Hawkesbury City Council

Attachment 1

to

item 7

Fact Sheet Rising Damp Heritage Development Guidelines

date of meeting: 22 July 2021
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HAWKESBURY CITY COUNCIL

FACT SHEET RISING DAMP

HERITAGE GUIDELINES

OCP ARCHITECTS
Draft A – February 2021

CONTENTS

1 INTRODUCTION

Rising damp is a major cause of decay of masonry building fabric such as brick, stone, mortar, and plaster finishes on masonry walls. Mild rising damp can cause unsightly staining, bubbling of paint finishes, deterioration of plaster finishes as well as crumbling of external masonry. Severe rising damp, especially if in combination with salts, if not treated, can result in eventual structural failure of masonry walling. Damp walls resulting from rising moisture encourage mould growth, resulting in musty smells and possible health problems for occupants.

This Fact Sheet introduces rising damp, the means of diagnosing it, and methods of treatment and control.

Figure 1: Typical blistering of paint and damage to plaster finish caused by combination of rising damp and salt

Figure 2: Typical salt damp damage causing decay of the bricks (Heritage Council NSW)

Figure 3: Loss of mortar in joints due to salt attack causing dislodgement of bricks, with white salt efflorescence stains evident.

1.1 What is Rising Damp?

Rising damp is caused by capillary suction of moisture of the fine pores and voids that are present in all masonry materials, such as brick, stone, and mortar. These capillaries draw water from the ground resulting in damp areas at the base of walls. As the moisture evaporates from both the exterior and interior of the wall it allows further moisture to be drawn up. Normally the height limit for rising damp is about 0.5m to 1.5m above floor level but is ultimately determined by the evaporation rate and the particular nature of the wall material.

Internally rising damp may show up as a tide mark on wall finishes, bubbling paint or loss of wall plaster. Externally, as well as crumbling and fretting masonry, it may show as extreme loss of mortar in joints and loss of masonry units completely.

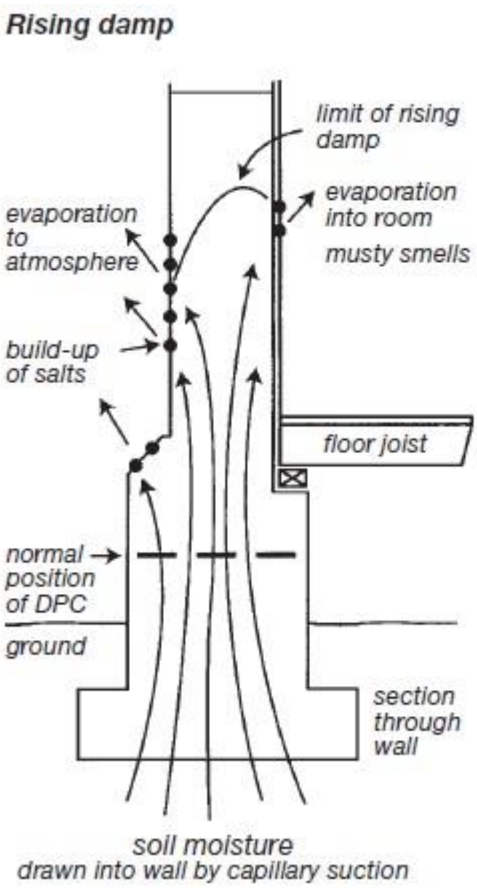

Figure 4: Rising damp (NSW Heritage Office)

1.2 Porosity and Permeability

Masonry building materials such as stone, brick or concrete are to varying degrees porous, i.e., they contain voids or pores. The higher the porosity of the material the more susceptible to moisture migration and generally the less durable. The degree to which the pores in a material are interconnected is called permeability. Most masonry materials are permeable to some extent, so water and air can move through them to varying degrees. Highly impermeable materials include granite, concrete, marble, and slate, while materials such as sandstone, brick and limestone are more permeable and more susceptible to the migration of damp.

1.3 Breathability of walls

Masonry walls 'breath' by expanding when they warm up, allowing a small proportion of air to leave the wall via pores, and contracting when the wall cools down, allowing the air to move back into the wall from the outside atmosphere.

