Tree Cassyn

Damp. Timber. Moisture Investigations.

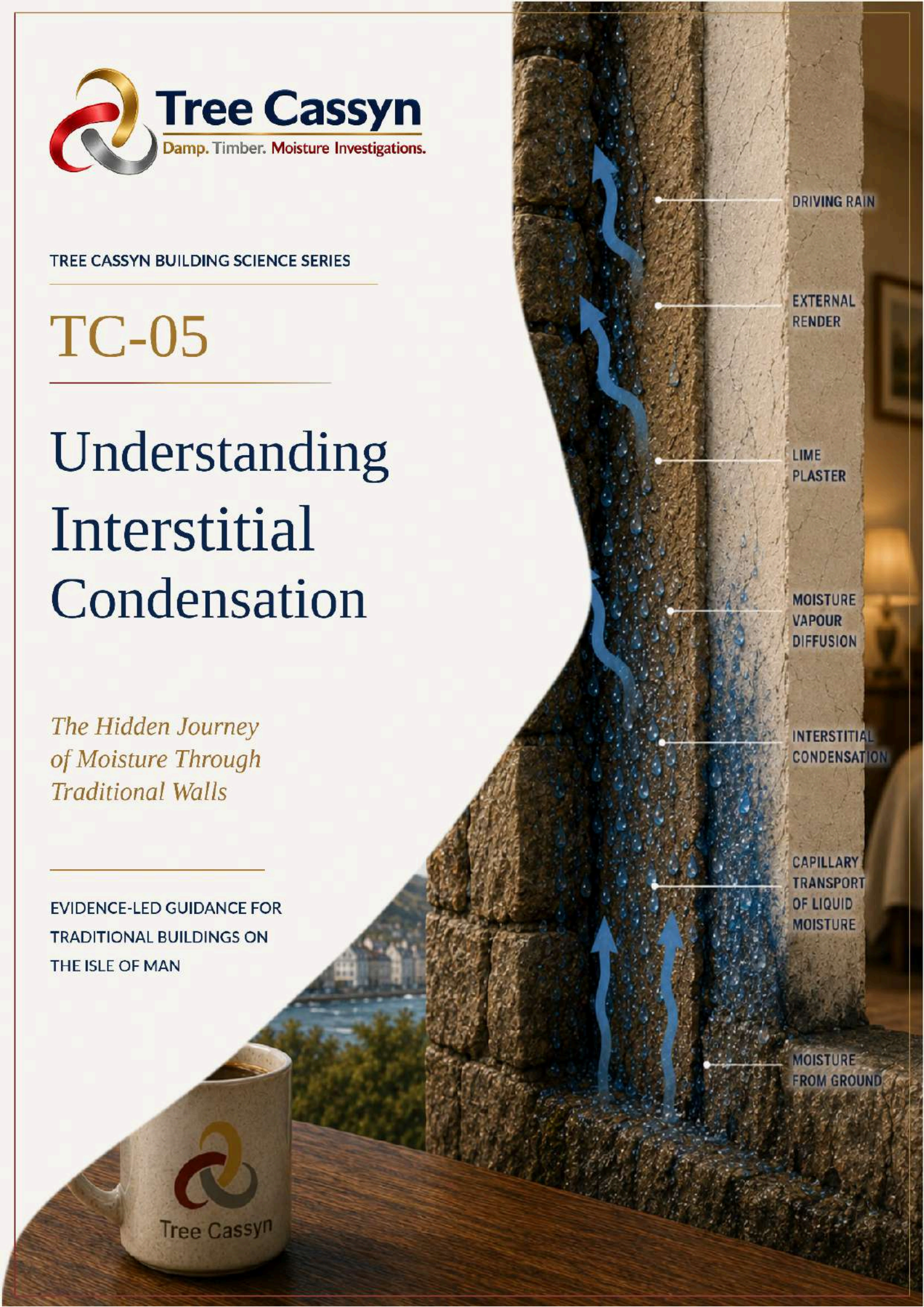
TREE CASSYN BUILDING SCIENCE SERIES

TC-05

Understanding Interstitial Condensation

The Hidden Journey of Moisture Through Traditional Walls

EVIDENCE-LED GUIDANCE FOR TRADITIONAL BUILDINGS ON THE ISLE OF MAN



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Foreword

Most people first meet condensation on a surface they can see: a window, a cold corner or the back of a wardrobe. TC-04 followed the interaction between moisture, surface temperature and local humidity, showing how cold surfaces can support mould growth and, if the dew point is reached, visible condensation.

This guide follows the same physics somewhere rather less obvious - into the building fabric itself.

Interstitial condensation sounds like a specialist subject. But the basic idea is surprisingly familiar: the same physical process that puts water on a cold window can also happen somewhere inside a wall, roof or floor - only this time we cannot see it.

What happens next is where the subject becomes particularly interesting. Once vapour has become liquid water, the rules change. That water can be stored within pores, move by capillary action, redistribute under gravity, evaporate again, carry salts and interact with materials that may respond very differently to the same moisture.

Traditional buildings make this especially important because their walls are rarely homogeneous. A thick Manx rubble wall may contain several types of stone, lime mortar, voids, bedding planes, historic repairs and later finishes, each of which can alter the journey.

Our aim is not to suggest that every unexplained damp patch is interstitial condensation. Quite the opposite. Understanding a mechanism is not the same as diagnosing it. The purpose of this guide is to show why moisture diagnosis becomes unreliable when we jump from a visible symptom to a convenient label without understanding the route taken by the water. The evidence is stronger for the physical plausibility of interstitial condensation, and for changing moisture conditions within traditional walls, than it is for any claim that interstitial condensation is a common or dominant cause of visible dampness in ordinary uninsulated traditional homes. TC-05 therefore distinguishes evidence that a mechanism can occur from evidence that it is actually responsible in a particular building.

The deeper we go into the science, the more useful one principle becomes: observe the building first, then ask which moisture mechanism best explains all of the evidence.



Introduction

A brief note on the science

This guide uses a little more technical language than others in the Tree Cassyn Building Science Series.

That is deliberate. Interstitial condensation is a nuanced process, and explaining it properly requires us to introduce concepts such as vapour pressure, temperature gradients and dew point. Avoiding those terms altogether would risk oversimplifying what is actually happening within a building.

You do not need a scientific background to understand this guide. Wherever technical terms are necessary, we will explain what they mean and, more importantly, why they matter in a real building.

The aim is not to turn this into a science lesson. It is to give you enough of the science to understand the journey that water can take through a building - and why following that journey can be so important when investigating dampness.

That is also how Tree Cassyn approaches the question during an investigation. We do not begin by deciding that an unexplained damp wall is 'interstitial condensation'. We ask whether the construction, temperatures, humidity, exposure and moisture pattern make that mechanism plausible, and whether another explanation fits the evidence better. That is consistent with the whole-building, evidence-led approach set out in the RICS, Historic England and Property Care Association Joint Position Statement on moisture investigation in traditional buildings.

There is a useful moment in any discussion about condensation when the familiar picture of a wet window stops being enough.

We understand that warm, moisture-laden air can cool against glass until the dew point is reached. We also understand that the same thing can happen on a cold wall. The obvious next question is whether the temperature can continue falling as we move into the wall itself.

In a thick traditional wall, the answer is yes. Temperature, vapour pressure, pore structure and moisture content can all change through the thickness of the construction. That does not mean a neat line of water is always sitting at a predictable depth. Real masonry is much more complicated than that, but the concept gives us a useful way into the subject.

TC-05 therefore starts with interstitial condensation, but it quickly becomes a guide to something broader: how moisture moves through traditional building fabric, how materials store and release it, how the Island's geology can influence the pattern we see, and why apparently simple dampness can have several plausible explanations.

For readers who want only the practical explanation, the main text is intended to remain accessible. A small number of optional science boxes go one layer deeper where the underlying physics is particularly revealing.



CHAPTER 1

Could Condensation Be Happening Inside the Wall?

