Archicentre

Treatment of Dampness

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Technical Information Sheet

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 minimized by simple remedial work but a few will need substantial outlays. This sheet outlines the causes and remedies of dampness.

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 Building Code of Australia, to which all new construction must comply, requires damp-proof courses (dpcs) 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. (SAA Masonry Code, AS3700.)

Falling damp

Refers mainly to leaking roofs, pipes etc., which 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 air which is inside a house will condense into its liquid state if it touches cold windows, walls, or the underside of metal roof sheeting.

Signs of Dampness - what to look for

If the wall or ceiling is damp, problems can be hard to detect, but these start to show up as things become drier. The three most common signs are:

Sign of damp: 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. They 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 dishwashing detergent) but the stains can sometimes be stubborn and require specialised treatment.

Sign of damp: Lifted surface finishes

As a rising damp wall 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 of the sort shown. Wallpaper or other applied finishes, including timber panels, can be similarly damaged.

Sign of damp: 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

Figure 1. Rising damp lifting finishes.

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 heard. With rising damp, there is a continuous supply of water 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.

Causes of Rising damp or “Salt-damp”

Cause of damp: Disrupted damp-proof course

The minor movements to which all structures can be subjected sometimes cause brittle dpcs to crack and thus create a path for dampness. Slate and mortar dpcs are the sorts 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.

Cause of damp: The d.p.c. no longer copes

Some change to the conditions at the base of the wall that put increased pressure on what was always a deficient dpc (e.g a mortar dpc with inadequate waterproofer 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 dpc. 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 dpc. Therefore such soil should be removed.

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Similarly where the renovation of a house with a timber floor involves the substitution of a new concrete floor slab in place of a timber floor the concrete against the boundary wall will stop moisture evaporating from that wall and can induce rising damp damage. If the plastic membrane underneath the slab has also been holed or broken down this can create additional load on a poor dpc and cause rising damp (See figure 2) particularly if the ground underneath is boggy. A partial remedy is to drain the ground.

Cause of damp: The d.p.c. is bridged

If a membrane dpc is not placed through the full thickness of the wall, you will have 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 SAA masonry code requires sheet damp proof courses to stick out either side of the wall.) This problem is most commonly seen in older houses where a bituminous felt membrane was used that is 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 dpc to do its intended job.

A similar, but non-selfcuring problem can occur when older face brickwork or blockwork is rendered and the render bridges the dpc. Other cases are also illustrated in Figure 2. One example is where a concrete path is located above dpc level with the problem being made worse if the path slopes towards the wall or successive layers of mulch or top soil build up adjacent garden beds above the dpc level. Changing the adjacent ground level can also create easy access to the sub floor for termites (refer Archicentre Technical Information Sheet on Termites and Borers).

Another bridging problem can be created where mortar droppings in the base of the wall cavity build up and cover the stepped flashing/dpc 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.

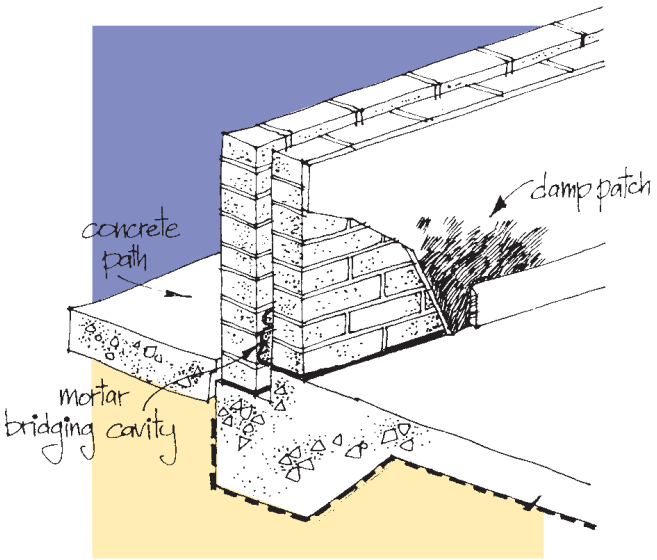

Figure 2. Bridging of the dpc

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 which will also increase the chance of rising damp. A thorough examination of all these elements may reveal sources of leaks.

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's Technical Sheet on "Roofing and Guttering" or by contacting a licensed plumber for major repairs.

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 making it difficult to determine the precise source of the problem. Tracing the origin of white salts on the underside of the sheets or tiles may produce the answer. Replacing the roof sheeting or tiles, patching partly defective surfaces or reducing condensation where possible are the best solutions.

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. Particular care must also be taken with the location and correct plumbing connections of rain water tanks and air conditioning condensate drains located against 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 wall the dampness accumulates at some horizontal gap. Bricklaying that leaves mortar joints less than perfectly full is a common reason for those gaps, but footing movement which creates cracking, cutting holes in walls or defective flashings can also be the cause. In most cases where the single wall is soundly built, the moisture evaporates from the brick faster than it can penetrate to any depth, so is not a problem.

Causes of condensation dampness

Cold surfaces within the house on which condensation takes place are typically ceilings or windows, the tops of walls or in stagnant areas e.g behind cupboards. Also the underside of the roof-covering can easily become cold enough to be the location for condensation, particularly with metal roofs.