When humid air is drawn into the wall and if the wall material cools below dew point, some of the moisture will condense as droplets within the pores of the wall. When the weather is warmer and drier, some of this moisture will leave the wall by evaporation. The amount of water will vary with seasons and the climate. If there are salts and other moisture attracting materials in the masonry wall, the amount of moisture drawn in may be sufficient to cause the wall to be visibly damp.

Coatings such as modern impermeable paints, which are applied to seal the surface of the wall from water penetration, risk trapping the moisture within the wall behind the protective coating. If there are salts within the damp, they will cause damage to the masonry wall fabric.

1.4 Damp- proof courses

In modern buildings a damp-proof course (DPC), often made of polyethylene and 0.5mm thick, inserted into the masonry wall below floor level prevents the migration of damp up the wall. Many older buildings were constructed without DPCs, and it was not until the third quarter of the 19th C that they were recognised as a necessity, and became more prevalent. Often consisting of roofing slates, lead, bitumen impregnated fibre and various asphalt based composites, these DPCs eventually deteriorate, resulting in a rising damp problem.

Illustrations below show how an existing DPC can be bridged by changes to the outside ground level, the addition of a rendered finish, or the timber floor replaced with a concrete slab.

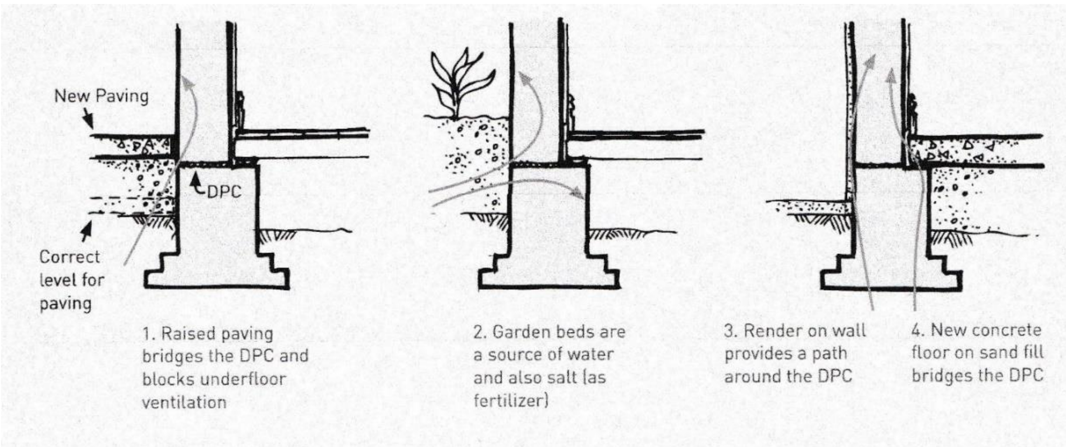

Figure 5: Rising damp bridging the DPC (Heritage Council of NSW)

1.5 Salt Attack

If there are salts present in the soil, they can be carried up into the wall in solution, exacerbating damage to the wall material and wall finish. When the moisture evaporates from the wall the salts are left behind, slowly growing and disrupting the masonry fabric causing fretting and loss of surface skin. Over seasonal wetting and drying the repetitive precipitation of salts results in the progressive decay and crumbling of the masonry surface.

Salts left behind by evaporation of moisture can be often observed as white efflorescence on the wall surface.

Figure 6: Efflorescence on brickwork caused by the presence of crystalline salt

1.6 Other forms of damp

While most damage is caused by salt attack associated with rising damp, there are other forms of damp which can cause damage to building fabric.

Falling damp

Falling damp is moisture percolating downwards through the pores in the masonry walling material. Like rising damp, if salts are present in the moisture, when it evaporates it leaves salts behind which damage the masonry material.

Causes range from blocked or leaking roof gutters, blocked or broken downpipes, deteriorated roof and gutter flashings, open joints in masonry walling, and the build-up of dirt and mosses on upper surfaces of masonry walls. Vegetable matter such as fallen leaves, moss, lichen and dirt as well as bird manure all contain weak acids and salts, and if carried into masonry walls can cause decay.