"If condensation can form on a cold wall surface... could exactly the same process be happening somewhere inside it?"

Yes. And this is the first useful shift in perspective: the visible face of a wall can be dry while conditions deeper inside the construction are very different.

A traditional external wall is not one temperature from front to back. During cold weather the inner part of the wall is influenced by the heated room, while the outer part responds to the external environment. Between those two faces sits a changing temperature profile through the thickness of the construction.

Water vapour is also present. Some travels with air through cracks and gaps; a smaller amount can diffuse through the pore structure of permeable materials. If the local vapour pressure reaches the saturation vapour pressure at the temperature within part of the construction, some of that vapour can condense into liquid water out of sight.

When water vapour condenses and liquid moisture accumulates within the construction rather than on a visible surface, we describe the process as interstitial condensation.

An Important Distinction

Not all moisture found within a wall is interstitial condensation. The term applies specifically where water vapour changes into liquid water within the construction; moisture may also arrive or move through a wall as liquid water by other mechanisms.

Possible is not the same as proven.

That qualification does not mean interstitial condensation should be excluded by default. In some heated traditional buildings, water vapour, substantial temperature gradients and permeable materials can create conditions in which condensation within the fabric is physically plausible. It should be considered where the construction, environment and moisture pattern support the hypothesis, alongside rain penetration, ground moisture, plumbing defects, salts and other recognised mechanisms. Physical plausibility, however, is not evidence of frequency and is not proof that the mechanism explains a particular damp patch.

Beyond the Visible Surface

A thick solid wall experiences a gradient of conditions rather than a single room temperature. The internal surface may feel warm enough, while a zone deeper in the masonry remains much cooler.

Moisture can be present or stored within that zone without any condensation having occurred. Hygroscopic materials can take up water vapour, while liquid water may also have arrived by capillary transport or another route. Interstitial condensation is the more specific event in which water vapour actually changes into liquid water within the construction.

High local Relative Humidity within the fabric can still matter before saturation is reached. Hygroscopic materials may take up more moisture and vulnerable concealed materials, including timber, can experience a more humid local environment even where no free condensate is present. The distinction is therefore important: elevated



interstitial humidity describes the moisture condition; interstitial condensation describes the actual change of state from vapour to liquid.

TECHNICAL NOTE

Pore moisture is not an on/off switch.

The familiar dew-point threshold describes saturation of bulk air. Porous building materials also adsorb water onto internal pore surfaces as relative humidity rises. In very fine pores, capillary condensation can occur below 100% bulk RH because the equilibrium behaviour of water is altered by pore geometry.

This does not mean that every humid wall is undergoing damaging interstitial condensation. It means that moisture storage in porous masonry can rise progressively before visible free condensate forms, which is one reason local humidity and material moisture storage must be interpreted together.

What Has Actually Been Measured?

The temperature gradient through a traditional wall is not merely a theoretical construction. The SPAB Building Performance Survey, carried out with support from Historic England, monitored temperature and relative humidity at several depths within traditional wall assemblies over extended periods. The programme included stone, brick and cob construction and followed some walls for several years.

RESEARCH SPOTLIGHT

SPAB put sensors inside real traditional walls.

At Mill House in Drewsteignton, one monitored wall comprised approximately 600 mm of granite masonry bedded in lime mortar. Temperature and relative humidity were measured at positions through the construction, allowing local wall temperature to be compared with local dew-point temperature rather than inferred from room conditions alone.

The researchers later described the difference between measured temperature and dew-point temperature as the saturation margin: the temperature drop still required before the air at that measured location would reach saturation. A smaller margin means conditions are closer to saturation; it does not, by itself, identify why the wall is wet or prove that condensation is occurring.

This does not provide a universal rule such as '1 degree C per 50 mm'. The profile varies with wall thickness, material, moisture content, voiding, orientation, weather and heating history. What the measurements demonstrate is the principle: a thick wall contains real internal thermal conditions that can differ substantially from both the room air and the visible wall surface.



1. CONDITIONS THROUGH A SOLID WALL - NOT A FIXED DEW-POINT LINE

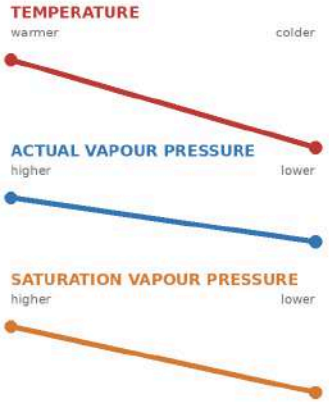
Temperature, actual vapour pressure and saturation vapour pressure are different quantities. Their profiles change with time.

WHAT CHANGES?

- **Temperature**
  Usually falls from the warmer interior towards the colder exterior in winter.
- **Actual vapour pressure**
  Often higher indoors in winter, but can reverse with changing moisture and weather.
- **Saturation vapour pressure**
  Falls strongly as temperature falls.
- **Relative humidity**
  For a similar actual vapour pressure, RH rises as temperature falls.



KEEP THE PROFILES SEPARATE



HIGH LOCAL RH
Moisture storage increases; vulnerability may rise.

LOCAL SATURATION
If actual vapour pressure reaches local saturation, condensation can occur.

LIQUID REDISTRIBUTION
Capillarity, gravity and interfaces can move condensate.

DRYING
Evaporation and vapour movement can release moisture when conditions permit.

CONCEPTUAL ONLY - NOT TO SCALE. DRAWN LINE CROSSINGS DO NOT MARK A FIXED CONDENSATION PLANE.

CHAPTER 2

Why Does Water Vapour Move Through a Wall?

"If water vapour is invisible and almost weightless, what actually makes it move through building fabric?"

Water vapour molecules are moving continually, but nothing is simply pulling them towards the cold. The useful concept for building science is vapour pressure: the portion of the total air pressure contributed by water vapour.

Where vapour pressure differs between two environments, there is a tendency for water vapour to move from the higher vapour pressure towards the lower one. In an occupied building during winter, indoor vapour pressure is often higher because occupants continually add moisture and the warmer indoor air commonly contains more water vapour. The vapour-pressure difference - not the temperature difference by itself - is what drives net vapour diffusion. Temperature remains crucial because saturation vapour pressure falls as temperature falls, so the temperature gradient helps determine where within the construction vapour may reach saturation and condense.

If the wall contains permeable materials, a small amount of water vapour can move through their interconnected pore structure by diffusion. Bulk air can also move through cracks, gaps and other unintended paths when an air-pressure difference is created by wind, stack effect or mechanical systems. That moving air carries water vapour with it and can transport far more moisture than molecular diffusion.

That distinction matters. Vapour diffusion is real, but it is comparatively slow. Pressure-driven bulk air leakage can carry much more water vapour wherever an air path exists, while liquid-water transport through connected pores, joints or drainage paths can also dominate. These are different transport mechanisms and should not be reduced to one universal 'movement speed'.

A Vapour-Pressure Gradient

The common winter picture is a higher vapour pressure inside and a lower vapour pressure outside, giving an outward vapour drive. It is tempting to describe this as moisture being 'attracted to the cold', but that is not quite what the physics says. The net movement is driven by a pressure difference, not by cold surfaces exerting a pull on water vapour.

Why Winter Can Strengthen the Vapour Drive

Consider a simple winter example. Air at 20 degrees C and 60% RH has a water-vapour pressure of about 1.40 kPa. Outside air at 5 degrees C and 80% RH has a vapour pressure of only about 0.70 kPa. The outside air has the higher Relative Humidity, yet the vapour-pressure drive is still strongly outward. The example is illustrative rather than predictive of every wall, but it shows why RH percentages cannot be compared without temperature.

A Useful Way to Picture It

One useful mental model is to imagine the saturation vapour pressure as the size of a bucket. Warm conditions provide a larger bucket; colder conditions provide a smaller one. The water level represents the actual vapour pressure. As temperature falls through the wall, the bucket becomes progressively smaller.

