Treatment of Dampness

This technical information sheet constitutes a vital part of Archicentre Australia’s recommendations to you. Failure to observe the provisions of the warning sheet could lead to premature deterioration of the home. Please ensure that all works are undertaken by appropriately qualified tradespersons.

Damp houses can be unhealthy and costly to remedy. Knowing more about the problems can reduce the worry and expense. Most dampness problems can be cured or minimised by simple remedial work but a few will need substantial outlays. This sheet outlines the causes and remedies of dampness mainly affecting double brick and concrete structural panel construction and some framed buildings with concrete, stone or brick foundations.

In many instances, dampness in your home may not be present all year round and, depending on the source, may only become evident after a change in weather conditions, usually during the colder or wetter months or after periods of heavy or extreme rainfall.

TYPES OF DAMPNESS

Rising Damp

Rising damp occurs at the bases of walls. Water accumulating there has a tendency to "wick up" through the capillaries that are present in the walls, be they brick, block or most stone; and through the mortar in which they are laid. Damp-proof courses are there to block this upward movement of moisture but sometimes are ineffective.

The NCCS Building Code of Australia (BCA), to which all new construction must comply, requires damp-proof courses to be placed through the full thickness of the base of walls below floor level to form an impervious layer that keeps rising dampness out of the interior of the house (Refer Australian Standard AS3700: Masonry Structures).

Falling Damp

Refers mainly to the effect of leaking roofs, pipes etc., where water penetrates the wall or walls from above. Leaking pipes or downpipes, if ponding near a wall, can increase rising damp.

Horizontal Damp

Various defects can cause water to move horizontally through a wall at any height and create a damp patch.

Condensation Dampness

Moist warm air that is inside a house will condense into its liquid state where it touches colder surfaces such as windows, walls, or the underside of metal roof sheeting.

SIGNS OF DAMPNESS - WHAT TO LOOK FOR

With the exception of condensation, most forms of building damp are the result of rain and not unexpectedly, the signs of this defect may be absent during dry seasons or periods of extended drought. Even if a wall or ceiling is damp, the problem can often be hard to detect until the material starts to dry out, drawing the moisture to the surface.
The three most common signs are:

1. **Surface Stains**

   Water moving through bricks, blocks etc may dissolve some of the alkaline salts from the mortar. The salts can then react with the tannins in timber, wallpaper or the like to produce stains that are usually brown. The stains can be unsightly, but do not cause damage.

   Some clay bricks with vanadium salts stain brown or purple after being cleaned with spirits of salts (i.e. hydrochloric acid, which is often applied to remove mortar splashes). Such stains usually disappear with a scrubbed-on application of diluted caustic soda (e.g. some dishwashing detergents) but the stains can sometimes be stubborn and will then require specialised treatment.

2. **Lifted Surface Finishes**

   As a wall affected by damp dries, the water will be drawn to the surface and find itself trapped under the paint film or other surface finish. The evaporating water lifts the film in bubbles that will eventually break to leave blisters. Wallpaper or other applied finishes, including timber panels, can be similarly damaged.

3. **Efflorescence and Fretting**

   Where there is a continuous supply of water rising up a wall, it will contain dissolved salts, and when that water dries out at the surface, the salts will crystallise. If the crystals form on the surface of the wall as a white furry coating, it will be suffering from non-damaging efflorescence, but if the crystallisation occurs within the bricks or mortar, the forming crystals can exert pressure that causes the surface to break down and fret away.

   In most of Australia this phenomenon is called salt attack, but the South Australian name for it - salt damp, is often also used. With rising damp, there is generally a continuous supply of water (such as damp soils around and under the footings and walls) so salt attack damage worsens over time, but it usually reaches a stage where crystallisation occurs only on the surface as efflorescence and fretting stops.

   ![Fretted mortar resulting from rising damp.](image)

**CAUSES OF RISING DAMP OR "SALT-DAMP"**

### Disrupted Damp-Proof Course

The minor movements to which all structures can be subjected sometimes cause brittle damp-proof courses to crack and thus create a path for dampness. Slate and mortar damp-proof courses are the type most subject to damage from this cause, but tar and sand can also become brittle enough to crack. The result is usually a local patch of efflorescence, fretting or timber rot.

### The Damp-Proof Course no Longer Copes

Some change to the conditions at the base of the wall that put increased pressure on what was always a deficient damp-proof course (e.g. a mortar damp-proof course with inadequate waterproofing compound mixed into it) is the most common reason for a building to develop a dampness problem.