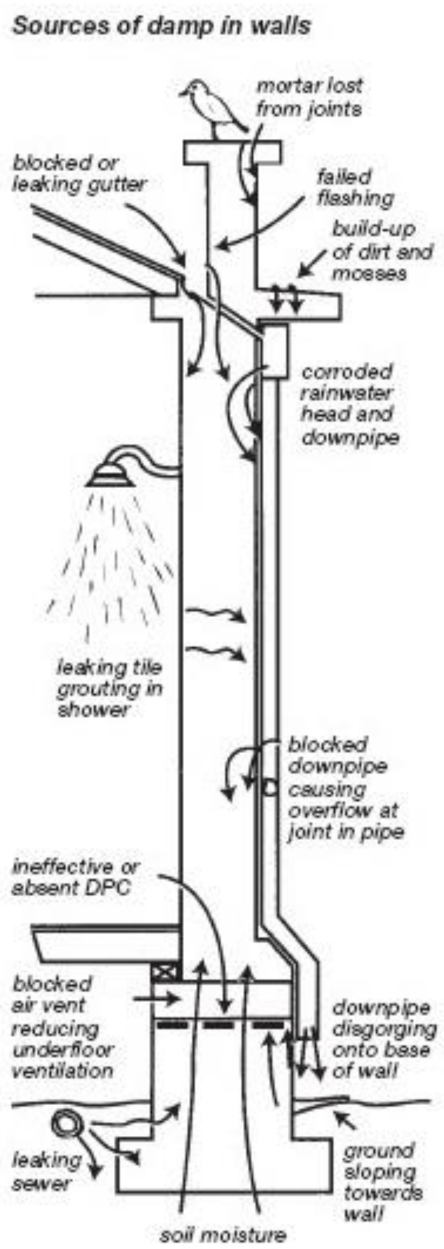

Figure 7: Sources of damp in masonry walls (NSW Heritage Office)

Figure 8: Open joints in cornice stones has allowed water with salts to discolour and damage stonework below

Figure 9: Falling damp from blocked rainwater head has produced dark green algae and salt attack in stonework (Heritage Council of NSW)

Penetrating damp

Horizontal or penetrating damp can result from various causes, and can enter both from the interior and exterior of a masonry wall. Internally this may include leaking water or waste pipes, damaged tiles or failed grout in shower recesses or other wet areas, persistent condensate drips from air conditioners and leaking hot water systems. These sources are recognisable as localised damp spots and/or decay.

Externally penetrating damp may result from defective mortar joints where the mortar has eroded and the joint is open, or construction faults such as mortar droppings left on brick ties in cavity brick walls which allow water to migrate to the inner skin. Older buildings had no brick cavity and usually consisted of two brick skins separated by mortar. These walls depended on the integrity of the construction, and when they leaked were often rendered to reduce water penetration. In recent times modern paints have been used for the same purpose, but because they do not allow the wall to dry out rapidly after rain, they can increase rather than decrease the occurrence of internal damp.

2 DIAGNOSIS

Accurate diagnosis of the cause and degree of a damp problem in a masonry structure is important. While the presence of rising, falling or penetrating damp may be detected by the home owner, it is advisable that specialist advice be sought as to the exact nature of the problem. Failure to correctly identify the cause or causes of damaging damp can lead to wasteful and unnecessary repairs which do not solve the problem, or may in fact make the problem worse.

The following should be question to be asked:

- Is the damp simply the result of condensation inside the building?
- Is the damp resulting from hot water overflows or air conditioning condensate drains?
- Is the damp rising, falling, or penetrating damp, or a combination of these?
- Is the damp localised in one area which may indicate a leaking pipe or downpipe failure?
- Is there a damp proof course present?
- Is the damp at a similar level all around the base of the building, or is it localised in one area at the base of the wall? If the former it may indicate general failure of the DPC. If the latter it may indicate localised bridging or breakdown of the DPC
- Is the sub-floor area damp or dry?
- Are there signs of old repairs such as hard cement render repairs which are causing n moisture migration?

Inspections should be carried out before and after a dry spell in the weather to avoid the possibility that rain may have washed salts back into the walls, making their presence less obvious. Follow-up monitoring inspections are highly recommended.

2.1 Moisture meter

The moisture content of masonry materials can be measured with a moisture meter. There are several varieties which measure related electrical properties, including the conductivity, and the impedance of a material. Water held in masonry can significantly alter these properties, as can the presence of salts.