The water level does not have to rise dramatically for the risk to increase. If the bucket shrinks around a similar moisture level, the distance to the brim becomes smaller. That distance is analogous to the saturation margin: the smaller it becomes, the closer the local conditions are to saturation.



Nor is the direction fixed. A rain-wet external wall heated strongly by sunshine can develop a higher vapour pressure near the outer face and drive vapour inward. If that vapour reaches a sufficiently cool zone, condensation may occur within the construction. This mechanism is more precisely described as solar-driven inward vapour diffusion.

TECHNICAL NOTE

Vapour pressure is a more precise explanation than saying that warm air simply 'pushes moisture towards the cold'.

At any point in the wall, water vapour has a partial pressure. Where that pressure is higher on one side of a permeable layer than the other, diffusion produces a net movement towards the lower vapour pressure.

Temperature still matters because it changes the saturation vapour pressure and therefore how close the local air is to saturation. The temperature profile and the vapour-pressure profile interact, which is why interstitial condensation is a hygrothermal problem rather than a humidity problem alone.

SPAB used the term saturation margin for the difference between the measured temperature and the local dew-point temperature within a wall. A 3 degrees C margin means the measured location would need to cool by about 3 degrees C before saturation, assuming the moisture condition remained otherwise unchanged.

The concept is deliberately broader than a fixed 'condensation plane'. High local RH can reflect rain wetting, stored construction moisture, restricted drying or vapour movement as well as condensation from internally generated moisture.

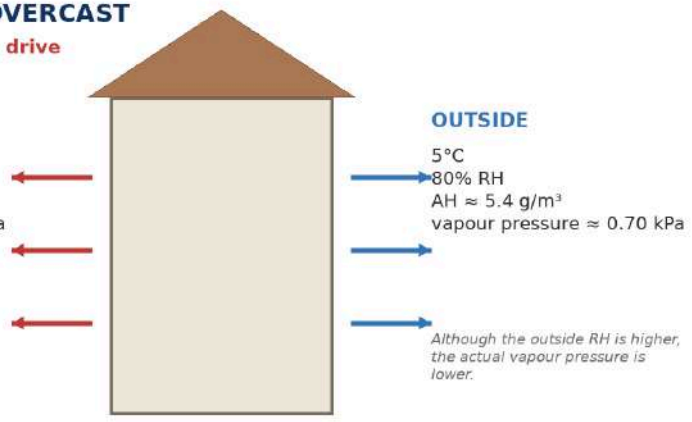


2. VAPOUR PRESSURE IN WINTER CONDITIONS

Vapour diffusion follows a water-vapour partial-pressure gradient. Bulk air movement and liquid water are separate transport mechanisms.

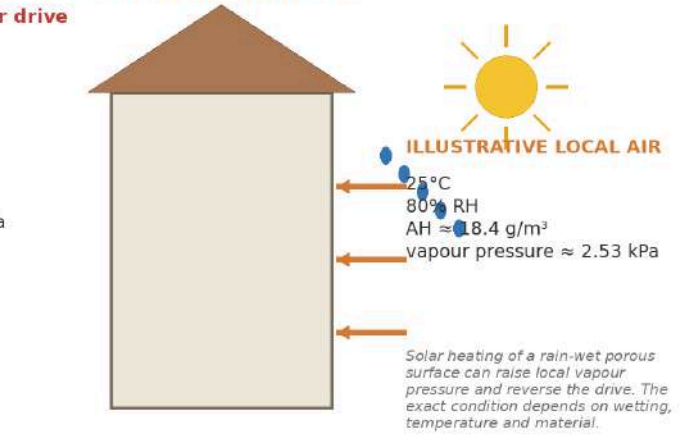
WINTER NIGHT / OVERCAST

Typical outward vapour drive



SUN-WARMED, RAIN-WET EXTERNAL SURFACE

Potential inward vapour drive



NO FIXED SPEEDS: DIFFUSION IS USUALLY SLOW; AIR LEAKAGE AND LIQUID PATHWAYS CAN TRANSPORT MUCH MORE MOISTURE.

CHAPTER 3

What Happens When Vapour Becomes Liquid?

"Why does the behaviour of moisture change so much once condensation has occurred inside the wall?"

The reason is simple: the moisture has changed state.

Water vapour can move with air and diffuse slowly through permeable materials. Once some of that vapour becomes liquid water, a different set of transport mechanisms becomes important.

Liquid water can be absorbed into pore structures, drawn through connected pores by capillary action, collect at interfaces, evaporate when conditions improve and, where sufficient free water is present, move downwards under gravity.

This is why the distinction between vapour and liquid is so important during an investigation. The same molecule of water can take more than one journey as conditions change.

Gravity Enters the Story

Water vapour is not meaningfully pulled downwards through a wall by gravity in the way liquid water is. Its molecules move in all directions, with net transport governed mainly by air movement and vapour-pressure differences.

Once liquid water has formed, gravity can become relevant. It will not necessarily cause immediate vertical flow because capillary forces within small pores can be stronger, but where enough free water accumulates, downward redistribution becomes possible.

The Visible Patch May Be the End of the Journey

A damp patch can therefore appear some distance from the point at which the moisture first entered the fabric or first changed from vapour to liquid.

Water may condense in one zone, redistribute through mortar or stone, move along an interface, evaporate, condense again elsewhere and finally produce a visible response some distance away. Where that response appears can be influenced by local temperature, evaporation, material changes, finishes and salts. The location of the symptom is useful evidence, but it is not automatically the location of the cause.



CHAPTER 4

Why Do Repeated Cycles Matter?

"If a wall can absorb a little moisture and dry again, when does interstitial condensation become a problem?"

The answer is less about one event than about what happens next.

A single short-lived episode of interstitial condensation may be insignificant because traditional masonry can often absorb limited moisture and release it again when conditions provide a drying opportunity. The more important question is whether the cycle repeats faster than the wall can recover.

Consider an occupied house during winter. If heating has been reduced for several hours, the room air can warm again much faster than a thick masonry wall. Cooking, showering and normal occupation may then add water vapour at the same time as substantial parts of the wall remain comparatively cold.

Later, when heating is reduced again, the air and fabric begin another cooling cycle. In both directions the wall responds slowly. The important point is that the temperature shown by a room thermostat does not necessarily describe the temperature of the massive fabric around it.

Concern increases when this happens frequently and the wall cannot dry adequately between episodes. Repeated over months and years, those cycles can alter the moisture pattern within the fabric.

A Thick Wall Has a Thermal Memory

Thermal mass gives traditional masonry substantial inertia: it resists rapid temperature change. That behaviour has been measured directly. In a listed building in Nicosia, researchers monitored a 500 mm rubble-filled stone wall from 2014 to 2015, placing temperature sensors at several depths through the wall. Over longer 72-hour temperature cycles they reported a thermal lag of about 28 hours. That figure belongs to that particular wall and climate, but it demonstrates how slowly massive masonry can respond compared with the air around it.

RESEARCH SPOTLIGHT

Heating the air does not instantly heat the wall.

R. B. Becker's 1993 dynamic analysis directly compared intermittent and continuous heating. It found that heating schedule and wall thermal inertia materially affected internal surface temperatures and surface-condensation risk. The work was modelling of thermal response rather than direct evidence of interstitial condensation inside a traditional rubble wall; its value here is to demonstrate how heating pattern and thermal inertia alter the boundary conditions.

Field monitoring in the 13th-century Krimulda Church in Latvia provides a useful real-building counterpart. During rapid intermittent heating, measured indoor air temperature rose by about 10 degrees C while the stone masonry retained much of the thermal condition of the preceding cold period. Measurements provided boundary data from which envelope temperatures and condensation risk were also calculated. The building is not a domestic Manx house and the study does not directly prove interstitial condensation in one; it provides real-building evidence of the air/fabric thermal mismatch.