For example, some brick walls are higher off the ground than required by regulation and water wicking up that wall is frequently able to evaporate off from the sides of the masonry before it reaches the level of the damp-proof course. However, if that evaporation is inhibited by raising the level of the ground outside, or by blocking the ventilators that are provided to ensure good air circulation under the floor, the moisture has nowhere to go except up through the deficient damp-proof course. Therefore these impediments should be removed.

Similarly where the renovation of a house with a timber floor involves the substitution of a new concrete floor slab in place of a pre-existing timber floor the concrete against the original external wall will stop moisture evaporating from that wall and can induce rising damp damage. If the plastic membrane underneath the slab has also been damaged or has broken down this can create an additional load on a poor damp-proof course and cause rising damp particularly if the ground underneath is boggy and poorly drained. A partial remedy is to improve the drainage.
The Damp-Proof Course is Bridged

If a membrane damp-proof course is not placed through the full thickness of the wall, there will be a mortar "bridge" at the face of the mortar joint. Moisture will cross that bridge and can cause salt attack fretting in the bricks and mortar above. (The Australian Standard masonry code requires sheet damp proof courses to protrude out from either side of the wall.) This problem is most commonly seen in older houses where a bituminous felt membrane was used that was less than the full width of the wall, but fortunately it seldom produces extensive damage because the mortar bridge itself soon frets away and thus enables the membrane damp-proof course to do its intended job.

A similar, but non self-curing problem can occur when older face brickwork or blockwork is rendered and the render bridges the damp-proof course. Other cases are also illustrated below. One example is where a concrete path is located above damp-proof course level. The problem is made worse if the path slopes towards the wall. Another is where successive layers of mulch or topsoil build up on adjacent garden beds above the damp-proof course level. Building up the adjacent ground level can also create easy access to the sub floor for termites (Refer Archicentre Australia's "Termites and Borers" Technical Information Sheet).

Another bridging problem can be created where mortar droppings in the base of the wall cavity build up and cover the stepped flashing/damp-proof course and thus provide a passage for dampness from the outer to the inner leaf of the wall. This type of bridge is seldom continuous and usually only causes local patches of damp to develop.

CAUSES OF FALLING DAMPNESS

Water pipes, stormwater pipes, roofs, gutters and downpipes can all leak water into roofs, down walls and also into the ground that will also increase the chance of rising damp. A thorough examination of all these elements may reveal the sources of leaks and a repair should be affected.

Minor guttering problems can be patched with bituminous tape or similar. Water pipe problems and other persistent problems may be solved through reference to Archicentre Australia's "Roofing and Guttering" Technical Information Sheet or by contacting a licensed plumber.

Water from leaking roofs or condensation on the underside of roof sheeting can travel for some distance before it finally appears within the house as falling dampness makes it difficult to determine the precise source of the problem. Tracing the origin of white salts on the underside of the roof sheets or tiles may produce the answer.

In houses built without eaves, with the gutter fascia often in direct contact with the wall, the slightest irregularity in gutter placement or blocked or damaged gutters may result in water overflowing directly down the wall, increasing the likelihood of water penetrating behind loose render, or worse still penetrating through to the wall cavity. Particular care must also be taken with the location and the correct plumbing connections of rainwater tanks and air conditioning condensate drains to ensure the overflows are directed away from the walls to avoid similar potential problems.

CAUSES OF HORIZONTAL DAMPNESS

Where horizontal dampness is present in a cavity wall, it is usually because mortar droppings lodge on the ties joining the two walls and form a bridge for water to cross and create damp patches internally.

In most instances of dampness penetrating a single skin wall, it will accumulate at a horizontal gap (commonly a less than perfectly full mortar joint, but which may also be caused by footing movement which creates cracking); cutting holes in walls or defective flashings can also be the cause. In most cases where the single skin wall is
soundly built, the moisture evaporates from the external face of the brick faster than it can penetrate to any depth, so it is not usually a significant problem.

CAUSES OF CONDENSATION DAMPNESS
Where warm air comes into contact with cooler surfaces, it leaves a film of moisture. This is commonly encountered in cars in winter, particularly at night when demisting is required.

In the home, condensation typically takes place on cold surfaces such as ceilings, or windows, the tops of walls or in air flow stagnant areas e.g. behind cupboards and furniture placed hard up against walls, and on windows behind part closed blinds or part drawn curtains, particularly where there is no pelmet.