Moisture meters with sensor pads are preferred for use on heritage buildings rather than those with sharp probes, avoiding damage to finishes such as paint and wallpapers.

Moisture meters are a convenient first indicator of damp and/or salt problems in masonry walls, but they should not be used as the only means of diagnosing a damp problem. Care is need in interpreting meter readings because the presence of salts has a significant effect on the electrical properties (e.g., increasing conductivity) which means moisture meters cannot distinguish between relatively dry but salty walls, and those that are wet but free of salt.

Figure 10: Measuring damp levels in wall with moisture meter

Figure 11: Moisture meter

3 CONTROL AND TREATMENT

3.1 Removing salt

If good housekeeping practices (see Section 4 below) are not sufficient to reduce or keep damp and salt build-up under control, other methods may need to be employed, all of which should be carried out by specialist contractors.

Desalination methods include the application of poultices, dry vacuuming, captive-head washing and ultimately the insertion of a DPC.

Poultices

Poultices are highly absorbent materials (such as absorbent clays, with pulp paper reinforcement) with fine pores, which when applied to masonry suck up the moisture and salts. Water in the poultice when applied to a wet to dryish wall, shrinks onto and into the masonry wall, and as the wall dries water borne salts are drawn to the surface evaporate and are absorbed by the poultice, which is removed when it dries. This method may take several cycles of application to reduce salts to an acceptable level.

Poultices are now commercially available.

Dry vacuuming

Surface salt deposits can be removed by use of a commercial vacuum cleaner with a brush head.

Captive-head washing

Captive-head washing is a system designed for cleaning dirt and grime from building façades in which the dirty wash water is captured by a powerful wet vacuum cleaner, thus minimising clean-up and waste disposal issues. This system is now successfully used to reduce salts in masonry walls. For example, by removing salts prior to repointing mortar joints, because the mortar has less salt to cope with it will have a longer life.

Figure 12: Captive-head vacuum washing

3.2 Inserting a Damp-proof Course

In very severe damp situations, when other methods have proved to be insufficient, or have only been of temporary benefit, the insertion of a DPC may be the only long term solution. Insertion of a DPC can be an expensive procedure and should be only carried out by experienced practitioners.

DPCs should be located between 150mm and 250mm above finished ground level, i.e., about two to three courses of brickwork. The methods of inserting a DCP include:

Undersetting, where sections of the wall base are removed in short lengths, the semi-rigid DPC inserted in overlapping lengths and the wall section replaced either in new masonry, or if possible, with the existing masonry units.

Slot sawing, where a horizontal slot is sawn through the wall base to allow the insertion of a semi-rigid sheet DPC

Chemical impregnation, where water repellent chemicals are injected through spaced drill holes, the chemical permeating through the natural pore structure and joining with the chemical from adjacent drill holes to form a continuous water repellent zone.

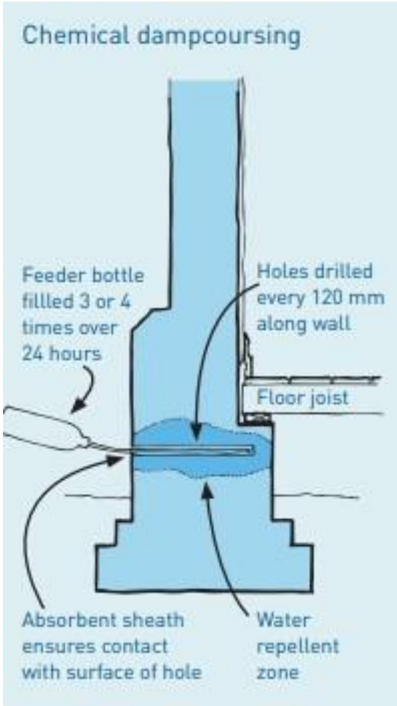

Figure 13: Chemical DPC impregnation process (Heritage Council of NSW)

Figure 14: Chemical DPC impregnation in progress

As individual circumstances will vary, advice as to which DPC insertion method is employed should be sought from reputable practitioners, or specialist heritage consultants.

4 GOOD HOUSEKEEPING PRACTICE

4.1 Maintenance

Very often damp problems are the result of neglect and poor maintenance. Basic maintenance of stormwater is essential in keeping walls dry and preventing damp problems.