What Stable Heating Changes

Imagine the same solid wall under two different heating regimes. With intermittent heating, the room air can reach a comfortable temperature quickly while the inner masonry remains cold. In the bucket analogy, the room's



saturation bucket has expanded, but the smaller buckets within the wall have barely changed. If morning activity raises vapour pressure at the same time, the saturation margin may become small relatively close to the internal face.

With steadier thermostatically controlled heating, the inner part of the wall has had more time to warm. All else being equal, saturation vapour pressure is then higher through more of the wall and a larger saturation margin can persist further into the construction. Any zone of closest approach to saturation may therefore be displaced towards the colder outer part of the wall.

This should not be imagined as a permanent razor-thin 'dew-point line'. Real rubble masonry is heterogeneous and vapour pressure, temperature, liquid-water storage and drying all vary through time. Steadier heating changes one important boundary condition: it can warm more of the internal fabric and increase the thermal margin. It does not remove an excessive moisture load, repair rain penetration or restore a blocked drying route. The useful principle is simpler: a room thermometer can change quickly; a massive wall cannot.

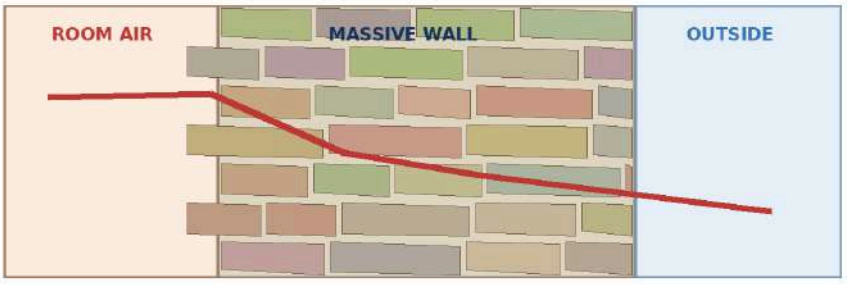


3. HEATING PATTERN AND THERMAL INERTIA

A room can warm quickly while massive masonry lags. The diagrams are qualitative, not calculated temperature profiles.

INTERMITTENT HEATING

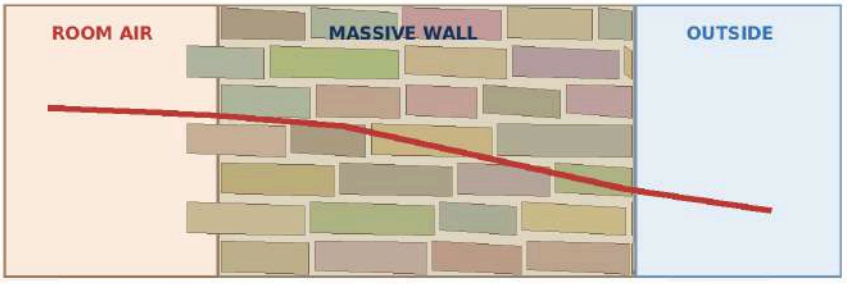
Short bursts warm the air quickly; the wall remains comparatively cold.



SMALLER LOCAL SATURATION MARGIN may occur near the colder inner masonry when indoor vapour pressure rises.

STEADIER BACKGROUND HEATING

More consistent heating gives the inner fabric time to warm and stabilise.



LARGER SATURATION MARGIN can persist through more of the wall, all else being equal.

STEADIER HEATING CHANGES ONE BOUNDARY CONDITION; IT DOES NOT REMOVE OTHER MOISTURE SOURCES.

Conceptual illustration: the temperature profile and saturation margin vary with heating regime; real walls remain heterogeneous and conditions vary with time.

Imagine two similar traditional cottages through the same winter.

Both experience similar moisture loads and conditions within the wall that favour condensation. One retains lime-based, moisture-open finishes; the other has less moisture-open or otherwise incompatible finishes.

In the first, modest condensate can redistribute and dry. In the second, drying is reduced or redirected, so the wall may enter the next cycle before fully recovering. Repeated small events can therefore accumulate.

Drying Is the Other Half of the Equation

In traditional construction, whether condensation can occur is only half of the question; what happens afterwards is just as important.

A useful way to think about it is this: moisture entering a wall, or forming within it, is not necessarily the problem. The problem begins when moisture accumulates more readily than the building can release it. **Inappropriate finishes may not create the original condensation; they can magnify its consequences by restricting recovery.**

TREE CASSYN OBSERVATION

Think in years, not hours.

A single small condensation episode may be insignificant if the wall later dries. Now imagine similar cycles repeated hundreds or thousands of times over decades. Add wind-driven rain through cracked render or pointing, leaking rainwater goods, raised ground levels or plumbing defects, and free liquid water may enter the same fabric already managing seasonal vapour and condensation.

Then reduce the available drying by adding dense or less vapour-permeable finishes, capillary-inhibiting coatings or incompatible repairs. These mechanisms can overlap. The more useful long-term question is the wall's moisture balance: over the year, does wetting and moisture formation exceed the opportunities for that wall to redistribute and release moisture?



CHAPTER 5

Why Does the Stone Itself Matter?

"Two stone houses can look almost identical from the street. Why might moisture behave differently inside their walls?"

Because a stone wall is not a single material, and not all stone has the same pore structure.

The Isle of Man gives us an unusually useful local illustration. Much of the Island is underlain by rocks of the Manx Group, dominated by laminated mudstone and siltstone with sandstone units, while red sandstone also occurs around Peel. Traditional walls may therefore contain markedly different local stone, mixed field stone and lime mortar even within a relatively small geographic area.

Those materials need not absorb, store or release moisture in the same way. A relatively dense or strongly cleaved stone may offer fewer readily connected pore pathways through the intact material, concentrating moisture movement more strongly through mortar joints, fractures, bedding planes, interfaces and the rubble core.

A more porous sandstone can accept and redistribute more moisture within the body of the stone itself. That does not make sandstone inherently better or worse; it simply changes the routes available to the water.

The construction of the wall matters just as much as the stone type. Rubble walls may contain irregular voids, small packing stones, old lime bedding, later cement repairs and concealed timbers. Two walls built from broadly similar stone can therefore still behave differently.

Pore Structure Changes the Journey

Porosity is not simply a question of how many voids a material contains. The size, shape and connectivity of those pores determine how readily vapour and liquid water can enter, move and leave.

A stone with relatively low vapour permeability may still contain fractures or bedding planes that provide local pathways. Conversely, a porous stone may absorb moisture readily but also offer a large evaporative area when conditions improve.

> **The geology of the wall can become part of the moisture diagnosis.**
>
> Two houses exposed to the same weather and occupied in similar ways may still develop different moisture patterns because the stone, mortar, voids and interfaces inside their walls are not the same.
>
> That is one reason generic rules about 'stone walls' can be misleading.



6. MANX MASONRY - STONE, MORTAR, VOIDS AND INTERFACES

A wall is a heterogeneous assembly. Local geology matters, but moisture behaviour cannot be inferred from stone type alone.

LOCAL GEOLOGICAL CONTEXT

- Manx Group - predominantly mudstone, siltstone and sandstone.
- Peel Sandstone Group - red sandstones around Peel.
- Igneous intrusions - local granite and dolerite.
- Glacial deposits - clay, sand and gravel influence ground conditions.

Traditional buildings may combine several local and imported materials within one wall.

WHAT THIS MEANS FOR MOISTURE

Different pore structures

affect how much moisture can be stored and how quickly it can move.

Fractures and bedding planes

can provide local pathways even through relatively dense stone.

Mortar and interfaces

can carry and redistribute liquid water differently from the stone blocks.

Heterogeneous construction

means rubble, packing stones, voids, repairs and concealed timbers all change the route.

KEY POINT

Moisture response is controlled by the whole wall:

- stone type
- mortar type
- joint quality
- thickness
- exposure
- internal climate
- finishes & alterations

OBSERVE, TEST AND UNDERSTAND THE ACTUAL WALL - NOT ONLY THE STONE.

CHAPTER 6

How Do Traditional Walls Manage Moisture?

"If traditional walls have always become wet from time to time, how have so many survived for well over a century?"