Condensation is most common in bathrooms when running a shower or bath, in laundries while using an internally vented clothes dryer, and in kitchens when cooking. Also the underside of the roof covering can easily become cold enough for condensation to form, particularly with metal roofs. Moisture condensation will often occur at night in unheated or uninsulated bedrooms when moist breath exhaled while sleeping comes in contact with the cold surface of walls, ceilings and windows.

While condensation may be noticed under some lighting conditions as a sheen across the surface, it often goes undetected until mould begins to develop. Moulds require moisture, a food source (such as paper, paint, clothing, etc) and still air to grow. About 70 of mould problems are due to condensation coming from wet areas like bathrooms and laundry, while 30 comes from rising damp.

Above: Bridging of Condensation induced mould which has developed behind furniture above, and at the top of the walls and ceiling in an uninsulated room right.

CURES FOR RISING DAMPNESS
Repair the Damaged Damp-Proof Course
A deteriorated damp-proof course is nearly always one that has cracked rather than physically broken down. The associated damage is usually local and close to the crack. In the case of isolated patches of rising damp due to this cause, local insertion of a new damp-proof course followed by treatment of deteriorated plaster or other wall covering will usually be appropriate.

Improve Sub-Floor Ventilation
Rising damp can often result from a lack of sufficient, partly or completely blocked, sub-floor ventilators or vents. Typically, older brick dwellings have an inadequate number of sub-floor vents. Blocked ventilators commonly occur where the ground or garden bed level around the house has risen over time, or a new path or verandah paving has been laid at a higher level than the ventilators. Removing the obstruction or lowering the ground or garden bed level will frequently fix the problem. Where this is not possible, ducts connected to sub-floor vents that rise above the obstruction, will frequently bring the desired cure.

Traditional terra cotta and cast iron vent faces in older houses can look handsome, but the holes through them offer only about one tenth of the ventilation area as their modern metal counterparts. Substitution of the originals for modern vents will frequently bring sufficient improvement to circulation under the house to eliminate a rising damp problem. Simply increasing the number of vents will further improve circulation. In the case of full brick houses, it might be necessary to carefully form openings in the internal base walls below the floor to ensure the free flow of air throughout the whole sub-floor space. Ensure this work is undertaken by a qualified tradesperson.
as care should be taken to ensure that this is done in areas such as under doorways where there is no load. Alternatively appropriately sized lintels will need to be installed.

Sub-floor air flow can also be increased by installing a solar or dc powered unit in the sub-floor space. Alternatively, ventilation can be further increased by creating suitably located flues, such as a sheet metal pipe, that uses the non-mechanical (passive) stack effect to draw air from the sub-floor area and discharge it to the outside above roof level. Using wind driven rotating cowl fans on the top of such flues, or solar- powered electric fans can increase the amount of air moved. A disused chimney can also serve this purpose if the fireplace is blocked off and holes are cut through the hearth. Again ensure this work is undertaken by a qualified tradesperson.

Where an open fireplace is still in use, placing a closable ventilator through the floor near the hearth will enable that fireplace to draw air from the sub-floor area while at the same time reducing the cold air drafts that would otherwise pass the feet of those enjoying the fire's radiant heat.

Repair Leaking Plumbing

Modern domestic water meters measure the volume of water passing through them with such accuracy that they can be used to test for leaks. If all the taps are turned off and the meter still registers a flow of water, there must be a leak. Cracked or damaged waste pipes - sewer or stormwater - should also be investigated preferably by a licensed plumber. These may be more problematic to detect. Repair of leaking water pipes or drains will eliminate them as a cause of the problem and should be undertaken by a licenced plumber. Remedying the damage caused will often require additional effort.

Combat Damp-Proof Course Bridging

Dampness caused by poorly laid paths or high garden beds can be cured by either (a) rebuilding the path or re-levelling the garden bed below the damp-proof course, and grading or sloping it away from the house or (b) installing a spoon or enclosed drain in the path adjacent to the wall below the damp-proof course and connecting it to the stormwater. Of the two, (a) is preferable because it also improves sub-floor ventilation.

Where dampness is caused by a bridge of mortar droppings in the base of the cavity in a full masonry house, experience shows it often to be practically impossible to gain access to the cavity to remove the bridge. However, there will usually only be occasional damp spots and a local damp-proof course insertion above the damp patch plus the internal application of a waterproof coating of the masonry below the new damp-proof course and then replastering if necessary will usually effect a cure.