1. Maintain gutters, downpipes and rainwater heads with regular cleaning of leaves and debris so they are free of blockages. Realign gutters where necessary to maintain adequate falls. Repair leaks in gutters and downpipes as soon as they occur. Are the size of gutters and downpipes sufficient, and are there enough downpipes to cope with heavy and sustained rainfall?
2. Ensure that the base of downpipes are connected to the stormwater system so that water does not discharge onto the base of walls. If there is no stormwater system readily available ensure that the stormwater discharges to a downslope outfall. Ensure there are enough inspection points in the downpipes especially at bends and ground level so that blockages can be rodded free.
3. Maintain ground levels at the base of walls at least 200mm below DPC level.

4.2 Site drainage

To prevent water ponding around the base of masonry walls and promoting dampness, ground levels at the base should fall away from the wall. A fall of about 1:40 is recommended. An open spoon drain is also an effective means of drainage and is easily cleaned of debris.

Plants and gardens should never be located at the base of masonry walls as the resulting ground level rise from the addition of mulch encourages damp and fertilisers which contain salts which are watered into the base of the wall. Garden beds should be set back from the wall base with a 300mm minimum zone for drainage and (Figure 15).

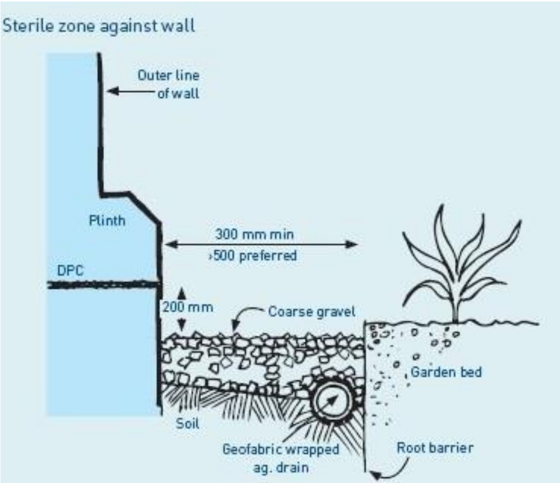

Figure 15: Drainage zone at base of masonry wall
(Heritage Council of NSW)

An air drain is an alternative means of controlling damp at the base of external walls.

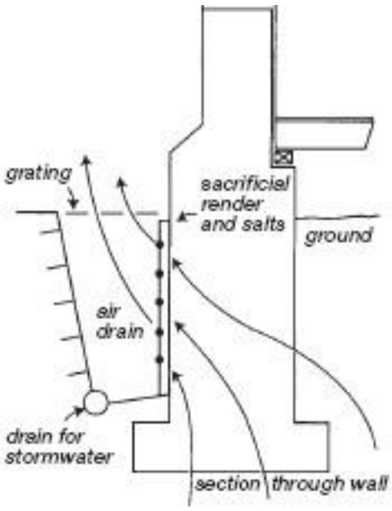

Figure 16: Installation of air drain encourages evaporation of moisture out and away from the masonry wall base (NSW Heritage Office)

4.3 Sub-floor ventilation

Sub-floor ventilation is an essential part of controlling rising damp as it allows moisture in the soil to evaporate from under the floor and to be expelled through air vents in the base of the walls. This also assists in preventing rot in timber floor framing and mould growth internally. Sub-floor vents should be regularly maintained so they are free of debris and other blockages. Ideally, where sub-floor vents are absent, they should be introduced.

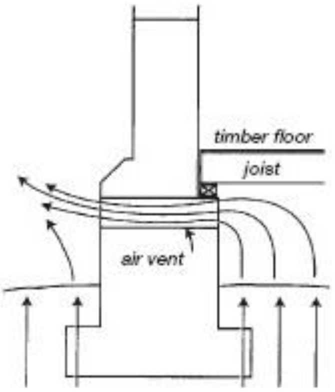

Figure 17: Sub-floor ventilation by use of wall vents (NSW Heritage Office)

4.4 Concrete floors and other paving

A major mistake that renovators make is replacing a ventilated timber floor with a concrete slab on fill. The concrete slab prevents the moisture in the soil from evaporating which forces the moisture to the edges and into the wall bases, causing, or exacerbating existing rising damp.