Traditional walls have survived not because they always stayed dry, but because limited wetting could be followed by drying. Their durability has much more to do with limiting excessive wetting, storing modest quantities of moisture safely and providing opportunities for that moisture to redistribute and leave the construction again.

That is a different moisture strategy from much modern construction. It relies on the behaviour of the complete wall assembly: stone or brick, lime mortar, renders, plasters, finishes, timber and the surrounding environment all play a part.

The materials do not behave identically. Lime mortars, renders and plasters are often especially important because their interconnected pore structure makes them vapour permeable and capillary active, allowing moisture to be taken up, redistributed and released over a comparatively large surface area.

Drying may occur outwards, inwards or in both directions at different times. Weather, solar exposure, wind, heating, ventilation and occupancy continually change the balance.

Wet Does Not Automatically Mean Damaged

Moisture becomes most damaging when it remains excessive for long periods, reaches vulnerable materials or is prevented from leaving the construction.

A wall that becomes briefly wetter after wind-driven rain and then dries is behaving very differently from a wall kept persistently wet by a leaking gutter, high external ground level or a low-permeability finish that has removed an important drying route.

Modern Living, Older Walls

The buildings may not have changed greatly, but the way we use and ventilate them has. Central heating, frequent showers, additional bathrooms and indoor clothes drying can all increase or redistribute internal moisture. Older buildings also often experienced greater overall air exchange through a combination of open flues, less airtight joinery and incidental leakage, alongside deliberately provided ventilation to vulnerable parts of the structure. Later sealing or alteration can therefore change both accidental and intentional drying routes.

Traditional walls can accommodate modern living, but their margin for error may be reduced when higher internal moisture loads are combined with incompatible finishes, colder unused rooms or alterations that change the original drying pattern.



4. THE TRADITIONAL WALL MOISTURE BALANCE

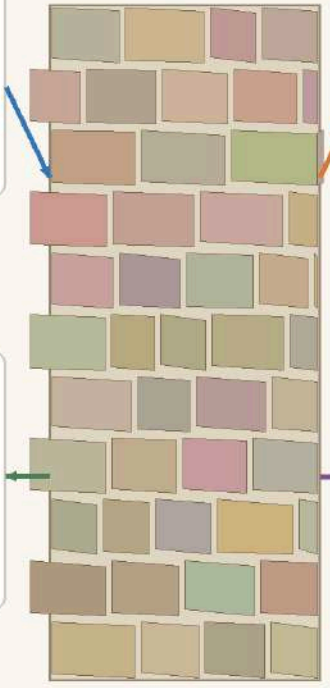
Traditional solid walls can tolerate limited wetting when moisture can be stored, redistributed and released.

1. WETTING

Rain penetration, wind-driven rain, ground moisture, leaks and condensate.

2. STORAGE

Moisture is stored within materials and pores, joints and voids.



4. DRYING

Evaporation releases moisture. Vapour can then move inward or outward as conditions change.

3. REDISTRIBUTION

Liquid moves by capillarity, gravity and along interfaces; salts can travel with it.

BALANCE THROUGH THE YEAR

A wall may become wetter during one period and drier during another. Concern increases when moisture entering or forming within the wall repeatedly exceeds the opportunities for redistribution and drying.

THE GOAL IS NOT A PERFECTLY DRY WALL - IT IS A MANAGEABLE MOISTURE BALANCE.

CHAPTER 7

Why Do Modern Cavity Walls Behave Differently?

"If the physics is the same, why does a modern cavity wall manage moisture differently from a thick traditional solid wall?"

Because the cavity changes the rules of the wall.

The reason is that the construction strategy is different. A conventional modern cavity wall separates the outer and inner leaves with a gap: the outer leaf deals with the weather and may become wet, while the cavity provides a physical break intended to prevent liquid water crossing directly to the inner leaf. Damp-proof courses, cavity trays and other details then help direct water away.

The internal leaf can therefore remain comparatively protected from external wetting. Insulation and thinner individual leaves also produce a different temperature profile from a thick rubble wall.

It is worth clarifying one common misconception: the cavity is not necessarily a ventilated void in the same sense as a roof space. Its primary moisture function is separation and drainage. Some cavity constructions include ventilation or weep provisions, but the essential idea is that water reaching the outer leaf should not be given an easy route to the inner one.

Interstitial Condensation Is Not Just a Traditional-Building Phenomenon

It would be easy to assume that interstitial condensation is mainly associated with thick traditional solid walls. The same physical process can, however, occur within modern cavity-wall construction when moisture reaches a part of the wall build-up that is sufficiently cold.

During prolonged periods of low or absent heating, the inner leaf and other parts of the construction can become considerably colder than they would be in a normally heated home. If sufficient moisture is already present within the building, or is able to enter the wall through air leakage or vapour movement, local condensation can occur on concealed surfaces or within materials in the wall assembly.

An unoccupied house is not automatically at greater risk. With no cooking, showering or occupants, internal moisture generation may be much lower. The important combination is whether moisture remains available while the fabric becomes cold, and whether the construction is then given sufficient opportunity to dry.

This can complicate damp investigations. Moisture within or immediately adjacent to the inner leaf can contribute to elevated electrical moisture meter readings even where there is no obvious external water penetration or physical bridge across the cavity.

Once again, the meter cannot tell us how that moisture arrived there. Elevated readings might relate to condensation, salts, rain penetration, cavity bridging or another source entirely. The pattern, construction and environmental conditions still have to be explained.

What Happens When the Cavity Is Bridged?

Mortar droppings, debris, poorly detailed openings and other bridges can create local pathways across the cavity. Under suitable exposure, liquid water may then reach the inner leaf and produce apparently isolated internal damp patches.



Cavity fill insulation adds another layer of complexity. In a suitable modern cavity wall, correctly specified and installed insulation can perform well. It should not be assumed to be a defect simply because it is present.

However, early or narrow cavity walls, severely exposed elevations and walls with existing defects require particular caution. Filling a cavity changes the route available to moisture, and where liquid water penetrates the outer leaf it may provide a path by which that moisture can reach further inward. Historic England specifically advises treating early cavity walls cautiously when considering cavity fill.



5. TRADITIONAL SOLID WALL vs MODERN CAVITY WALL - DIFFERENT MOISTURE STRATEGIES

Different constructions use different details to manage rain and moisture.

TRADITIONAL SOLID WALL

Rain is absorbed at the exposed face and stored within the wall.

Moisture can redistribute through mortar, pores, fractures and interfaces.

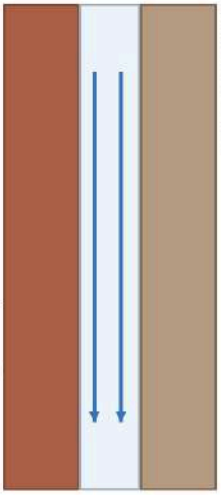


Drying may occur inward and outward at different times.

Performance depends on material compatibility, thickness, exposure, finishes, heating and ventilation.

MODERN CAVITY WALL

Outer leaf manages most rain exposure and may become wet.



The cavity provides separation and a drainage path. Cavity trays and weep holes discharge water where detailed.

The inner leaf and insulation remain comparatively protected when details are sound.

IMPORTANT

A cavity is not automatically a ventilated void. Ventilation is construction-specific; separation and drainage are the primary moisture functions.

NEITHER CONSTRUCTION IS RISK-FREE. THE PATHWAYS, EXPOSURE AND CONTROL DETAILS ARE

CHAPTER 8

What Does "Breathable" Really Mean?

"If two products both claim to be breathable, does that mean they will behave the same way on a traditional wall?"

No. 'Breathable' sounds reassuring, but on its own it tells us surprisingly little. It is useful shorthand, not a technical specification.

Materials differ in how readily they allow water vapour to pass, how much liquid water they absorb, how efficiently they move that water by capillary action, how quickly they dry and how they respond mechanically to movement and salts.

That is why compatibility is a more useful idea than simply dividing products into breathable and non-breathable.