The origin of moist air can simply be the house occupants, but the common sources of large volumes of water vapour are cooking, bathing or clothes drying.

CURES FOR RISING DAMPNESS

Cure for damp: Repair the damaged d.p.c.

Mention has been made that a deteriorated dpc 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 dpc followed by treatment of deteriorated plaster as further described will usually be appropriate.

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Cure for damp: Improve sub-floor ventilation

Where rising damp results from sub-floor ventilators having become partly or completely blocked, usually because ground level around the house has risen over time, removing the obstruction or lowering the ground level will frequently fix the problem. Where the blockage is caused by the laying of a higher than original level path or verandah and it is not possible to lower them, ducts connected to sub-floor vents 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 the 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.

Ventilation can be further increased by creating suitably located flues, such as a sheet metal pipe, that uses the stack effect to draw air from the sub-floor area and discharge it to the outside above roof level. The amount of air moved can be increased by using wind driven rotating cowls on the top of such flues or solar-powered electric fans. A disused chimney can also serve this purpose if the fireplace is blocked off and holes are cut through the hearth.

Where an open fireplace is still in use, placing a closeable 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.

Cure for damp: 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 licenced plumber, but may be more problematic to detect. Repair of leaking water pipes or drains will eliminate them as a cause of the problem, but remedying the damage will often require additional effort.

Cure for damp: Combat d.p.c. bridge

Dampness caused by poorly-laid paths can be cured by either (a) rebuilding the path below the dpc, and sloping it away from the house or (b) installing a spoon or enclosed drain in the path adjacent to the wall 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 dpc insertion above the damp patch plus the internal application of a waterproof coating of the masonry below the new dpc and then replastering will usually effect a cure.

Cure for damp: 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, to the effective elimination of all others and they are now discussed

(a) Physically insert a new membrane

A mortar bed-course, at a level below the lowest floor framing member is cut out and a new dpc 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.

(b) Create a chemical d.p.c.

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 a pump to impregnate a band of bricks and mortar to render that layer highly resistant to the passage of water.

The method has the great advantage of not requiring any interference with the structure, but like all other methods of damp proof insertion, its effectiveness is highly reliant on the care taken, and expertise of, an experienced operator.

Repairing the damage done by rising or salt damp

Repairing damaged plaster

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

Mention has been made of the use of waterproof plaster in the cure of salt attack resulting from horizontal damp, where mortar bridges the cavity or the dpc, but that is about the only time that it will fix the problem.

Attempts are sometimes made to cure the consequences of damp rising through an inadequate dpc by applying waterproofed plaster to the damp areas. Rising damp is far too smart to be cured by this technique and the result will usually be to simply cause it to move further up the wall and appear in what was previously an un-effected area. Figure 3 illustrates the action.

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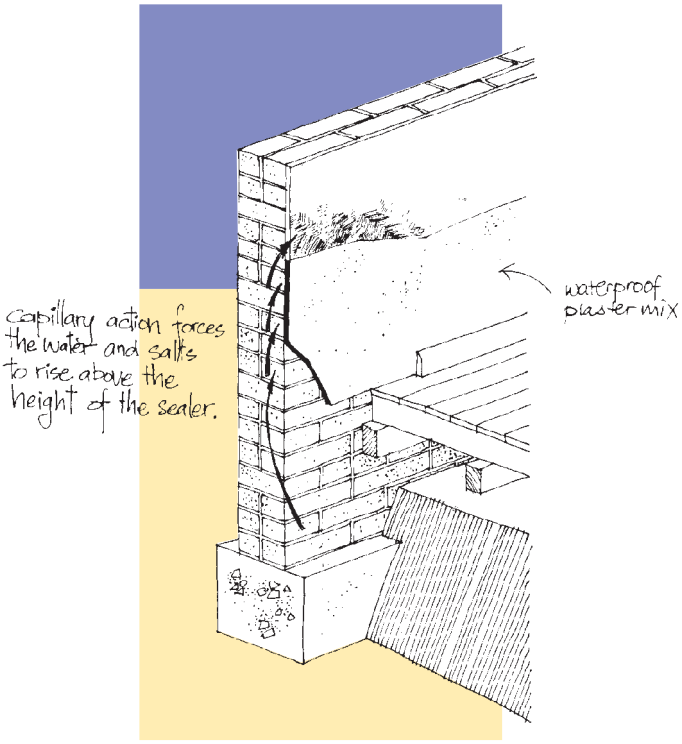

Figure 3. Waterproof plaster does not work

Installing veneers

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

All of these methods fall into the category of cover-ups rather than cures and consequently cannot really 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. Equal parts of cement and lime plus six parts of sand - that is a C1:L1:S6 mortar - will be as strong as will be needed.

The cure for horizontal dampness

Horizontal dampness by mortar bridging between walls are usually isolated patches and can be repaired with waterproof plaster etc. Horizontal dampness problems are usually cured by the application of a waterproof coating to the outside of the wall. 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.

If the horizontal damp penetration has been severe and protracted, it might be necessary to strip off and replace affected plaster, as 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 ended 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 fuel 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 roofspace where they can cause condensation problems particularly when the house has a metal roof.

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