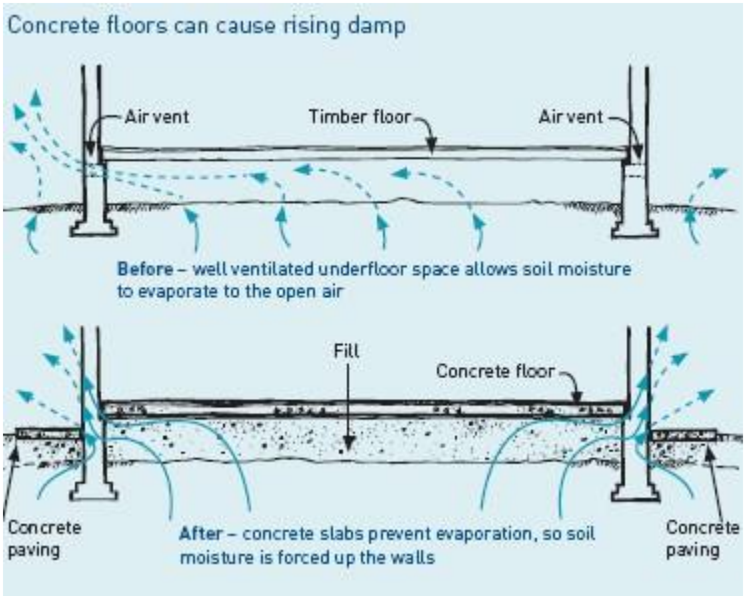

Figure 18: Installation of a concrete floor forces moisture to the base of walls (Heritage Council of NSW)

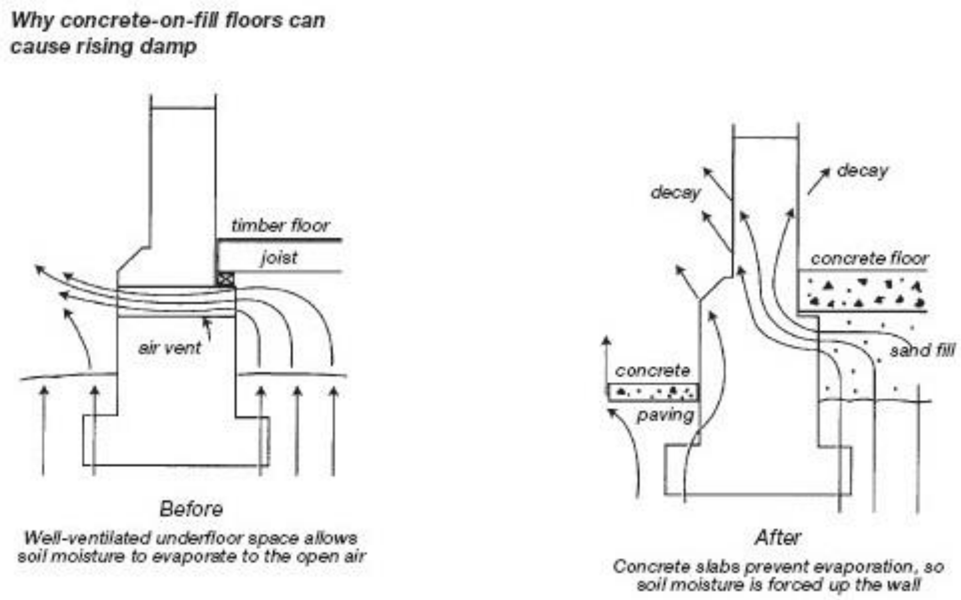

Figure 19: Installation of concrete before and after consequences (NSW Heritage Office)

5 FREE HERITAGE ADVISORY SERVICE

Council's heritage advisor is available by prior arrangement to provide advice about renovation and maintenance of heritage listed buildings and structures in the Hawkesbury City Council area, prior to carrying out the works. The service is available to owners and managers of heritage items that are listed in either the Hawkesbury Local Environmental Plan or the NSW State Heritage register**,** and the initial consultation is free. The consultation will generally take place on site.

References

NSW Heritage Office, *Information Sheet 2.1, Rising Damp*

David Young for: Heritage Council of NSW, *Salt attack and rising damp, A guide to salt damp in historic and older buildings*