Vapour Permeability and Sd Value

Vapour permeability describes how readily water vapour can pass through a material. For a finished layer or product, one useful comparison is the Sd value: the thickness of still air that would offer an equivalent resistance to water-vapour diffusion.

A lower Sd value means lower vapour resistance and greater vapour openness. A higher Sd value means greater resistance. The number becomes particularly useful when a product is marketed simply as 'breathable', because two products carrying the same description can perform very differently.

For paints and coatings, product-specific data should relate to the actual system at the recommended applied thickness. A laboratory value for a material in isolation may not describe the completed wall build-up.

Ask the Manufacturer

If a masonry paint, coating, insulation system or cementitious waterproofing product is promoted as breathable, ask for the Sd value of the specific product at the recommended finished thickness.

That does not settle the question of compatibility, but it replaces a marketing adjective with a measurable property and gives us something meaningful to compare.

TECHNICAL NOTE

Why does thickness matter?

The material property often described by the Greek letter μ (mu) is the water-vapour resistance factor: how much more resistant the material is than an equivalent thickness of still air.

Sd combines that resistance with the actual thickness of the layer. In simple terms, Sd is approximately μ multiplied by the layer thickness in metres. The same material therefore creates more vapour resistance when it is applied more thickly.

This is why asking only whether a material is 'vapour permeable' can miss an important part of the picture.

Sd Is Not the Whole Story

Traditional walls also have to manage liquid water, and vapour diffusion through a material is usually slow. Capillary activity, hygroscopic buffering, drying direction, mechanical compatibility and the presence of salts can all matter as much as the headline Sd number.



A coating with a low Sd value is not automatically suitable if it prevents useful capillary drying, is too strong for the substrate or forms part of a wall build-up that traps liquid water elsewhere.

Ask About Liquid Water Too

Vapour resistance is only one measurable property. BS EN ISO 15148:2002+A1:2016 provides a test for the short-term liquid-water absorption coefficient of building materials by partial immersion, while BS EN 1062-3:2008 addresses liquid-water permeability of coatings and coating systems for exterior masonry and concrete. These answer different questions from the vapour-transmission tests in BS EN ISO 12572.

For a traditional wall, product selection should therefore consider vapour resistance, capillary water absorption, liquid-water permeability or shedding, drying potential, strength, salts and compatibility with the substrate and surrounding materials. A low Sd value alone is not a compatibility certificate.

Lime and Dense Cement-Rich Repairs

This is why the familiar contrast between lime and dense cement-rich mortar is more nuanced than 'one breathes and one does not'. Dense cement-rich pointing is often harder, less flexible and less vapour permeable than the lime mortar it replaces.

Extensive repointing can reduce drying through the joints and encourage moisture to leave through adjacent stone instead. If the stone is softer or more vulnerable, repeated wetting, salt crystallisation and freeze-thaw action can shift deterioration from a sacrificial mortar joint into the masonry itself.

Cement is not inherently a bad material. The issue is whether the material is compatible with the wall in which it is being used.



8. VAPOUR RESISTANCE AND COMPATIBILITY

"Breathable" is not a switch. Sd depends on both the material vapour-resistance factor and the installed thickness.

THE PRINCIPLE

Sd = μ × thickness (m)

μ (mu) describes the material's vapour-resistance factor relative to still air. Sd describes the resistance of the finished layer.

Both the material and the installed thickness matter.

HYPOTHETICAL EXAMPLES - NOT PRODUCT VALUES

Same material	Same material, thicker	Different material
μ = 10; thickness 10 mm	μ = 10; thickness 20 mm	μ = 50; thickness 10 mm
Sd = 0.10 m	**Sd = 0.20 m**	**Sd = 0.50 m**

Sd IS NOT THE WHOLE STORY

For traditional masonry, product selection should also consider liquid-water behaviour and compatibility.

- capillary water absorption
- liquid-water permeability / shedding
- drying potential
- salt compatibility
- strength and flexibility
- substrate compatibility

Relevant test methods include BS EN ISO 12572 (vapour transmission), BS EN ISO 15148 (liquid water absorption coefficient) and BS EN 1062-3 (liquid water permeability of exterior masonry coatings).

ASK FOR PRODUCT-SPECIFIC DATA. THINK WHOLE-SYSTEM, NOT JUST Sd.



CHAPTER 9

Can a Wall Carry Evidence of Its Own History?

"Could the moisture pattern we see today partly reflect what happened to the building years ago?"

Yes. A wall can outlive the defect that first made it wet - and still carry evidence of it.

Very often, today's moisture pattern reflects more than the conditions we happen to observe during one inspection. Traditional buildings have experienced decades - sometimes centuries - of changing weather, heating, occupation, alterations and repairs, and repeated wetting and drying can leave chemical and physical evidence behind.

A building that was once poorly heated, later centrally heated, repointed in cement, replastered in gypsum and then left empty for several winters has not had one moisture environment. It has had many.

Moisture Can Move Salts

Liquid water moving through stone, brick and mortar can dissolve soluble salts already present in the materials or introduced by previous use, combustion, ground moisture or contaminated water.

As the wall dries, the water moves towards an evaporating surface and the dissolved salts travel with it. When the water evaporates, those salts are left behind and may crystallise.

Crystals forming harmlessly on the surface are commonly seen as efflorescence. Where crystallisation occurs within the pore structure, the resulting pressure can damage the surrounding material and contribute to powdering, spalling or loss of the stone or brick face.

Hygroscopic and Deliquescent Salts

Some salts are hygroscopic: they absorb moisture from the surrounding air. A wall containing a high concentration of these salts can therefore feel or appear damp at times of higher humidity even when no new liquid water is entering the building.

Some salts go further and are deliquescent. Above a characteristic relative humidity they can absorb enough water from the air to dissolve into their own solution. This is one reason salt-contaminated chimney breasts, for example, can become visibly damp in humid weather without a straightforward rainwater leak.

The practical implication is important: a historic moisture source can continue influencing the behaviour of a wall long after the original defect has been repaired.

TECHNICAL NOTE

Why can salt crystallisation damage apparently solid stone?

A crystal growing freely on a surface can simply form an efflorescent deposit. Inside a small pore, however, crystal growth is constrained by the surrounding masonry.

Under suitable conditions the growing crystal can exert pressure against the pore walls. Repeated dissolution and recrystallisation cycles can therefore cause progressive loss of the surface even though each individual cycle may be microscopic.



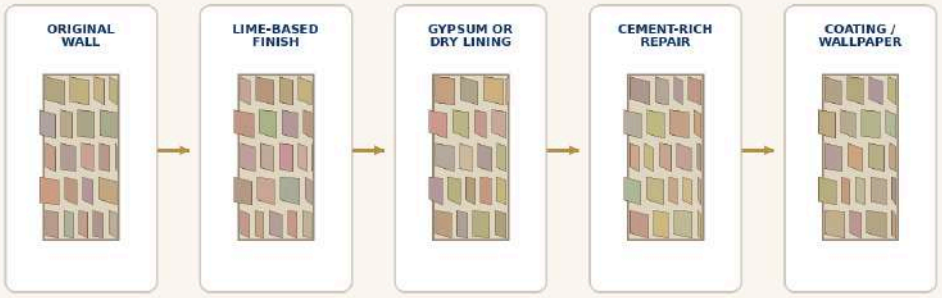
The Building Carries Clues, Not Conclusions

Salt patterns, old repairs, localised decay and moisture meter responses can all tell us something about the wall's history. None should be read in isolation.

The challenge is to decide which clues relate to an active moisture source, which reflect earlier conditions and which are being maintained by the present indoor environment.

7. WALL HISTORY CHANGES MOISTURE BEHAVIOUR

Successive alterations can change thermal, vapour, capillary and airflow behaviour. Their effect depends on the complete build-up.