Install New Damp-Proof Course

Where the remedies described above are ineffective or not possible it will be necessary to embark on the process of inserting a new damp-proof course. There are a variety of methods of doing this, but two dominate:

1. **Physically insert a new Membrane**
   A mortar bed-course, at a level below the lowest floor frame member is cut out and a new damp-proof course membrane is then inserted into the resulting horizontal gap.
   The main difficulty is in ensuring that the mortar caulking around the new membrane is adequate to support the wall above. Because of this problem, the technique is now mostly associated with a patented method using a plastic bag as the membrane. It is inserted into the joint and then pumped full of a quick-setting mortar to ensure support.

2. **Create a Chemical Damp-Proof Course**
   A horizontal row of holes is drilled into the bricks or mortar and they are then injected with a chemical - usually polysiloxane - under the pressure of gravity or using a pump to impregnate a band of bricks and mortar that render that layer of bricks highly resistant to the passage of water.
   This method has the great advantage that it does not interfere with the structure, but like all other methods of damp proof insertion, its effectiveness is highly reliant on the care taken and the expertise of an experienced tradesperson.

REPAIRING THE DAMAGE DONE BY RISING OR SALT DAMP

Repairing Damaged Hard Plaster

Hard plaster that has been wet because of rising damp will have reacted with the salts in the rising water to create hygroscopic compounds that attract water from the air into the plaster. Because of this, a completely dry wall will not be created unless that contaminated plaster is replaced.
It is wise to remove that plaster to a height about 300 mm above the level to which water was observed to have risen, but it is also wise to wait several weeks - perhaps as long as three months between repairing the damp problem and replacing the plaster. This time period will allow the rising damp moisture to evaporate off the bricks, draw the undesirable salts into the plaster layer and thus enable that salt to be removed with the plaster.

**Repairing with Waterproof Plaster**

The use of waterproof plaster in the cure of salt attack resulting from horizontal damp, where mortar bridges the cavity or the damp-proof course, is about the only time that this product may fix the problem.

Attempts are sometimes made to cure the consequences of damp rising resulting from a failed damp-proof course by applying waterproofed plaster to the damp areas. Rising damp is rarely cured by this technique rather it simply causes the damp to move further up the wall and appear in what was previously an unaffected area.

**Installing Veneers**

Some contractors replace the entire surface with waterproof plasterboard. Others use a technique of attaching battens to affected walls and nailing on new plasterboard, providing a 5mm to 10mm gap between the old surface and providing ventilation slots top and bottom. In this case, all timber used for framing should be decay-resistant and the fastenings rust resistant.

All of these methods fall into the category of cover-ups rather than cures and consequently cannot be considered permanent solutions.
Repairing Fretted Mortar

Where rising damp has caused mortar in external face brickwork to fret away and the cause of that dampness has been cured, the appearance of the brickwork can be restored by repointing the joints. If this is undertaken, it will be wise to rake out the existing joints to a depth of 25 to 30 mm before repointing and it will be important not to use too strong a mortar in that repointing. Waterproof mortar should be used if repointing the damp-proof course.

THE CURE FOR HORIZONTAL DAMPNESS

Horizontal dampness caused by mortar bridging between walls are usually isolated patches and once the external point or area of water of entry has been identified, a waterproof coating can be applied. Painted-on coatings, either obscure and pigmented, or as clear coatings, such as silicones, are very effective for this purpose. However, competent repairs of cracks and gaps in the mortar are essential prior to painting, otherwise the coating will probably deliver more water to the gap than was the case before the coating was applied.

Internal damage can be repaired by patching, as mentioned above. If the horizontal damp penetration has been severe and protracted, it might be necessary to strip off and replace affected plaster, as also described above in relation to rising damp.

THE CURE FOR CONDENSATION DAMPNESS

Simple cases of condensation dampness on ceilings and the top parts of external walls can often be resolved by installing ceiling insulation. It stops both the ceiling and the tops of walls from getting too cold and brings with it a significant saving in the amount of energy needed to heat the house in winter. Heavy drapes with pelmets over windows similarly create an insulating layer of air, preventing condensation on the colder surface of the glass.

In addition increase airflow through the house at times when the external air is drier, thus decreasing humidity. This could involve opening windows and cutting back shrubbery.

All exhaust flues from cooking, bathing and clothes drying should be vented externally and not into the roof space, or wall cavity where they can cause condensation problems particularly where the house has a metal roof, or the roof is lined with reflective sarking or insulation.