-tolerance approach for landlords to excess condensation and mould complaints. Housing Providers must do everything in their power to manage condensation problems for their tenants.

Mould frequently forms in areas where there is little air movement such as: window reveals, floor-wall and floor-ceiling junctions, behind furniture against colder walls and in the corners of rooms.

The controlling factors in the growth of mould are temperature, humidity and substrate conditions as summarised in the diagram below. Of these factors, temperature and humidity can be readily controlled. For mould to be safely prevented, the humidity should be kept below 70 %RH.

How to Measure Condensation

Humidity Cards: spots of colour printed on the card will gradually 'bleed' into the card surround, depending on the severity of the problem.



Moisture Meters: hygrometers measure water vapour in the air. Only a 'snapshot' reading.

Data Loggers: can take accurate measurements of temperature and humidity over a period of time. Can be viewed on your computer/ phone and plot moisture activity in the home. These are the preferred choice for a detailed study.

Preventative Measures

The Four Common Approaches

There are four different approaches to controlling condensation and mould in the home:

1. **Reduce the amount of water in the air**
2. **Increase the temperature of the surface of the wall**
3. **Absorb excess water with moisture buffering materials**
4. **Control the mould with biocidal products.**

1 Reduce the Amount of Water in the Air

Lifestyle Changes: small changes to your daily routine can reduce condensation. Simple steps like opening windows, drying clothes outside, keeping shower doors closed and using lids on saucepans can stop moisture build-up.

Dryzone® Fans: older homes are naturally ventilated by gaps, floors and flues. Newer and renovated homes are sealed with double glazing, draught-proofing and blocked vents. Fans provide added ventilation. Keep the fan between 0.5 to 1.5 air changes per hour:

Dryzone® Humidistat Air

Dryzone® PIV

There are various types of fans available:

- ***Humidity-Controlled Extractor Fan:*** these automatically come on when a high Relative Humidity (RH) is detected. "Smart" types are controlled by phone apps or remote controls. Some models have sensors for CO_2, radon or other indoor air pollutants.
- ***Positive Input Ventilation (PIV):*** a fan installed in the loft introduces fresh filtered air into the home through ceiling vents. Consideration should be given to the dryness of the air in the loft and escape routes for damp air from the house. Supplementary extractor fans may be necessary.
- ***Mechanical Ventilation with Heat Recovery (MVHR):*** these extract warm, humid air from the home and draw in fresh air from outside. The warm, extracted air is passed through a heat exchanger to recover the heat before being expelled to the outside. Fresh outside air is passed through the heat exchanger, where it is pre-warmed before entering the property.

Dehumidifiers: these remove water from the air, reducing the RH of the home to a comfortable level. They work best at night. Running costs will depend on the severity of the condensation.

Moisture Traps (Calcium Chloride): small boxes containing hygroscopic salts that attract moisture from the surroundings. Water and salt are collected in the trap. Ideal for small areas such as wardrobes or under-stair cupboards.

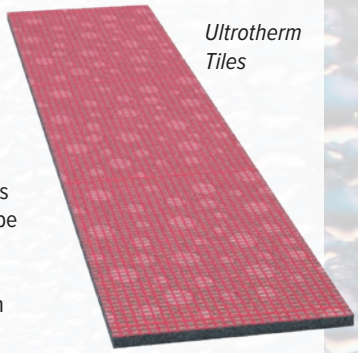
2 Increase Wall Surface Temperature

Increasing the inner surface temperature of the wall reduces its relative humidity to inhibit and reduce mould growth. This can be achieved with low-profile solutions:

Insulating Plasters: renovating plasters contain lightweight aggregate which forms air pockets in the structure with low thermal conductivity (below 0.3 W/mK). In comparison, gypsum (0.5 W/mK) and sand/cement (1 W/mK) are colder surfaces that are more vulnerable to excess condensation.

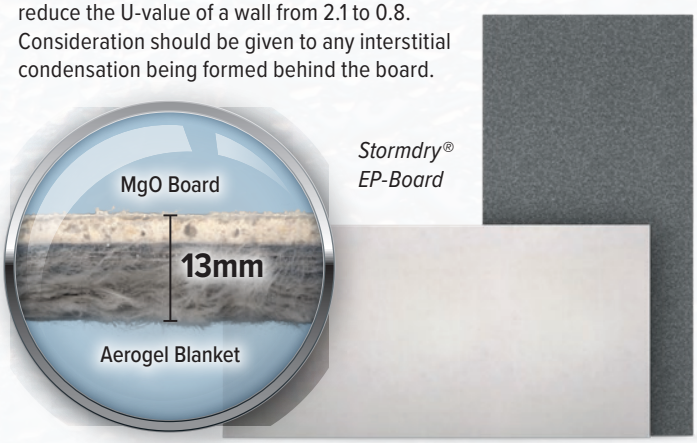
Dryzone® Renovation Plasters

Insulating Tiles: thin tiles of insulation (10 – 12 mm) with very low thermal conductivity (below 0.05 W/mK). These increase the surface temperature of the wall to reduce condensation. Insulating tiles reduce heat loss through the wall and can be plastered onto with board finish plaster.