HOW ALTERATIONS MAY CHANGE THE WALL

- Added layers can change vapour resistance and drying direction.
- Dry lining can create concealed voids, alter local surface temperatures and create new air-leakage paths if detailing is poor.
- Cement-rich repairs can reduce drying through joints and redirect moisture into adjacent masonry.
- Paints, coatings and wallpapers can change evaporation and surface behaviour.
- None of these materials is automatically defective: performance depends on material properties, thickness, continuity, exposure and the wall's moisture condition.

ALTERATIONS CHANGE THE SYSTEM. UNDERSTAND THE WHOLE HISTORY BEFORE DECIDING

CHAPTER 10

Why Diagnosing Dampness Is Rarely Simple

"If the damp patch is obvious, why can the diagnosis still be uncertain?"

Because very different moisture mechanisms can produce similar visible symptoms.

Blistering paint, salt deposits, discoloured plaster, localised decay and elevated electrical moisture meter readings are all useful observations. None of them, by itself, identifies where the moisture came from or how it travelled.

A reliable investigation therefore starts with the building rather than the instrument.

Observation Comes First

Where is the moisture visible, and where is it absent? Does the pattern relate to an external defect, a chimney, a floor junction, an exposed elevation, a cold room or a change in material? Does it vary with weather, heating or occupation?

Only after those questions have been considered do measurements become truly useful, because the measurements can then test an explanation rather than create one.

Moisture Meters: Useful, but Limited

Electrical moisture meters can be useful comparative tools when used with an understanding of the material being tested. On masonry, however, they do not directly measure a percentage of water content in the way many people assume.

Electrical response can be influenced by moisture, soluble salts, the material itself and surface conditions. A high reading is therefore evidence that deserves investigation; it is not a diagnosis of rising damp, penetrating damp or condensation.

This principle is consistent with current professional guidance. The Joint Position Statement on moisture investigation calls for a whole-building, evidence-led approach and cautions against reliance on potentially misleading data. BS 6576:2005+A1:2012, the current British Standard release concerned specifically with rising damp, explicitly emphasises the need to differentiate rising damp from other causes of damp conditions.

> TREE CASSYN OBSERVATION
>
> **A moisture meter does not diagnose rising damp. It does not diagnose interstitial condensation either.**
>
> It gives us a response at a particular location and material.
>
> The diagnosis comes from explaining that response alongside the construction, pattern, environment, salts, temperature, humidity and other available evidence.

Following the Evidence

Depending on the question, an investigation may combine visual inspection with temperature and RH logging, absolute humidity and dew-point analysis, surface-temperature measurement, thermal imaging, examination of external defects, salt assessment and, where justified, more invasive sampling.

No single technique is intended to replace judgement. The aim is to find the explanation that best fits all of the available evidence and to remain willing to revise that explanation when the evidence does not fit.



Testing the Thermal Hypothesis

Where interstitial condensation is genuinely suspected, environmental and surface measurements can help establish the boundary conditions acting on the wall. Useful observations may include internal air temperature and RH, internal wall-surface temperature, external wall-surface temperature, external air temperature and RH, prevailing weather and the reported heating regime - for example, steady thermostatic heating, timed intermittent heating, occasional heating or unknown.

These measurements cannot tell us the exact temperature or RH 300 mm inside a 600 mm rubble wall. External surface temperatures can also be distorted by sunshine, recent rain, wind and exposure. Their value is to test whether the proposed mechanism is physically plausible. Published measurements and hygrothermal modelling can then help interpret what cannot be measured directly during an ordinary survey.

This distinction matters. Some evidence is measured, some is calculated or modelled, and some is professional inference. Theoretical modelling is valuable precisely because direct measurement inside an occupied wall is rarely available, but the confidence of the conclusion should remain proportionate to the assumptions and the evidence. Showing that the conditions could allow condensation is evidence for the mechanism. Showing that condensation actually occurred, in the location and amount needed to explain the visible dampness, is a separate diagnostic task.

Simplified Calculation and Transient Hygrothermal Modelling

BS EN ISO 13788:2012 provides simplified calculation methods for surface humidity and the risk of interstitial condensation due to water-vapour diffusion. The standard explicitly notes that its interstitial-condensation method does not account for several important phenomena, including moisture-dependent material properties, capillary suction and liquid-water transfer, air movement through gaps or air spaces, and the hygroscopic moisture capacity of materials. It is therefore applicable only where those effects can reasonably be treated as negligible.

Those exclusions matter in traditional rubble masonry, where capillary transport, moisture storage, air paths and changing material properties can be important parts of the real behaviour. A neat Glaser-style dew-point or 'condensation plane' calculation should therefore not be treated as a complete model of a thick, heterogeneous Manx wall.

BS EN 15026:2023 provides a framework for transient numerical hygrothermal simulation of coupled heat and moisture transfer, including changing climatic boundary conditions, rainfall, water absorption and drying. Such modelling can be much more informative where suitable material data and boundary conditions are available, but it remains a model: the result is only as reliable as the assumptions, input data, geometry and validation against the real building.

Interstitial Condensation Is a Hypothesis to Test

One of the risks of understanding a mechanism well is becoming tempted to see it everywhere. TC-05 should not leave the impression that unexplained dampness in a traditional wall is probably interstitial condensation. Published field monitoring and hygrothermal research demonstrate that moisture and thermal conditions within traditional walls can approach saturation and can respond materially to weather, heating, finishes and retrofit; they do not establish that interstitial condensation is routinely the dominant cause of visible dampness in uninsulated traditional domestic masonry.



Interstitial condensation may prove to be the explanation, but the same evidence might instead relate to rain penetration, a plumbing defect, ground moisture, salt-related hygroscopicity, a cavity bridge, an altered floor junction or several mechanisms acting together.

The useful question is not 'Which label fits the damp patch?' but 'What sequence of moisture movement best explains why it is appearing here, now, in this building?'

Evidence Can Also Weaken the Hypothesis

A good investigation does not only look for evidence that supports interstitial condensation. A plausible thermal gradient, elevated indoor vapour pressure, intermittent heating, restricted drying and a compatible seasonal or depth pattern may strengthen the hypothesis. A simpler liquid-water source, a strong rainfall relationship, salt behaviour or depth evidence inconsistent with moisture accumulation may weaken it.

Two cautions are especially useful: a cold wall does not prove interstitial condensation, and a dry internal surface during one inspection does not prove it has never occurred deeper within the construction. The diagnosis comes from the combined weight of what is present and absent. Where that evidence remains insufficient, it is valid to say so and use monitoring or targeted further investigation rather than force a label.



Closing Thoughts

Interstitial condensation is fascinating because it forces us to stop thinking of a wall as a static barrier. What looks solid and unchanging from the room is, in reality, an environment in which heat and moisture are continually moving. This guide has explained how the mechanism can occur and how it can be tested; it has not attempted to claim how often it is the principal cause of visible dampness in traditional homes.

A traditional wall is a changing hygrothermal system. Heat is moving through it, moisture is being absorbed and released, vapour pressure is changing, liquid water can be redistributed, and the materials themselves influence the route taken.

That complexity does not make moisture investigation impossible. It simply means that good diagnosis depends on following evidence rather than relying on a single symptom or reading.

If there is one idea worth carrying away from this guide, it is that the visible damp patch may represent only one moment in a much longer journey.

Understanding that journey is where useful diagnosis begins.



Glossary of Key Terms

A quick reference to the technical terms introduced throughout TC-05.

Relative Humidity (RH)
How close the air is to saturation at its current temperature, expressed as a percentage.

Vapour Pressure
The partial pressure exerted by water vapour. A vapour-pressure difference can drive net vapour diffusion.

Interstitial Condensation
Condensation occurring within a building element or construction rather than on its visible surface. The resulting liquid water may subsequently accumulate or redistribute within the fabric.

Hygroscopic
Able to absorb water vapour from the surrounding air.

Efflorescence
Visible salt crystals deposited at a surface as moisture evaporates.

Vapour Permeability
How readily a material allows water vapour to pass through it.

μ-value (mu)
A material's water-vapour resistance factor relative to still air. Together with thickness, it determines Sd.