Ultrotherm Tiles

Insulating Boards: new exceptionally thin aerogel insulating boards with a thermal conductivity below 0.015 W/mK can additionally reduce the U-value of a wall from 2.1 to 0.8. Consideration should be given to any interstitial condensation being formed behind the board.



Stormdry® EP-Board

Energy Retrofit: If possible, retrofitting to improve thermal performance is always more energy efficient than alternatives. Space heating accounts for 15 % of the UK's carbon emissions.

Preventative Measures

3 Moisture Buffering

Calcium Silicate Boards: these boards absorb moisture from the air at peak times and then slowly release it once the air dries out. They are alkaline which prevents mould growth, with class A1 fire rating and low thermal conductivity (0.06 W/mK). Breathable paints are required when finishing.

Furnishings: reduce moisture buffering by removing carpets and/or curtains and using gloss paint in a room. These may cause condensation in a previously 'safe' room.

4 Mould Control

In combination with treating excess condensation, products can be used to help protect vulnerable surfaces from mould formation.

Dryzone® Mould Removal and Prevention Kit

Mould Removal: anti-mould sprays kill mould and prevent further growth. This gives time to treat condensation problems and keep homes mould-free.

Anti-Mould Paints: these are emulsion paints with additional biocides which help to prevent mould growth for up to five years. They should not be overcoated once applied as this can reduce the biocide function.

Dryzone® Mould-Resistant Emulsion Paint

Alternatively, concentrated biocide additives can be mixed with any emulsion paint or grout. The advantage is that any colour emulsion paint can be used. This additive can prevent mould growth for up to three years

Dryzone® Anti-Mould Additive

Anti-Condensation Paint: uses hollow glass spheres as a paint binder to form a thin layer of insulation.

Dryzone® Anti-Condensation Paint

Conclusion

The choice of which preventative method is appropriate will depend on the environment, house condition and construction type. Older houses with built-in ventilation will benefit more from measures which increase wall surface temperature. Tightly sealed new builds may be more suited to increased fan ventilation.

Dryzone® Mould Removal and Prevention Kit

A set of bleach and biocidal cleaners designed to remove mould from bathroom and kitchen surfaces with long lasting effects.

Pack contents:
3 × 500 ml sprays
1 × microfibre cloth
1 × pair of gloves

Dryzone® Mould-Resistant Emulsion Paint

A mould-resistant interior paint designed to protect against unsightly and unhygienic black mould even when there is persistent condensation for up to 5 years.

Pack sizes:
1 and 5 litre containers

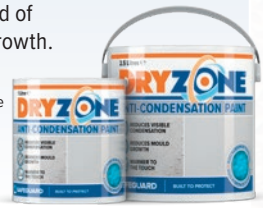
Dryzone® Anti-Mould Additive

A concentrated anti-mould additive that can be added to paints, wallpaper paste and grouts to prevent the growth of mould for up to 3 years. Compatible with all types of paint.

Pack size:
100 ml bottle

Dryzone® Anti-Condensation Paint

Contains glass microspheres which create a warmer surface to the touch, increasing the time to condensation and reducing the likelihood of mould growth.



Pack size:
1 and 2.5 litre containers

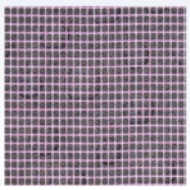
Stormdry® EP-Board

Internal insulation plasterboard consisting of 10 mm of aerogel insulation and 3 mm of MgO board adhered directly to the wall. Reduces heat loss through a solid wall by 61%.

Board size:
1.2 × 0.6 m

Ultrotherm Tiles

Internal insulation consisting of 10 – 12 mm thick tiles which can be plastered onto. They reduce heat loss through solid walls by up to 40%.



Pack size:
10 tiles –
1000 × 500 mm
(5 m² coverage)

Dryzone® Renovation Plasters

Lightweight alternatives to sand and cement. They are designed to prevent the passage of moisture and salts, are breathable and ready to use.

Pack sizes:
20 and 23 kg bags

Dryzone® Anti-Mould Silicone Sealant

Mould-resistant silicone sealant for use in bathrooms and kitchens. Low odour and low VOCs.

Pack size:
310 ml cartridge

Precautions

Read all featured product instructions and health and safety data sheet (available upon request) before use.

Guarantees

Call Safeguard on **01403 210204** for details of specialist contractors who offer guarantees on **Dryzone**® installations.

Further Information

The **Dryzone**® manual **"Rising Damp & its Control"** is available upon request, or can be downloaded free from our website:

www.safeguardeurope.com/dryzone-system

www.dryzonesystem.com

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07/24