Saturation Margin
The temperature difference between a local measured temperature and the local dew-point temperature. A smaller margin indicates conditions closer to saturation.

Dew Point
The temperature at which air reaches saturation with its existing moisture load and condensation can begin.

Vapour Diffusion
Slow movement of water vapour through the pore structure of a permeable material, driven by a vapour-pressure difference.

Capillary Action
Movement of liquid water through connected pores under capillary forces. Where liquid water is present, capillary transport can be considerably more significant than vapour diffusion through permeable masonry.

Deliquescent
Describes a salt that can absorb enough atmospheric moisture above a characteristic RH to dissolve into solution.

Salt Crystallisation
Formation or regrowth of salt crystals; within pores this can exert damaging pressure on masonry.

Sd Value
The equivalent thickness of still air offering the same resistance to vapour diffusion as the finished layer; lower Sd means more vapour-open.

Hygrothermal
Describes the interacting behaviour of heat and moisture within a material or building assembly.

Thermal Inertia
The tendency of massive building fabric to resist rapid temperature change, so that it warms and cools more slowly than the surrounding air.



Further Reading & Sources

TC-05 deliberately explains complex building science in accessible language. The publications below provide a deeper technical route for readers who want to explore the subject further or examine the professional guidance behind the diagnostic approach. The research base includes measured wall behaviour, modelling and professional guidance; these forms of evidence are useful for understanding mechanism and risk but should not be read as prevalence data for visible dampness in ordinary traditional housing.

Moisture investigation and traditional buildings

RICS / Historic England / Property Care Association - Investigation of Moisture and its Effects on Traditional Buildings: Principles and Competencies, Joint Position Statement (2022). The central professional reference for whole-building, evidence-led moisture investigation. Read online

Historic England - Assessing Damp in Historic Buildings: A Practical Guide to Investigation and Diagnosis (HEAG311, 2026). Detailed current guidance on moisture assessment, monitoring techniques and interpretation. Read online

Historic England - Properties of Traditional Building Construction. Particularly useful on capillary transport, vapour diffusion, hygroscopic buffering and the interaction between moisture and heat. Read online

Condensation, walls and retrofit

BS 5250:2021 - Management of moisture in buildings. Code of practice. The current British Standard takes an integrated whole-building approach to moisture in all states and includes condensation risk. Read online

BS EN ISO 13788:2012 - Hygrothermal performance of building components and building elements. Internal surface temperature to avoid critical surface humidity and interstitial condensation. Calculation methods. Useful precisely because its simplified diffusion-based method states the important phenomena it does not model, including capillary liquid transfer, air movement through gaps and hygroscopic moisture storage. Read online

BS EN 15026:2023 - Hygrothermal performance of building components and building elements. Assessment of moisture transfer by numerical simulation. The current framework for transient numerical hygrothermal simulation of coupled heat and moisture behaviour. Read online

Historic England - Air and Vapour Control Layers (AVCLs) in Buildings of Traditional Construction (2024). Useful technical discussion of vapour-pressure gradients, solar-driven vapour diffusion and moisture risk in traditional fabric. Read online

Historic England - Insulating Walls in Historic Buildings and Risks of Energy Efficiency Interventions. Useful on solid walls, early cavity walls, moisture transport and unintended consequences of incompatible insulation systems. Read online

Measured wall performance and heating behaviour

ArchiMetrics Ltd / SPAB - SPAB Building Performance Survey 2019: Final Report (Historic England Research Report 231/2020). Long-term monitoring of temperature and moisture within traditional stone, brick and cob walls; particularly useful for the saturation-margin concept and post-insulation wall behaviour. Read online

Rye, C., Scott, C. & Hubbard, D. - SPAB Building Performance Survey 2013 (Historic England Research Report 95/2013). Includes plotted temperature and dew-point gradients through monitored traditional walls and discussion of how the margin between them changes through the construction. Read online

Browne, D. - SPAB Building Performance Survey: Hygrothermal Modelling 2012 (Historic England Research Report 59/2012). Advanced hygrothermal modelling of a traditional case-study wall and discussion of the strengths and limitations of condensation-risk modelling. Read online

Heracleous, C., Ioannou, I., Philokyprou, M. & Michael, A. - Hydrothermal Performance of a Stone Masonry Wall in a Traditional Building in Cyprus (PLEA 2017). Long-term in-situ monitoring of a 500 mm rubble-filled stone wall, including temperature through its depth and thermal lag. Read online

Becker, R. B. - Effects of heating patterns on internal surface temperatures and risk of condensation, Building and Environment 28(3), 1993, 333-345. Dynamic comparison of intermittent and continuous heating, wall thermal inertia and condensation risk. Read online

Metals, M., Lesinskis, A., Borodinecs, A. & Turauskis, K. - Preliminary Study on Indoor Air Temperature and Moisture Behaviour in 13th-Century Churches in Latvia, Sustainability 15(18), 13965 (2023). Field evidence from intermittently heated historic masonry showing rapid air-temperature change while the building envelope responds much more slowly. Read online

Maroy, K., Steeman, M., De Backer, L., Janssens, A. & De Paepe, M. - Conservation Climate Analysis of a Church Containing Valuable Artworks, Energy Procedia 78 (2015), 1269-1274. A historic masonry building monitored under intermittent heating and during a two-month period of permanent heating; useful evidence on heating regime, RH stability and moisture release from massive walls. Read online

Vapour permeability and material compatibility

SPAB - Breathability and Old Buildings. A practical explanation of vapour permeability, capillary behaviour and why manufacturers should support 'breathable' claims with measured data. Read online

BS EN ISO 7783:2018 and BS EN ISO 12572:2016+A1:2024. Test standards used to determine water-vapour transmission properties of coatings and building materials. Read online

BS EN ISO 15148:2002+A1:2016 - Hygrothermal performance of building materials and products. Determination of water absorption coefficient by partial immersion. Provides a measured short-term liquid-water absorption coefficient rather than a vapour property. Read online

BS EN 1062-3:2008 - Paints and varnishes. Coating materials and coating systems for exterior masonry and concrete - Determination of liquid water permeability. Relevant when assessing how an exterior coating behaves with rainwater as distinct from water vapour. Read online

ASHRAE Handbook - Fundamentals (2025), Chapter 25: Heat, Air, and Moisture Control in Building Assemblies - Fundamentals. Useful on sorption, moisture storage in porous materials, capillary condensation and the relative importance of diffusion, bulk air movement and liquid-water transport. Read online

A diagnostic cross-check: rising damp

BS 6576:2005+A1:2012 - Code of practice for diagnosis of rising damp in walls of buildings and installation of chemical damp-proof courses. Its relevance to TC-05 is diagnostic: the standard emphasises the need to differentiate rising damp from other causes of dampness. Read online

Local geology

British Geological Survey - Geology of the Isle of Man and its offshore area. Authoritative geological context for the Manx Group and the contrasting rock units discussed in Chapter 5. Read online

The recurring principle is the same throughout these sources: measurements are evidence, not diagnoses. Moisture should be interpreted in the context of the construction, environment, material behaviour and the building as a whole.



About the Tree Cassyn Building Science Series

The Tree Cassyn Building Science Series provides practical, evidence-led guidance on the behaviour, maintenance and repair of traditional buildings on the Isle of Man.

Tree Cassyn is an independent Isle of Man firm specialising in damp, timber and moisture investigations, using a diagnostic, evidence-led approach informed by established professional guidance and relevant British Standards.

Each guide introduces one aspect of building performance in accessible terms, drawing upon the recurring construction details and moisture patterns encountered during Tree Cassyn investigations.

IMPORTANT NOTE

This publication provides general educational guidance. Traditional buildings vary considerably, and similar-looking symptoms may arise from different causes. Repairs should be based upon an investigation of the individual building rather than upon general descriptions alone.

TREE CASSYN

DAMP · TIMBER · MOISTURE INVESTIGATIONS

ISLE OF MAN

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